Theoretical particle physics activities in Switzerland

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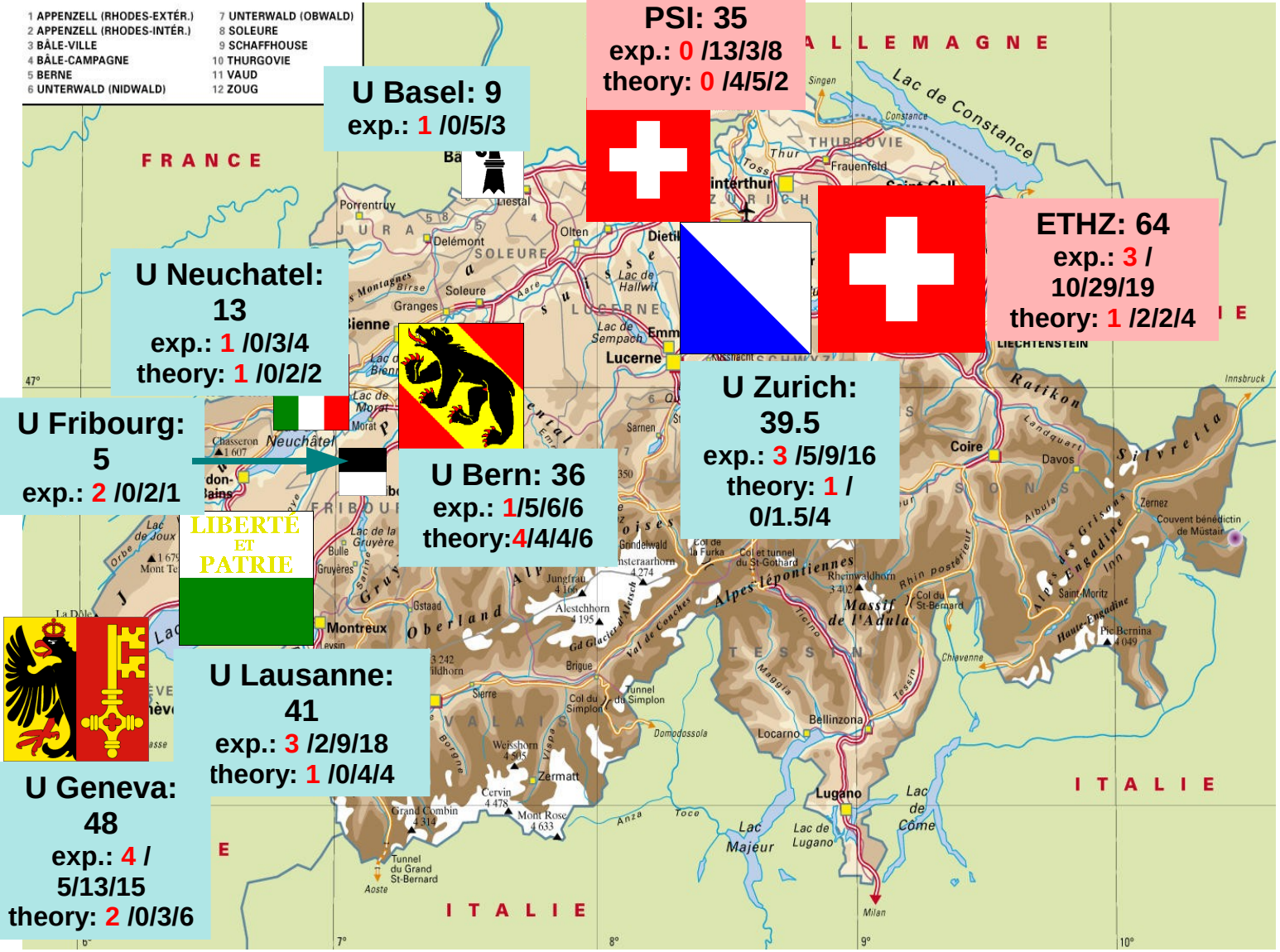
UNIVERSITÄT BERN

Swiss HEP landscape in 2002

Scientific personnel:

Full professors / tenured staff / untenured staff / PhD students

+ administrative & technical staff (hard to quantify)



U Basel: 9
exp.: 1 /0/5/3

PSI: 35
exp.: 0 /13/3/8
theory: 0 /4/5/2

ETHZ: 64
exp.: 3 / 10/29/19
theory: 1 /2/2/4

U Neuchatel: 13
exp.: 1 /0/3/4
theory: 1 /0/2/2

U Fribourg: 5
exp.: 2 /0/2/1

U Bern: 36
exp.: 1/5/6/6
theory:4/4/4/6

U Zurich: 39.5
exp.: 3 /5/9/16
theory: 1 / 0/1.5/4

U Lausanne: 41
exp.: 3 /2/9/18
theory: 1 /0/4/4

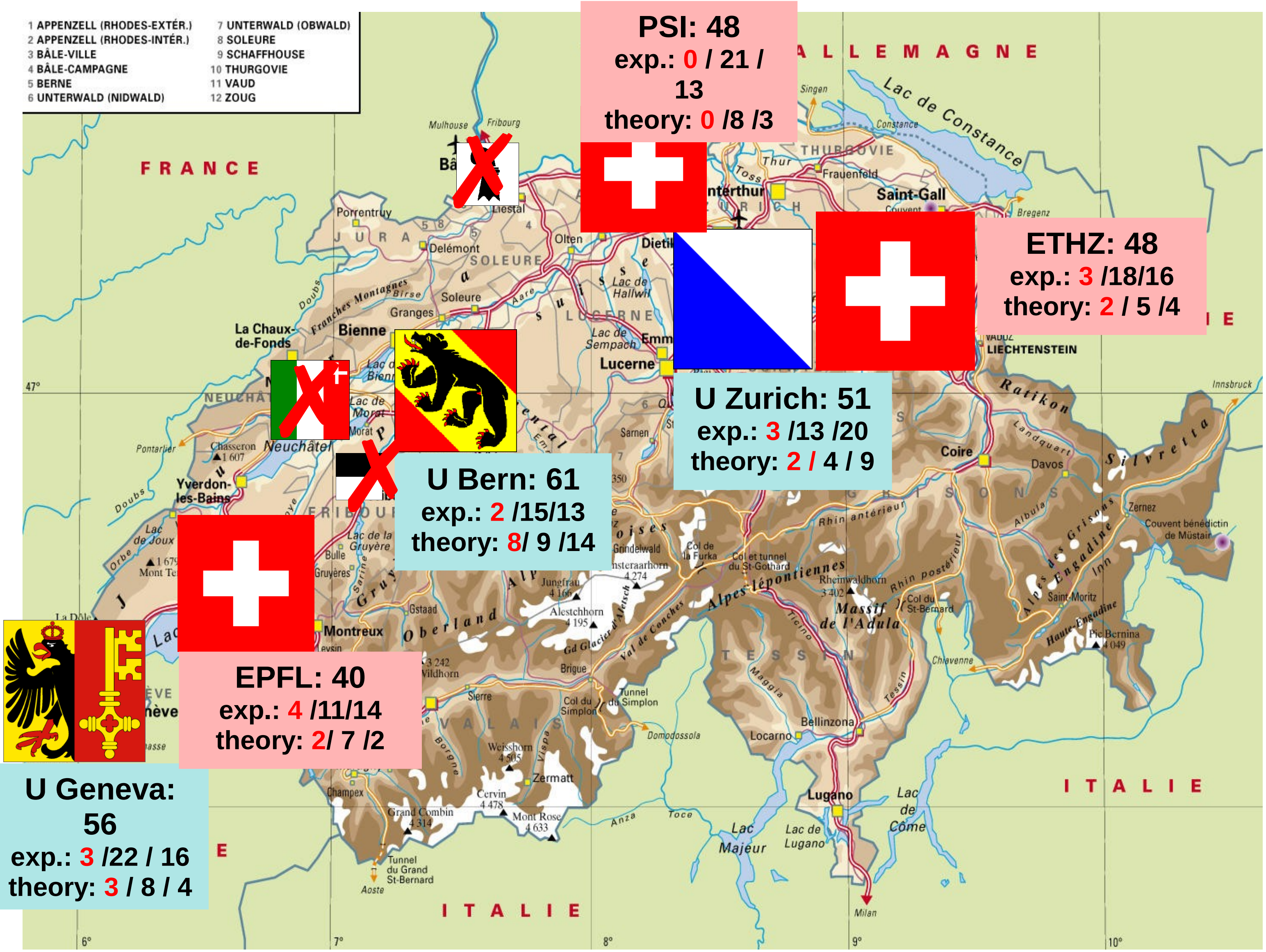
U Geneva: 48
exp.: 4 / 5/13/15
theory: 2 /0/3/6

Swiss part. phys. landscape in 2009

Scientific personnel:

Full professors / staff / PhD students

+ administrative & technical staff (hard to quantify)



Particle physics concentrated to less universities, without reducing sum – so far

Theory Groups

	prof+staff	postdoc	PhD	Master
• Uni Bern	6+3	8	14	8
• Uni Geneva	3+0	4	5	2
• EPF Lausanne	2+2	7	9	6
• PSI	0+3	5	3	1
• Uni Zurich	2+0	6	7	4
• ETH Zurich	2+2	7	9	6
• **Total**	**15+10**	**37**	**47**	**27**

Uni Geneva

Cosmology, astrophysics, string theory and relations to particle physics

- Full professors
  - Durrer: CMB anisotropies, interpretation and data analysis, braneworlds, cosmological phase transitions, cosmic strings
  - Maggiore: gravitational waves, astrophysics and cosmology
  - Mariño: mathematical aspects of string theory and quantum field theory, quantum gravity

ITP EPF Lausanne

Cosmology, QFT, string theory and particle physics, electroweak SB, beyond the SM, QCD

- Full professors
  - Rattazzi QFT, electroweak SB and the LHC, BSM: Grand Unification, Supersymmetry, Supergravity
  - Shaposhnikov baryon asymmetry, phase transitions in gauge th. and cosmology, extra dimensions, cosmic rays and magnetic fields
- Other staff members
  - Scrucca (SNF prof.) string theory
  - Frixione (6y joint CERN) higher order QCD corrections
  - Lesgourgues (6y joint CERN) cosmology

ITP Bern

Lattice QCD, ChPT, K and B physics, SUSY, strings, gravity

- Full professors
  - Blau string theory, quantum gravity, GR, mathematical aspects of QFT
  - GC ChPT for pheno and lattice QCD, flavour physics in SM and beyond
  - Derendinger model building in superstrings and supergravity, SUSY
  - Gasser ChPT, nonrelativistic EFT, hadron phenomenology
  - Hasenfratz lattice QCD: theory and simulations with perfect actions
  - Wiese lattice gauge th., simulations of condensed matter systems
- \+ Greub (associate prof.) QCD effects in B physics, B rare decays
  - Niedermayer (staff) nonperturbative aspects of QFT, lattice simulations
  - Wenger (SNF prof.) tm lattice QCD, finite baryon and isospin density

PSI Theory Group

Electroweak Precision Physics, Higgs Physics, Supersymmetry, ChPT, Hadronic Physics

- Permanent staff
  - Denner LHC and linear collider physics, NLO corrections, precision tests of electroweak interactions, at present and higher energies
  - Rosenfelder Medium Energy Physics: Chiral Perturbation Theory, Hadronic Physics
  - Spira Higgs physics, supersymmetry, pert. QCD, leptoquarks, compositeness

ITP Uni Zurich

Collider physics, SM and beyond, B physics, neutrinos

- Full professors
  - Thomas Gehrmann precision calculations for collider observables within the Standard Model and beyond
  - Wyler physics beyond the SM, B physics neutrinos

- Strong astrophysics and cosmology group in the same institute:
  - Full prof.: Lake, Moore, Seljak
  - other prof: Jetzer, Mayer, Teyssier, Tran

ITP ETH Zurich

Collider physics, perturbative and lattice QCD, strings

- Full professors
  - Anastasiou Perturbative methods, QCD, Higgs physics, electroweak precision measurements at hadron colliders
  - Gaberdiel mathematical aspects of string theory and conformal field theory
  - (Kunszt Pheno of particle physics and higher orders in QCD)
- Other staff members
  - De Forcrand Lattice QCD, finite temp. and baryon density
  - Aude Gehrmann (SNF prof) higher order calculations in QCD
- Strong mathematical physics group in the same institute (Fröhlich)

Collaboration theory-experiment

- CMS (ZH,PSI) ↔ ETHZ (Anastasiou, Kunszt)
  PSI (Denner, Spira)
- H1 (ZH) ↔ UniZH (Gehrmann)
- ATLAS (BE) ↔ Bern (Becher, GC)
- neutrinos(BE,ZH) ↔ EPFL (Shaposhnikov)
- NA48/62, DIRAC ↔ Bern (Gasser, GC)
- LHCb (EPFL,ZH) ↔ CERN (Hurth, Fleischer)
  Bern (Greub), ZH(Wyler)

Networks

- FLAVIAnet – EC FP6 Network
  - Node in Bern, includes CERN, EPFL, UniZH both theory and experiments involved
- Heptools – EC FP6 Network
  - Node at PSI, includes ETHZ and UniZH
- ForcesUniverse – EC FP6 Network (ended 11.08)
  - Nodes at Neuchatel and ETHZ
- GeNeZiSS (GeBeZiSS?) - String theory swiss network
  - Geneva, Neuchatel → Bern, ETHZ

Conferences and schools

- STRINGS 08, CERN, 18-23 August 2008
  http://ph-dep-th.web.cern.ch/ph-dep-th/content2/workshops/strings2008/
- Chiral Dynamics 09, ITP Bern, 6-10 July 2009
  http://www.chiral09.unibe.ch
- RADCOR 09, ITP ZH, 25-30 October 2009
  http://www.itp.uzh.ch/radcor2009/
- CHIPP Winter school, January 2010
  http://www.chipp.ch/
- Zuoz Summer school, July 2010
  http://ltpth.web.psi.ch/zuoz_school

Advanced education in theory

- Fribourg+Geneva+EPFL → Troisième cycle de la physique en Suisse romande
- Bern → newly founded Graduate school in fundamental physics (theory and experiment)
- ITP Zurich → newly founded Graduate school in theoretical physics and astrophysics
- ETH Zurich → PhD studies

CERN Theory Institute

- “We are launching a “Theory Institute” at CERN with focused programs in High Energy Physics and related subjects. (...) The ultimate aim is to make the best use of our resources and to share them with the community. We are also happy to coordinate our activities with those of other Institutes, Universities, or Research Centers whenever possible.”

- “As in other places, the Institute would work by hosting programs in HEP and related areas. While the organizers can be from anywhere outside CERN, there should be a local staff member in the organizing committee of the program. This guarantees a smooth interaction with the CERN administration. We plan to have at least one dedicated person to handle the local organizational matters.”

The Center for Theoretical Studies

- The CTS was originally established by Jürg Fröhlich at the ITP, ETHZ in 1985. In 2006 the ITP UniZH has joined. The CTS is supported also by the (SNF).
- Aim: to foster teaching and research in theoretical physics and related subjects in the Zürich area. To bring scientists from all over the world to come to Zürich, to interact with local and other visiting scientists, and to enrich the graduate education.
- More specifically the CTS organizes thematic programs of a few months' duration, as well as shorter workshops. It also invites scientists to come to Zürich for collaborative visits and to teach graduate courses.
- Proposals for thematic programs and workshops can be submitted by any professor from a Swiss University, but should also involve a professor from Zürich.

Summary

- Theoretical particle physics in Switzerland has a long and very strong tradition but quite a young face today
- It has strong connections to experiments and fruitful collaborations with the experimental colleagues...
- ...but also to mathematical, astro- and condensed matter physics
- Networking in Switzerland and Europe is working very well