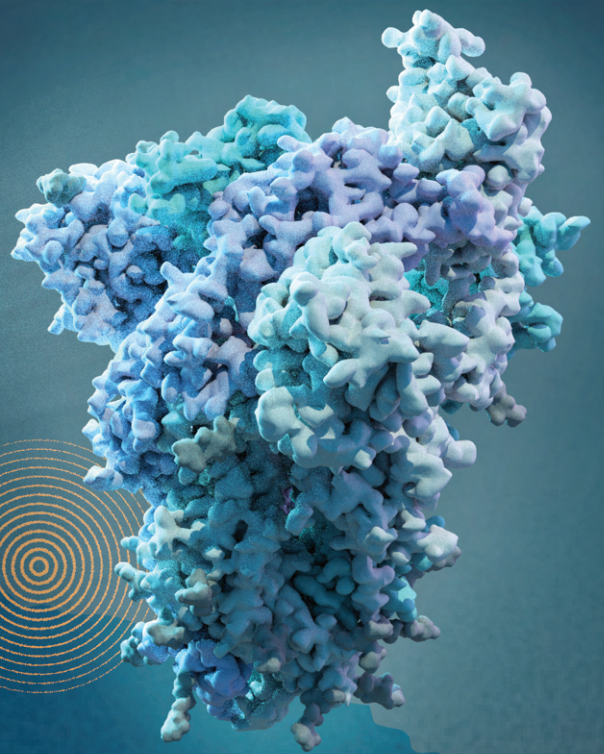


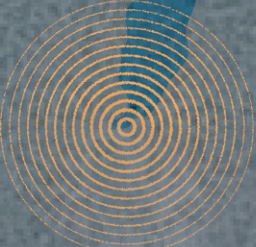


# 2022 DCI Symposium

Inaugural Symposium of the  
Dubochet Center for Imaging



June 8<sup>th</sup>-10<sup>th</sup>, 2022



University of Geneva  
Sciences II, A300  
30 quai Ernest-Ansermet  
1211 Geneva 4

University of Lausanne - EPFL  
Amphimax  
Quartier Sorge  
1015 Lausanne





# The Word of the Organizers

We welcome you to the 2022 Dubochet Center for Imaging Symposium, which will be held at the University of Geneva (UNIGE) and at the University of Lausanne (UNIL) / EPFL on June 8-10.

The Dubochet Center for Imaging (DCI) was inaugurated in 2021. It consists of two sites: The DCI-Lausanne resides on the common campus of the EPFL and UNIL and is featuring two TFS Titan Krios and one TFS Glacios cryo-electron microscope. The DCI-Geneva is hosted by UNIGE and is featuring a TFS Arctica, a TFS G2 Sphera and a TFS Talos L120C cryo-electron microscope. The addition of the University of Bern as third DCI site is in preparation.

The DCI Symposium celebrates cryo-electron microscopy, and the pioneering work that scientists have invested to transform this technique into the most successful Structural Biology method today. Cryo-EM was recognized in 2017 with the Nobel prize in Chemistry awarded to Jacques Dubochet, Joachim Frank and Richard Henderson. Jacques Dubochet studied at the Universities of Geneva and Basel, made his ground-breaking developments at the EMBL in Heidelberg and at UNIL, and today is Emeritus Professor of UNIL. We start the Symposium by celebrating Jacques' birthday on June 8.

The DCI Symposium 2022 has attracted a diverse set of participants from all over the world. We hope that you will have a wonderful time in Geneva and Lausanne, and have a chance to discuss with new collaborators and meet old friends.

A. Boland H. Stahlberg

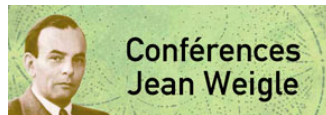


**Andreas Boland**  
University of Geneva

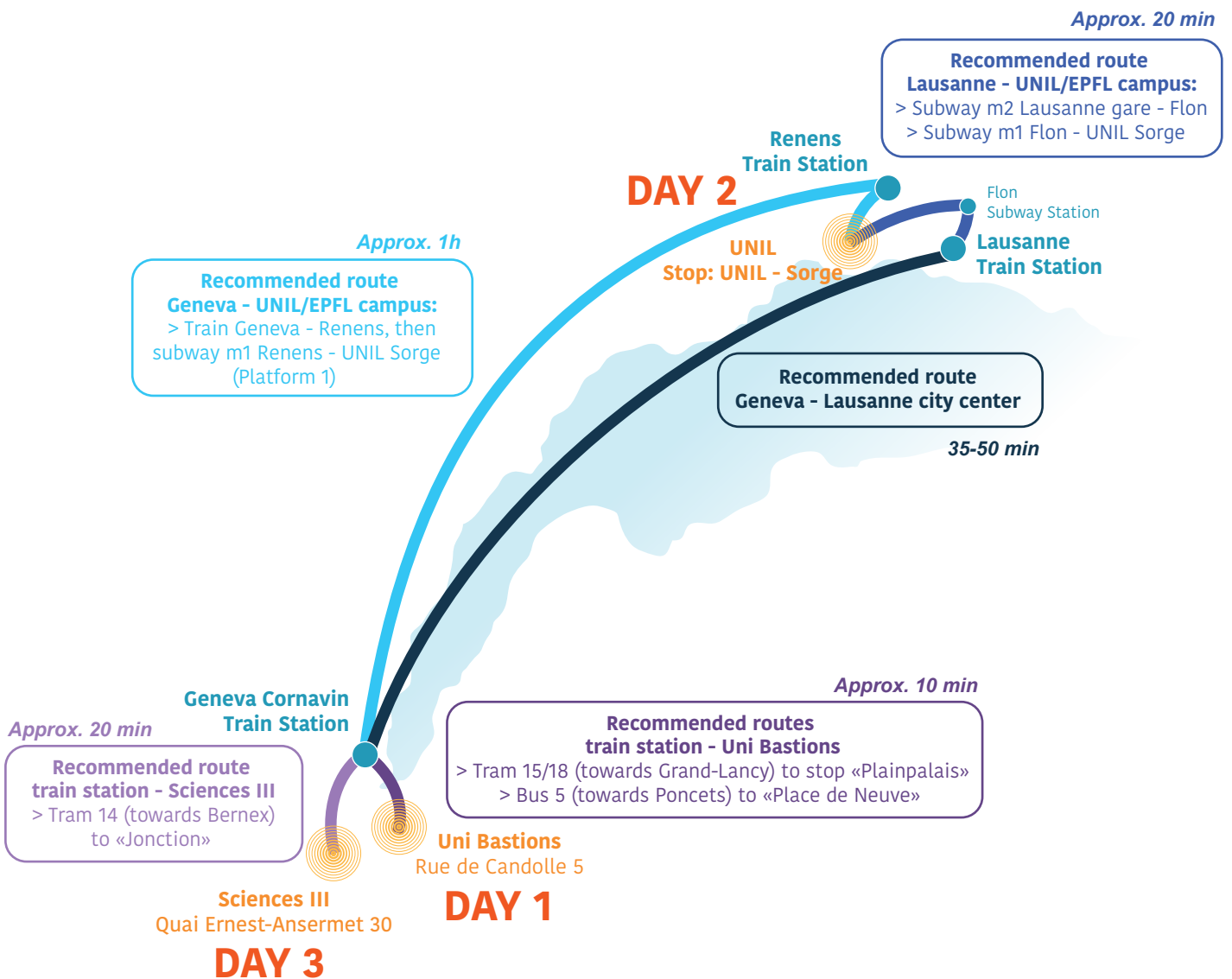


**Henning Stahlberg**  
University of Lausanne & EPFL

# Many thanks to our sponsors!



# Practical Information



## Which ticket to buy?...

Train tickets can be purchased via:

- the CFF/SBB website: <https://www.sbb.ch/en/home.html>
- machines in the stations (payment in CHF, EUR and by credit card)

Train tickets are not valid in the city tram, bus, subway, etc...

Tram/bus/metro tickets can be purchased via machines located at any stop (payment in CHF, EUR & by credit card, except the machine at the stop on UNIL campus that doesn't take cards)

### > From Geneva train station to UNIL campus:

Buy a ticket to «Sorge» (valid in the train + subway)

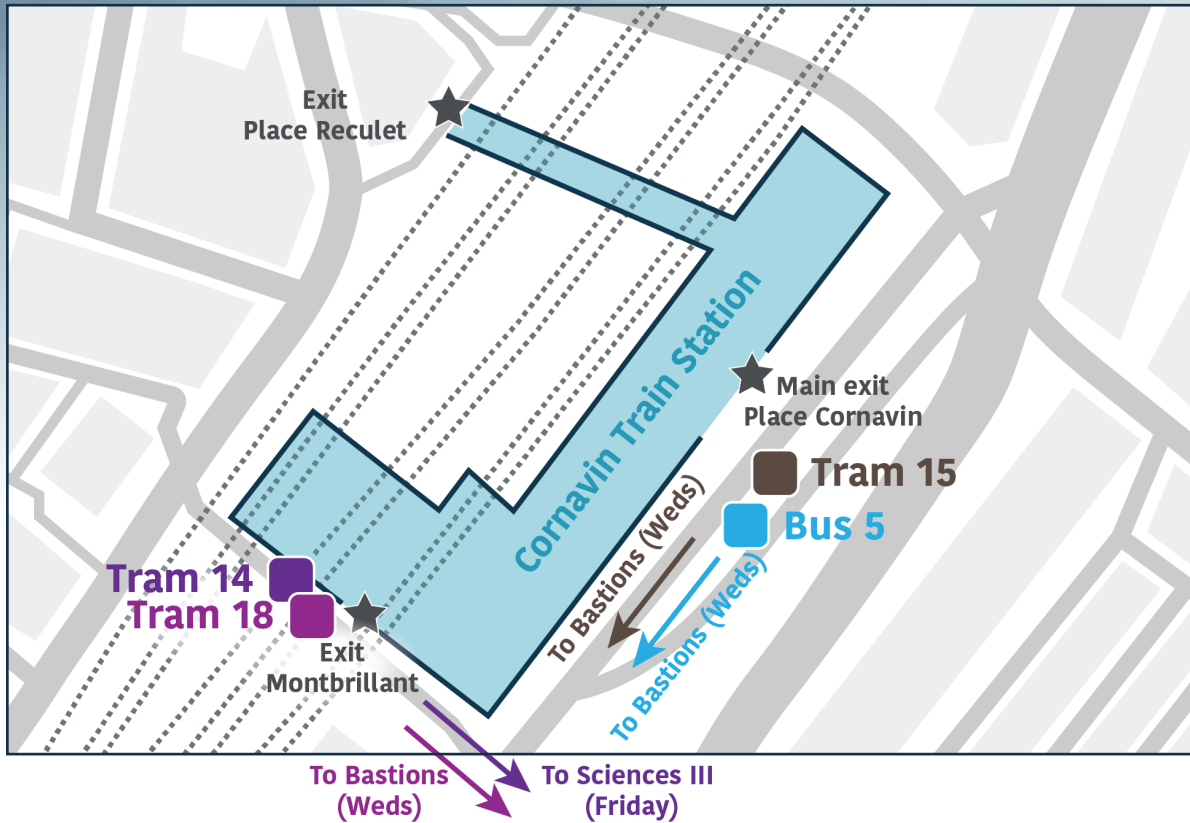
### > To take the public transports in Geneva:

Buy a ticket «TOUT GENEVE» (3CHF/EUR, valid 1h)

### > To take the public transports in Lausanne:

Buy a ticket «GRAND LAUSANNE» (3CHF/EUR, valid 1h)

## MAP: Geneva Train station

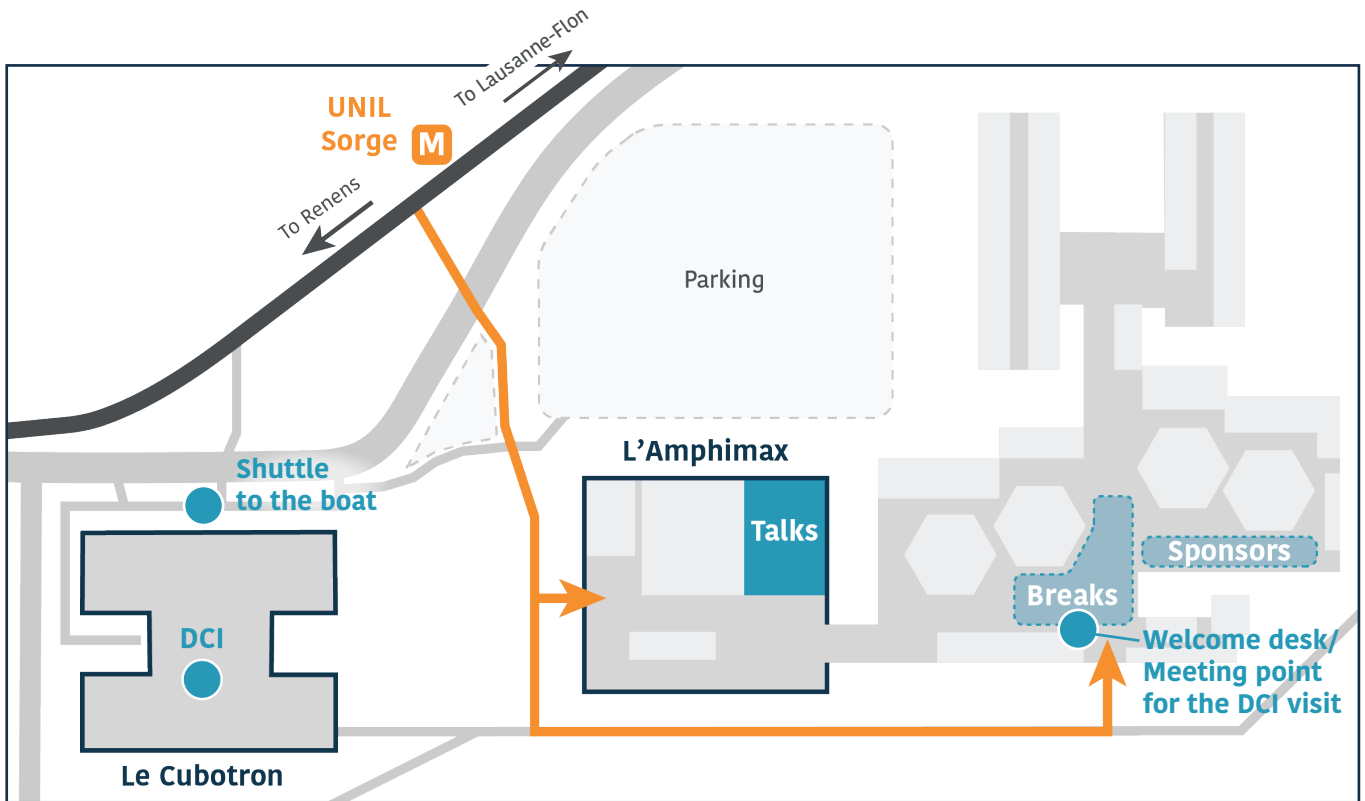


## MAP: UNIGE - Bastions (Day 1)





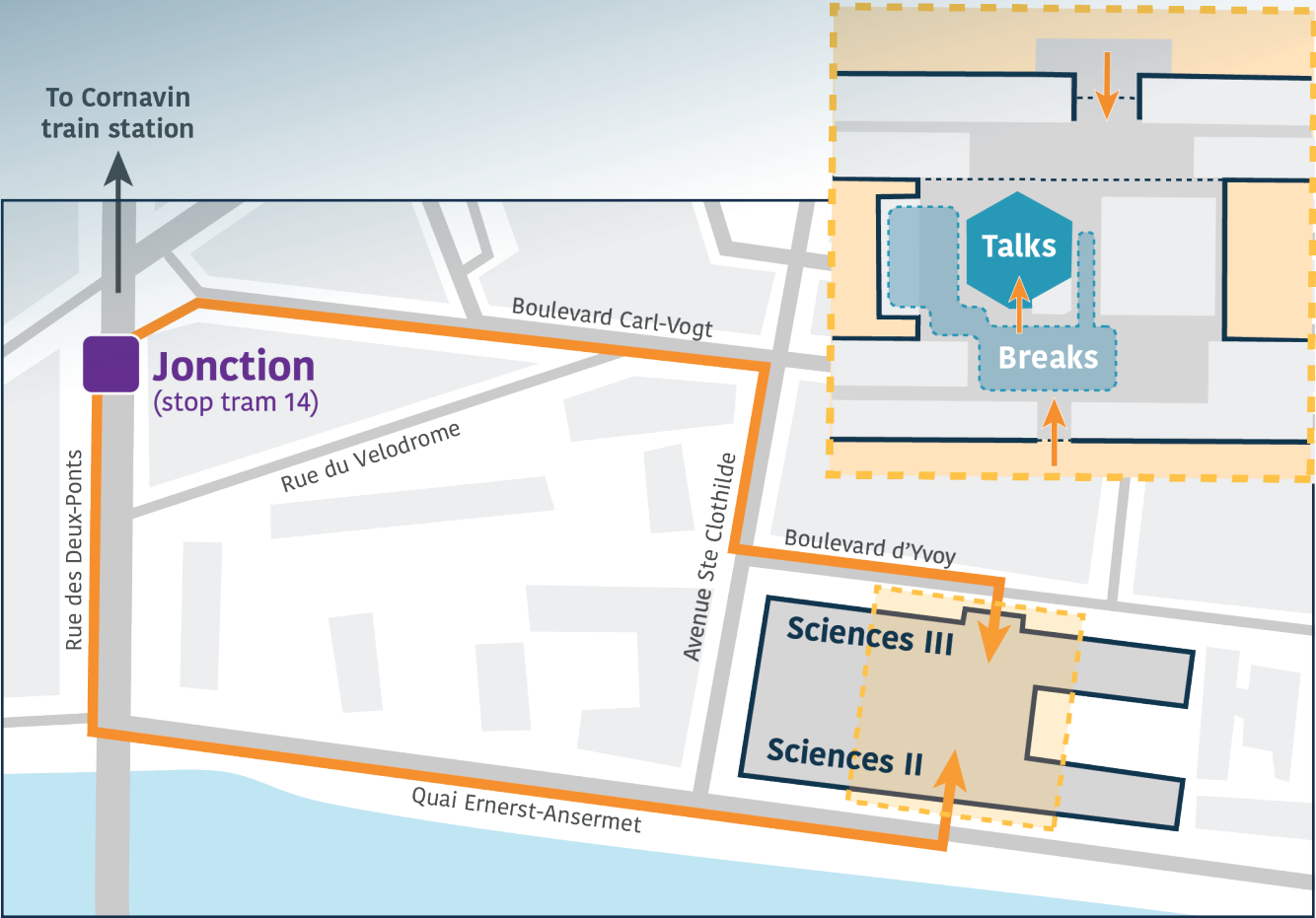
## MAP: UNIL Campus (Day 2)



## MAP: Cruise arrival (Day 2)



# MAP: UNIGE - Sciences Building (Day 3)





# Day 1

## Joyeux Anniversaire, Jacques!

**SCHEDULE: Wednesday, June 8<sup>th</sup>**  
**Geneva, Uni Bastions**

**13:00 - 16:00** Arrival and registration

**16:00 - 16:10** **Opening**  
Andreas Boland, University of Geneva  
Henning Stahlberg, EPFL & University of Lausanne

**16:10 - 17:00** **Keynote lecture**  
**Holger Stark**, MPI for Multidisciplinary Sciences, Göttingen, Germany  
Atomic resolution structure determination by cryo-EM

**18:00 - 19:30** **Introduction of the DCI by Yves Flückiger**, Rector of the University of Geneva  
**Public Lecture: «Dans l'intimité d'une cellule»** (with English translation)  
• **Seminar by Clélia Bourgoïn**, University of Geneva, Switzerland  
• **«Carte blanche» to Jacques Dubochet**

**19:30 - 20:30** Apéro & birthday celebration of Jacques Dubochet



### To go to Lausanne:

Go to Cornavin train station, then you'll have trains leaving very regularly to Lausanne.

## The speakers of the day



### Holger Stark

MPI for Multidisciplinary Sciences, Göttingen, Germany

Holger Stark obtained his PhD in biochemistry from the Free University of Berlin, Germany, in 1996 and pursued his postdoctoral work at the Imperial College in London, UK. His research currently mainly focuses on spliceosomal components called snRNPs to obtain structural information about the eukaryotic pre-mRNA splicing using single particle cryo-EM. In 2020, Holger Stark and his team have broken a crucial resolution barrier in cryo-EM. For the first time ever, they have recorded data that allowed the visualization of single atoms in the apoferritin structure by cryo-EM.



### Jacques Dubochet

Honorary Professor from the University of Lausanne, Switzerland

Jacques Dubochet shared the Nobel Prize in Chemistry in 2017 with Joachim Frank and Richard Henderson for their pioneering work on cryo-EM, and in particular for developing a vitrification method for sample preparation. Jacques Dubochet studied physics at the Ecole Polytechnique Fédérale de Lausanne, Switzerland, and Molecular Biology at University of Geneva, Switzerland. He completed his thesis in biophysics at the Universities of Geneva and Basel, Switzerland, in 1973. He then became a group leader at the EMBL in Heidelberg, Germany, before moving to Lausanne University where he stayed until he retired and became honorary professor in 2007.

# Day 2



**Suggested trains to go to UNIL:** (get a ticket to «UNIL-Sorge» directly)

7:50-8:31 RE 18413, towards Vevey

8:20-9:01 RE 18461, towards St Maurice

8:50-9:31 RE 18415, towards Vevey

Get off in Renens, then take subway m1 to UNIL-Sorge from platform 1 (10min)

## SCHEDULE: Thursday, June 9<sup>th</sup> Lausanne

09:00 - 10:00 **Arrival & welcome coffee**

**Visit of the DCI Lausanne - Group 1**  
**Meet your guides at the Welcome desk**

10:00 - 10:15 **Introduction**

10:15 - 11:00 **Keynote lecture**

**Nikolaus Grigorieff**, University of Massachusetts, Worcester, USA

Detection of distinct 60S ribosome maturation intermediates in cells by 2D template matching

11:00 - 11:30 **Coffee break**

11:30 - 11:55 **Sharon G. Wolf**, Weizmann Institute of Science, Israel  
New developments in cryo-STEM Tomography

11:55 - 12:20 **Maya Topf**, CSSB Hamburg, Germany  
From Blobs to Atoms - Fitting and validation of atomistic models in cryo-EM maps

12:20 - 13:20 **Lunch**

13:20 - 13:45 **Benoît Zuber**, University of Bern, Switzerland  
Morphofunctional changes at the active zone during synaptic vesicle exocytosis

13:45 - 14:10 **Martin Pilhofer**, ETH Zurich, Switzerland  
Multiscale models of microbial cell-cell interactions

14:10 - 14:40 **Coffee break**

14:40 - 15:05 **Ariane Briegel**, Leiden University, Netherlands  
Exploring the structure and function of microbial motility

15:05 - 15:30 **Radostin Danev**, The University of Tokyo, Japan  
Real-time defocus modulation and parallel cryo-tomography

15:30 - 16:00 **Coffee break**

16:00 - 16:45 **Keynote lecture**

**Bridget Carragher**, New York Structural Biology Center, USA

Cryo-EM automation: better, faster, cheaper... smarter

16:45 - 17:45 **Snacks & drinks**

**Visit of the DCI Lausanne - Group 2**  
**Meet your guides at the Welcome desk**

17:45 - 18:30 Shuttle bus from the campus to the pier

18:30 - 21:45 **Steam boat cruise from Lausanne to Geneva & dinner** (limited places)



**To go back to Geneva after the talks:**

Get a «GRAND LAUSANNE» ticket at the UNIL-Sorge station and take the subway m1 to Renens-gare. Then you'll have trains leaving every 30min to Geneva (towards Annemasse, 17:28 - 17:58 - 18:28 - 18:58).



**To go back to Lausanne after the cruise:**

22:05-22:47 IR 1839, towards Brig  
22:20-23:08 RE 18489, towards Lausanne  
22:45-23:38 RE 18443, towards Lausanne

# The speakers of the day



## Nikolaus Grigorieff

University of Massachusetts, Worcester, USA

Niko Grigorieff came to biology after studying physics. His Ph.D. thesis, obtained from the University of Bristol, UK, focused on EM studies of semiconductor devices. As a postdoctoral fellow at the Medical Research Council in England, he used EM to study large biological protein complexes, developing techniques and algorithms to obtain higher-resolution images of these assemblies inside cells. Niko Grigorieff started his own lab at Brandeis University in 1999 and became an HHMI investigator in 2000. He was a *Janelia* group leader from 2013 to 2018 and is now a professor at University of Massachusetts Chan Medical School, where his team is developing new methods to detect molecules and assemblies in situ.



## Sharon G. Wolf

Weizmann Institute of Science, Rehovot, Israel

Sharon Wolf studied chemistry at the University of California in Santa Cruz, USA, and structural chemistry at the Weizmann Institute of Science in Rehovot, Israel. She obtained her PhD in 1991 for her work on the structure of 2D crystals at the air-solution interface under the supervision of Prof. L. Leiserowitz. She then moved to Lawrence Berkeley National Laboratory, USA to pursue postdoctoral studies with Dr. K.H. Downing, during which she elucidated the structure of tubulin by high resolution electron crystallography and microscopy. Sharon Wolf is now a Senior Research Fellow & Head of the EM Unit at the Weizmann Institute of Science, where she currently focuses on developing cryo-scanning transmission electron tomography for probing structure and chemical composition of intact vitrified cells.



## Maya Topf

CSSB Hamburg, Germany

After studying chemistry at Tel Aviv University, Israel, Maya Topf received her PhD from the University of Oxford, UK in 2002, where she used hybrid QM/MM & molecular dynamics simulations to study serine protease deacetylation. She pursued postdoctoral studies in Andrej Sali's lab at the University of California in San Francisco, USA, where she combined cryo-EM data analysis and comparative modelling to model macromolecular structures at an atomic resolution. Maya Topf then worked at the Institute of Structural and Molecular Biology (Birkbeck College & UCL, London, UK), and is now a group leader at the Centre for Structural Systems Biology (CSSB) in Hamburg, Germany. Her research focuses on the development of integrative structural methods, combining experimental data with bioinformatics and modelling techniques to characterize macromolecular machines.



## Benoît Zuber

University of Bern, Switzerland

Benoît Zuber studied biology at the University of Lausanne, Switzerland, where he also obtained his PhD in Life Sciences under the supervision of Jacques Dubochet in 2007, before joining the lab of Nigel Unwin at the MRC Laboratory of Molecular Biology in Cambridge, UK, for his postdoctoral studies. He has been a group leader at the University of Bern, Switzerland, since 2011, where he develops and applies advanced methods to explore the fine structure of organs, cells, and proteins, mostly by cryo-EM and serial block face scanning EM.





## Martin Pilhofer

ETH Zürich, Switzerland

After studying biology at the University of Bayreuth, Germany, & the Technical University of Munich, Germany, Martin Pilhofer obtained his PhD in Microbiology in 2008 from the Technical University of Munich, Germany, for his work in the lab of Karl-Heinz Schleifer. After postdoctoral studies in structural cell biology with Grant Jensen at the California Institute of Technology (Caltech, USA), he became a group leader at ETH Zürich, Switzerland in 2014. Martin Pilhofer's research focuses on understanding bacterial cell-cell interactions from the molecular to the cellular and intercellular scale, by combining cryo-ET with other imaging techniques and functional assays.



## Ariane Briegel

Leiden University, Netherlands

Ariane Briegel received in-depth training in electron microscopy as part of her masters studies in biology at the Ludwig Maximilian University in Munich, Germany. She then joined the lab of Wolfgang Baumeister in Martinsried, Germany, for her doctoral thesis, in which she investigated the structure and function of prokaryotic macromolecular complexes in situ. As a postdoctoral fellow, Ariane Briegel joined the lab of Grant Jensen at the California Institute of Technology (Caltech, Pasadena, USA), where she continued her research in cryo-ET as a tool for understanding microbial ultrastructure. Currently part of Leiden University in the Netherlands, the Briegel Lab uses cryo-ET to directly study microbes in their native state and to understand how they sense and respond to their environment.



## Radostin Danev

The University of Tokyo, Japan

Rado Danev studied solid-state physics at the Sofia University in Bulgaria. During his PhD and in the following years, he worked on the development of EM phase plates in the laboratory of Prof. Nagayama in Okazaki, Japan, publishing the first phase plate applications in cryo-EM single particle analysis and cryo-ET. In 2011, he started his own group at the Max Planck Institute of Biochemistry in Martinsried, Germany. Rado Danev led an academia-industry collaboration that gave birth to the Volta phase plate, and was awarded the Ernst Ruska prize of the German Society for Electron Microscopy in 2017. His lab is currently focusing on G-protein coupled receptors (GPCRs) as well as developing new methods for cryo-EM.



## Bridget Carragher

New York Structural Biology Center, USA

Bridget Carragher studied physics at the University of the Witwatersrand, South Africa, and Northwestern University, Evanston, USA, before obtaining her PhD from the University of Chicago, USA in 1987. She has been involved in the development of streamlined and automated EM methods, aiming at improving both the quality of EM data as well as the accessibility of these techniques to the wider biological community. Bridget Carragher worked in various positions after her PhD, both in industry and academia, until moving to the Scripps Research Institute in 2001, where she served with Clint Potter as the Director of the National Resource for Automated Molecular Microscopy (NRAMM). In 2015 they moved to the New York Structural Biology Center, where they serve as Co-Directors of the Simons Electron Microscopy Center, and started the National Center for CryoEM Access and Training (NCCAT) in 2018.

# Day 3



## Suggested (faster) trains to Geneva:

08:13-08:50	IR 1808, towards Genève-Aéroport	] Get off in Genève-Cornavin, then take tram 14 direction Bernex, get off at Jonction and walk to the university (20 min total)
08:43-09:18	IC 706, towards Genève-Aéroport	
08:51-09:40	RegioE 18458, towards Annemasse	

You'll need to buy a ticket «TOUT GENEVE» at the tram stop once in Geneva before hoping on.

## SCHEDULE: Friday, June 10<sup>th</sup> Geneva, Sciences III

09:00 - 10:00	Arrival & welcome coffee
10:00 - 10:45	<b>Keynote lecture</b> <b>Joachim Frank</b> , Columbia University, New York, USA New developments in time-resolved cryo-EM
10:45 - 11:15	Coffee break
11:15 - 11:40	<b>Rebecca Thompson</b> , University of Leeds, UK Single particle cryo-EM pipelines (reasons to be optimistic)
11:40 - 12:05	<b>Julia Mahamid</b> , EMBL Heidelberg, Germany Enabling discovery by in-cell structural biology
12:05 - 13:05	Lunch
13:05 - 13:30	<b>Martin Beck</b> , MPI of Biophysics, Frankfurt, Germany Nuclear pores dilate and constrict in cellulose
13:30 - 13:55	<b>Ana Casañal</b> , Human Technopole, Milan, Italy Integrative approaches in cryo-EM: the structure and function of mRNA modifying machines
13:55 - 14:25	Coffee break
14:25 - 14:40	Industry Talk - Thermo Fisher Scientific
14:40 - 15:05	<b>Nigel Unwin</b> , MRC-LMB, Cambridge, UK Structure of a cholinergic cell membrane
15:05 - 15:30	<b>Gabriel Lander</b> , Scripps Research, La Jolla, USA Crystal structures: truth or fiction? Answers revealed by cryo-EM
15:30 - 16:00	Coffee break
16:00 - 16:45	<b>Keynote lecture</b> <b>Richard Henderson</b> , MRC-LMB, Cambridge, UK Cryo-EM: a look back and a look forward
16:45 - 17:05	Closing ceremony
17:05 - 18:05	Visit of the DCI Geneva

# The speakers of the day



## Joachim Frank

Columbia University, New York, USA

Joachim Frank shared the Nobel Prize in Chemistry in 2017 with Jacques Dubochet and Richard Henderson for their work on cryo-EM, and in particular for developing image processing methods by averaging low-exposure electron micrographs. After studying physics at the Universities of Freiburg and Munich, Germany, Joachim Frank received his PhD at the Technical University of Munich for his work in EM-related image processing under the supervision of Walter Hoppe. He has worked at several institutions in the U.S. and Europe, including the Wadsworth Center, New York State Department of Health, State University of New York at Albany, Howard Hughes Medical Institute and Columbia University, where he has remained since 2008.



## Rebecca Thompson

University of Leeds, UK

Rebecca Thompson studied Molecular Biology at Cardiff University, UK, before joining the University of Leeds, UK, for her doctorate. Her PhD work was carried out under the joint supervision of Neil Ranson, Eric Hewitt and Sheena Radford, and focused on the interaction of amyloid fibrils with cell membranes. She then joined the Astbury Biostructure Laboratory as a cryo-EM support scientist in 2016 and became the Facility Manager in 2017. Her research interests currently focuses on the development of workflows for in situ structural biology by combining different microscopy techniques to provide greater insight into complex biological questions, including fluorescence microscopy and soft-X ray microscopy.



## Julia Mahamid

EMBL Heidelberg, Germany

Julia Mahamid obtained her PhD in Chemistry in 2010 from the Weizmann Institute of Science, in Rehovot, Israel. She pursued her postdoctoral research work at the Max Planck Institute of Biochemistry in Munich, Germany, and has been a group leader at the EMBL in Heidelberg, Germany, since 2017. Her team brings together the emerging field of biomolecular condensates and state-of-the-art cellular cryo-ET to advance our understanding on the functional organisation of the cytoplasm.



## Martin Beck

MPI of Biophysics, Frankfurt, Germany

Martin Beck studied Biochemistry in Halle/Saale, Germany, and obtained his doctorate from the Technical University of Munich in 2006. He pursued his postdoctoral studies at the Swiss Federal Institute of Technology in Zurich before starting his own group at the European Molecular Biology Laboratory in Heidelberg, Germany, in 2010. He is the Director of the Max Planck Institute of Biophysics since 2019, where his lab uses integrative, in situ structural biology techniques to study the structure, function and assembly of very large macromolecular complexes in their native environment.





## Ana Casañal

Human Technopole, Milan, Italy

Ana Casañal studied Chemistry, Biochemistry and Biotechnology at the University of Malaga, Spain, where she also obtained her PhD in Biotechnology in 2014. As a postdoctoral fellow, she then moved to the MRC-Laboratory of Molecular Biology, Cambridge, UK, where she studied mRNA processing machines by cryo-EM. Ana Casañal is a group leader at the Structural Biology Center at Human Technopole, Milan, Italy, where she continues to focus on mRNA modifications. Her lab combines cryo-EM with biochemical and biophysical methods to understand the structure and mechanisms of the macromolecular machines that add and read out mRNA marks.



## Nigel Unwin

MRC-LMB, Cambridge, UK

Nigel Unwin obtained his PhD from Cambridge University, UK, in 1968, and then took a position at the MRC Laboratory of Molecular Biology, UK, from 1968 to 1980. He was Professor of Cell Biology at Stanford University, CA, USA, from 1980 to 1987, before returning to the MRC Laboratory of Molecular Biology, taking also a joint appointment at the Scripps Research Institute. Nigel Unwin has a long-standing interest in membrane proteins, and in developing electron imaging methods to explore their three-dimensional structures and how they work in their natural lipid setting.



## Gabriel Lander

Scripps Research, La Jolla, USA

Gabe Lander studied Biochemistry at Binghamton University (New York, USA) before obtaining his PhD in Biophysics in 2009 from the Scripps Research Institute (LaJolla, CA, USA) under the joint supervision of Bridget Carragher, Clint Potter, and Jack Johnson. He then performed his postdoctoral research at UC Berkeley, applying streamlined cryo-EM methods to investigate the properties of microtubule dynamics and the mechanisms of protein degradation by the proteasome. Gabe Lander is now back at the Scripps Research Institute, where his group uses the latest cutting-edge cryo-EM instrumentation and processing algorithms to study the molecular bases of human diseases such as cancer, heart diseases, and neurodegenerative diseases.



## Richard Henderson

MRC-LMB, Cambridge, UK

Richard Henderson shared the Nobel Prize in Chemistry in 2017 with Jacques Dubochet and Joachim Frank for their work on cryo-EM. Richard Henderson switched to biology after initially studying physics at Edinburgh University, UK. For his doctorate, he joined the team, led by David Blow, that worked out the atomic structure of chymotrypsin at the MRC-LMB in Cambridge, UK. He then developed an interest in the structure of membrane proteins during his postdoctoral studies at Yale University, USA, working for a few years on voltage dependent ion channels. After returning to LMB in 1973, he collaborated with Nigel Unwin to develop EM into a powerful tool for solving protein structures, most notably bacteriorhodopsin.

