



Center for  
Cellular Imaging and  
Nano Analytics



**Welcome to the third  
*International Workshop on  
Electron Crystallography of Membrane Proteins.***

**August 1-7, 2010.**

Organizer: Karen Bergmann

Scientific Organization: Thomas Walz, Andreas Engel, Henning Stahlberg.

Location: C-CINA, Biozentrum, University Basel, at the D-BSSE, Mattenstrasse 26, CH-4058 Basel

Web page: <http://2dx.org/workshop/2010>

We acknowledge generous support by:



# Electron Crystallography Workshop at C-CINA, Biozentrum, University Basel August 1-7, 2010

## Organization:

Karen Bergmann ([Karen.Bergmann@unibas.ch](mailto:Karen.Bergmann@unibas.ch)). +41-61-387 32 31 (office)

## Scientific Organization:

Tom Walz ([Thomas.Walz@hms.harvard.edu](mailto:Thomas.Walz@hms.harvard.edu))

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Henning Stahlberg ([Henning.Stahlberg@unibas.ch](mailto:Henning.Stahlberg@unibas.ch))

## Web Site:

<http://2dx.org/workshop/2010>

## Emergency Phone Numbers:

Henning Stahlberg: +41-79-502 75 22 (mobile), Karen Bergmann: +41-79-714 14 45 (mobile)

## Location:

C-CINA, Biozentrum, at the D-BSSE, Mattenstrasse 26, CH-4058 Basel

(Google Maps: <http://tinyurl.com/cina-basel>)

Seminars: Room BASILEA  
WetLab: Room P.28  
Sample Prep: Room U2.56  
TEMs: Room U2.56  
Computing: Room P.60 (Euler)

## Program

### Sunday, August 1, 2010

Afternoon **Arrival**  
Registration 4:00 pm in the C-CINA  
lab. Location see above.

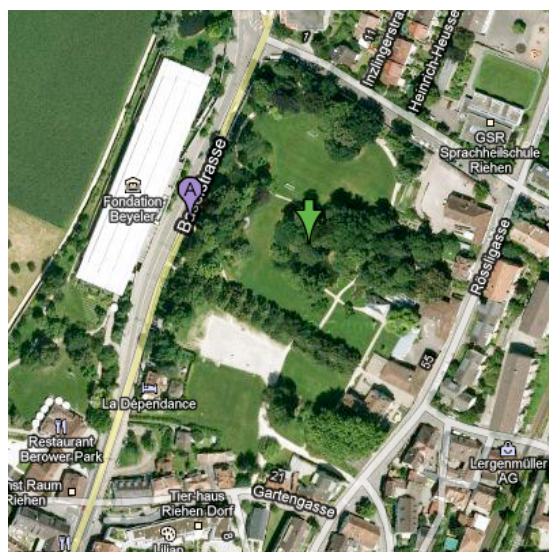
Karen Bergmann  
Thomas Walz  
Andreas Engel  
Henning Stahlberg

7:00 pm **Dinner**  
At the 1<sup>st</sup> August party in the  
Sarasin Park, Riehen

In front of the Fondation Beyeler, which is  
also the name of the tram stop (Tram 6).

Google Map of the location is here:  
<http://tinyurl.com/sarasinpark>

Mobile phones for emergency contact:  
Karen Bergmann: +41-79-714 14 45  
Henning Stahlberg: +41-79-501 75 22



## Monday, August 2, 2010

8:00 am	Breakfast.	
9:00 am	<b>Welcome</b>	Karen Bergmann Tom Walz Andreas Engel Henning Stahlberg
9:20 am	Introduction to Practicals <b>SESSION CHAIR: Daniel Levy</b>	Henning Stahlberg
9:45 am	Detergents and their properties	Michael Landsberg
10:25 am	Coffee Break	
10:40 am	Lipids and their properties	Catherine Venien-Bryan
11:00 am	2D crystallization: Dialysis	Thomas Walz
11:30 am	2D crystallization: Monolayer approach & biobeads	Daniel Levy
12:00 pm	Lunch.	
	<b>SESSION CHAIR: Tom Walz</b>	
1:00 pm	2D crystallization: Detergent chelation and dilution	Andreas Engel
1:40 pm	Introduction to 2dx	Marcel Arheit
2:05 pm	Introduction to IPLT	Andreas Schenk
2:25 pm	Introduction to OpenStructure	Valerio Mariani
2:45 pm	Coffee Break	

	<b>Group A</b>	<b>Group B</b>
3:00 pm	2D Image Processing <ul style="list-style-type: none"> <li>• <i>MRC</i> <i>Janet Vonck, Anchi Cheng</i></li> <li>• <i>2dx_image</i> <i>Marcel Arheit, Daniel Castaño-Diez, Xiangyan Zeng, Henning Stahlberg</i></li> </ul>	2D Crystallization of Membrane Proteins <ul style="list-style-type: none"> <li>• <i>Drop Box (detergent conc.)</i> <i>Daniel Caujolle-Bert</i></li> <li>• <i>Dialysis (buttons / machine)</i> <i>Alexandra Graff, Philippe Ringler, Priyanka Abeyrathne, Mohamad Chami</i></li> <li>• <i>Biobeads and Monolayer</i> <i>Daniel Levy, Catherine Venien-Bryan</i></li> <li>• <i>MBCD machine</i> <i>Francoise Erne-Brand</i></li> <li>• <i>Single Particle quality control</i> <i>Kenny Goldie, Mohamed Chami, Philippe Ringler</i></li> </ul>

6:00 pm	Dinner	
	<b>SESSION CHAIR: Andreas Engel</b>	
7:15 pm	Science Talk	Dimitrios Fotiadis
8:00 pm	Science Talk	Werner Kühlbrandt
8.45 pm	Posters/open hour	

## Tuesday, August 3, 2010

8:00 am Breakfast.

**SESSION CHAIR: Anchi Cheng**

9:00 am 2D crystal screening Iban Ubarretxena-Belandia

9:30 am Automation of 2D crystal screening Nicolas Coudray

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: Janet Vonck**

10:45 am TEM: Instrumentation for high resolution data collection Jürgen Plitzko  
 Vacuum, Gun (FEG/Thermal, Acc. Voltage), Stage (LN2, Helium), Low-Dose

11:30 am Film, MTF, Scanner Andreas Engel

12:15 pm Lunch.

**SESSION CHAIR: Hans Hebert**

1:30 pm Data collection: Imaging Janet Vonck  
 Alignment (Coherence, Beam tilt, stability), Data collection (Defocus, Astigmatism), Dose limitation and dose measurement

2:15 pm Data collection: Diffraction Richard Hite  
 Principle, Alignment, Operation mode (Exp. Time, etc.), Film/CCD

3:00 pm Coffee Break

	Group A	Group B
3:15 pm	2D Crystallization of Membrane Proteins <ul style="list-style-type: none"> <li>• <i>Drop Box (Detergent Conc.)</i> Daniel Caujolle-Bert</li> <li>• <i>Dialysis (buttons / machine)</i> Alexandra Graff, Philippe Ringler, Priyanka Abeyrathne, Mohamad Chami</li> <li>• <i>Biobeads and Monolayer</i> Daniel Levy, Catherine Venien-Bryan</li> <li>• <i>MBCD machine</i> Francoise Erne-Brand</li> <li>• <i>Single Particle quality control</i> Kenny Goldie, Mohamed Chami, Philippe Ringler</li> </ul>	2D Image Processing <ul style="list-style-type: none"> <li>• <i>MRC</i> Janet Vonck, Anchi Cheng</li> <li>• <i>2dx_image</i> Marcel Arheit, Daniel Castaño-Diez, Xiangyan Zeng, Henning Stahlberg</li> </ul>

6:15 pm Dinner

**SESSION CHAIR: Iban Ubarretxena-Belandia**

7:15 pm Science Talk Tom Walz

8:00 pm Science Talk Hans Hebert

8.45 pm Posters/open hour

## Wednesday, August 4, 2010

8:00 am	Breakfast.	
	<b>SESSION CHAIR: Daniel Castaño-Diez</b>	
9:00 am	Fourier Theory: 2D Real space / Fourier space, FFT, Correlation, Convolution, Autocorrelation Lattice lines, CTF	Carsten Sachse
10:00 am	Symmetry Point groups, Unit cells and lattices, Symmetry operations Space groups, plane groups, crystallographic notation	Michael Landsberg
10:15 am	Group Photo	
10:30 am	Coffee Break	
	<b>SESSION CHAIR: Andreas Schenk</b>	
10:45 am	Overview over Algorithms	Henning Stahlberg
11:00 am	Image Processing in 2D: MRC software for real-space images MRC Programs, Unbending	Richard Henderson
12:00 pm	Lunch	
1:20 pm	<b>Industry Presentations. SESSION CHAIR: Kenny Goldie</b>	
1:20 pm	DECTRIS: Direct electron detectors	Clemens Schulze-Briese
1:45 pm	GATAN: Imaging Detectors	Bernd Kraus
2:10 pm	JEOL: High-end transmission electron microscopy	Matthias Rodewald
2:35 pm	Zeiss: High-end transmission electron microscopy	Isabel Angert
3:00 pm	Coffee Break	
3:15 pm	<b>Group A</b>	<b>Group B</b>
	3D Merging <ul style="list-style-type: none"> <li>• <i>2dx_merge</i> <i>Marcel Arheit, Daniel Castaño-Diez, Henning Stahlberg</i></li> </ul> Hopefully available for consulting: <i>Richard Henderson, Anchi Cheng, Janet Vonck, Per Bullough</i>	2D crystal screening <ul style="list-style-type: none"> <li>• <i>Staining Robot</i> <i>Francoise Erne-Brand</i></li> <li>• <i>Negative staining (CM10, T12)</i> <i>Alexandra Graff, Philippe Ringer</i></li> </ul> Sample Preparation for Cryo EM <ul style="list-style-type: none"> <li>• <i>Trehalose Embedding</i> <i>Nobuhiko Gyobu, Priyanka Abeyrathne</i></li> <li>• <i>Plunge Freezing (Vitrobot)</i> <i>Radosav Pantelic, Kenny Goldie</i></li> </ul> Cryo EM data collection <ul style="list-style-type: none"> <li>• <i>Imaging (Titan Krios)</i> <i>Kenny Goldie, Radosav Pantelic</i></li> <li>• <i>Electron Diffraction (CM200FEG)</i> <i>Mohamed Chami</i></li> </ul>
6:15 pm	Dinner	
	<b>SESSION CHAIR: Tom Walz</b>	
7:15 pm	Science Talk Posters/open hour	Richard Henderson

## Thursday, August 5, 2010

8:00 am Breakfast.

**SESSION CHAIR: Marcel Arheit**

9:00 am Image Processing in 3D:  
Tilt geometry, TTF – SpotSplitting and deconvolution, Beam Tilt Per Bullough

10:00 am IPLT software: Diffraction processing: Processing of patterns Andreas Schenk

10:45 am Coffee Break

**SESSION CHAIR: Daniel Castaño-Diez**

11:00 am Merging with the MRC software Anchi Cheng  
Phase origin, Defocus, Beam-tilt, Lattice Lines  
ORIGTILT, MAKETRAN

11:45 am Merging with the 2dx software Henning Stahlberg  
Project management  
Iterative merging and re-processing of images

12:15 am Lunch

**SESSION CHAIR: Per Bullough**

1:30 pm IPLT software: Diffraction processing: Merging and refinement Andreas Schenk

2:15 pm Molecular replacement and crystallographic refinement Richard Hite

3:00 pm Coffee Break

	Group A	Group B
3:15 pm	<p>2D crystal screening</p> <ul style="list-style-type: none"> <li>• <i>Staining Robot</i> <i>Francoise Erne-Brand</i></li> <li>• <i>Negative staining (CM10, T12)</i> <i>Alexandra Graff, Philippe Ringer</i></li> </ul> <p>Sample Preparation for Cryo EM</p> <ul style="list-style-type: none"> <li>• <i>Trehalose Embedding</i> <i>Nobuhiko Gyobu, Priyanka Abeyrathne</i></li> <li>• <i>Plunge Freezing (Vitrobot)</i> <i>Radosav Pantelic, Kenny Goldie</i></li> </ul> <p>Cryo EM data collection</p> <ul style="list-style-type: none"> <li>• <i>Imaging (Titan Krios)</i> <i>Kenny Goldie, Radosav Pantelic</i></li> <li>• <i>Electron Diffraction (CM200FEG)</i> <i>Mohamed Chami</i></li> </ul>	<p>3D Merging</p> <ul style="list-style-type: none"> <li>• <i>2dx_merge</i> <i>Marcel Arheit, Daniel Castaño-Diez, Henning Stahlberg</i></li> </ul> <p>Hopefully available for consulting: <i>Richard Henderson, Anchi Cheng, Janet Vonck, Per Bullough</i></p> <p>Electron Diffraction Processing</p> <ul style="list-style-type: none"> <li>• <i>IPLT</i> <i>Andreas Schenk, Richard Hite</i></li> </ul> <p>Hopefully available for consulting: <i>Richard Henderson, Anchi Cheng, Janet Vonck, Per Bullough, Thomas Walz, Andreas Engel</i></p>

6:15 pm Dinner

**SESSION CHAIR: Tom Walz, Andreas Engel, Henning Stahlberg**

7:30 pm Student Talks

9:30 pm Open hour

## Friday, August 6, 2010

8:00 am Breakfast.

**SESSION CHAIR: Daniel Castaño-Diez**

9:00 am CCP4

Hans Hebert

9:30 am Visualization

Valerio Mariani

9:50 am Single Particle Maximum Likelihood approach to 2D crystals

Xiangyan Zeng

10:15 am Coffee Break

**SESSION CHAIR: Xiangyan Zeng**

10:30 am Calculation of the variance of a 3D map by the bootstrap method

Anchi Cheng

11:00 am Projective Constraint Optimization

Henning Stahlberg

11:30 am Free Electron Laser

Rafael Abela

12:15 pm Lunch.

1:30 pm

- Result of T12 Screening  
*Francoise Erne-Brand, Nicolas Coudray*
- Krios Demo  
*Radosav Pantelic, Kenny Goldie*
- CCP4 Demo (Hans Herbert)  
*Hans Hebert*

3:00 pm Discussion, Closing Remarks

Tom Walz  
Andreas Engel  
Henning Stahlberg

4:00 pm Free Time to explore Basel

7:00 pm

**Banquet**

Restaurant Löwenzorn

Gemsberg 2/4

CH-4051 Basel

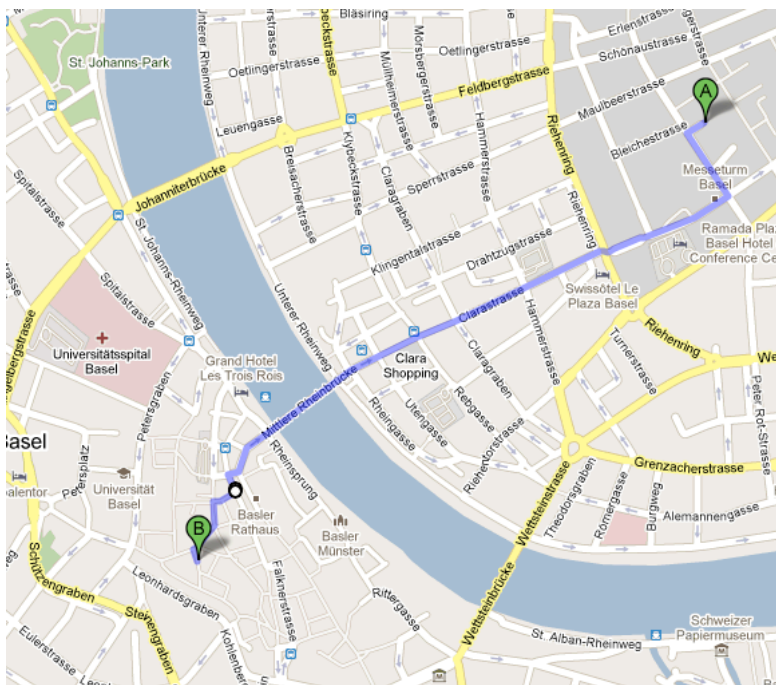
Tel. +41-61-261 42 13

<http://www.loewenzorn.ch>

Map:

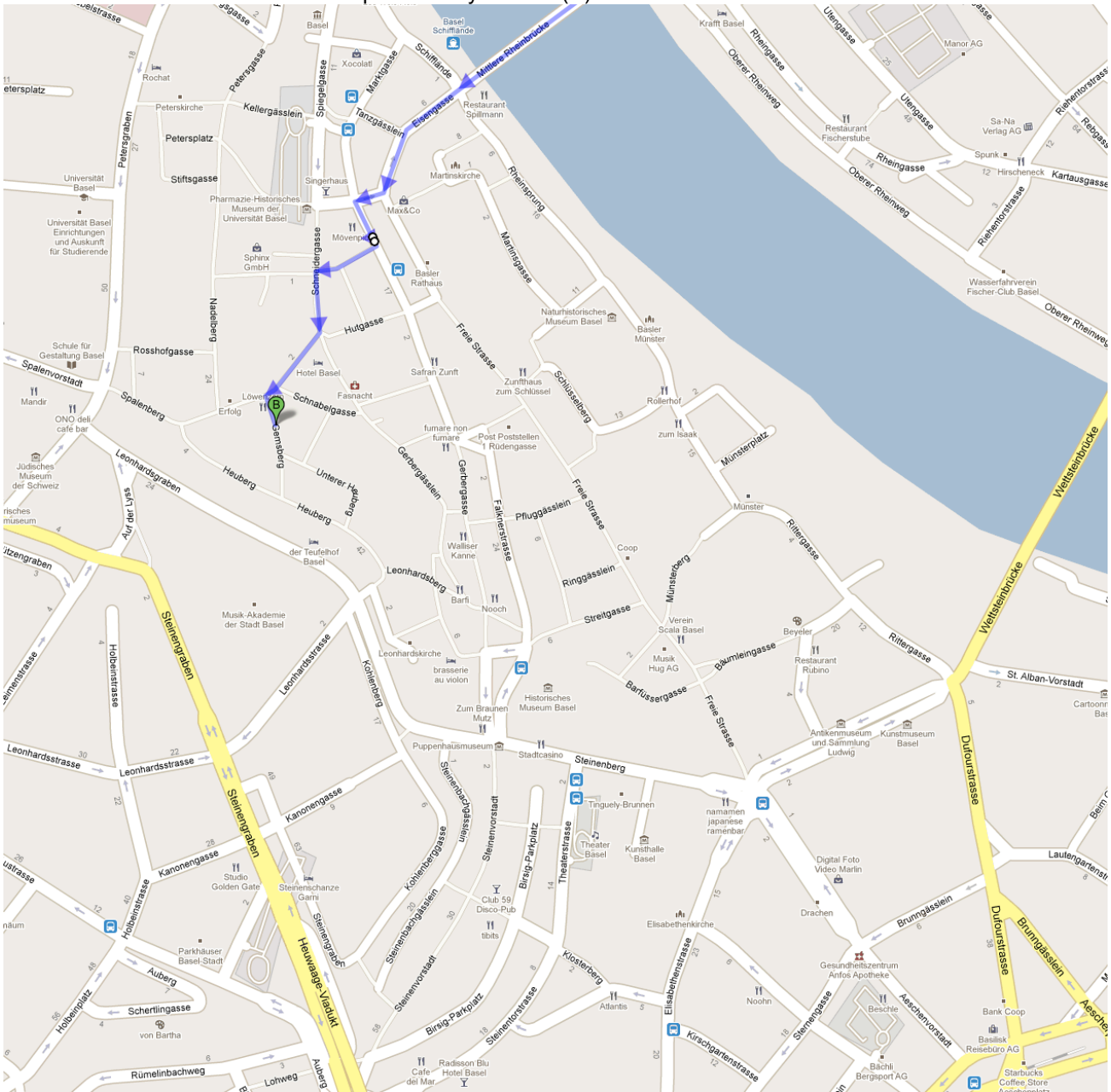
<http://tinyurl.com/loewenzorn>

Map from C-CINA (A) to  
Löwenzorn (B):





Map of the city center. (B) is the Löwenzorn.



## Saturday, August 7, 2010

8:00 am Breakfast in the Hotels.

9:00 am Departure