

4th meeting as LS² intersection Cardiovascular Biology

Cardiovascular Research Meeting 2022



Meeting Booklet

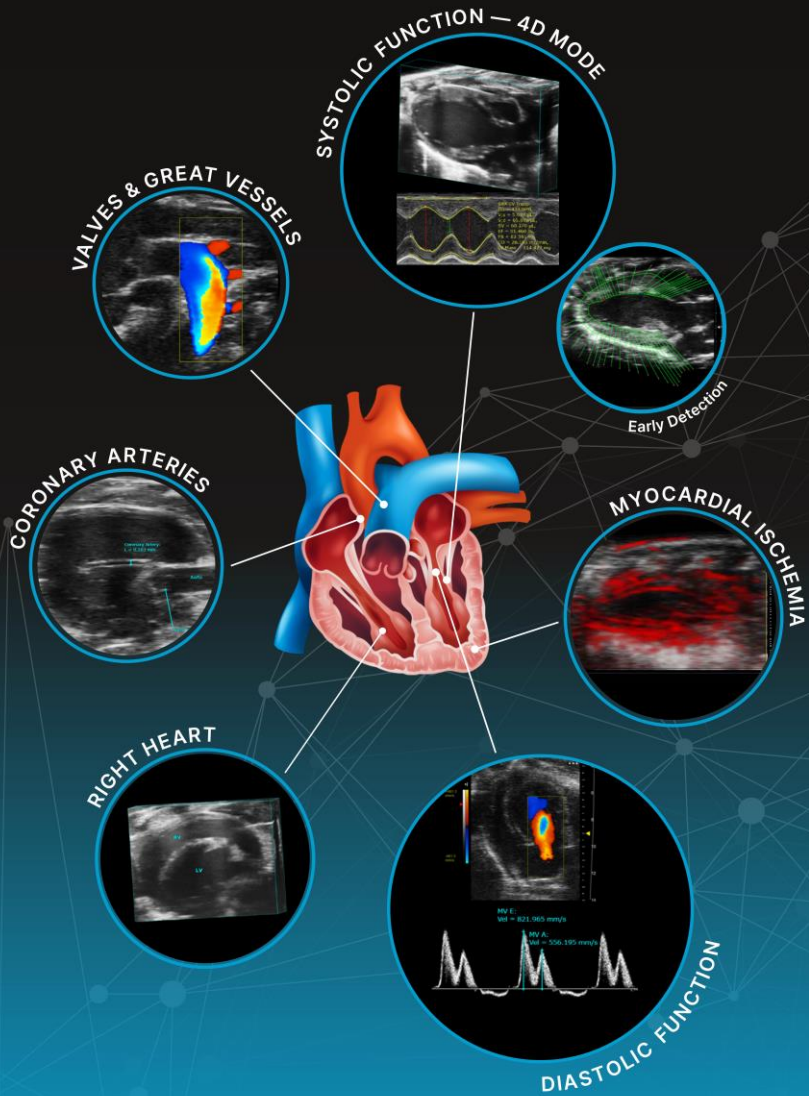


This meeting booklet belongs to:

Content

Program overview	3
Posters	9
Directions to the meeting dinner	16
Organizers	17
Sponsors	18
Upcoming LS2 meetings	19

Micro-Ultrasound & Photoacoustic Imaging for Translational Cardiovascular Research in Preclinical Animal Models



Program Overview

Monday 4th July 2022

- 09:00-10:00** **Registration and Welcome Coffee**
- 10:00-10:05** Welcome note from the President of the LS² Intersection
Cardiovascular Biology:
Andrea Banfi (University of Basel)
- Session 1:** **Cardiovascular physiology**
Chairs: Christophe Montessuit (University of Geneva) &
Elena Osto (University Hospital Zurich. UZH).
- 10:05-10:35** **Keynote 1: Christian Soeller** (University of Bern)
*"New concepts in the nano-domain regulation of cardiac
myocyte calcium release"*
- 10:35-11:05** **Plenary 1: Martin Flueck** (University of Fribourg)
"Perfusion-related aerobic metabolism and the heart beat"
- 11:05-11:55** **Talks selected from abstracts**
- Lucilla Giammarino** (University of Bern).
"Sex differences in atrial electrical properties"
- Eve Rigal** (University of Burgundy)
*"Long-term impact of postnatal overfeeding on cardio-
metabolism risk and on sensitivity to ischemia-reperfusion
injury in vivo"*
- Ettore Vanni** (University of Geneva)
*"Lipid droplets protect cardiomyocytes from lipotoxic
impairment of glucose transport"*
- Shafeeq Ahmed Mohammed** (University of Zurich)
*"A Chromatin Signature by the Methyltransferase SETD7
Orchestrates Angiogenic Response in Diabetic Limb
Ischemia"*

11:55-13:30

Lunch break, networking & poster viewing

Workshop

13:30-14:30

Michael Vanlandevijck (University of Uppsala)

"Single cell sequencing of vascular beds: Outlooks and challenges"

Introduced by **Marie-Luce Bochaton-Piallat**

(University of Geneva).

14:30-15:50

Poster session 1 & coffee break

Session 2:

Regeneration

Chairs: Jan Kucera (University of Bern) & Marie-Noelle Giraud (University of Fribourg)

15:50-16:15

Plenary 2: Nina Ullrich (University of Heidelberg).

"iPSC-cardiomyocytes for cardiac regenerative medicine "

16:15-17:05

Talks selected from abstracts

Yiqi Gong (University of Zurich)

"A Large-scale MicroRNA Functional High-throughput Screening Identifies Mir-515 and Mir-519e as Potent Inducers of Human iPSC-cardiomyocyte Proliferation"

Marion Delaunay (University of Lausanne)

"Investigation of the role of AKAP2 in stress-induced"

Ievgeniia Kocherova (University of Zurich)

"Transcriptome and proteome profiling of human cardiac fibroblasts reveals new candidate targets implicated in myocardial fibrosis"

Shaista Ahmed (University of Fribourg)

"Investigating the role of CD45 enriched bone marrow cells in modulating cardiomyoblast fate."

17:05-17:40

Keynote 2:

Charles Murray (University of Washington)

"Regenerating the Human Heart with Stem Cells" (ONLINE)

17:40–18:10

Cardiovascular working group: General Assembly

19:30

Meeting Dinner (upon previous registration)

Address of the restaurant on the page: 16

Tuesday 5th July 2022

Session 3:

Vasculature

Chairs: Giovanni Camini (University of Zurich) & Andrea Banfi (University of Basel)

08:30-09:05

Keynote 3:

Magnus Bäck (University of Stockholm)

“Lipid mediators for the resolution of atherosclerosis inflammation”

09:05-10:35

Poster session 2 & Coffee break

10:35-11:00

Plenary 3:

Joanna Maria Kalucka (Aarhus University, Denmark)

“Role of endothelial heterogeneity in health and disease”

11:00-11:50

Talks selected from abstracts

Elisa Dietrich (University Hospital Zurich)

“Bile Acids as novel regulators of Endothelial Cell metabolism and quiescence”

Stefano Ministrini (University of Zurich)

“JCAD promotes arterial thrombosis through PI3K/Akt modulation: a translational study”

Luis Miguel Cardoso dos Santos (University of Zurich)

“Smooth muscle cell-specific deletion of S100A4 reroutes their fate and modifies the inflammatory status of murine atherosclerotic lesions”

Basant Shaker Mohamed Elsaid (Universitätsklinikum Carl Gustav Carus Tu Dresden)

“Role of endothelium in mediating sex specific differences: the vasorelaxant effect of estrogen and estrogen receptors in mouse thoracic aorta”

11:50-12:10

Poster Award Session

12:10-13:30

Lunch break, networking & poster viewing

Session 4:

Cardiomyocyte Biology

Chairs: Sarah Longnus (University of Bern) & Anna Jazwinska (University of Fribourg)

13:30-14:05

Keynote 4: Milica Radisic (University of Toronto)
“Advances in Heart-on-a-Chip”(ONLINE)

14:05-14:35

Coffee break

14:35-15:00

Plenary 4: Carolina Balbi (University of Lugano)
“The pleiotropic effect of extracellular vesicles derived from cardiac mesenchymal progenitor cells”

15:00-15:50

Talks selected from abstracts

Myra Chavez (University of Bern)

“The zebrafish as a model to study autophagy and lysosomal processing in heart and valve development”

Maria-Nieves Sanz (University of Bern)

“Investigating the roles of mitochondrial DNA and TLR9 in a preclinical model of heart donation after circulatory death”

Camilla Schinner (University of Basel)

“Defective Desmosomal Adhesion Causes Arrhythmogenic Cardiomyopathy by involving an Integrin- α V β 6/TGF- β Signaling Cascade”

Myriem Otmani Idrissi (University of Fribourg)

“The tissue Renin-Angiotensin System characterization in Exercise-induced cardiac hypertrophy.”

15:50–16:00

Award Ceremony

*Best oral presentation award sponsored by **AdipoGen***

*Best poster award sponsored by **NIKON***

*2nd Best poster award sponsored by **AdInstruments***

16:00-16:10

Closing remarks from the next president of the LS²
Cardiovascular Biology Inter-Section

Elena Osto (University of Zurich)

Research Prize of the Swiss Society of Cardiology

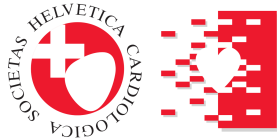
CHF 30'000.-

for
young researchers

Deadline for submission: 30 March 2023

Further information: Schweizerische Gesellschaft für Kardiologie
Frau Karin Guldenfels
Dufourstrasse 30, 3005 Bern
Tel. 031 388 80 90, E-Mail: info@swisscardio.ch

123



Swiss Society
of Cardiology

AMGEN

Cardiovascular

CH-REP-0621-00007

Posters

Poster #1

Aurelien, Frobert

University of Fribourg

Evaluation of a 3D-printed bioresorbable polymeric coronary scaffold

A.Frobert¹, G.Aljabert^{1,2}, J.Valentin¹, J.Egger¹, Z.Yang², S.Cook¹, MN.Giraud¹

¹Heart repair and regeneration.

Department of Endocrinology, Metabolism and Cardiovascular System, University of Fribourg, Fribourg, Switzerland

²Cardiovascular and Aging Research. Department of Endocrinology, Metabolism and Cardiovascular System, University of Fribourg, Fribourg, Switzerland

Poster #2

Azar, Pascal

University of Geneva

Role of apelin in vascular smooth muscle cell phenotypic transition: a proatherogenic factor for atherosclerosis

Pascal Azar, Luís Miguel Cardoso Dos Santos, Chiraz Chaabane, Cécile Brun, Stéphane König, Angela Roatti, Yves Audigier, Alex J Baertschi, Marie-Luce Bochaton-Piallat

Poster #3

Banfi, Andrea

University of Basel

Rapid and physiological self-assembly of stable microvascular

networks in vitro and in vivo by VEGF-decorated fibrin matrices

Adelin Rouchon 1, Priscilla S. Briquez 2, Dirk J. Schaefer 3, Jeffrey A. Hubbell 4, Nunzia Di Maggio 1,3, Andrea Banfi 1,3

1 Department of Biomedicine, Basel University Hospital and University of Basel, Switzerland

2 Department of General and Visceral Surgery, Medical Center – University of Freiburg, Germany

3 Department of Plastic, Reconstructive, Aesthetic and Hand Surgery, Basel University Hospital, Switzerland

4 Pritzker School of Molecular Engineering, University of Chicago, IL, USA

Poster #4

Clowsley, Alexander

University of Bern

Protein-protein detection with nanometre localisation using proximity dependent (PD)-PAINT.

Alexander H Clowsley (1,2), William T Kaufhold (3), Tobias Lutz (2), Anna Meletioui (1,2), Lorenzo Di Michele (3,4), Christian Soeller (1,2).

1. Institut für Physiologie, Universität Bern, Bern, Switzerland.

2. Living Systems Institute & Biomedical Physics, University of Exeter, Exeter, UK.

3. Cavendish Laboratory, University of Cambridge, Cambridge, UK.

4. Department of Chemistry, Molecular Sciences Research Hub, Imperial College London, London, UK.

Poster #5

Crossman, David

University of Auckland

Collagen VI knockout and cardiac myocyte Ca²⁺ transient

Dr David Crossman

Poster #6

Di Maggio, Nunzia

University of Basel

The cross-talk between vessels and bone: Semaphorin3a couples osteogenesis and angiogenesis for bone regeneration

Andrea Grosso¹, Priscilla S. Briquez³, Dirk J. Schaefer^{1,2}, Jeffrey A. Hubbell³, Andrea Banfi^{1,2}, Maximilian G. Burger^{1,2} and Nunzia Di Maggio¹

1Department of Biomedicine, Basel University Hospital and University of Basel, Switzerland

2Department of Plastic, Reconstructive, Aesthetic and Hand Surgery, Basel University Hospital, Switzerland

3Pritzker School of Molecular Engineering, University of Chicago, IL, USA

Poster #7

Diteepeng, Thamonwan

University of Zurich

Protein misfolding: an additional mechanism in the heart-brain communication after ischemic stroke

T Diteepeng¹, YM Puspitasari¹, S Ministrini^{1,2}, D Vdovenko³, A Akhmedov¹, JH Beer^{1,5}, TF. Lüscher^{1,6}, GG Camici^{1,4,7} and M Luciani^{1,5}

1 Center for Molecular Cardiology, University of Zurich, Schlieren, Switzerland

2 Internal Medicine, Angiology and Atherosclerosis, Department of Medicine and Surgery,

University of Perugia, Perugia, Italy

3 Immunology-Oncology Section, Maisonneuve-Rosemont Hospital Research Center,

Département de Microbiologie, Infectiologie et Immunologie, Université de Montréal, Montréal,

Quebec, Canada

4 Department of Cardiology, University Heart Center, University Hospital Zurich, Zurich,

Switzerland

5 Department of Internal Medicine, Cantonal Hospital of Baden, Baden, Switzerland

6 Department of Cardiology, Royal Brompton & Harefield Hospitals and National Heart & Lung

Institute, Imperial College, London, United Kingdom

7 Department of Research and Education, University Hospital Zurich, Zurich, Switzerland

Poster #8

Egle, Manuel

University of Bern

Nitric oxide synthase activity required for beneficial effects of cardiac hypothermic oxygenated perfusion in a rat model of donation after circulatory death

M. Egle^{1,2,3}, N. Mendez-Carmona^{1,2}, A. Segiser^{1,2}, S. Graf^{1,2}, M. Siepe^{1,2}, S. Longnus^{1,2}

1Department of Cardiac Surgery, Inselspital, Bern University Hospital and University of Bern, Switzerland

2Department for BioMedical Research,
University of Bern, Switzerland
3Graduate School for Cellular and
Biomedical Sciences, University of Bern,
Switzerland

Poster #9

Evans, Bryce

University of Bern

**Unravelling the role of vascular
ChemR23 expression in
atherosclerosis**

*Bryce Evans, Emiel van der Vorst, Yvonne
Jansen, Manovriti Thakur, Nico Angliker,
Mark Siegrist¹, Christian Weber, Iris
Baumgartner & Marc Schindewolf and
Yvonne Döring*

Poster #10

Filippova, Maria

University of Basel

**T-cadherin is a novel regulator of
pericyte function and
interactions with endothelial
cells during angiogenesis.**

*B. Dasen, S. Pigeot, G. M. Born, I. Martin,
M. Filippova*

Poster #11

Gianni Barrera, Roberto

University of Basel

**Lateral induction of Dll4
expression initiates
intussusceptive angiogenesis by
VEGF and its inhibition promotes
therapeutic angiogenesis in
muscle.**

*Roberto Gianni Barrera¹, Andrea
Uccelli¹, Marianna Trani¹, Raquel*

*Blanco³, Katie Bentley⁴, Holger
Gerhardt⁵ and Andrea Banfi¹*

*1Department of Biomedicine and of
Surgery, Basel University Hospital,
Switzerland*

*2The Biomedical Research Centre, the
University of British Columbia,
Vancouver, Canada.*

*3Vascular Biology Laboratory, London
Research Institute, London, UK*

*4Pathology, Beth Israel Deaconess
Medical Center, Harvard Medical School,
Boston, USA*

*5Max-Delbrück Center for Molecular
Medicine, Helmholtz Association, Berlin,
Germany*

Poster #12

Graf, Selianne

University of Bern

**Functional and metabolic effects
of macrophage-derived
extracellular vesicles on cardiac
grafts in a preclinical model of
donation after circulatory death**

*S. Graf, V. Biemmi, M. Arnold, A. Segiser,
A. Müller, M. Egle, M.N. Sanz, N. Méndez-
Carmona, M. Siepe, L. Barile, S. Longnus*

Poster #13

Iamshanova, Oksana

University of Bern

**Role of 14-3-3 proteins on human
cardiac sodium channel Nav1.5**

*Iamshanova Oksana, Hämmerli Anne-
Flore, Ramaye Elise, Ross-Kaschitza
Daniela, Schärz Noëlia, Seljmani Arbresh,
Maria Essers, Sabrina Guichard, Rougier
Jean-Sebastien, Abriel Hugues*

Poster #14
Ivanovic, Ena
University of Bern

Ephaptic coupling in cardiac intercalated disc nanodomains: insights from a finite element model

Ena Ivanovic and Jan Pavel Kucera – Department of Physiology, University of Bern

Poster #15
Kakava, Sofia
University of Zurich

Apolipoprotein E defines high-density lipoprotein trafficking in brain endothelial cells

*Sofia Kakava^{1,2}, Eveline Schlumpf¹, Arnold von Eckardstein^{1,2} and Jerome Robert¹
1.University hospital Zurich (Switzerland). 2.University of Zurich (Switzerland)*

Poster #16
Kapitanova, Ksenia
University of Geneva

Characterization of S100A4-induced inflammatory SMCs in vitro and in vivo

Ksenia Kapitanova, Pascal Azar, Marie-Luce Bochaton-Piallat

Poster #17
Malamelli, Lilia
University of Basel

Doxorubicin induces cardiac compensatory mechanisms in a

sex-specific manner – do acute metabolic effects of NRG-1 improve cardiac adaptation?

*L. MALAMELLI, L. XU, M. ALIOUI, C. MORANDI and M. BRINK
Department of Biomedicine, University of Basel and University Hospital, Hebelstrasse 20, CH-4031 Basel, Switzerland.*

Poster #18
Meletiou, Anna
University of Bern

Improved resolution of IP3R2 distribution in left ventricular cardiac porcine tissue

A. Meletiou, A. Clowsley, C. Soeller

Poster #19
Nayir, Seyma
University of Bern

Effects of blebbistatin and streptomycin on beat rate variability and mechano-electric feedback in spontaneously active cardiomyocyte cultures

Seyma Nayir, Stéphanie P. Lacour, Jan P. Kucera

Poster #20
Nimani, Saranda
University of Bern

Genotype-differences in the extent of mechano-induced electrical QT-changes in long-QT, wildtype, and short-QT syndrome rabbits

Nimani S, Hornyik T, Alerni N, Lewetag R, Giammarino L, Perez-Feliz S, Matas L,

Moss KR, Zehender M, Brunner M, Seemann G, Odening KE
Translational Cardiology, Dep. of Cardiology and Dep. of Physiology, University Hospital Bern, University of Bern, Switzerland;
Dep. of Cardiology and Angiology I, University Heart Center Freiburg, University of Freiburg, Germany

Poster #21
Pellegrin, Maxime
University Hospital Lausanne

Effects of moderate- and high-intensity exercise training in normoxia or hypoxia on atherosclerosis in mice.

Linjia Wang, Jessica Lavier, Karima Bouzourène, Lucia Mazzolai, Ying Zhang, Grégoire P. Millet, Maxime Pellegrin

Poster #22
Puspitasari, Yustina Maria
University of Zurich

Effects of PCSK9 inhibitor after stent implantation: A novel potential therapeutic strategy to reduce stent-related complications.

Yustina M Puspitasari, Stefano Ministrini, Ana Vukolic, Luca Liberale, Giovanni G Camici

Poster #23
Rosenblatt-Velin, Nathalie
University Hospital Lausanne

The C-type Natriuretic Peptide: a new player in the development of the Marfan syndrome ?

S. Clerc-Rignault, C. Biemann, K. Bouzourene, T. Déglise, L. Mazzolai, N. Rosenblatt-Velin

Poster #24
Selimi, Zoja
University of Bern

An automated unbiased algorithmic pipeline to analyze single-channel recordings and to investigate cooperative interactions between sodium channels

Zoja Selimi¹, Jean-Sébastien Rougier², Hugues Abriel², Jan P. Kucera¹
¹Department of Physiology, University of Bern, Switzerland
²Institute of Biochemistry and Molecular Medicine, University of Bern, Switzerland

Poster #25
Zoia, Matteo
University of Bern

A gene desert as cis-regulatory hub controlling pleiotropic Shox2 expression and cardiac pacemaker development

Matteo Zoia^{1*}, Samuel Abassah-Oppong², Brandon J. Mannion³, Raquel Rouco⁴, Virginie Tissieres⁵, Virginia Roland¹, Julie Gamart^{1,6}, Iros Barozzi^{3,7}, Diane E. Dickel³, Javier Lopez Rios⁵, Guillaume Andrey⁴, Len A. Pennacchio^{3,8}, Axel Visel^{3,8}, John Cobb² and Marco Osterwalder^{1,3,6}
¹ Department for BioMedical Research (DBMR), University of Bern, 3008 Bern, Switzerland.
² Department of Biological Sciences, University of Calgary, 2500 University Drive N.W., Calgary, Alberta, T2N 1N4, Canada.

3 *Environmental Genomics and Systems
Biology Division, Lawrence Berkeley
National Laboratory, Berkeley, CA 94720,
USA.*

4 *Department of Genetic Medicine and
Development and iGE3, Faculty of
Medicine, University of Geneva, 1211
Geneva, Switzerland.*

5 *Centro Andaluz de Biología del
Desarrollo (CABD), CSIC-Universidad*

*Pablo de Olavide-Junta de Andalucía,
41013 Seville, Spain.*

6 *Department of Cardiology, Bern
University Hospital, Bern, Switzerland*

7 *Center for Cancer Research, Medical
University of Vienna, Vienna, Austria.*

8 *US Department of Energy Joint Genome
Institute, Lawrence Berkeley National
Laboratory, Berkeley, CA 94720, USA.*

**Presenting author*



OLS OMNI Life Science
Laufenstraße 90
4053 Basel, Switzerland

Contact:
Hatice Demiral
+41 800 666 454
info@ols-bio.ch
<https://www.ols-bio.ch>



OLS – Your Partner in Cell Research

Focusing on people and innovations, OLS accelerates research in life sciences and biotech with smart, reliable and user-friendly technologies. Our products are found in laboratories of both the public and private sector, as well as laboratories of the pharmaceutical and biotechnology industries. The broad portfolio includes instruments, media, biochemicals, consumables, as well as services and consultation for cell counting, cell culture, imaging, flow cytometry, and cell analysis. This enables us to accompany you during the entire research process, from conception to conclusion.

Cell Counting

Researchers need to know their cells and the most important factor is cell concentration and viability. Our self-developed CASY Cell Counter & Analyzer is a highly reliable and user-friendly device to determine cell numbers exactly, no matter the cell type (iPSCs, PBMCs, bacteria, yeast, algae etc.), even under consideration of aggregates. The results are reproducible, statistically robust, and GMP/GLP-compliant with rapid measuring speed.

Cell Culture

Advances in disease modelling and increasing rejection of animal testing has led to the rise of organoid & spheroid research. The CERO 3D Incubator and Bioreactor – developed and manufactured in Bremen – allows for benchtop cultivation of these 3D cell structures. Our advanced approach for cell suspension allows for high longevity and viability under precisely controlled conditions.

In order to cater to all the needs of your cell culture lab, we provide a comprehensive portfolio of HiMedia lab products. HiMedia is an internationally established and renowned vendor of certified lab supplies. Our vast catalogue encompasses cell culture media, sera, stains, bioreagents & chemicals in numerous variations, as well as lab consumables.

Imaging

We provide a wide range of products for any imaging need, if you want to keep an eye on your cells.

The xCELLigence Real-time Analyzer eSight combines real-time cell impedance-based analysis with live cell imaging. It can be used in a wide range of applications, such as immuno-oncology, proliferation assays, cytotoxicity and apoptosis or viral infections of cells. The zenCELL owl Incubator Microscope is a compact way of visualising real-time data within your incubator. Inside, 24 microscopes enable a new simultaneous observation of your cell culture. Your drug discovery efforts can also be substantiated by the Hermes WiScan Screening Workstation. The Hermes is a flexible, high-quality automated device, supports precise Z-stacking and operates at high speeds of image acquisition.

Flow Cytometry

When it comes to flow cytometry, OLS provides a large range of products. Our NovoCyte Flow Cytometers offer different properties, functionalities, and designs for every need, with 3-5 lasers.

The Proteintech antibody portfolio comes with conjugated and unconjugated primary antibodies validated for flow cytometry. Using advanced microfluidics, the NanoCell Single Cell Dispenser sorts and dispenses single cells directly into multi-well plates.

Cell Analysis

Both immune cells and tumour cells have many varying behaviours, requiring deep insight with high sensitivity. The xCELLigence Real Time Cell Analyzer (RTCA) technology allows detection of these cellular changes, such as adhesion, cell number, morphology, cell contacts or infections. It evaluates up to four 384-well-plates non-invasively and simultaneously for your drug discovery and pre-clinical studies.

Directions to the meeting dinner

(attendance upon previous registration only)

Altes Tramdepot - Brauerei Restaurant AG

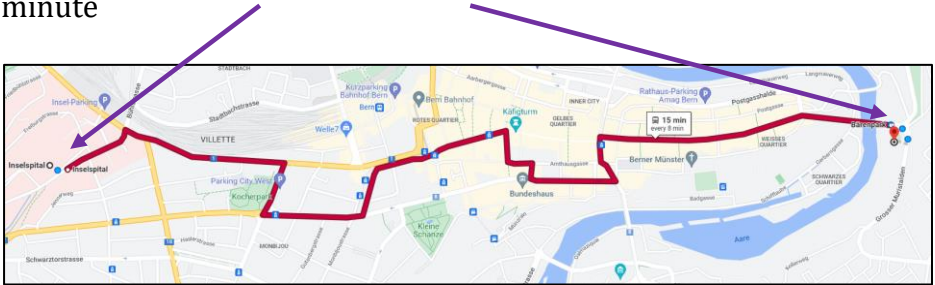
Grosser Muristalden 6

CH - 3006 Bern

+41 (0) 31 368 14 15. www.altestramdepot.ch

From the venue:

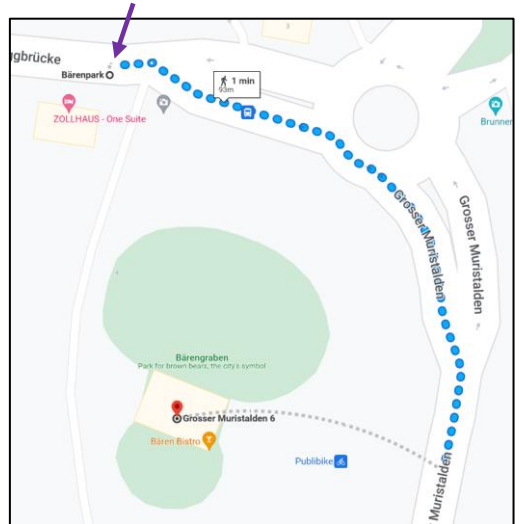
Bus #12 from Inseleppital to Bärenpark (13 mint), then walk 1 minute



From the venue to Inseleppital



From Bärenpark to the restaurant



Organizers

The Executive Committee of the LS² intersection Cardiovascular Biology

Andrea Banfi, University Hospital Basel, *president*
Elena Osto, University and University Hospital Zurich, *vice-president*
Marie-Noelle Giraud (University of Fribourg), *past-president*
Marie-Luce Bochaton-Piallat, University of Geneva
Christophe Montessuit, University of Geneva
Nathalie Rosenblatt, CHUV Lausanne
Giovanni G. Camici, University of Zurich
Sarah Longnus, University of Bern
Jan Kucera, University of Bern
Anna Jazwinska, University of Fribourg



Life Sciences Switzerland (LS²)

Adela Calvente (Scientific Officer)
Neringa Mannerheim (Scientific Officer)
Jacqueline Oberholzer (Executive Secretary)
...and our freelance support:
Dagmar Bocakova (design, bocakova@gmail.com),
Dominique Ritter (administration)
Michael Vögeli (IT)



Sponsors

We are very grateful to the contributions of...



Upcoming LS² events

Swiss Physiology Meeting

- **September 6th, 2022. Bern**
- *Registration deadline: August 17th, 2022*
- <https://meetings.ls2.ch/physiology2022>

Autophagy Workshop

- **September 16th, 2022. Lausanne.**
- *Abstract submission deadline: July 15th, 2022*
- *Registration deadline: August 22nd, 2022*
- <https://meetings.ls2.ch/autophagy-workshop-2022>

LS² Annual Meeting 2023 & Young Scientists' Satellite

- *February 15th, 16th & 17th, 2022. Zurich*
- *To open soon: <https://annual-meeting.ls2.ch/>*

Thank you all for your participation!

Feedback to:
info@ls2.ch

www.meetings.ls2.ch/cardiovascular2022

FUJIFILM
VISUALSONICS

OLS[®]
OMNI Life Science


ADINSTRUMENTS
making science easier


Nikon

AdipoGen[®]
LIFE SCIENCES