



The CERN Accelerator School

Closing remarks

Hermann Schmickler

The CERN Accelerator School and the Paul Scherrer Institute are organizing a course on

Beam Dynamics and Technologies for Future Colliders

21 February to 6 March, 2018
Crowne Plaza Hotel,
Zurich, Switzerland

The course will be of interest to staff and students from laboratories and universities who wish to learn about the various options being considered for future colliders for high-energy physics. The material presented will be at an accessible level and cover circular hadron and lepton colliders, as well as linear lepton colliders.

The program will cover the beam dynamics of the colliders presently under consideration and the associated technologies that will be needed to build them. Beam generation and machine protection issues will also be addressed. Students will have the opportunity to work on realistic case studies throughout the school.

CAS course on Beam Dynamics and Technologies for Future Colliders



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cas.web.cern.ch
Accelerator.school@cern.ch





A bit of history

- This course first time ever
- Idea for course born during last Linear Collider School and during FCC week in Berlin
- Visit and choice of hotel in June 2017 (hotel transformation was announced at that moment for November 2017)
- Program committee meeting at CERN in May 2017
 - decision: 13 days, 56 hours lectures, 3h discussion session, 10 h case studies, 1 seminar, 1 podium
 - list of speakers and subjects
 - NO PROCEEDINGS
- 13 iterations of program
- Total of 65 students (low participation from US and Asia)

	Wed, 21.2.2018	Thu, 22.2.2018	Fri 23.2.2018	Sat, 24.2.2018	Sun, 25.2.2018	Mon, 26.2.2018	Tue, 27.2.2018	Wed, 28.2.2018	Thu, 1.3.2018	Fri, 2.3.2018	Sat, 3.3.2018	Sun, 4.3.2018	Mon, 5.3.2018	Tue, 6.3.2018				
Arrival day and registration	08:30	Course Opening / Seminar H.Schmickler / L. Rivkin	Detectors for high energy colliders/Machine detector interface I L.Linssen	Recap of long. BD F.Tecker	Collider Diagnostics / Measurement of critical beam parameters I J.Wenniger	Beam-Beam Effects/Beamstrahlung I W.Herr	Instabilities in high energy colliders and their mitigation I O.Boine-Fr...	Excursion	Superconducting RF systems I E.Jensen	Normalconducting & permanent magnets T. Zickler	Low Level RF challenges/timing systems I A. Gallo	Interaction of particles with matter N. Mokhov	Normal conducting high gradient RF systems II W.Wuensch	Departure day				
	09:20	Discussion							Discussion									
	09:30	High energy physics at colliders M. Mangano	Recap of transverse BD I H.Schmickler	Large colliders critical technologies to be announced	Circular Hadron Collider beam dynamics I M.Syphers	Circular Lepton Collider beam dynamics/damping rings I K. Oide	Circular Lepton Collider beam dynamics/damping rings II K. Oide		positron production M. Kuriki	Superconducting RF systems III E.Jensen	Low Level RF challenges/timing systems II A. Gallo	Normal conducting high gradient RF systems I W.Wuensch	Kickers & Septa M.Paraliev					
	10:30	Coffee							Coffee									
	11:00	Luminosity goals, critical parameters B. Muratori	Detectors for high energy colliders/Machine detector interface II L.Linssen	Circular Hadron Collider beam dynamics III D. Schulte	Collider Diagnostics / Measurement of critical beam parameters II J.Wenniger	Beam-Beam Effects/Beamstrahlung II W.Herr	Instabilities in high energy colliders and their mitigation II O.Boine-Fr...		Superconducting RF systems II E.Jensen	magnet vibration and feedbacks A.Seryi	RF power systems, CLIC drive beam S. Doebert	machine protection concepts N. Mokhov	alignment&metrology/requirements and realization D. Missiaen					
	11:50	Discussion							Discussion									
	12:00	Introduction to a Muon Collider and Gamma Collider W.Chou	Recap of transverse BD II H.Schmickler	Discussion Session I B. Holzer	Circular Hadron Collider beam dynamics II M.Syphers	injection and extraction M.Aiba	Discussion Session II B. Holzer		Large colliders civil engineering and siting J.Osborne	Lessons learnt from SLC F. Zimmermann	Discussion III B. Holzer	Final Focus layouts and stability considerations A. Seryi	High Energy Ion Colliders J. Jowett					
	13:00	Lunch							Lunch									
	14:30	Linear Collider studies overview S.Stapnes	Linear Collider Beam dynamics I D.Schulte	Case Studies Introduction WH/BH/DS	Free	Case Studies II WH/BH/DS	Case Studies IV WH/BH/DS		Superconducting material/cables C. Senatore	Case Studies VI WH/BH/DS	Free	Case Studies VIII WH/BH/DS	Reliability Engineering/Availability of a large collider complex M.Zerlauth					
	15:30	Large circular colliders overview(including h-e option) M.Benedikt	Emittance Preservation in Hadron Machines H. Schmickler	Case Studies I WH/BH/DS		Case Studies III WH/BH/DS	Case Studies V WH/BH/DS		Superconducting magnets /Low temperature Superconductors L. Bottura	Case Studies VII WH/BH/DS		Case Studies IX WH/BH/DS	Case Studies Presentations I WH/BH/DS					
	16:30	Coffee							Coffee									
	17:00	Lessons learnt from LEP/LHC M.Lamont	Linear Collider Beam dynamics II D.Schulte	polarized electron beams/energy calibration J.Wenninger	SwissFEL, the X-ray free electron laser at PSI H. Braun	Vacuum Challenges R.Kersevan			Superconducting magnets /High temperature Superconductors L. Bottura	Advanced future Collider Concepts P. Muggli	collimators & Dumps & Masks M.Seidel		Case Studies Presentations II WH/BH/DS					
	18:00	Reception							Closing									
	18:30	Podium discussion: Future of high energy colliders							Medical Applications of accelerator technologies at PSI									
	19:30	late dinner (20h)							dinner						Dinner	Gala Dinner	Dinner	

The whole course on one slide (1/2)

- Status of present large scale projects, physics case, strategies, politics....
- Beam dynamics:
 - transverse and longitudinal recap
 - Hamiltonian description
 - ...up to 6D maps for a few elements
 - applied to FF systems
 - beam-beam
 - a first glance at instabilities
- **No further treatment of**
 - **collective effects**
 - **non linear beam dynamics**
 - **Landau damping**

Advanced CAS

The whole course on one slide (2/2)

- Technologies
 - “enabling technologies”:
 - FCC-hh : high field magnets, MP
 - FCC-e+e-: SC RF
 - ILC, CLIC: high gradient RF, RF power generation +++
 - “technologies needing performance improvements”
 - vacuum, quadrupole stability, collimation, kickers&septa, alignment and metrology, warm magnets, synchronization
- **Not covered:**
 - beam instrumentation, power converters, sources, cooling, controls, operations....

Feedback I

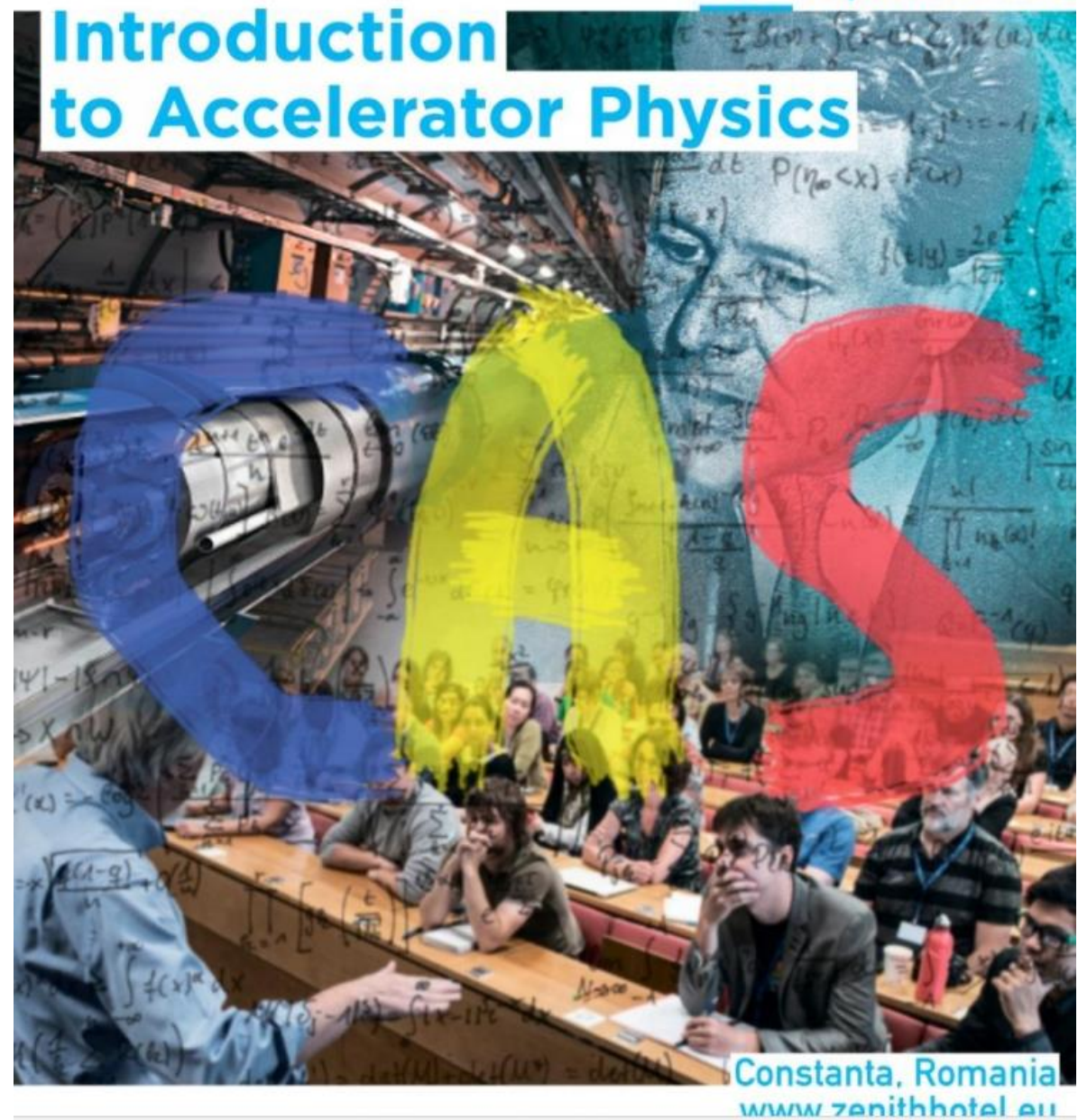
- Comments to the program
- Balance of topics (beam dynamics/technologies)
- Balance between collider projects
- Case studies

Next to come



16-29 September 2018

And then

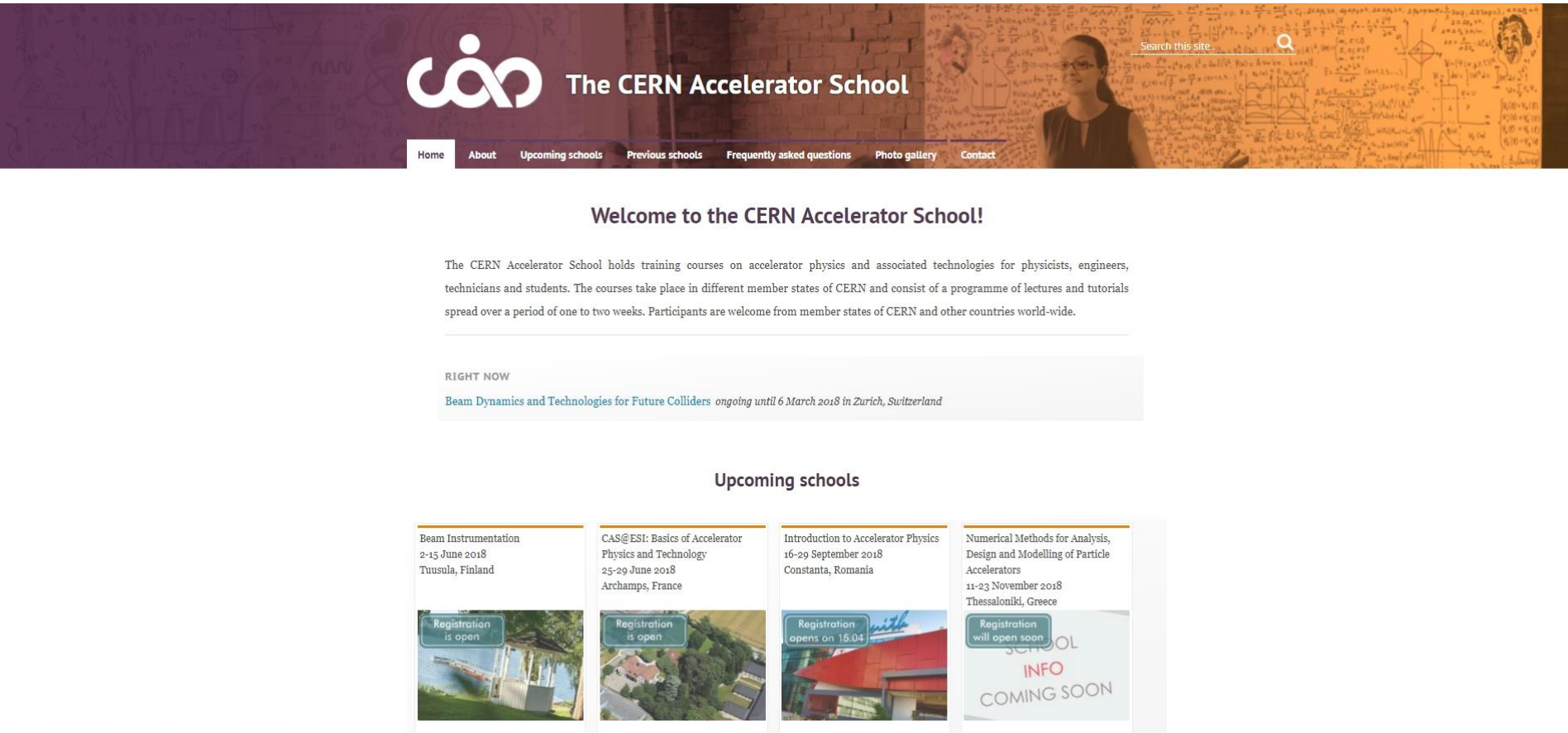


And more in the future:

	Period I Feb-April	Period II May-June	Period IIb End June	Period III Sept-Oct	Period IV Nov-Dec	
2018	Future Colliders Switzerland	Beam Instrumentation Finland	Short Introduction local	General Introduction Romania	Comp. Methods Greece	JAS 2017: RF Japan (Hayama)
2019	Advanced Acc. Concepts Portugal (Lisbon)	General Advanced Danmark	Short Introduction local	General Introduction Slovakia	RF associate member state	JAS: Ion Colliders Russia
2020	Warm magnets Austria	Mechanical Engineering	Short Introduction local	General Introduction	tbd	
2021	Digital Signal Processing	General Advanced	Short Introduction local	General Introduction	tbd associate member state	JAS: Very Advanced Beam Dynamics Canada (Saskatoon)???

Our website: <http://cas.web.cern.ch/>

Author: Anastasiya



The screenshot shows the homepage of the CERN Accelerator School website. At the top, there is a navigation bar with the CERN logo and the text "The CERN Accelerator School". Below the navigation bar, a large banner image features a woman standing in front of a chalkboard filled with mathematical equations and diagrams. A search bar is visible in the top right corner of the banner. Below the banner, a navigation menu includes links for Home, About, Upcoming schools, Previous schools, Frequently asked questions, Photo gallery, and Contact. The main content area begins with a heading "Welcome to the CERN Accelerator School!" followed by a paragraph describing the school's training courses. Below this, a section titled "RIGHT NOW" highlights a current course: "Beam Dynamics and Technologies for Future Colliders" ongoing until 6 March 2018 in Zurich, Switzerland. The "Upcoming schools" section displays four course cards, each with a title, dates, location, and a registration status button.

The CERN Accelerator School

Home About Upcoming schools Previous schools Frequently asked questions Photo gallery Contact

Welcome to the CERN Accelerator School!

The CERN Accelerator School holds training courses on accelerator physics and associated technologies for physicists, engineers, technicians and students. The courses take place in different member states of CERN and consist of a programme of lectures and tutorials spread over a period of one to two weeks. Participants are welcome from member states of CERN and other countries world-wide.

RIGHT NOW

[Beam Dynamics and Technologies for Future Colliders](#) ongoing until 6 March 2018 in Zurich, Switzerland

Upcoming schools

<p>Beam Instrumentation 2-15 June 2018 Tuusula, Finland</p> <p>Registration is open</p>	<p>CAS@ESI: Basics of Accelerator Physics and Technology 25-29 June 2018 Archamps, France</p> <p>Registration is open</p>	<p>Introduction to Accelerator Physics 16-29 September 2018 Constanta, Romania</p> <p>Registration opens on 19.04</p>	<p>Numerical Methods for Analysis, Design and Modelling of Particle Accelerators 11-23 November 2018 Thessaloniki, Greece</p> <p>Registration will open soon</p>
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Feedback II

- How did you know about this course?
- What we do:
 - Design, print and distribute 500 posters
 - Our webpage
 - Facebook, twitter...
- What else?

Feedback

VACUUM FOR PARTICLE ACCELERATORS

6-16 June, 2017

Glumslöv, Sweden

YOUR IMPRESSIONS OF THE PROGRAMME

Please mark each lecture with a number 1 to 5 in each of the three columns labelled "Level, Content and Presentation". The meaning of the numbers is as shown below. Please return this sheet to Barbara Strasser or Roger Bailey as soon as possible when completed. Your answers are confidential.

LEVEL	CONTENT	PRESENTATION
1 – Much too low	1 – Completely uninteresting	1 – Very poor
2 – Low	2 – Uninteresting	2 – Poor
3 – Just right	3 – Of some interest	3 – Fair
4 – Too high	4 – Interesting	4 – Good
5 – Much too high	5 – Very interesting	5 – Very good

TITLE	LEVEL	CONTENT	PRESENTATION
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- Please help us

- Very important

- For
- For

With the new online version much more feedback than in the past
Thank You!

- About

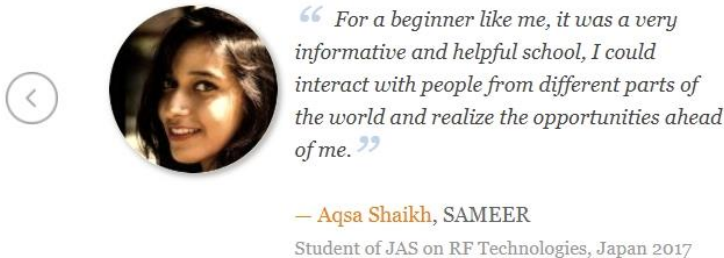
- The lectures
- The tutorials
- The place
- Anything else

Introduction to Cryogenics			
Cryopumping			
Industrial Vacuum Applications			
Beam Induced Desorption			
Beam-Gas Interaction			
Surface Characterisation			
Interactions between Beams and Vacuum System Walls			
Surface Cleaning & Finishing			
Thin-Film Coating			
Controlling Particles/Dust in Vacuum Systems			
Beam Induced Radioactivity & Radiation Hardness			
Radiation Damage and its Consequence			
Control & Diagnostic			
Vacuum Design Aspects			
Manufacturing & Assembly for Vacuum Technology			
The Real Life of Operation			
Challenges for Vacuum Technology of Future Accelerators			

“Testimonials” on the CAS website



What our students say about us



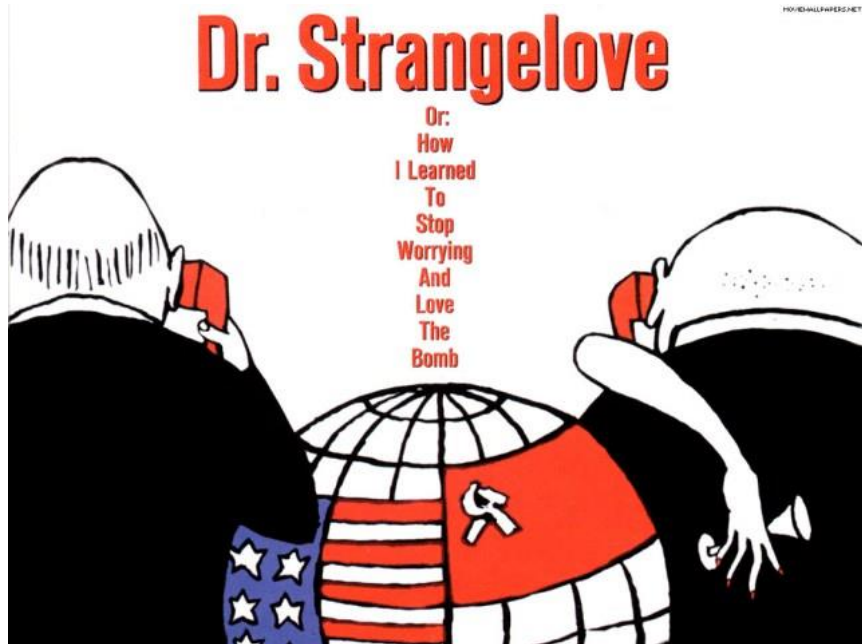
- All it needs:
 - a photo
 - name + affiliation + CAS course
 - “a sentence”

What I would like to get from you:

- Some testimonials
- Photos for the website
- Feedback

Social life during course:

- Next to the course teaching the most important aspect of the school
“ electronic training will never replace CAS courses”
- What happened:
 - people socialising (and even working) up to late in the evenings
 - lots of interactions students <-> teachers
 - cinema evening
 - excursion
 - PSI visit
 - gala dinner



Program:

21:00 – 21:15

Short clips

21:15 - 21:30

drinks, pop-corn...

21:30 film

event will happen in “Romeo”

1: Dr. Strangelove: 9/12 pts

2: The 3 idiots: 8/12 pts

3: Pink Floyd: The wall 7/12 pts

GLÜCK IST DAS EINZIGE,
DAS SICH VERDOPPELT, WENN MAN ES TEILT.

"Happiness is the only thing that doubles when you share it."

Albert Schweitzer



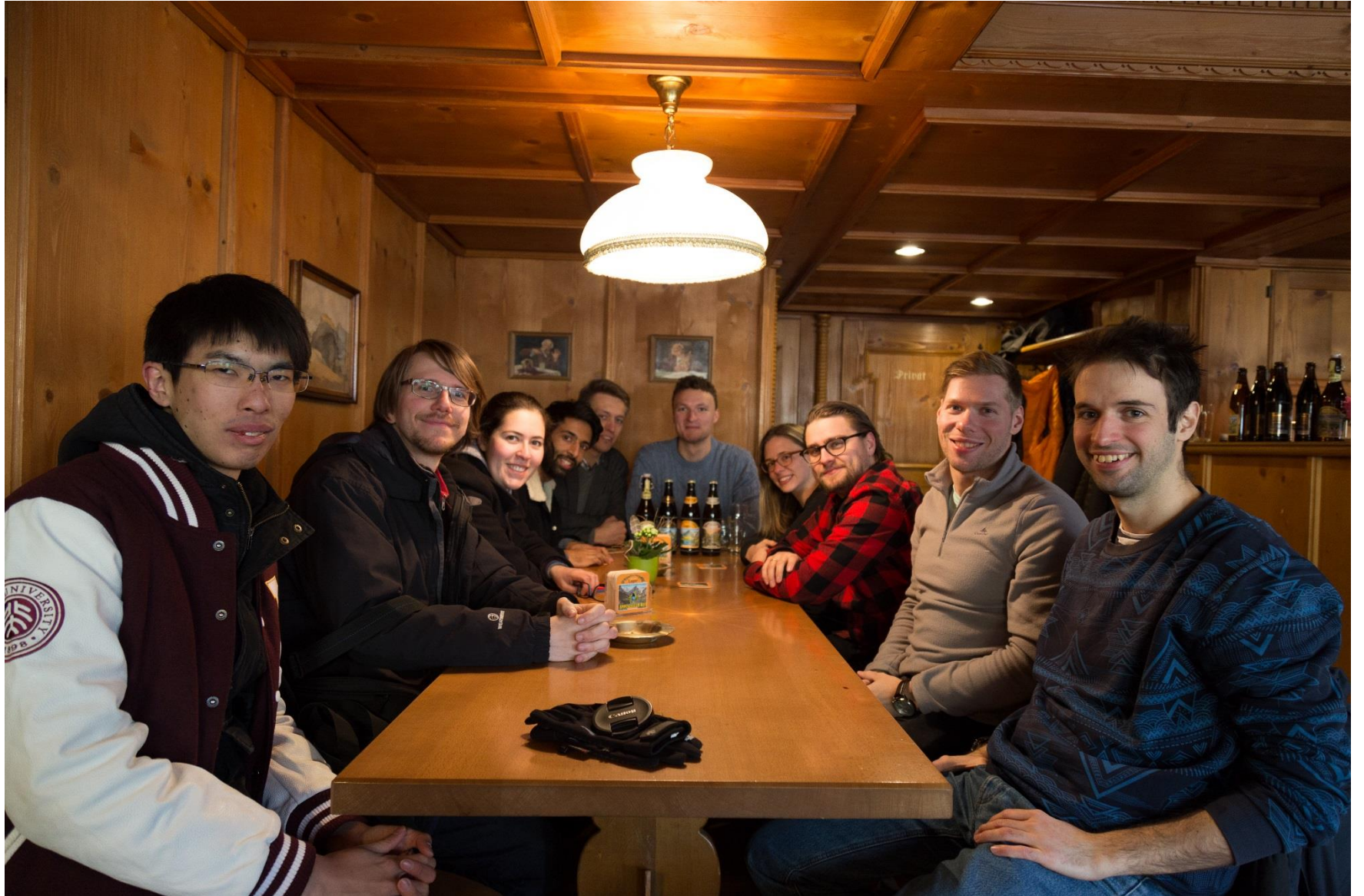
















Last not least:

- This course would not have happened without:
 - lecturers: they do all the work for “love”
- the case study leaders:
 - Werner Herr & Frank Tecker
 - Bernhard Holzer & Weiren Chou
 - Daniel Schulte
- The “souls” of the event:
 - Barbara Strasser
 - Delphine Rivoiron
 - Anastasiya Safronava
- Marlen Bugmann & Lenny Rivkin from PSI
- **YOU**

