INSTITUT PASTEUR - PARIS

CALL FOR APPLICANTS & UNDERGRADUATE INTERNSHIP PROGRAM FOR SUMMER 2015

APPLICATION PACKET
Sponsored by the Pasteur Foundation • www.pasteurfoundation.org

Complete application, including letters of recommendation (2), must be postmarked by FRIDAY, FEBRUARY 20, 2015.

Founded in 1887 by Louis Pasteur and located in the heart of Paris, the Institut Pasteur is one of the world’s leading biomedical research organizations. With more than 130 laboratories and 2,600 people on campus, it is a vibrant, international community devoted to basic scientific research.

The Pasteur Foundation US sponsors a 10-week summer program for U.S. undergraduates to conduct research in a Paris-based Institut Pasteur lab. The goal is to encourage students to pursue a scientific career and to expose them to an international laboratory experience. For a list of the laboratories participating in Summer 2015, please see page 2.

This application form and answers to Frequently Asked Questions are available on our website: www.pasteurfoundation.org.

Interns will carry out research supervised by a lab mentor, write a work report and give an oral presentation. Applicants should be eager to immerse themselves in a robust scientific culture, and self-sufficient in arranging travel and securing housing in Paris. Pasteur-sponsored housing may be available but is not guaranteed. Interns will receive the equivalent of a living allowance of $6,500. Travel, requisite insurance, and associated costs are the sole responsibility of the intern.

Eligibility: Applicants MUST 1) be US citizens (not permanent residents), 2) be currently enrolled undergraduates with a demonstrated interest in biosciences and biomedical research (prior lab experience is highly recommended) with excellent academic records; 3) have completed three full years (i.e. six semesters) of college course work by the time the internship commences (i.e. be a rising senior); and 4) will not have received an undergraduate degree by the time of the internship. While not required, knowledge of French or desire to learn French will enhance the experience.

Dates: See lab descriptions for possible dates; exact start/end dates of the 10-week period will be arranged upon candidates’ program acceptance and in accordance with the sponsoring lab.

Applicants will be notified prior to March 20, 2015.
Awardees will be obligated to accept or decline by March 31, 2015.
SUMMER 2015 HOST LABORATORIES:
PASTEUR FOUNDATION INTERNSHIPS

Rank the following labs in order of preference on your cover sheet and on Application Form 1.

Name of Laboratory: Biology and Genetics of the Bacterial Cell Wall
Laboratory Head: Ivo G. Boneca
Internship Overseer (daily mentor): Ivo G. Boneca and Joel Berry
Helicobacter pylori is a human-specific pathogen responsible for severe gastric pathologies such as ulcers and gastric adenocarcinomas. H. pylori is characterized by its natural ability to acquire DNA. It uses natural transformation to evolve to its changing environment along its host lifespan and to repair constant DNA damage due to the chronic inflammation induced by its presence in the stomach. Despite its natural transformation, the molecular biology tools are rather limited in H. pylori with few resistance markers available to generate mutants and introduce define modifications of its genome. In particular, tools to introduce markerless mutations into H. pylori genome have been hampered by the lack of good counter-selective markers. The objective of this project is to develop and optimize the CRIPR genome-editing tool for H. pylori to allow simultaneous editing of multiple loci without the use of resistance markers.

Internship in this lab may be scheduled for 10 weeks between June 1 and September 30, 2015.

Name of Laboratory: Insect-Virus Interactions
Laboratory Head: Dr. Louis Lambrechts
Internship Overseer (daily mentor): Dr. Laura Dickson
This research group investigates the complex interplay between host genetics, viral genetics, microbiota and other environmental factors governing natural variation in the ability of Aedes aegypti mosquitoes to support transmission of dengue viruses. Dengue is the most rapidly expanding, globally dominant arthropod-borne (arbo) viral disease of humans. A major emphasis of the group is to bridge the gap between field-based research and experimental systems in the laboratory. The group uses a combination of approaches and concepts ranging from ecology, population and functional genomics, quantitative genetics to molecular biology. The summer intern will join a project on symbiotic bacteria colonizing the midguts of Aedes aegypti mosquitoes in relation with their ecological habitat in sub-Saharan Africa. The proposed methodology includes bacterial metagenomics, basic microbiology and functional assays in vivo. Ultimately, the project aims at understanding the influence of symbiotic bacteria on the vectorial capacity of mosquitoes for arboviruses of public health significance.

Internship in this lab may be scheduled between June 8 and August 29, 2015.

Name of Laboratory: Molecular Retrovirology Unit (MRU)
Laboratory Head: Simon Wain-Hobson
Internship Overseer: Rodolphe Suspène
The research will revolve around a group of endogenous human DNA mutator enzymes, notably APOBEC3A and APOBEC3B. Cancer genomes exhibit large numbers of mutations, anywhere from 2-300K and large numbers or rearrangements. The source of many of these mutations and rearrangements is APOBEC3A which is massively up-regulated by type I and II interferons. This is important, for chronic inflammation underlies many cancers – notably persistent HBV, HCV and Helicobacter pylori infections. In as little as 4 years, it is not accepted that these enzymes are as important to cancer as UV light and benze[a]pyrenes in cigarette smoke. Deletion of APOBEC3B, a natural polymorphism which is highly prevalent in East Asia predisposes individuals to an increased risk of breast, ovarian and liver cancer, and probably all cancers. This seemed counter intuitive. The MRU worked out the mechanism – deletion stabilizes APOBEC3A mRNA meaning that intracellular levels of the APOBEC3A mutator enzyme were increased. More than ever, cancer is seen as a mutation/selection process in the soma, with the mutagen being inside the cell. The working hypothesis is that very different chronic stimuli converge on a common mutagen – APOBEC3A. The work will explore transcriptional control of the APOBEC3A gene as well as working out (at a single-cell level) the amount of genetic damage these enzymes can perform. Techniques will be molecular and cell biology as well as those of modern genomics.

Internship in this lab may be scheduled between May 1 and August 14, 2015.
**Name of Laboratory: Biology of Gram-positive pathogens**  
*Laboratory Head: Professor Patrick Trieu-Cuot*  
*Internship Overseer: Shaynoor Dramsi*

**Summer Internship 2015 Project:** Characterization of GBS adhesion to human colonic mucus

This Unit uses genetic methods to study the molecular bases of commensalism/ virulence of Streptococcus agalactiae (also known as Group B Streptococcus or GBS). GBS is the foremost cause of severe infections in newborns. It is a common colonizer of the gastro-intestinal and urogenital tracts of up to 30% of healthy individuals. However, in certain undefined circumstances, GBS can become a life-threatening pathogen. In about 80% of cases, neonatal GBS infection is acquired during delivery by direct mother-to-baby transmission through the oral or respiratory way. The development of GBS disease requires successful bacterial colonization of the vaginal/digestive epithelium, translocation across placental or epithelial barriers, resistance to immune clearance in bloodstream and, in cases of meningitis, the ability to breach the endothelial blood–brain barrier. In this proposal, we aim to identify the surface components that are necessary for the colonization of human colon and in particular for binding to colonic mucus. This project will begin with the testing of several GBS clinical strains for their ability to bind to human mucus. Next, we will screen a bank of mutants already available in the laboratory (5,000) on colonic mucus purified from the HT29-MTX cells using crystal violet staining on 96 wells plates. The mutants altered in mucus binding will be further characterized by sequencing the transposon insertion sites and complementation studies will be performed to confirm the role of the proteins potentially involved in adhesion to the colon. The mutants displaying reduced or increased binding to the human mucus will be tested for adhesion/invasion on HT29-MTX cells using immunofluorescence microscopy.

**Internship in this lab may be scheduled between May 15 and July 31, 2014.**

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**Name of Laboratory: Bioimage Analysis Unit**  
*Web site: www.bioimageanalysis.org*  
*Laboratory Head: Prof. Jean-Christophe Olivo-Marin*  
*Internship Overseer (daily mentor): Dr Thibault Lagache*

Analyzing the molecular orchestration of cellular processes is mostly achieved by the quantitative analysis of the spatial coupling between molecules labeled with different colors in fluorescence imaging. Standard methods to analyze molecule coupling are based on correlation analysis of the overlap between molecule spots with different colors. However, correlation methods are not well-suited for super resolution microscopy where spot sizes are drastically reduced. Thus, we are developing new object based methods that detect the positions of molecule spots, and analyze statistically their spatial distribution. The goal of this internship will be to extend these methods to localization based microscopy like PALM and STORM. This project is in close collaboration with a neuroscience team and aims at deciphering the single molecule organization of dendrites and synapses in super resolution microscopy.

**Internship in this lab may be scheduled between June 1 and August 14 (or earlier), OR between July 1 and September 11 (or earlier), 2015.**

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**Name of Laboratory: Stem Cells & Development**  
*Laboratory Head: Prof. Shahragim Tajbakhsh*  
*Internship Overseer (daily mentor): Prof. Tajbakhsh, Brendan Evano*

Research in the Tajbakhsh lab focuses on identifying and characterising skeletal muscle stem cells. The aim of the laboratory is to characterise stem cells and their daughters during embryonic and postnatal development of skeletal muscle to understand how this tissue is established, and how it regenerates during disease, and after injury. We are investigating how stem and progenitor cells self-renew, essentially via symmetric vs. asymmetric cell divisions, and how the stem cell niche is defined. The project will focus on generating and testing tools that will allow the manipulation of muscle stem cell properties using CrispR/Cas9 technology to manipulate Pax7 (muscle stem cell regulator) and to insert fusion proteins under the regulation of its endogenous locus. This will be done in ES cells, and myogenic differentiation in vitro will allow testing of the various fusion constructs. This will also be done in primary adult myogenic cells to allow the monitoring of stem cell alterations directly. Fusion proteins include fluorescent markers and tetracycline inducible altered transcription factor function to assess self-renewal and differentiation dynamics in living cells.

**Internships of 10 weeks will starting during the month of June and end in August 2015.**
PASTEUR FOUNDATION INTERNSHIP APPLICATION CHECKLIST

DEADLINES

A Note to Applicants: due to extremely limited staff resources, we may appear to be rigid on these deadlines. We apologize for this. The internship program has had a tremendous response, and we want to give ample time to the review of all applications. Therefore, we ask your understanding and your compliance. Please do not ask us to make exceptions as we are unable to do so. Please make your recommenders aware.

The completed application and two recommendations (included in application packet or mailed directly) must be postmarked by February 20, 2015. Applications postmarked after this date and incomplete applications will not be considered.

This application form and answers to Frequently Asked Questions are available on our website: www.pasteurfoundation.org.

Application Checklist: Application Packet + (2) Letters of Recommendation:

Send the items below to:
Pasteur Foundation, 420 Lexington Avenue, Suite 1654, New York, NY 10170.
Please do not bind materials in any way.

☑ A cover sheet with your name, the names of your two evaluators with their email addresses, and a list indicating the laboratories in which you would like to work, in order of preference.

☑ Two recommendation forms and letters (see “Recommendation Form”) Letters must be sealed and signed across the seal by the evaluator, if included in the application packet. If mailed directly, the February 20 deadline still applies. Letters may be written by professors, lab mentors, academic advisors or supervisors of your scientific work. Scientific recommenders are preferred when possible. No more than 2 letters will be considered.

☑ The completed, signed form “Application Part 1”

☑ Responses to personal statements/questions “Application Part 2”

☑ A résumé not to exceed one page, including any lab-related experience, achievements and awards.

☑ Official transcript for all undergraduate work completed.
Applicant’s Last Name

Pasteur Foundation Summer Internship 2015: Application Part 1

Name:____________________________________________________________________________________________

School:__________________________________________________________________________________________

Major(s):________________________________________________________________________________________

Are you a Junior? (circle one):    Yes       No

Degree Sought:_________________________ Expected Graduation Date: _______________________________

Home Address: ____________________________________________

City: _________________ State: ______________ Zip: _________

Home/Cell Telephone: (  ) _______________ Email:__________________________________________________________________________________________

Birthdate: _________________

Circle: Male    Female

Cumulative GPA: ______

Please list your recommenders:

Recommender 1 Name:_________________________ Email:

Recommender 2 Name:_________________________ Email:

Have you worked in a laboratory independently outside your coursework? YES    NO (circle one)

(Please note that independent work is not required but is recommended. See Part II to elaborate.)

Do you plan to pursue a graduate degree? If so, what degree: ________________________________

Do you speak/write French?

⇒ Speak: YES    NO

⇒ Write: YES    NO

(Please note that French is not required for this program. See Part II to elaborate.)

Please list Lab Head of host laboratories (Boneca, Lambrechts, Wain-Hobson, Trieu-Cuot, Olivo-Marin) in order of your preference:

1. __________

2. __________

3. __________

4. __________

5. __________

⇒ Are you available for the time periods indicated for each lab? YES    NO

⇒ If not, what is your exact availability (must be at least 10 weeks but more if possible)?
If you are strictly interested in a certain project in a lab/labs and do not wish to be considered for other labs, please specify here, otherwise we will assume you are willing to work in all labs for which your availability is compatible:

Please list all scientific coursework (courses and labs) done in college and grades received.
To indicate courses in progress for which a grade has not been received, use an asterisk (*). Please attach an additional page if you require more room.

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I hereby certify that I am a **U.S. citizen** and the information provided herein is accurate and truthful.

Signed: ___________________________ Date: ________________, 2015
Pasteur Foundation Summer Internship 2015: Application Part 2

Please attach responses to the following questions.

1. Please indicate whether you have:
   ➤ Hands-on lab class experience: YES  NO  (circle one)
   ➤ Independent lab research experience: YES  NO  (circle one)

   Brief description of both (200 words max.):

2. What are your current careers goals?
   If you already know that you will continue on a scientific path, what fields are of specific interest to you and why? (200 words max.)

3. What do you hope to learn from a Pasteur Foundation Summer Internship, and how does it fit in to your educational and career goals? (200 words max.)

4. What is your most developed non-academic interest? (150 words max.)

5. French level: Please provide a very brief description of your French language skills (both written and spoken). Knowledge of French is not required but some basic French would improve the quality of your stay. (50 words max.)
Recommendation Form
Summer Internship 2015

Student Applicant’s Name: _________________________________

Instructions for Evaluators: PLEASE COMPLETE THIS FORM AND ATTACH A 1-PAGE LETTER OF RECOMMENDATION. The letter and this form must be either included in the applicant’s packet (with your signature over your envelop’s seal) or mailed directly to: Pasteur Foundation, 420 Lexington Ave., Suite 1654, New York, NY 10170 Postmark deadline: February 20, 2015.

EVALUATOR’S NAME: ____________________________
Institution: ______________________________________
Title: __________________________________________
Telephone: ____________________________ E-mail: __________________________

APPLICANT’S NAME:

How long have you known the applicant?: __________________________

In what capacity?: __________________________

PART I
Please evaluate the student by assigning a number on the following scale:

X=Cannot Evaluate; 1=Below average; 2=Average; 3=Above average; 4=Exceptional

Intellectual level = __________________________
Scientific Level = __________________________
Lab Skills = __________________________

Originality of thought = __________________________
Motivation = __________________________
Maturity = __________________________

Rapport with Peers = __________________________
Rapport with Faculty or Lab Mentor = __________________________

PART II
Please write an evaluation of the applicant not to exceed one page. Within the evaluation, please discuss (if you are able) the applicant’s competence in the laboratory, how s/he compares to other students you have mentored (what percentile would you place the candidate in?) and how s/he might react to an international laboratory experience. We appreciate your candor since an international experience presents particular challenges.

Evaluator’s signature ____________________________ Date: ____________