

Electron Crystallography Workshop at UC Davis, August 7-11, 2006

Organization:

Rena Hill (RMHill@ucdavis.edu)

Scientific Organization:

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

Henning Stahlberg (HStahlberg@ucdavis.edu)

Web Site:

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

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Lodging:

UCD Conference Housing, Tercero Area

Seminars:

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

Practicals:

WetLab: 15 Briggs Hall, UC Davis (Phone: (530) 754 8285)

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

Computing: 2060 Science Lecture Building, Computer Room, UC Davis

Sponsors:



National Science Foundation
DIRECTORATE FOR
Biological Sciences (BIO)



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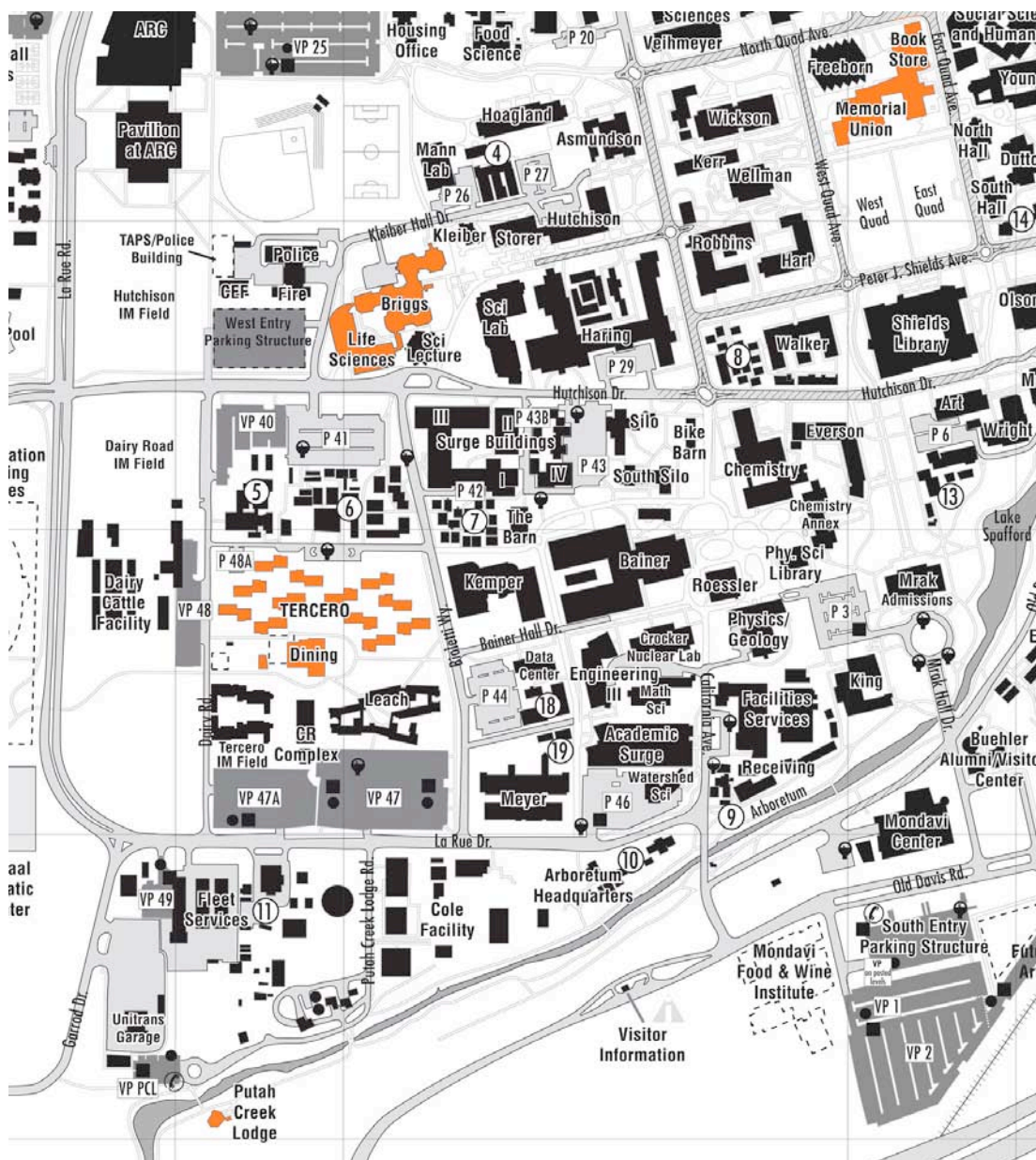
Program

Sunday, August 6, 2006

Afternoon Arrival
Registration 4:00 pm – 6:00 pm
Foyer of UCD Conference Housing, Tercero

Rena Hill
Ben Hankamer
Henning Stahlberg
Hui-Ting Chou
Po-Lin Chiu
Ludovic Renault

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



Monday, August 7, 2006

8:00 am	Breakfast.		
9:00 am	Welcome 1022 Life Sciences	Ben Hankamer Rena Hill Henning Stahlberg	
9:30 am	Detergents and their properties <ul style="list-style-type: none"> - Definition of a detergent - briefly describe amphipathic nature - Main detergent types: Ionic, non-ionic etc. - Common classes of non-ionic detergents (malt, gluc. etc) - CMC, Micelle size, hydrophobic lipophobic balance. - Important properties of detergents for membrane protein purification and stabilization. - Detergent exchange - Important properties of detergents for membrane protein crystallization - Alternative amphiphiles - Specialized properties: temperature dependent phase separation and hydrophobicity - Statistics: Best detergents - Detergent suppliers - and purity 	Ben Hankamer	
10:20 am	Coffee Break		
10:45 am	Lipids and their properties <ul style="list-style-type: none"> - Definition of a lipid - briefly describe biophysical properties - How do lipids differ from detergents? - Main types of lipids - Important properties of lipids for 2D crystallization. (Saturation, liquid crystal:crystalline phase transition). - Statistics: Best lipids for crystallization. - Choosing lipids for crystallization 	Daniel Levy	
12:00 pm	Lunch.		
1:00 pm	Detergents: Purifying, solubilizing and crystallizing membrane proteins <ul style="list-style-type: none"> - 2D and 3D crystal types - Native 2D crystals - Dilution - Dialysis - Biobeads - Monolayers - Factors affecting crystallization - Towards systematic 2D crystallization screens 	Ben Hankamer	
2:00 pm	Practical: 2D crystallization <ul style="list-style-type: none"> - Monolayer Trial (Daniel Levy, Amy Anderson) - Dialysis Trial (Tom Walz, Po-Lin Chiu) - Biobead Trial (Ben Hankamer, Rena Hill, Ludovic Renault) 	Practical: Image Processing <ul style="list-style-type: none"> - Installation of MRC, 2dx, possibly IPLT on the private portable computers - Introduction to the image processing in small sub-groups 	Ben Hankamer Daniel Levy Stahlberg Lab Tom Walz
5:30 pm	Dinner, Tercero Dining Area.		
6:30 pm	Student Posters and Coffee, in 1022 LSA		
7:30 pm	Round table discussion: Improved approaches to 2D crystal production	Tom Walz Ben Hankamer	
9:00 pm	Open hour.		

Tuesday, August 8, 2006

8:00 am	Breakfast.				
9:00 am	TEM: Instrumentation - Vacuum, Gun (FEG/Thermal, Acc. Voltage), Stage (LN2, Helium), Low-Dose, Spot Scanning, Detection (Film/CCD)	Ken Downing			
9:45 am	Sample Preparation - Methods for enriching crystals from a mixture of crystals and vesicles. - Harvesting crystals: preventing damage to crystals during transfer (monolayer, bilayers). - Benefits of glucose, trehalose etc. - Back injection, Carbon sandwich and other techniques	Nobuhiko Gyobo			
10:30 am	Coffee Break				
10:45 am	Data collection: Imaging - Alignment (Coherence, Beam tilt, stability) - Data collection (Defocus, Astigmatism) - Dose limitation and dose measurement	Dieter Typke			
11:20 pm	Data collection: Diffraction - Principle, Alignment, Operation mode (Exp. Time, etc.), Film/CCD	Janet Vonck			
12:00 pm	Lunch.				
1:00 pm	TEM development at FEI	Wim Busing			
1:30 pm	TEM development at JEOL	Barbara Armbruster			
2:00 pm	CCD camera development at TVIPS	Mathias Stumpf			
2:30 pm	Sample holders and other developments at GATAN	Bob Morrison			
3:00 pm	<table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> Practical: Sample Preparation / CryoEM data collection - RT & Cryo: Neg. stain (Hui-Ting Chou) - Cryo: Back injection (Nobuhiko Gyobo) - Cryo: Sandwich (Nobuhiko Gyobo) - Cryo-EM imaging (Dieter Typke, Nobuhiko Gyobo, James Evans) - e-Diffraction (Janet Vonck, Ludovic Renault) </td> <td style="vertical-align: top;"> Practical: Image Processing - Installation of MRC, 2dx, possibly IPLT on the private portable computers - Introduction to the image processing in small sub-groups </td> <td style="vertical-align: top;"> Janet Vonck Nobuhiko Gyobo Dieter Typke Bryant Gipson Ansgar Philippsen Andreas Schenk </td> </tr> </table>	Practical: Sample Preparation / CryoEM data collection - RT & Cryo: Neg. stain (Hui-Ting Chou) - Cryo: Back injection (Nobuhiko Gyobo) - Cryo: Sandwich (Nobuhiko Gyobo) - Cryo-EM imaging (Dieter Typke, Nobuhiko Gyobo, James Evans) - e-Diffraction (Janet Vonck, Ludovic Renault)	Practical: Image Processing - Installation of MRC, 2dx, possibly IPLT on the private portable computers - Introduction to the image processing in small sub-groups	Janet Vonck Nobuhiko Gyobo Dieter Typke Bryant Gipson Ansgar Philippsen Andreas Schenk	
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5:30 pm	Dinner, Tercero Dining Area				
6:30 pm	Student Posters and Coffee, in 1022 LSA				
7:30 pm	Deceleration CCD	Ken Downing			
8:00 pm	Phase Plate Technology	Bob Glaeser			
8:30 pm	Experiences with a Cs corrected and energy filtered TEM	James Evans			
9:00 pm	Dynamic Transmission Electron Microscopy (DTEM)	Nigel Browning			
9:30 pm	Open Hour				

Wednesday, August 9, 2006

8:00 am	Breakfast.		
9:00 am	Overview of algorithms for 2D crystal image processing		Henning Stahlberg
	<ul style="list-style-type: none"> - Fourier-space solutions (filtering, unbending) - Real-space solutions 		
9:30 am	Fourier Theory		Bob Glaeser
	<ul style="list-style-type: none"> - Real space / Fourier space - FFT, Correlation, Convolution, Autocorrelation - Lattice lines 		
10:00 am	Symmetry		Michael Landsberg
	<ul style="list-style-type: none"> - Point groups - Unit cells and lattices - Symmetry operations - Space groups, plane groups, crystallographic notation 		
10:30 am	Coffee Break		
10:45 am	MTF		Dieter Typke
	<ul style="list-style-type: none"> - Determination of the MTF of CCD - Scanner vs. Film 		
11:15 am	Image Processing in 2D: MRC software for real-space images		Anchi Cheng
	<ul style="list-style-type: none"> - Format - Documentation - Work-flow - Programs 		
12:00 pm	Lunch.		
1:00 pm	Practical: Sample Preparation / CryoEM data collection <ul style="list-style-type: none"> - RT & Cryo: Neg. stain (Hui-Ting Chou) - Cryo: Back injection (Nobuhiko Gyobo) - Cryo: Sandwich (Nobuhiko Gyobo) - Cryo-EM imaging (Dieter Typke, Nobuhiko Gyobo, James Evans) - e-Diffraction (Janet Vonck, Hui-Ting Chou) 	Practical: Image Processing <ul style="list-style-type: none"> - Introduction to the image processing in small sub-groups 	Janet Vonck Nobuhiko Gyobo Dieter Typke Bryant Gipson Ansgar Philippsen Andreas Schenk
4:10 pm	Automation of TEM data collection		Clint Potter
	<ul style="list-style-type: none"> - Leginon 		
4:50 pm	Beam-induced movement of samples		Bob Glaeser
	<ul style="list-style-type: none"> - SpotScanning - Beam-induced drum-head movement vs. charging 		
5:30 pm	Dinner, Tercero Dining Area		
6:45 pm	Scanning Transmission Electron Microscopy		Nigel Browning
	<ul style="list-style-type: none"> - Comparison of STEM vs. TEM - How is STEM implemented - Aberration corrected STEM - What are the applications and implications to biological samples - High-resolution results. 		
7:30 pm	High resolution membrane protein structure		Tom Walz
8:15 pm	Tubulin		Ken Downing
9:00 pm	Open hour		

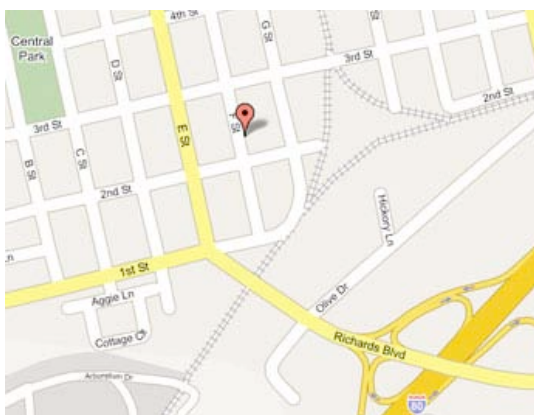
Thursday, August 10, 2006

8:00 am	Breakfast.		
9:00 am	Tilt geometry		Henning Stahlberg
9:30 am	2dx: Image processing of 2D crystal images using 2dx_image		Bryant Gipson
10:15 am	Coffee Break		
10:30 am	Image Processing: MRC software for e-diffraction evaluation - Algorithm - Programs		Janet Vonck
11:15 am	IPLT architecture		Ansgar Philippsen
12:00 pm	Lunch.		
1:00 pm	IPLT: Image processing of e-diff pattern		Ansgar Philippsen
1:45 pm	Practical: Image processing of non-tilted 2D crystal data - MRC: Processing of 2D crystal images (Janet Vonck, Anchi Cheng) - 2dx: Processing of non-tilted and tilted images (Bryant Gipson, Henning Stahlberg) - IPLT: Processing of e-diff pattern (Ansgar Philippsen, Andreas Schenk)	Practical: Image processing trouble shooting session - Targeted problem sessions in small groups with requested teachers	Bryant Gipson Ansgar Philippsen Andreas Schenk Henning Stahlberg Janet Vonck
5:30 pm	Dinner, Tercero Dining Area		
6:45 pm	Quality Assessment		Anchi Cheng
7:30 pm	A Maximum Likelihood approach to 2D crystals		Xiangyan Zeng
8:15 pm	Advantages of higher (icosahedral) symmetries		Holland Cheng
9:00 pm	Open hour		

Friday, August 11, 2006

8:00 am	Breakfast.		
9:00 am	Tilted Transfer Function (TTF): SpotSplitting and Fourier spot deconvolution	Henning Stahlberg	
9:30 am	A new method for Tilted Transfer Function correction	Ansgar Philippsen	
10:00 am	Coffee Break		
10:10 am	Merging with the MRC software (2D) - Phase origin, Defocus, Beam-tilt - ORIGTILT - MAKETRAN	Henning Stahlberg	
10:35 am	Merging with the MRC software (3D) - Tilt geometry refinement - ORIGTILT - Lattice lines	Anchi Cheng	
11:00 am	3D reconstruction - Lattice line interpolation, 3D volume generation, NCS - 3D Visualization with O / Dino	Andreas Schenk	
11:30 am	Molecular Replacement and Structure Refinement	Piotr Sliz	
12:00 pm	Lunch.		
1:15 pm	Calculation of the variance of a 3D map by the bootstrap method	Anchi Cheng	
2:00 pm	Practical: Image processing of tilted 2D crystal data - MRC: Processing of 2D crystal images (Janet Vonck, Anchi Cheng) - 2dx: Processing of non-tilted and tilted images (Bryant Gipson, Henning Stahlberg) - IPLT: Processing of e-diff pattern (Ansgar Philippsen, Andreas Schenk)	Practical: Image processing trouble shooting session - Targeted problem sessions in small groups with requested teachers	Bryant Gipson Ansgar Philippsen Andreas Schenk Henning Stahlberg Janet Vonck
5:00 pm	Data Deposition: PDB, EBI	Ben Hankamer	
5:30 pm	Closing Remarks	Ben Hankamer Henning Stahlberg	
6:00 pm	Free Time		
7:00 pm	Dinner:		

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<http://tinyurl.com/gmjyr>



Saturday, August 12, 2006

8:00 am	Breakfast.
9:00 am	Departure

Speakers

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