



COLUMBIA | ALLIANCE

COLUMBIA UNIVERSITY | ÉCOLE POLYTECHNIQUE
SCIENCES PO | PANTHÉON-SORBONNE UNIVERSITY.

Research Internship at Columbia University Academic year 2019 – 2020

Deadline: December 6, 2019

Created in 2002, the [Alliance Program](#) is an innovative joint-venture between Columbia University, the École Polytechnique, Sciences Po, and Paris 1 Panthéon-Sorbonne University. Every year, Columbia University offers a number of student internships in scientific disciplines, which are open to École Polytechnique students. The process for applying to these internships is outlined below.

Please note we advise students to be proactive in their research for an internship. Some Columbia University Research groups are listed below.

Please reach out to the research group or faculty member with a CV, Cover letter and letter of recommendation from a faculty advisor. Some departments have specific requirements; please refer to their application process.

Internship Description

- Students work with a faculty member, who acts as an academic advisor and supervises their research project.
Internships start in March 2020. The duration, objectives and tasks of the internship must be discussed with the supervisor at the host center or department.
- Internships are not paid. ***If compensated, it will be specified in the offer.***
- ***Students are responsible for finding housing.***
- ***All students are required to apply for a J1 Student Intern Visa to conduct an internship in the United States. Please note that \$500 fees are required by Columbia University to process the visa. If visa fees are sponsored by the host department, it will be indicated in the offer.***

Applications requirements

- Applicants must include a CV, a cover letter (1 page), and a letter of recommendation.
- Students should send their application to the Alliance Program to: alliance@columbia.edu
- To protect confidentiality, faculty members should send the letter of recommendation directly to:
alliance@columbia.edu
- **All materials must be submitted in English.**



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DEPARTMENT OF NEUROSCIENCE

1. Faculty Sponsor:

Rudy Behnia, Assistant Professor of Neuroscience
<http://behnialab.neuroscience.columbia.edu/>

2. Number of interns:

One (1) or Two (2) students.

3. Type of support available:

- ✓ Stipend
- ✓ Access to campus services and facilities
- ✓ Immigration and visa assistance/sponsor
- ✓ Will assist in finding accommodation

4. Internship Title:

Investigating color circuits in behaving *Drosophila melanogaster*

5. Description:

How are colors encoded in the brain? Despite decades of research, this question remains unanswered. My lab is interested in deciphering the neural computations underlying color vision by exploiting the genetic toolkit of *Drosophila* to ask how spectral information from photoreceptors in the eye is combined to encode colors in the brain. We use electrophysiological recordings, 2-photon activity imaging in live animals in response to visual stimuli as well and behavioral assays to characterize the role of specific neurons in color encoding. The intern will be involved in the process of setting up an advanced visual stimulus system for color vision to be used in combination with imaging methods, with the aim of monitoring neural activity during behavior.

6. Skills:

Coding (Matlab and/or Python) and quantitative methods, optical/mechanical/electrical engineering background encouraged but not necessary.

7. Additional Information:

For those interested in computational/theoretical neuroscience, we have a close collaboration with the Center for Theoretical Neuroscience at Columbia University.



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PEDIATRIC HEART VALVE RESEARCH LABORATORY – CUIMC AND SCHOOL OF ENGINEERING

1. Faculty Sponsor:

David Kalfa, MD, PhD,

Assistant Professor of Surgery, Section of Pediatric & Congenital Cardiac Surgery

Director, Pediatric Heart Valve Center

Director, Pediatric Heart Valve Research Laboratory

Columbia University College of Physicians and Surgeons

New York-Presbyterian Morgan Stanley Children's Hospital

<https://columbiasurgery.org/research/kalfa-lab>

<https://columbiasurgery.org/news/2017/03/08/heart-growth-project-innovative-approach-congenital-heart-disease>

2. Number of interns:

Two (2)

3. Type of support available:

- ✓ Stipend
- ✓ Access to campus services and facilities
- ✓ Immigration and visa assistance/sponsor

4. Internship Title:

Pediatric Heart Valve Research Laboratory

5. Description:

- Development of innovative heart valve medical devices with a potential for growth or expansion, based on mechanical engineered and tissue engineered concepts,
- Development of biomimetic smart materials mimicking the highly organized heart valve tissue.
- Computational modeling projects
- Robotics VAD project

We welcome applicants with different backgrounds. Main preferred expertise would be either in Mechanical Engineering or in Polymer Science or computational modeling



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6. Skills:

Preferred additional expertise/methods/skills can include:

- ✓ Previous experience in Medical device or biomaterial development
- ✓ Biomechanics and biomechanical testing
- ✓ Numerical simulation of fluid dynamics and/or tissue mechanics
- ✓ Computational modeling
- ✓ 3D CAD designing (Solidworks or other softwares,...)
- ✓ Fabrication/microfabrication methods (dip molding, injection molding, stereolithography, electrospinning, stereolithography,...)
- ✓ Characterization of biodegradable and non-biodegradable elastomeric/viscoelastic polymer including GPC, NMR, DSC, WAXS
- ✓ Biology methods (cell culture, immunohistochemistry, PCR,..)

7. Additional Information:

Interns will be working on two sites: medical campus and Morningside campus and will collaborate with engineers and surgeons.



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CENTER FOR SCIENCE AND SOCIETY – DEPARTMENT OF HISTORY

1. Faculty Sponsor:

Pamela H. Smith, Department of History

<https://history.columbia.edu/faculty/smith-pamela-h/>

2. Number of interns:

One (1)

3. Type of support available:

- ✓ Access to campus services and facilities
- ✓ Immigration and visa assistance

4. Internship Title:

Innovative interfaces and infrastructure for historians of art and science: constructing a digital scholarly edition of a sixteenth-century French manuscript

5. Description:

The intern will join the active research of the Making and Knowing Project team to carry out original research, working closely with Project Digital Lead, Assistant Director, and postdoctoral researchers. As part of an interdisciplinary and collaborative project, the intern will learn to manage discipline- and domain-specific priorities, knowledge, and working methods. At the start of the internship, the Project's Edition will have just recently had its first (and likely second or third) public releases and will be preparing for additional releases or extensions, as well as the launch of the Research and Pedagogy Template. The intern will work with the team to develop an independent research program that considers the Project's needs, user experience of the Edition and future Template, and the intern's own interests and experience. Particular focus will be on experimentation with and development of innovative, interactive, and analytic interfaces to Project data. These could include textual analysis and visualizations using tools such as Jupyter Notebook, Voyant, and GIS; and techniques such as natural language processing, text mining, and machine learning. As an active and evolving project in the digital humanities, the Project also explores methods and solutions not just for front-end interfaces but also for innovative and sustainable infrastructures. The intern will be tasked with considering the underlying support for such exploration or, alternatively, focus on the development or optimization of infrastructure. For example, projects may concentrate on data management, archiving, and data migration.



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In line with the Project's larger philosophy and methodology, the intern's research project will serve to provide both additional scholarly insights as well as pedagogical tools to engage users, students, and researchers from varied disciplines. The intern will gain experience in active research, in developing and overseeing an independent research program, in working with a wide range of disciplines, and in exploring and developing interfaces and infrastructures that serve both scholarly and pedagogical aim.


6. Skills:

- Programming/scripting languages (Python, Ruby, Java, C++)
- Linux command line utilities
- Familiarity with web development (HTML5, CSS, JavaScript)
- Desirable experiences:
 - Cloud infrastructure tools (AWS, Google Cloud, Docker, etc.)
 - Version control systems, especially git
 - Third-party REST APIs, especially OAuth and the Google Drive API
 - Advanced text manipulation and transforms, including regular expressions
 - Natural language processing, text mining, machine learning

COLUMBIA UNIVERSITY RESEARCH GROUPS

Please find below a list of some Columbia University Research Groups and Centers.

- ***Please note this list is not exhaustive and only includes some Departments that you might be interested in.***
- If you need to find the address email of a faculty/contact at Columbia University, please go to <https://www.columbia.edu/>
- On the top of the page, please type the name of the person and you will access his exact department and contact information



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| COLUMBIA ENGINEERING Research Involvement Program Research Areas | |
|---|---|
| APPLIED PHYSICS AND APPLIED MATHEMATICS | |
| Applied Physics | Research Groups |
| Applied Mathematics | Research Groups & Centers |
| Materials Science and Engineering | Research Groups |
| BIOMEDICAL ENGINEERING | |
| Cell and Tissue | Research Groups |
| Biosignals and Biomedical Imaging | Research Groups |
| Biomechanics | Research Groups |
| Neuroengineering | Research Groups |
| CHEMICAL ENGINEERING | |
| Research Experience for Undergraduates (REU) | Research Groups |
| Columbia Electrochemical Energy Center | Research Groups |
| Interdisciplinary Centers | Research Groups |
| CIVIL ENGINEERING AND ENGINEERING MECHANICS | |
| Transportation Engineering | Research Groups |
| Multi-Hazard Risk Assessment and Mitigation | Research Groups |
| Computational Mechanics | Research Groups |
| Advanced Materials | Research Groups |
| Fluid Mechanics | Research Groups |
| Geotechnical Engineering | Research Groups |
| Safety and Reliability | Research Groups |
| COMPUTER SCIENCE | |
| Theory | Research Groups |
| Graphics & User Interfaces | Research Groups |
| NLP & Speech | Research Groups |
| Security & Privacy | Research Groups |
| Computational Biology | Research Groups |
| Software Systems | Research Groups |
| Computer Engineering | Research Groups |
| Networking | Research Groups |
| Vision & Robotics | Research Groups |
| Machine Learning | Research Groups |



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| EARTH AND ENVIRONMENTAL ENGINEERING | |
|---|--|
| Sustainable Energy – Sustainable Water – Sustainable Materials and Mining | Research Groups |
| Research Opportunities for Students | Research Groups |
| ELECTRICAL ENGINEERING | |
| Signals, Information and Data | Research Groups |
| Networking and Communications | Research Groups |
| Nanoscale Structures and Integrated Devices | Research Groups |
| Systems Biology and Neuroengineering | Research Groups |
| Integrated Circuits and Systems | Research Groups |
| Smart Electric Energy | Research Groups |
| Centers and Projects | List |
| INDUSTRIAL ENGINEERING & OPERATIONS RESEARCH | |
| Optimization | Research Centers |
| Stochastic modeling and Simulation | Research centers |
| Financial Engineering & Risk Management | Research Centers |
| Operations | Affiliated Labs |
| MECHANICAL ENGINEERING | |
| Biomechanics and Mechanics of Materials | Research Labs |
| Control, Robotics, Design, and Manufacturing | Research Labs |
| Energy, Fluid Mechanics, and Heat/Mass Transfer | Research Labs |
| MEMS and Nanotechnology | Research Labs and Groups |
| Biological Engineering and Biotechnology | Research Labs and Groups |



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| OTHER DEPARTMENTS AND SCHOOLS | |
|---|---|
| BIOLOGICAL SCIENCES | |
| Cell & Molecular Biology Chemical Biology Computational Biology Developmental Biology Evolutionary Biology Genetics & Genomics Microbiology Neurobiology Structure and Biophysics | Research Groups Undergraduate Research at Barnard |
| CHEMISTRY | |
| Biological Experimental Physical Inorganic Materials Organic Theoretical | Research Groups Interdepartmental Research Centers |
| PHYSICS | |
| Astrophysics, Gravitational Wave Physics and Cosmology Biology and Physics Condensed Matter and Atomic, Molecular and Optical Physics High Energy Nuclear and Particle Physics | Research Groups |



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| BIOMEDICAL INFORMATICS | |
|---|--|
| Clinical Informatics | Faculty |
| Public Health Informatics | |
| Clinical Research Informatics | Research |
| Translational Bioinformatics | |
| Computational Biology | |
| NEUROSCIENCE | |
| Dept. of Neuroscience | Research Area |
| Centers and Institute | |
| | Contacts |
| EARTH INSTITUTE | |
| Research Centers and Programs | Contacts |
| SCHOOL OF INTERNATIONAL AND PUBLIC AFFAIRS | |
| Center for Development Economics and Policy | Contacts and Information |
| Center for Environmental Economics and Policy | Contacts and Information |
| Center on Global Economic Governance | Contacts and Information |
| Center on Global Energy Policy | Contacts and Information |
| Deepak and Neera Raj Center on Indian Economic Policies | Contacts and Information |
| Saltzman Institute of War and Peace Studies (SIWPS) | Contacts and Information |