

# Sixth Annual Interdisciplinary Quantitative Biology Winter Boot Camp

# SINGLE-PARTICLE CRYO-EM

ORGANIZED BY

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## PROGRAM

**January 7 – 11, 2019**

Institute for Quantitative  
Biomedicine (IQB)

Rutgers University | Busch Campus  
Proteomics Building  
174 Frelinghuysen Rd  
GPS Address: 679 Hoes Lane West  
Piscataway, NJ 08854-8076

[iqb.rutgers.edu/bootcamp](http://iqb.rutgers.edu/bootcamp)

## 6<sup>th</sup> Annual Interdisciplinary Quantitative Biology Winter Boot Camp

# SINGLE-PARTICLE CRYO-EM

Cover images sources:  
D. Sirohi *et al.* (2016)  
A. Merk *et al.* (2016)

The Institute for Quantitative Biomedicine, is delighted to be hosting the Sixth Annual Rutgers Interdisciplinary Quantitative Biology Boot Camp. This year's workshop is focused on Single-Particle Cryo-Electron Microscopy (Cryo-EM).

The 2019 immersive one-week Boot Camp has been designed to provide participants with: (1) a fundamental understanding of the cryo-electron microscope and its capabilities and limitations; (2) an overview of sample preparation techniques for single-particle Cryo-EM applications; (3) an introduction to high-throughput data collection workflows; (4) familiarity with the computational approaches and tools used for processing Cryo-EM image data and determining and interpreting three-dimensional structures derived therefrom.

Instruction will take the form of morning lectures on the theory and applications of Cryo-EM, addressing the advantages of this modern form of microscopy, and methods for analyzing and interpreting the data obtained. In addition to the lectures and invited presentations, a broad range of collaborative hands-on afternoon workshops will equip attendees with the skills needed to uncover the three-dimensional structures of complex biological machines.

The Boot Camp would not have been possible without tireless efforts of the many contributors listed pages 8-10 of this Program.

Financial contributions from Angstrom Scientific, Leica, NanoSoft, OHAUS, Thermo Fisher Scientific and Waters Corporation are much appreciated.

**Location:**

All sessions will be held or initiated in **Proteomics, Room 120**

**Laptops:**

Laptop computers are required. See page 11 for software specifications.

**Activity Legend**



Lecture



Lab Demo









Networking Opportunity










Hands-on







**DAY 1**

9:00 AM		<b>Welcome</b> S. David Kimball
9:10 AM		<b>Welcome &amp; Overview</b> Stephen K. Burley and Arek Kulczyk
9:20 AM		<b><i>Cryo-EM Resolution Revolution from the Perspective of the Protein Data Bank</i></b> Stephen K. Burley
10:15 AM		<i>Coffee Break</i>
10:30 AM		<b><i>Structures of Biological Macro-molecules by Single-Particle Cryo-EM: The roots of the “resolution revolution”</i></b> Marin van Heel
11:30 AM		<b><i>Cryo-Electron Microscopy 101: Why, What and How</i></b> Arek Kulczyk
12:30 PM		<i>Lunch &amp; Coffee/Tea</i>
1:30 PM		<b>Practical Session (1 hour)</b>
2:45 PM		<b>Image Processing (Coffee/Tea provided)</b>
4:15-5:00 PM		<b>Poster Session</b>








## DAY 2

9:00 AM		<b><i>A Service Vision on Microscope Setup</i></b> Gijs Janssen
10:00 AM		<i>Coffee Break</i>
10:15 AM		<b><i>Strategies for Large Scale Data Collection and On-the-fly Processing at SEMC</i></b> William Rice
11:00 AM		<b><i>Recent Xmipp/Scipion advances in Image Processing for Single Particle Analysis.</i></b> Carlos Sorzano
11:45 AM		<b>Panel Discussion</b> Led by Stephen K. Burley and Arek Kulczyk Panel members: Marin van Heel, Gijs Janssen, William Rice, and Carlos Sorzano
12:30 PM		<i>Lunch &amp; Coffee/Tea</i>
1:30 PM		<b>Practical Session (1 hour)</b>
2:45 PM		<b>Image Processing (Coffee/Tea provided)</b>
4:15-5:00 PM		<b>Poster Session</b>

## DAY 3

9:00 AM		<b><i>Cryo-Electron Microscopy and Tomography of the E.coli DnaB - phage Lambda P Complex</i></b> David Jeruzalmi
10:00 AM		<i>Coffee Break</i>
10:15 AM		<b><i>Sample Preparation for Cryo-EM and CLEM</i></b> Wei Dai
11:15 AM		<b><i>Microscope Tuning For High Resolution Data Collection</i></b> Sean Mulligan
12:15 AM		<i>Lunch &amp; Coffee/Tea</i>
1:30 PM		<b>Practical Session (1 hour)</b>
2:45 PM		<b>Image Processing</b> ( <i>Coffee/Tea provided</i> )
4:15 - 5:00 PM		<b>Poster Session</b>

## DAY 4

9:00 AM		<b>Challenges and Opportunities for EM Automation</b> Bridget Carragher
10:00 AM		<i>Coffee Break</i>
10:15 AM		<b>Integrated Approach to Membrane Surface Complexes: from NMR to EM</b> Andrew Byrd
11:15 AM		<b>Preserving the Native State</b> Nancy Rizzo
12:15 PM		<i>Lunch &amp; Coffee/Tea</i>
1:30 PM		<b>Practical Session (1 hour)</b>
2:45 PM		<b>Image Processing (Coffee/Tea provided)</b>
4:15-5:00 PM		<b>Poster Session</b>
5:15 PM		<b>Networking at Harvest Moon (Hors d'oeuvres provided)</b> 392 George St, New Brunswick

## DAY 5

9:00 AM



***Cryo-EM: An Imaging Tool Beyond Crystallography***  
Wah Chiu

10:00 AM

*Coffee Break*

10:15 AM



***Cryo-EM Data Resources, Validation and Challenges***  
Cathy Lawson

11:15 AM



***Emerging Cryo-EM methodologies: FIB-SEM***  
Jason Kaelber

12:15 PM

*Lunch & Coffee/Tea*

1:30 PM



**Practical Session (1 hour)**

2:45 PM



**Image Processing (Coffee/Tea provided)**

4:15-

5:00 PM

**Closing remarks**  
Stephen K. Burley and Arek Kulczyk



# Contributors

The organizers would like to extend a special thank you to the Boot Camp contributors:

**Gail Ferstandig Arnold, Ph.D.**

Associate Director, Graduate Studies and Academic Affairs  
Research Professor, Institute for Quantitative Biomedicine  
Rutgers University

**Zhiyong Bai, Ph.D.**

Postdoctoral Associate,  
Institute for Quantitative Biomedicine  
Rutgers University

**Iwona Bizukojc**

Systems Qualification Scientist, Waters Corporation  
Lab Manager, Institute for Quantitative Biomedicine  
Rutgers University

**Stephen K. Burley, M.D., D.Phil.**

Founding Director, Institute for Quantitative Biomedicine  
Director, RCSB Protein Data Bank  
University Professor and Henry Rutgers Chair  
Member, Rutgers Cancer Institute of New Jersey  
Rutgers University

**Andrew Byrd, Ph.D.**

Professor  
Structural Biophysics Laboratory  
Center for Cancer Research  
National Cancer Institute

**Bernadette Cariaga**

Associate Director and Business Manager  
Institute for Quantitative Biomedicine  
Rutgers University

**Bridget Carragher, Ph.D.**

Professor  
Electron Microscopy Co-Director  
New York Structural Biology Center

**Wah Chiu, Ph.D.**

Professor  
Department of Bioengineering  
Stanford University

**Don Corrette**

Building Manager  
Institute for Quantitative Biomedicine  
Rutgers University

**Heineken Queen Daguplo**

Undergraduate Student  
Institute of Quantitative Biomedicine  
Rutgers University



**Wei Dai, Ph.D.**

Assistant Professor, Cell Biology and Neuroscience  
Resident Member, Institute for Quantitative Biomedicine  
Associate II Member, Cancer Metabolism and Growth Program  
Rutgers University

**Kenneth Dalenberg**

Unit Computing Specialist  
Institute for Quantitative Biomedicine  
Rutgers University

**Primit Desai**

Undergraduate Student  
Institute of Quantitative Biomedicine  
Rutgers University

**Donald Gagné, Ph.D.**

Postdoctoral Associate  
Institute of Quantitative Biomedicine  
Rutgers University

**Jonathan Hackett**

Accounting Assistant  
Institute for Quantitative Biomedicine  
Rutgers University

**Marin van Heel, Ph.D.**

Professor  
Laboratório Nacional de Nanotecnologia - LNNano  
CNPEM/LNNano, Campinas, Brazil  
Emeritus Professor of Cryo-EM Data Processing, Leiden University, Netherlands  
Emeritus Professor of Structural Biology, Imperial College London, UK

**Brian Hudson, Ph.D.**

Biocurator, RCSB Protein Data Bank  
Rutgers University

**Gijs Janssen**

Technical Support Engineer  
Thermo Fisher Scientific, Netherlands

**David Jeruzalmi, Ph.D.**

Professor  
Department of Chemistry and Biochemistry  
The City College of New York

**Jason Kaelber, Ph.D.**

Director, Rutgers New Jersey Cryo-EM/Cryo-ET Core Facility  
Assistant Research Professor, Institute for Quantitative Biomedicine  
Rutgers University

**Vlad Kholodovych, Ph.D.**

Staff Scientist,  
Office of Advanced Research Computing  
Rutgers University

# Contributors

**S. David Kimball, Ph.D.**

Interim Senior Vice President, Research & Economic Development  
Vice President, Innovation & Research Commercialization  
Rutgers University

**Xuyan Kuang, Ph.D.**

Postdoctoral Associate  
Institute for Quantitative Biomedicine  
Rutgers University

**Arek Kulczyk, Ph.D.**

Assistant Professor, Biochemistry  
Full Member, Cancer Institute of New Jersey  
Resident Member, Institute for Quantitative Biomedicine  
Rutgers University

**Catherine Lawson, Ph.D.**

Associate Research Professor  
Chemistry and Chemical Biology  
Rutgers University

**Sean Mulligan**

Engineer III, Field Applications  
Thermo Fisher Scientific

**Harry Namkoong**

System Administrator  
Institute for Quantitative Biomedicine  
Rutgers University

**William Rice, Ph.D.**

Electron Microscopy Facility Manager  
New York Structural Biology Center

**Nancy Rizzo**

Application Specialist  
Leica Microsystems

**Michelle Sanghera**

Administrative Coordinator  
Institute for Quantitative Biomedicine  
Rutgers University

**Jan Siess**

Graduate Student  
Institute of Quantitative Biomedicine  
Rutgers University

**Carlos Oscar Sorzano, Ph.D.**

Staff Scientist  
National Center of Biotechnology, Spain

**Maria Voigt**

Senior Outreach Coordinator, RCSB Protein Data Bank  
Rutgers University

## Software

Boot Camp Participants will be using their own laptops. Calculations will be performed on Linux clusters at Rutgers.

Please make sure you have the following software installed PRIOR to the start of Boot Camp:

1. **Web Browser:** current generation of Safari or Google Chrome
2. **UCSF Chimera:** free for academic use; follow download and installation instructions at [www.cgl.ucsf.edu/chimera/download.html](http://www.cgl.ucsf.edu/chimera/download.html)

Recommended items:

1. Power supply cords
2. External mouse (very useful for structural visualization)

## Wi-Fi

### Rutgers affiliates:

Use RUWireless with NetID

### Guests:

Network:

**Proteomics\_Guest**

Password:

**1766Rutgers1997Proteomics**

## Sakai

Sakai access will be set up for all full-time registered participants.

## Parking

### Rutgers students, staff, and faculty:

Park according to your permit.

### Visitors:

Park in Busch **Lots A & B** located at 679 Hoes Lane West (see map on the back cover).

Visitors must register their vehicles to park on campus at [bit.ly/2LdTDGA](http://bit.ly/2LdTDGA)

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## Questions?

Registration and logistics:

[bootcamp@iqb.rutgers.edu](mailto:bootcamp@iqb.rutgers.edu)

The program:

[arek.kulczyk@rutgers.edu](mailto:arek.kulczyk@rutgers.edu)

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**Rutgers Busch  
Campus Map**

**Bus Stop  
A, B, H,**

**Bus Stop  
A, B, C, H,  
REXB**

**Bus Stop  
A, B, C, H,  
REXB**

**Boot Camp  
Visitor Parking**  
679 Hoes Lane West

**Lot B**

**Lot A**

