

FY2013 Annual Report

Molecular Cryo-Electron Microscopy Unit

Assistant Professor Matthias Wolf



Abstract

The unit has expanded with the addition of a third postdoctoral researcher (Dr. Sugita), whose focus lies on molecular virology. At the same time, collaborations and a joint research grant have been established with the Institute of Medical Science, University of Tokyo (IMSUT). Dr. Yang was able to secure a Kakenhi grant for his *Drosophila* brain research. We have steadily worked on improving the local EM-related compute infrastructure. Dr. Meshcheryakov is a crystallographer by training with interest in archeal bacterial motor proteins.

1. Staff

- Dr. Matthias Wolf, Professor
- Dr. Shun-Yen Yang, Researcher
- Dr. Vladimir A. Meshcheryakov, Researcher
- Dr. Yukihiro Sugita, Researcher
- Rika Yoshizawa, Research Administrator

Past members:

- Irina Reshodko, rotation student
- Zak Kulberg, rotation student
- Lee James O’Riordan, rotation student
- Alina Aseeva, summer intern student
- Kikuko Matsuo, Administrative Assistant
- Yoko Fujitomi, Administrative Assistant

2. Collaborations

Theme: Structure of Poliovirus isoforms

- Type of collaboration: Joint research
- Researchers:
 - Professor James M. Hogle, Harvard Medical School, Boston, MA, USA

Theme: Structure of Papilloma- and Polyomaviruses

- Type of collaboration: Joint research
- Researchers:
 - Professor Robert L. Garcea, University of Colorado at Boulder, Bio Frontiers Institute, USA

Theme: Structural and Functional Aspects of Herpes Simplex Virus

- Type of collaboration: Joint research
- Researchers:
 - Professor Yasushi Kawaguchi, Institute of Medical Science, University of Tokyo (IMSUT), Japan

Theme: Structure of Rosettasome Variants and Sulfolobus Cell Morphology

- Type of collaboration: Joint research
- Researchers:
 - Professor Jonathan Trent, NASA Ames Research Center, Mountain View, CA, USA

Theme: 30S Ribosome – Methyltransferase Complex

- Type of collaboration: Joint research

- Researchers:
 - Professor Petr Sergiev, Belozersky Institute, Moscow State University, Russian Federation

Theme: Novel Method for Subvolume Averaging in Electron Tomography

- Type of collaboration: Joint research
- Researchers:
 - Dr. Mike Strauss, Harvard Medical School, Boston, MA, USA
 - Dr. Mihnea Bostina, OCEM, University of Otago, Dunedin, New Zealand

Theme: Common data validation for x-ray crystallography and EM

- Type of collaboration: Joint research
- Researchers:
 - Assistant Professor, Kevin D. Corbett, UC San Diego Dept. of Cellular and Molecular Medicine, Ludwig Institute for Cancer Research, San Diego branch, USA

Project: Ion Channel Structure:

- Researcher: Dr. Vladimir Meshcheryakov

Project: Structure of Flagellar Proteins in Thermophiles

- Researcher: Dr. Vladimir Meshcheryakov

Project: Novel Methods for Determining Drosophila Brain Structure

- Researcher: Dr. Shun-Jen Yang
- Techniques: SEM, Correlative Light- and EM (CLEM), High Pressure Freezing

Project: Structure of Ebolavirus VLP and Nucleocapsid

- Type of collaboration: Joint research
- Researchers:
 - Dr. Yukihiko Sugita
 - Prof. Takeshi Noda, Prof. Yoshihiro Kawaoka, IMSUT, Japan; University of Wisconsin-Madison, USA
- Techniques: cryo-EM

Project: Structure of Influenzavirus RNPs

- Type of collaboration: Joint research
- Researchers:
 - Dr. Yukihiro Sugita
 - Prof. Takeshi Noda, Prof. Yoshihiro Kawaoka, IMSUT, Japan; University of Wisconsin-Madison, USA
- Techniques: cryo-EM, CLEM

OIST-internal collaborations:

- Prof. Y.Qi: novel TEM specimen support
- Prof. K.Dani: in-situ clonable contrast for Serial Blockface SEM

3. Activities and Findings

Nothing to report

4. Publications

4.1 Journals

Meshcheryakov VA, Yoon YH, Matsunami H, Wolf M, Purification, crystallization and preliminary X-ray crystallographic analysis of the flagellar accessory protein FlaH from methanogenic archaeon *Methanocaldococcus jannaschii*, *Acta Cryst Sec F*, *in press*

4.2 Books and Other One-Time Publications

Nothing to report

4.3 Oral and Poster Presentations

- Shionogi Pharma, Osaka, 4 Oct 2013, Molecular Structure from Images - Single Particle Cryo-EM in a Nutshell
- East Asia Joint Symposium Osaka, Nov 2013, A Mechanism for Poliovirus Uncoating from Cryo-EM Structures
- OIST xRyudai: OIST, 4 Dec 2013, Cryo-Electron Microscopy of Macromolecules
- Keystone Conference Frontiers of Structural Biology, March 30 - April 4, 2014, Utah, USA

5. Intellectual Property Rights and Other Specific Achievements

Nothing to report

6. Meetings and Events

6.1 Research Visit

- TSRI, Anchi Cheng, Bridget Carrhager, LEGINON operation and installation, March 25, 2014
- Harvard Medical School. Prof. James Hogle, 80S Poliovirus Structure, Sep 4, 2013
- Harvard University, Prof. Andres Leschziner, LEGINON, Sep 3, 2013
- Brandeis University, Prof. Daniela Nicastro, CLEM, Sep 5, 2013
- Brandeis University, Dr. Chen Xu, SerialEM, Sep 5, 2013

6.6 Invited Seminar Speakers

- Dr. Yong Yu Kim
Title: The understanding of visual signal transduction from X-ray structure analysis of a protein.
Date: Feb 4, 2014, Lab1/C15
- Prof. David J DeRosier
Title: High resolution electron microscopy of biological structures: How we got here, where we are, and where we're going.
Date: Jan 30, 2014, C209
- Dr. Yukihiro Sugita
Title: Morphogenesis of Influenza Virus Particle
Date: Jan 9, 2014, Lab1/C15
- Dr. Alan Maigne
Title: EELS Spectroscopy and FTEM
Date: Oct 30/31, 2013, Lab2/C, Lab1/B460
- Dr. Mike Strauss
Title: Chromatin structure and bioenergetics at the nanometer level
Date: Nov 26, 2013, Lab1/C15

7. Others

Nothing to report