

Paul Scherrer Institut (PSI)
European MECOR User Group (EMUG)
Welcome and Introduction

Salih Guentay

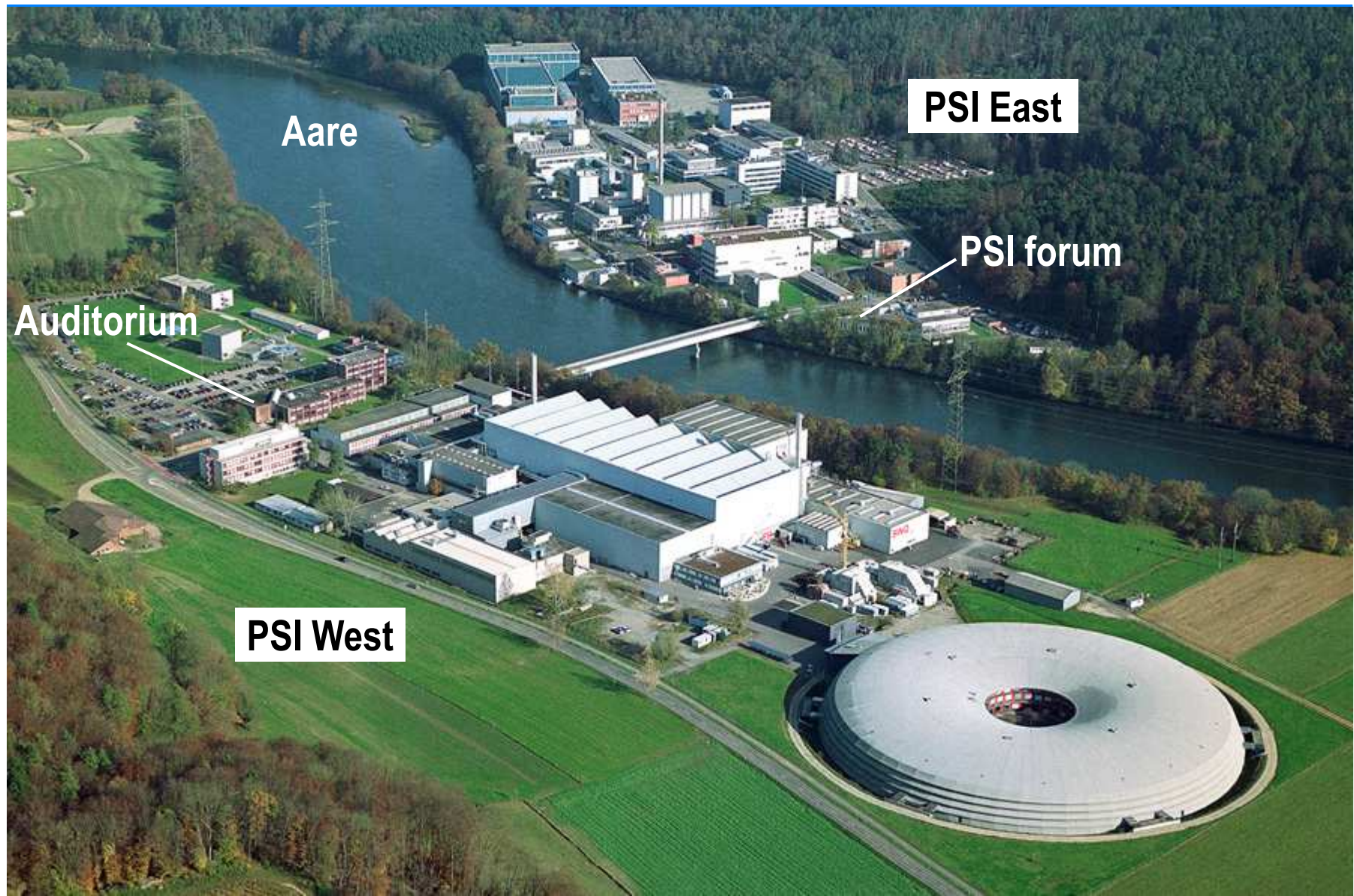
1.EMUG Meeting

December 15-16, 2008, Paul Scherrer Institut

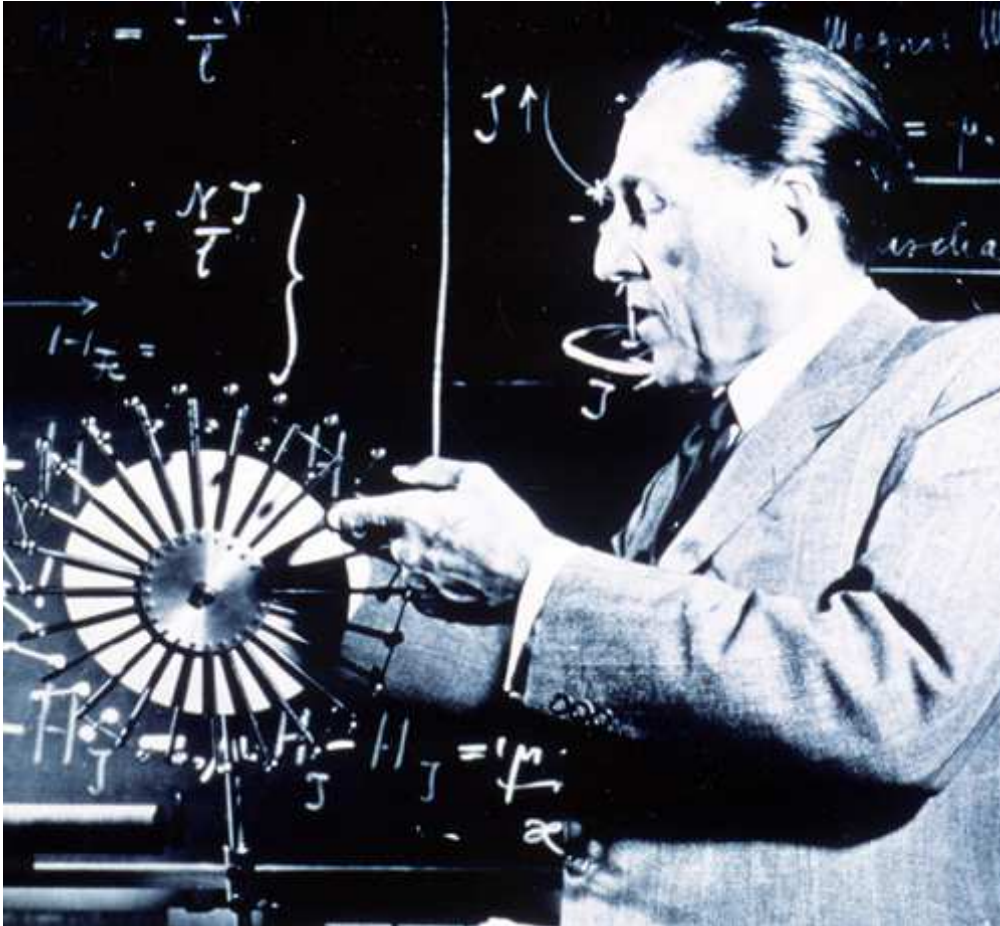
Severe Accident Research Group (SACRE)

Laboratory for Thermal-hydraulics (LTH)

Nuclear Energy and Safety Research Department (NES)

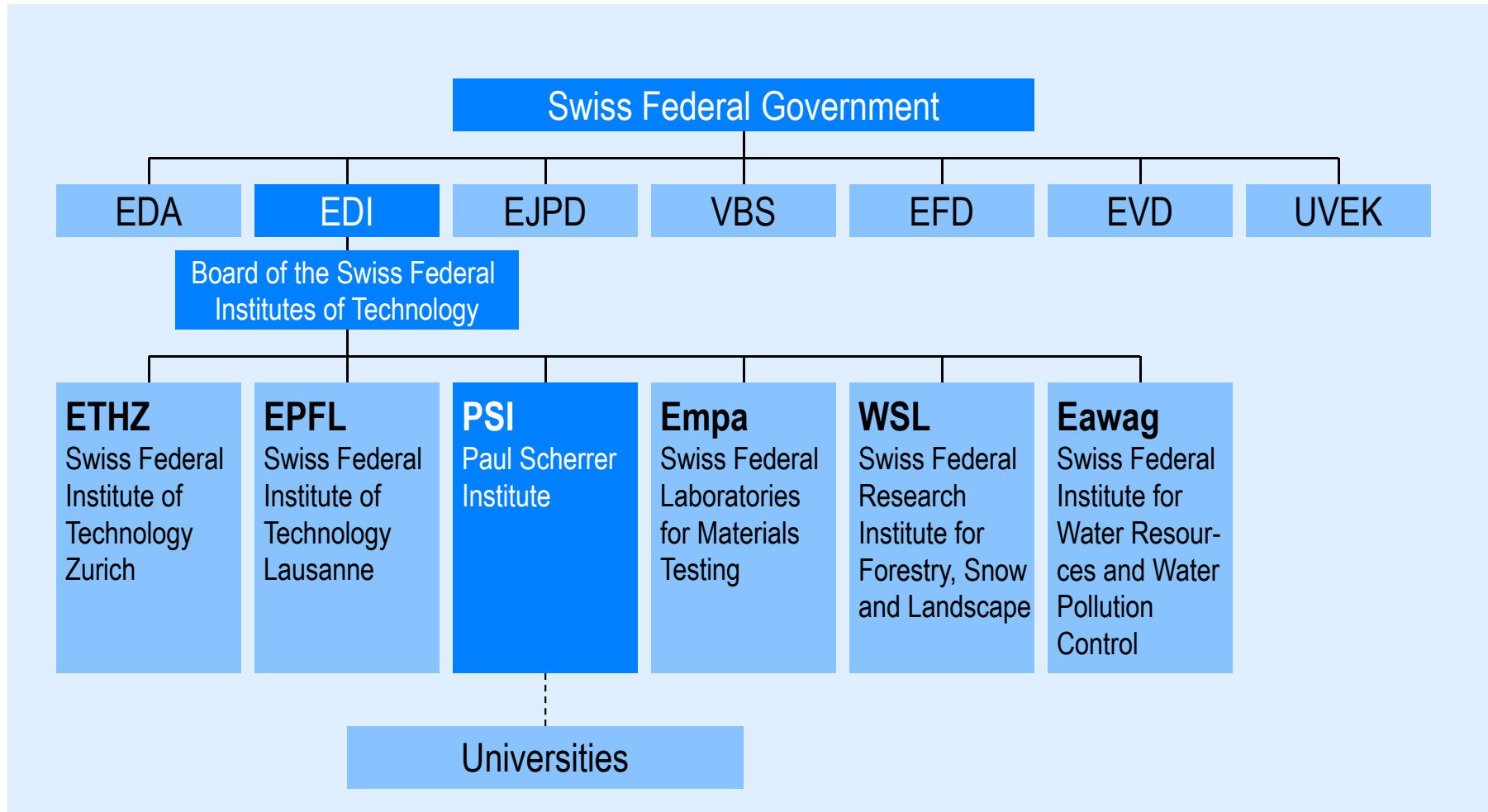


Paul Scherrer (1890 – 1969)

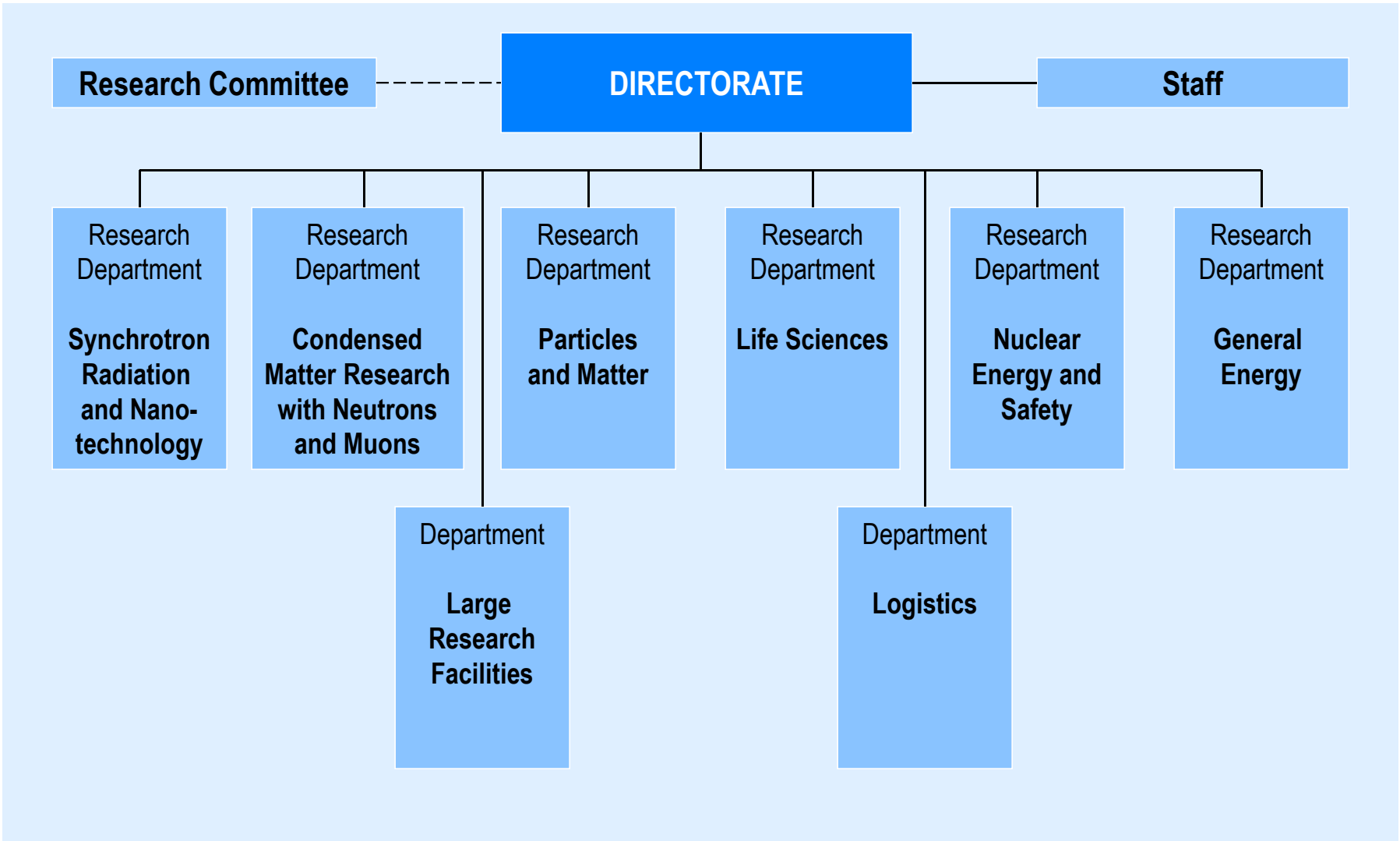


- Studied physics and mathematics at the Swiss Federal Institute of Technology (ETH) Zurich, in Königsberg and Göttingen in Germany
- 1920: Director of The Institute of Physics at the ETH Zurich. Became well-known for the clarity of his lectures
- Researched X-ray scattering on crystals, liquids and gases. Later research work was in nuclear physics
- 1946: President of the Swiss Study Commission on Atomic Energy
- Involved in the founding of CERN

Political embedding



PSI: organization



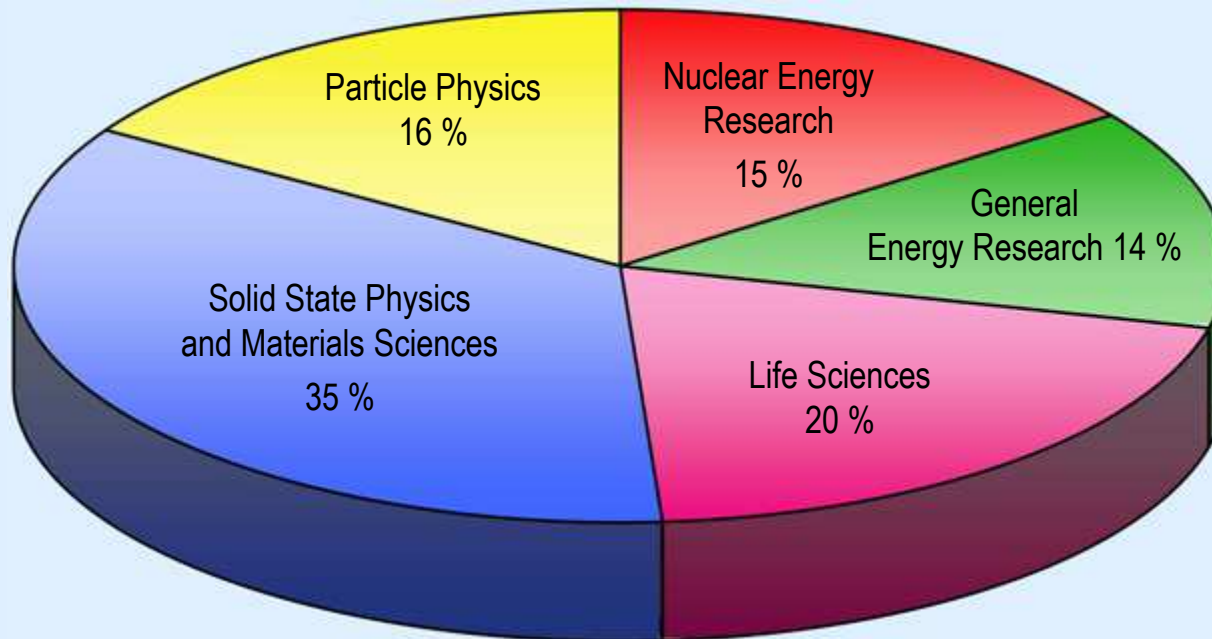
Key figures 2007

PSI funds (global budget)	225	MCHF
External funding	50	MCHF

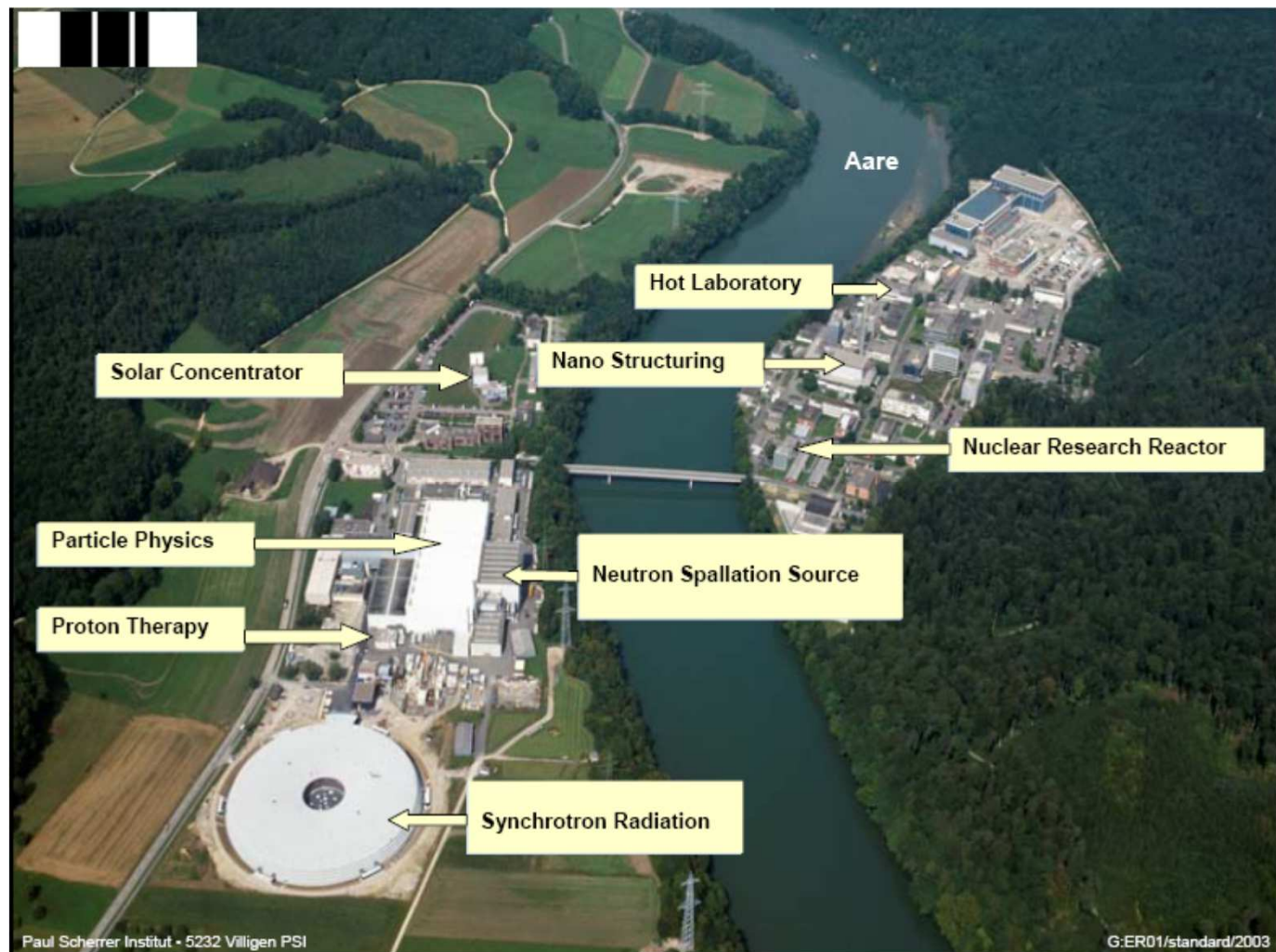
Staff	~ 1270	PJ
Of which externally financed	~ 300	PJ
Doctoral students	~ 270	
Apprentices	78	
External users	~ 1500	
Number of scientific publications	~ 800	
PSI-employees with teaching duties at ETH and universities	~ 70	

Budget 2007

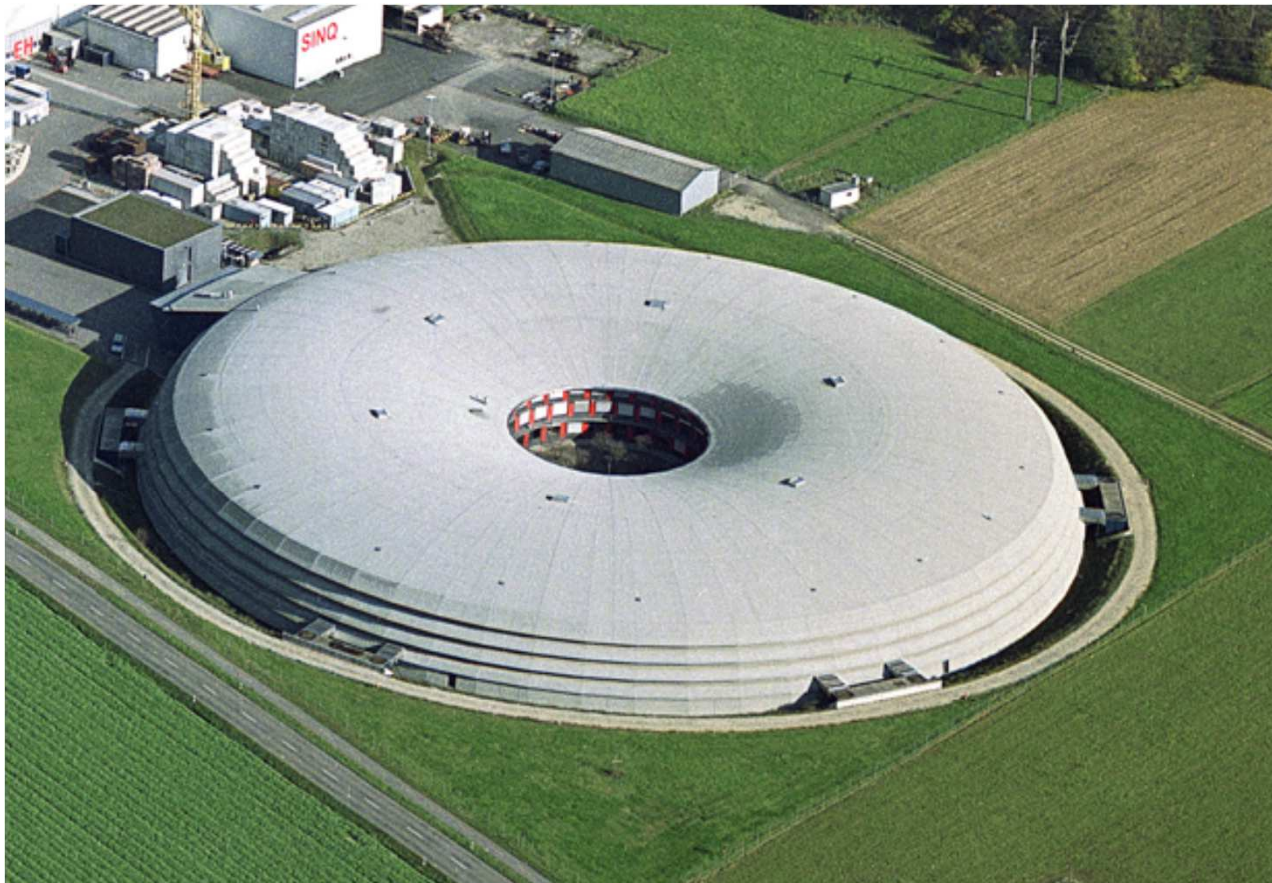
Distribution of funds: 275 MCHF (PSI and third-party contributions)



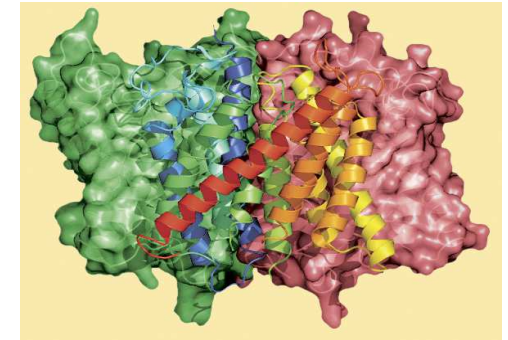
PSI: Large facilities



Swiss Light Source SLS (Synchrotron radiation and nanotechnology department)



Giant microscope for structure determination

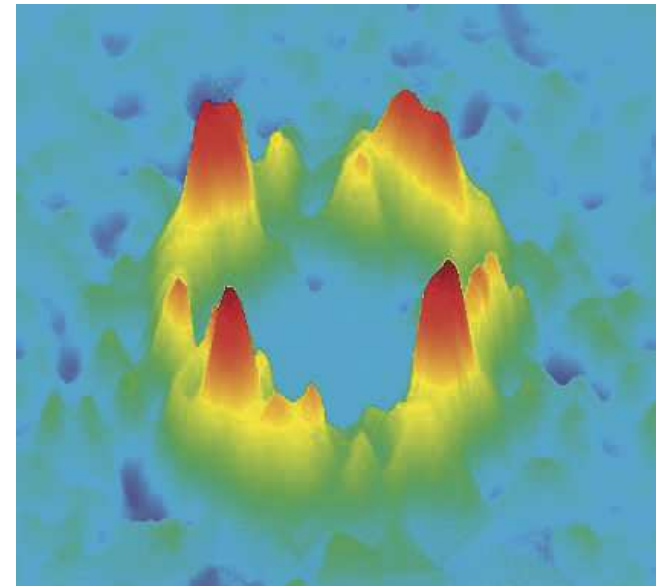


Decoded by synchrotron light: AmtB membrane protein, enables the transport of ammonia (nutritive substance) into the plants.

Tiny structures and new materials (Nanotechnology)



Experiments at the Spallation Neutron Source (SINQ)

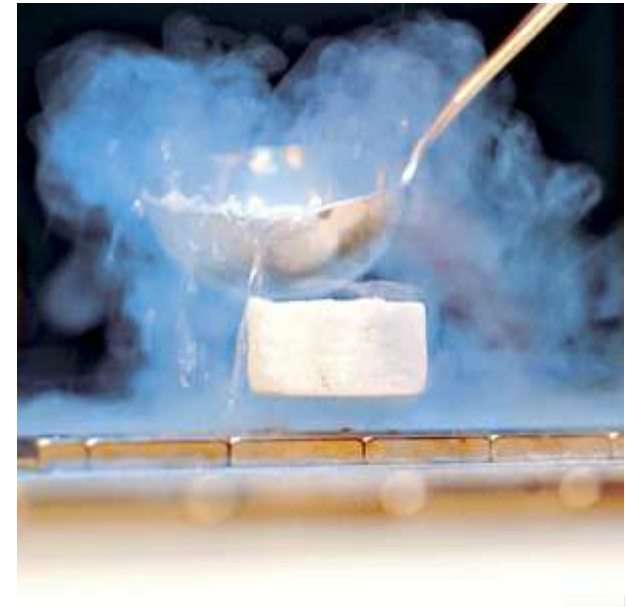


Neutrons as compasses:
magnetic flux lines in a
superconductor

The proton accelerator (Condensed Matter Research with Neutrons and Muons department)



Most powerful facility of this type, worldwide

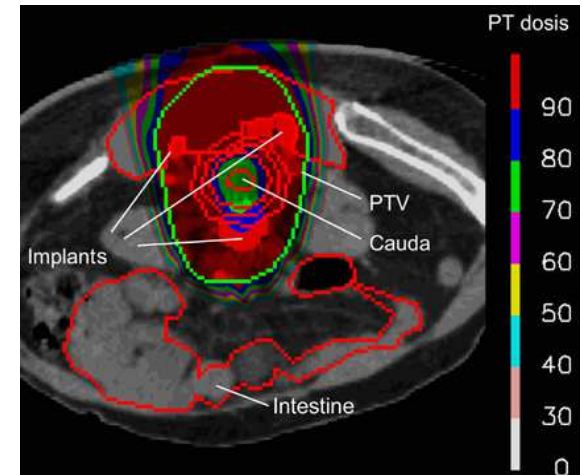


Muons inform about
magnetic fields:
for example in a
superconductor

Humans and health (Life Sciences department)



Radiation facility (Gantry) for proton therapy



Efficient spot-scanning
technique: irradiation plan
for a tumor at the lower
spine

General energy



The solar concentrator accumulates 5000 suns



Drives efficiently with hydrogen:
the fuel cell vehicle HY-LIGHT

Nuclear energy and safety



Research reactor PROTEUS



Large-scale facility PANDA:
drawing off heat by natural
circulation

Experimental Group
OG 4201
Dr. Domenico Paladino
Group Leader

Analysis and Modeling Group
OG 4202
Bojan Niceno
Group Leader

Severe Accident Research Group
OG 4203
Salih Guentay
Group Leader



Applications and goals

- Application of expertise and tools developed in thermal-hydraulics, aerosol physics and iodine chemistry to resolve critical safety
- Issues of current and future nuclear reactors
- Development of analytical methods and tools and generation of high quality experimental data to
 - ✓ Better predict associated phenomena and
 - ✓ Reduce related uncertainties in modeling for analysis of design basis and severe accidents
- Support to other PSI projects, safety authorities, utilities and industry with research activities involving unique experimental facilities and analytical tools

Experimental investigation in PANDA: major application areas

<p>Integral Containment Tests</p> <ul style="list-style-type: none"> Passive decay heat removal system behaviour Concept demonstrations 		<p>Component Tests</p> <ul style="list-style-type: none"> Passive decay heat removal condenser performance under specific conditions Effect of n-c gases (air, hydrogen) 	
<p>Primary System Tests</p> <ul style="list-style-type: none"> Natural circulation stability of BWRs Reactor start-up 		<p>Separate-effect Tests</p> <ul style="list-style-type: none"> Distribution of steam and gas inside LWR containments Mixing/stratification 	<p>Gas velocity map measured with PIV</p>

Activity overview

- ◆ **Experimental investigations** performed in different scales. The large scale PANDA facility is used for a broad application area. Medium scale (LINX and BUJET) and small scale facilities (T-J) are used for fundamental experimental fluid dynamics research
- ◆ **Analytical activities** including code and model development and application to multi-phase, multi-dimensional problems with large system thermal-hydraulics containment and CFD codes
- ◆ **Severe accident research** for addressing the needs of current and future ALWR for arresting and terminating severe accidents. Predicting the consequences of severe accidents as well as the prevention and mitigation of activity release into the environment constitute the framework.

Assessment and validation of advanced codes using PANDA Tests

Frameworks & partners

- ◆ **Fundamental studies:** PhDs, Post Docs
- ◆ **Cooperation** with Swiss and foreign universities
- ◆ **R&D via cooperation** with the research organizations and safety authorities through projects with bi- and multilateral contracts involving national and international partners
- ◆ **Transfer of know-how** by Application of developed tools to support nuclear industry and commercial product development for enhanced plant safety
- ◆ **Transfer of knowledge** by offering training courses

Investigations in the area of severe accidents

ARTIST project: how efficiently the PWR steam generator secondary side components can mitigate the activity release into the environment

European MELCOR User Group (EMUG)

- An initiative by PSI to promote exchanging experience and know-how among European Users
- Support from US-NRC and Sandia (SNL)
- Active participation of European MELCOR Users
- Annual meetings
- 1. meeting with 34 Participants from 20 Organizations (18 European organizations) organized jointly by PSI&US-NRC&SNL

European MELCOR User Group (EMUG): Aims

- To provide a forum for the presentation and discussion of the experience gained by:
 - MELCOR assessment using integral and separate-effect tests leading to presentation of performance of models and related issues including sensitivity to selected model parameters and model uncertainties,
 - Model development efforts,
 - Application of MELCOR for plant safety studies, including L2 PSA, which demonstrates weaknesses and strengths of MELCOR models in reproducing the individual severe accident phenomena and interplay between them occurring in the nuclear and balance of plant systems and the effect of operator actions on the accident progression through user input as introduced in the code input models,
 - Use of code with different compilers and operating systems.
- Prioritization of user error correction and model development needs, to be transmitted to the code developers and the NRC
- To minimize the efforts required to obtain an adequate knowledge of optimum use of the MELCOR, through sharing of experience,
- To support the gaining of MELCOR knowledge and experience, particularly concerning the younger and less experienced users.

European MELCOR User Group (EMUG): Method Of Working

- Group meetings and all exchanges of information are essentially informal, and not related to any other international collaborative activities.
- All exchanges are on a no-cost basis.
- Any information acquired via the MELCOR User Group exchanges should not be published in the open literature without the permission of the originator and due acknowledgement.
- Individual organizations may decide the extent to which they can make information available to the Group. (It is recognized that commercial considerations may need to be taken into account on occasions). Nevertheless all participants must be prepared to make some positive contributions to Group exchanges.
- Any new organization participating in Group meetings must accept this agreed Method of Working; and be active in the field.
- Any increased participation must be acceptable to all existing Group members.
- Participating European organizations must be prepared to host Group Meetings in turn.

European MELCOR User Group (EMUG): Future

- Views and opinions of the participants on:
 - goals of EMUG and achievements from the first meeting
 - next meeting: suggested topics for which presentations are to be called
 - Candidate organization for the 2. Meeting (2009) Organization
- User suggestions for:
 - Model improvements
 - Numerical stability and run time performance
 - Input preparation/format
- Others

Subject to
discussions
as the last
topic of the
agenda
today
(25.12.2008)