

Electron Crystallography Workshop at UC Davis, September 7-13, 2008

Organization:

Bryant Gipson (BRGipson@ucdavis.edu)

Scientific Organization:

Ben Hankamer (B.Hankamer@imb.uq.edu.au)

Tom Walz (Thomas_Walz@hms.harvard.edu)

Henning Stahlberg (HStahlberg@ucdavis.edu)

Web Site:

<http://2dx.org/workshop/2008>

Emergency Phone Numbers:

Henning Stahlberg: +1 (530) 574 0835 (mobile)

Seminars:

1022 Life Sciences, University of California, Davis, CA 95616

Practicals:

WetLab: 11 Briggs Hall, UC Davis (Phone: (530) 754 8285)

TEMs: 29 Briggs Hall, UC Davis (Phone: (530) 754 8338)

Computing: 148 Briggs Hall, UC Davis

Sponsors:



National Science Foundation
DIRECTORATE FOR
Biological Sciences (BIO)



UC DAVIS
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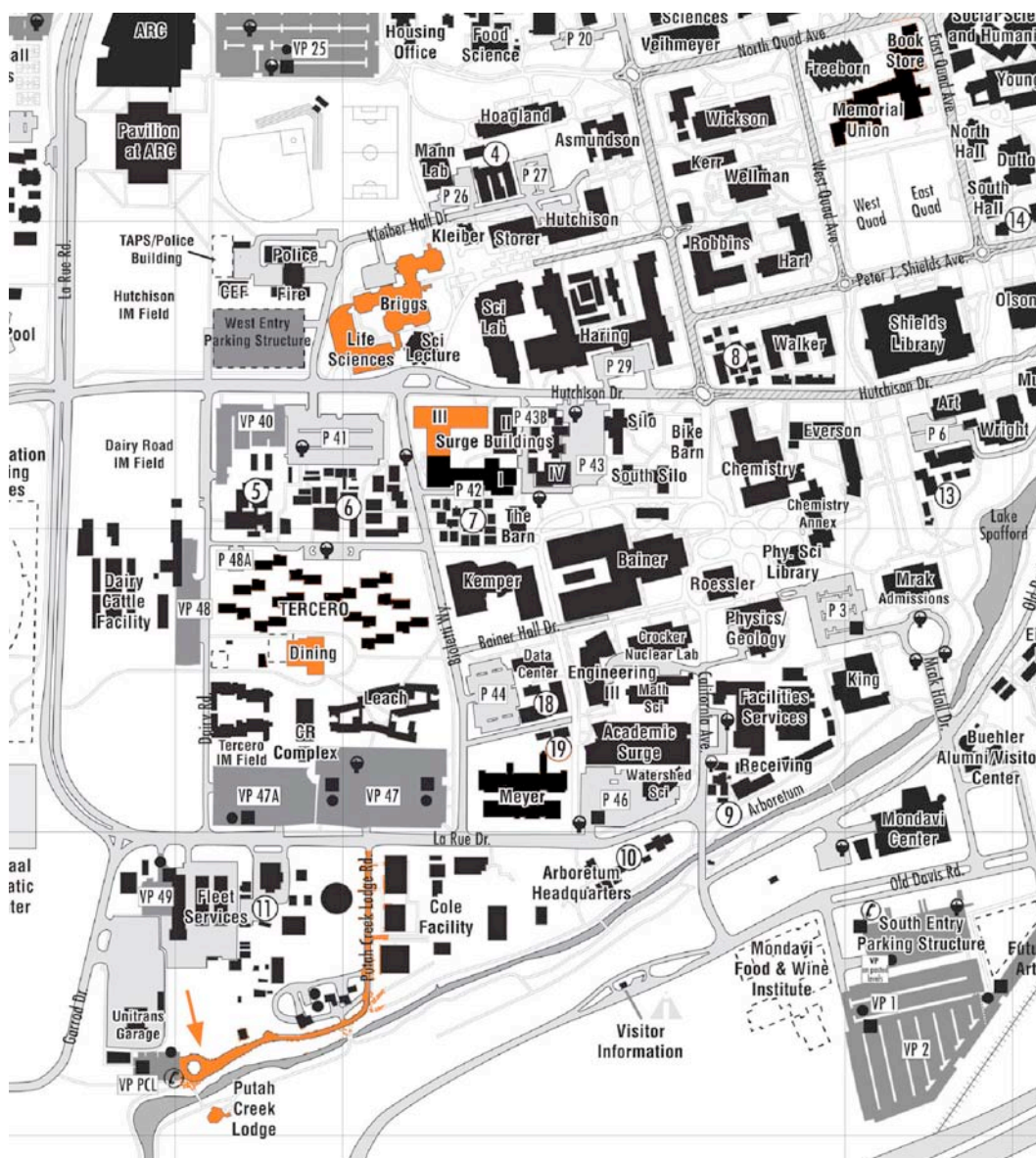
Program

Sunday, September 7, 2008

Afternoon Arrival
 Registration 7:00 pm
 Putah Creek Lodge (at the bottom of the map below)

Ben Hankamer
 Thomas Walz
 Henning Stahlberg
 Bryant Gipson
 Po-Lin Chiu
 Ludovic Renault

7:00 pm Dinner Buffet. Putah Creek Lodge (at the bottom of the map below)



Monday, September 8, 2008

8:00 am Breakfast.

9:00 am Welcome

Bryant Gipson
Tom Walz
Henning Stahlberg

SESSION CHAIR: Daniel Levy

9:30 am Detergents and their properties

Michael Landsberg

10.10 am Lipids and their properties

Catherine Venien-
Bryan

10:50 am Coffee Break

SESSION CHAIR: Daniel Levy

11.15 am 2D crystallization: Dialysis

Thomas Walz

12:00 pm Lunch. Segundo Dining Area

SESSION CHAIR: Tom Walz

1:00 pm 2D crystallization: Monolayer approach & biobeads

Daniel Levy

1.30 pm 2D crystallization: Detergent chelation and dilution

Herve Remigy

2:00 pm Practical: 2D
crystallization

- Monolayer Trial
(Daniel Levy)
- Dialysis Trial
(Tom Walz, Po-Lin)
- Biobead Trial
(Ben Hankamer,
Ludovic Renault)
- Dilution Demo
(Remigy / Engel)

Practical: Sample
Preparation / CryoEM
data collection

- Cryo-Neg. stain
(Ludovic Renault)
- Cryo: Back injection (H-
T Chou, Yifan Cheng)
- Cryo: Sandwich (Hui-
Ting, Nobuhiko Gyobu)
- Cryo-EM imaging
(Dieter, Po-Lin)
- e-Diffraction (Yifan
Cheng, James Buban)

Practical: Image
Processing

- Installation of MRC,
2dx, IPLT on private
portable computers
- 2D processing with
MRC (Anchi Cheng)
- 2D processing with
2dx_image (Bryant
Gipson)

Anchi Cheng
Andreas Schenk
Ansgar Philippsen
Bryant Gipson
Daniel Levy
Dieter Typke
Nobuhiko Gyobu
Herve Remigy
Hui-Ting Chou
James Buban
Ludovic Renault
Po-Lin Chiu
Tom Walz
Yifan Cheng

5:30 pm Dinner, Segundo Dining Area.

6:30 pm Student Posters and Coffee, in 1022 LSA

SESSION CHAIR: Tom Walz & Daniel Levy

7:30 pm Round table discussion: Improved approaches to 2D crystal production

8.15 pm Posters/open hour

Tuesday, September 9, 2008

8:00 am Breakfast.

SESSION CHAIR: Henning Stahlberg

9:00 am TEM: Instrumentation for high resolution data collection Bob Glaeser
 - Vacuum, Gun (FEG/Thermal, Acc. Voltage), Stage (LN2, Helium), Low-Dose, Spot Scanning

9:45 am Sample Preparation Nobuhiko Gyobu
 - Methods for enriching crystals from a mixture of crystals and vesicles.
 - Harvesting crystals: preventing damage to crystals during transfer
 - Benefits of glucose, trehalose etc.
 - Back injection, Carbon sandwich and other techniques

10:30 am Coffee Break

SESSION CHAIR: Bob Glaeser

10:45 am Data collection: Imaging Dieter Typke
 - Alignment (Coherence, Beam tilt, stability)
 - Data collection (Defocus, Astigmatism)
 - Dose limitation and dose measurement

11:20 pm Data collection: Diffraction Yifan Cheng
 - Principle, Alignment, Operation mode (Exp. Time, etc.), Film/CCD

12:00 pm Lunch. Segundo Dining Area

SESSION CHAIR: Ben Hankamer

1:00 pm TEM and other developments at FEI TBD

1:20 pm Hard/Software advances for high-resolution electron crystallography (JEOL) Barbara Armbruster

1:40 pm CCD camera and other developments at TVIPS Matthias Stumpf

2:00 pm High performance cameras for electron crystallography (GATAN) Chris Booth
 to 2:20 pm

<p>2:30 pm Practical: 2D crystallization</p> <ul style="list-style-type: none"> - Monolayer Trial (Daniel Levy) - Dialysis Trial (Tom Walz, Po-Lin) - Biobead Trial (Ben Hankamer, Ludovic Renault) - Dilution Demo (Remigy / Engel) 	<p>Practical: Sample Preparation / CryoEM data collection</p> <ul style="list-style-type: none"> - Cryo-Neg. stain (Ludovic Renault) - Cryo: Back injection (H-T Chou, Yifan Cheng) - Cryo: Sandwich (Hui-Ting, Nobuhiko Gyobu) - Cryo-EM imaging (Dieter, Po-Lin) - e-Diffraction (Yifan Cheng, James Buban) 	<p>Practical: Image Processing</p> <ul style="list-style-type: none"> - Installation of MRC, 2dx, IPLT on private portable computers - 2D processing with MRC (Anchi Cheng) - 2D processing with 2dx_image (Bryant Gipson) 	<p>Anchi Cheng Andreas Schenk Ansgar Philippsen Bryant Gipson Daniel Levy Dieter Typke Nobuhiko Gyobu Herve Remigy Hui-Ting Chou James Buban Ludovic Renault Po-Lin Chiu Tom Walz Yifan Cheng</p>
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5:30 pm Dinner, Segundo Dining Area

6:30 pm Student Posters and Coffee, in 1022 LSA

SESSION CHAIR: Henning Stahlberg

7:30 pm Contrast formation in the TEM: Phase Shifting devices, aberration vs. aberration correction. Bob Glaeser

8:15 pm Electron detection: DQE, MTF, Scanner vs. Film, CMOS, deceleration CCD Ken Downing

9:00 pm Posters/open hour

Wednesday, September 10, 2008

8:00 am Breakfast.

SESSION CHAIR: Ben Hankamer

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|---------|---|-------------|
| 9:00 am | Fourier Theory: 2D
- Real space / Fourier space
- FFT, Correlation, Convolution, Autocorrelation
- Lattice lines | Bob Glaeser |
| 9:40 am | Image Processing in 2D: MRC software for real-space images
- Format, Documentation, Work-flow
- Programs, Unbending | Anchi Cheng |

10:25 am Coffee Break

SESSION CHAIR: Henning Stahlberg

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|----------|-----------------------------|-------------------|
| 10:40 am | 2dx software: Introduction | Bryant Gipson |
| 11:30 am | IPLT software: Introduction | Ansgar Philippsen |

12:00 pm Lunch. Segundo Dining Area

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|---------|---|---|--|---|
| 1:00 pm | Practical: 2D crystallization
- Monolayer Trial (Daniel Levy)
- Dialysis Trial (Tom Walz, Po-Lin)
- Biobead Trial (Ben Hankamer, Ludovic Renault)
- Dilution Demo (Remigy / Engel) | Practical: Sample Preparation / CryoEM data collection
- Cryo-Neg. stain (Ludovic Renault)
- Cryo: Back injection (H-T Chou, Yifan Cheng)
- Cryo: Sandwich (Hui-Ting, Nobuhiko Gyobu)
- Cryo-EM imaging (Dieter, Po-Lin)
- e-Diffraction (Yifan Cheng, James Buban) | Practical: Image Processing
- Installation of MRC, 2dx, IPLT on private portable computers
- 2D processing with MRC (Anchi Cheng)
- 2D processing with 2dx_image (Bryant Gipson) | Anchi Cheng
Andreas Schenk
Ansgar Philippsen
Bryant Gipson
Daniel Levy
Dieter Typke
Nobuhiko Gyobu
Herve Remigy
Hui-Ting Chou
James Buban
Ludovic Renault
Po-Lin Chiu
Tom Walz
Yifan Cheng |
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SESSION CHAIR: Tom Walz

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| 4:00 pm | Beam-induced resolution loss
- SpotScanning
- Beam-induced drum-head movement vs. charging | Bob Glaeser |
| 4:30 pm | 2D crystal screening | Iban Ubarretxena-Belandia |
| 4:50 pm | Basel System for 2D crystal screening | Herve Remigy |
| 5:10 pm | Discussion: How do we address the crystallization bottleneck | Tom Walz |

5:30 pm Dinner, Segundo Dining Area

SESSION CHAIR: Iban Ubarretxena-Belandia

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|---------|--|-------------------|
| 7:00 pm | Molecular mechanisms of membrane transport studied by cryo-EM | Werner Kühlbrandt |
| 7:45 pm | Membr. assoc. proteins in eicosanoid and glutathione metabolism (MAPEGs) | Hans Hebert |
| 8:30 pm | Open hour | |

Thursday, September 11, 2008

8:00 am Breakfast.

SESSION CHAIR: Andreas Schenk

9:00 am Symmetry Michael Landsberg
 - Point groups, Unit cells and lattices, Symmetry operations
 - Space groups, plane groups, crystallographic notation

9:30 am Contrast transfer function (CTF) Henning Stahlberg

9:45 am Tilt geometry Henning Stahlberg

10:00 am A Maximum Likelihood approach to 2D crystals Henning Stahlberg

10:15 am Unbending: Effect of unbending before vs. after CTF correction Andreas Schenk

10:45 am Coffee Break

SESSION CHAIR: Andreas Engel

11:00 am IPLT software: Diffraction processing Ansgar Philippsen

11:45 am Tilted Transfer Function (TTF and TCIF): SpotSplitting and deconvolution Ansgar Philippsen

12:15 pm Lunch. Segundo Dining Area

1:15 pm	Practical: Image processing of electron diffraction data	Practical: Image processing trouble shooting session	
	- IPLT: Processing of e-diff pattern (Ansgar Philippsen, Andreas Schenk)	- Targeted problem sessions in small groups with requested teachers	Bryant Gipson Ansgar Philippsen Andreas Schenk Henning Stahlberg Anchi Cheng

4:00 pm **Storer Symposium: Andreas Engel:**
Attempts to observe membrane proteins in their native environment
In: 1309 Surge III

5:30 pm Dinner at Segundo Dining Area Also:
Storer Reception for invited UC Davis guests
at Putah Creek Lodge.

SESSION CHAIR: James Evans

7:00 pm DTEM Nigel Browning

7:45 pm Low-dose STEM James Buban

8.30 pm Open hour

Friday, September 12, 2008

8:00 am Breakfast.

SESSION CHAIR: Ansgar Philippsen

9:00 am Merging with the MRC software Anchi Cheng
 - Phase origin, Defocus, Beam-tilt, Lattice Lines
 - ORIGIN, MAKETRAN

9:45 am Merging with the 2dx software Henning Stahlberg
 - Project management
 - Iterative merging and re-processing of images

10:30 am Coffee Break

SESSION CHAIR: Tom Walz

10:45 am 3D reconstruction Andreas Schenk
 - Lattice line interpolation (from e-diff), 3D volume generation, NCS
 - 3D Visualization with O / Dino

11:10 am Hybrid Input Output Algorithm Bryant Gipson

11:30 am Calculation of the variance of a 3D map by the bootstrap method Anchi Cheng

12:00 pm Lunch.

1:00 pm Practical: 3D merging of e-cryst data - MRC: 3D merging with MRC software (Anchi Cheng, Henning Stahlberg) - 2dx: management and 3D merging with 2dx_merge (Bryant Gipson, Henning Stahlberg)	Practical: Image processing trouble shooting session - Targeted problem sessions in small groups with requested teachers	Bryant Gipson Ansgar Philippsen Andreas Schenk Henning Stahlberg Anchi Cheng
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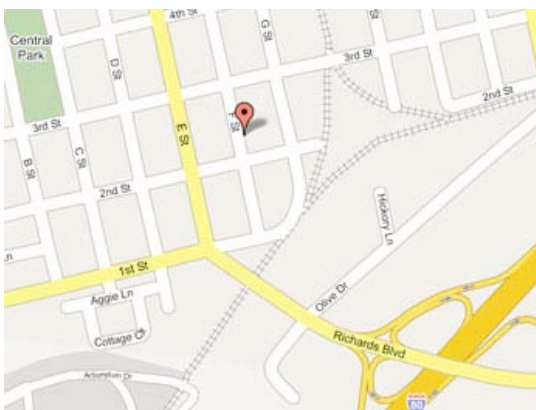
4:30 pm Practical: Image processing trouble shooting session
 - Targeted problem sessions in small groups with requested teachers

5:30 pm Closing Remarks Ben Hankamer
Tom Walz
Henning Stahlberg

6:00 pm Free Time

7:00 pm Dinner:
 Hosted by JEOL

Bistro 33
 226 F Street
 Davis, CA 95616
 Tel: (530) 756 4556
<http://tinyurl.com/6h5g99>



Saturday, September 13, 2008

8:00 am Breakfast.

9:00 am Departure