

# CHIPP

## Swiss Institute for Particle Physics

Thoughts & ideas on unique challenges of funding in  
particle physics

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**CHIPP**  
Swiss Institute of  
Particle Physics

# CHIPP - The Swiss Institute of Particle Physics

## Distribution of interests

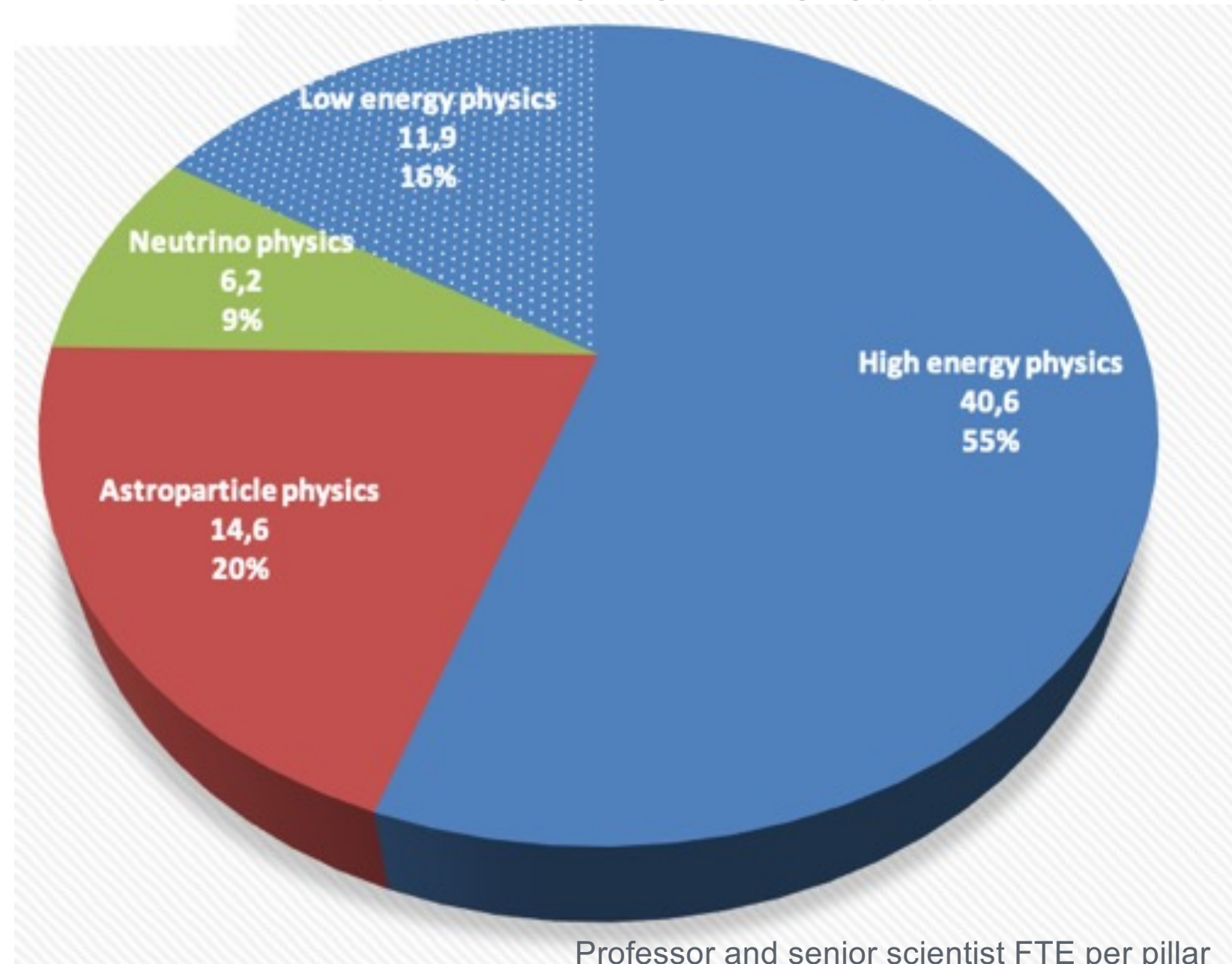
### Three experimental pillars:

- 1) High- and low-energy frontier
- 2) Neutrino physics
- 3) Astroparticle physics

+

Theory

Accelerator physics



CHIPP : 440 Scientists



# Answering fundamental particle physics questions

## Particle physics – Big questions

### I. High- & low-energy frontier

- Understand shape of Higgs potential: measure **Higgs self-interaction**  $H \rightarrow HH$
- Experiments: CMS & ATLAS
- Measurement requires full HL-LHC dataset

Design | Prototype | Construct | Operate | Analyze

← 2015      30 years      2045 →

### II. Neutrinos

- Measure **matter-antimatter asymmetry** in neutrino sector
- Experiments: DUNE & Hyper-K
- Measurement requires full dataset

Design | Prototype | Construct | Operate | Analyze

← 2010      30 years      2045 →

### III. Astroparticle

- Probe entire available weakly interacting **dark-matter** phase-space of cross-section vs. mass
- Experiment: DARWIN

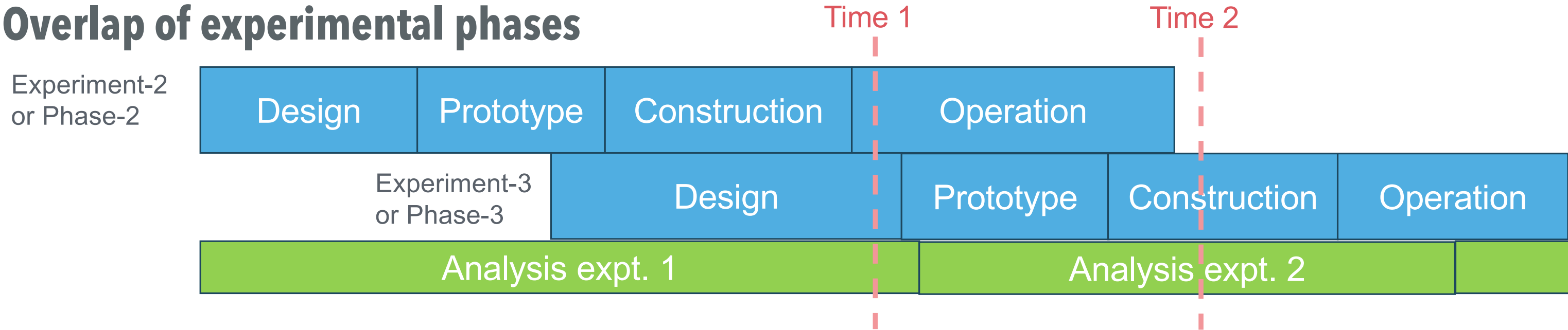
Design | Prototype | Construct | Operate | Analyze

← 2015      25 years      2040 →

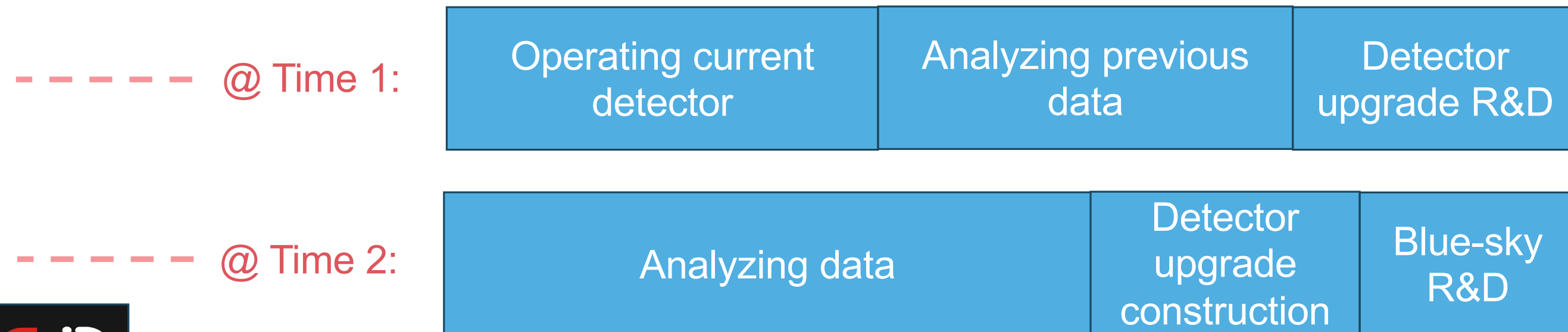
+ many other questions & other experiments on other timelines ...

# Evolution of experimental research groups

## Overlap of experimental phases



## Experimental research group efforts change over time:



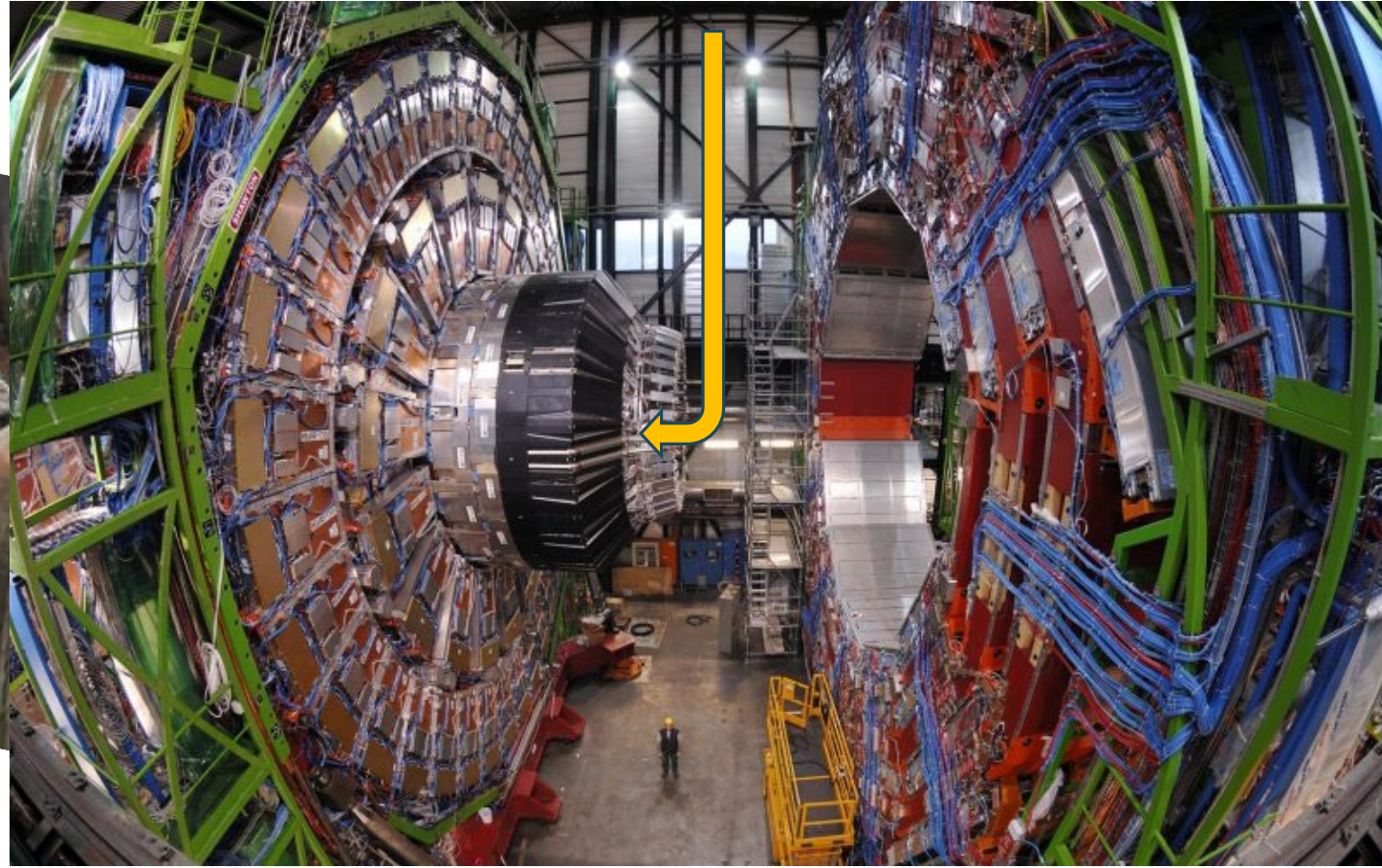
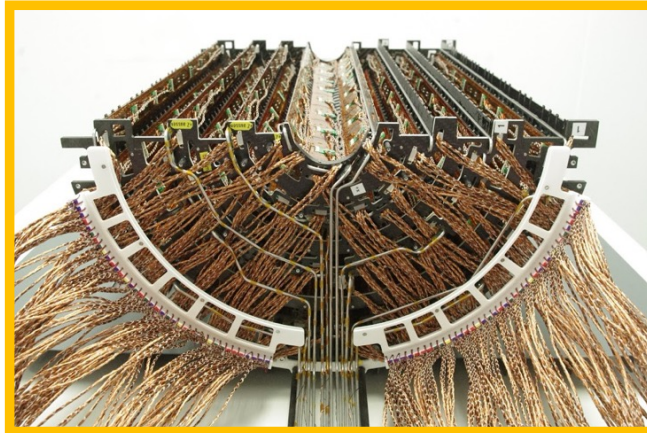
Multiple experiments / phases ensures physics output & maintenance of long-term



# Access to data to analyze relies on contributing to experiment

Building and operating this ...

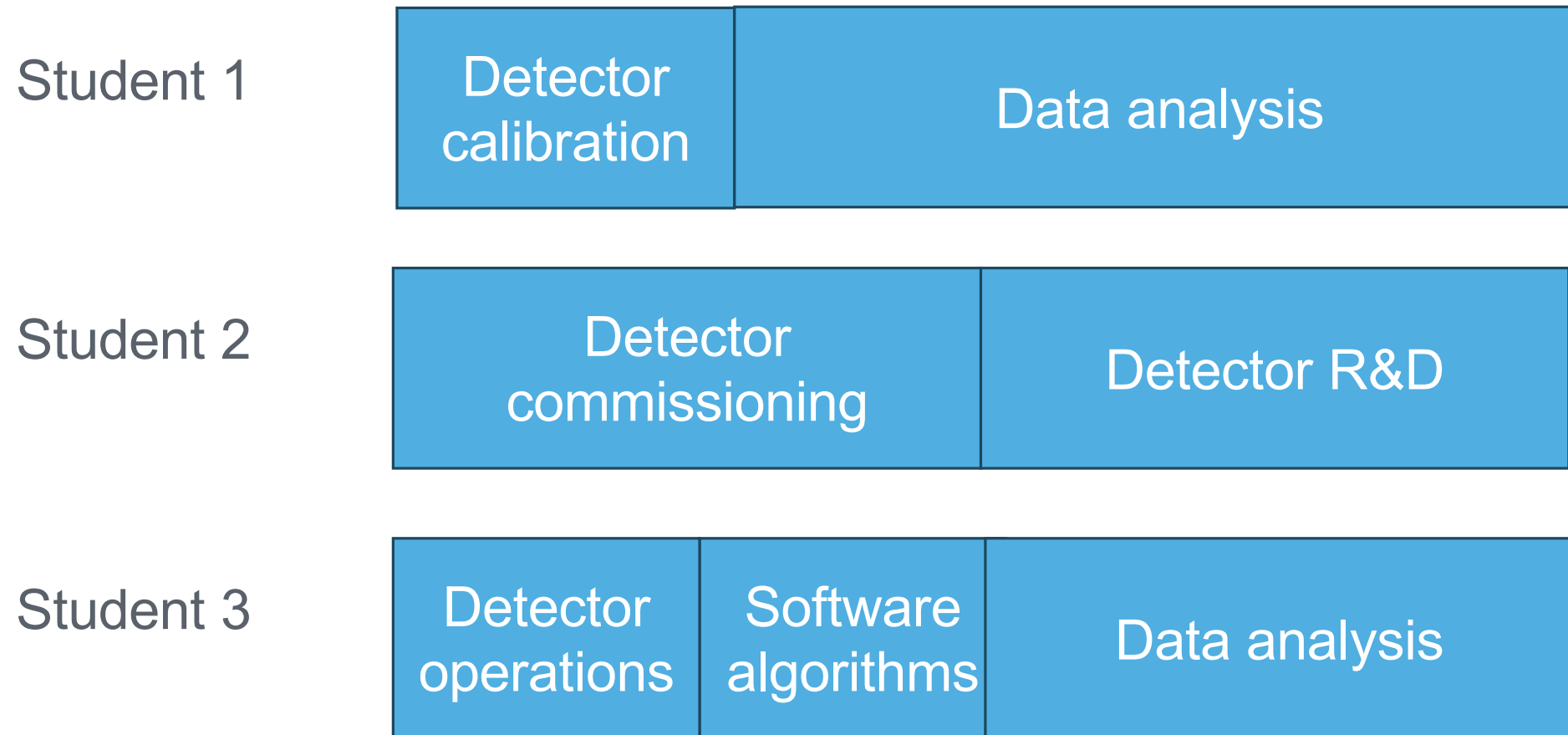
...gives you access to data from this



.. and contributes to ~1000 publications

# PhD students & postdocs play vital role

- **PhD thesis may encompass several phases of an experiment**
  - Vital to get experience both in data analysis & bringing experiment to fruition
    - These students become the project leaders of the future, answering the next big questions



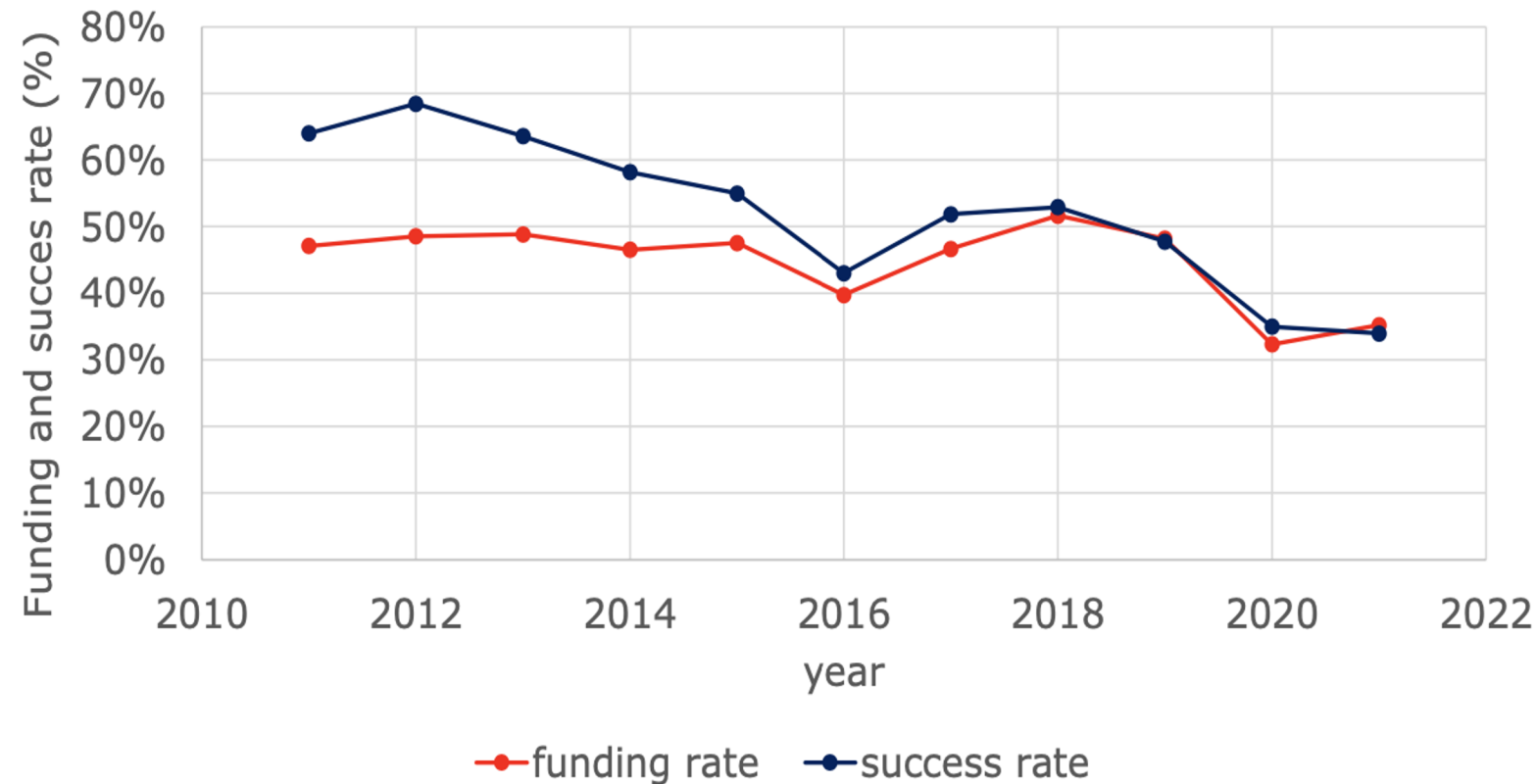


# Trends in third-party funding

- Success rate of fundamental physics project grants from SNF **has decreased**
- New trend of **zeroing grants** with criticism of sub-projects, rather than cutting them slightly
  - ➡ Reminder of SNF criteria : scientific relevance, topicality and originality, suitability of methods, feasibility, qualifications of researchers
- CHIPP has been investigating this, and providing feedback to SNF
  - ➡ SPS annual meeting 2022 : Plenary Session & Special: Physics funding in Switzerland
    - Presentation from Michele Weber (CHIPP chair)
    - Summary in October 2022 [SPG Mitteilungen Communications de la SSP](#)
  - ➡ Today: We try to be more clear about specific challenges & potential solutions
    - Specifically talking today about SNF project funding (PhDs & postdocs)
    - Note: We consider SNF FLARE model for funding experiments successful
      - However, this funding line cannot pay PhD, postdoc, scientist salary

# Slide from Bernd Gotsmann @ SPS 2022

## SNSF funding vs success rates in MINT project funding



Funding rate = approved budget / requested budget

Success rate = number of approved proposals / submitted proposals



# Concerns from CHIPP perspective

1. Switzerland strategically supports experimental efforts (FLARE, SERI, etc.)
  - ➔ Often long-term investments in experimental programs, R&D, construction, operation of experiments
  - ➔ Cutting project funding on these efforts damages strategic Swiss investment
  - ➔ Suggestion: SNF council could consider Swiss investment in grant decisions
2. Switzerland is a small country
  - ➔ Often only one or a few groups working on a line of research
  - ➔ Effect of ~30% grant success more severe effect than in big countries (like U.S.)
  - ➔ Suggestion: SNF council could consider risks of cutting research projects
3. SNF requires "novelty" of all sub-projects
  - ➔ How is support of necessary but "mundane" projects like detector quality control, calibration, reconstruction software, monitoring factored in ?
  - ➔ These service tasks are required by experiments, important for student/postdoc education, & provide access to data
  - ➔ Suggestion: Some fraction of project grant could be subject to different criteria
  - ➔ Suggestion: FLARE could accommodate students/postdocs detector service work

# Concerns from CHIPP perspective

4. Mismatch between long-term experimental planning and 1 to 4-year SNF cycle
  - ➔ PI needs to commit in advance to long-term endeavors:
    - Deliver, test, install, commission, and/or operate detector component
  - ➔ Suggestion: SNF council could consider Swiss pledges in decisions
5. Zeroing of funding means groups cannot fulfill service requirements to experiment
  - ➔ Suggestion: SNF council could consider Swiss pledges in decisions
  - ➔ Suggestion: SNF could provide baseline funding level, enough to fulfill responsibilities, and encourage another submission for other goals
6. Theory perspective: calculations for large experiments can also decade-long endeavors
  - ➔ Some highly relevant theoretical calculations are missing
  - ➔ Necessary to produce measurements in long-term experiments
  - ➔ Without these, poor existing calculations could misguide future planning of large experiments
  - ➔ Suggestion: SNF council could take into account relationship of theory calculations with long-term experiments

# Continuity problem between actual experimental cycle and 4-year SNF cycle

7. SNF grant cycle aims for PIs to start from scratch every 4 years
- No SNF responsibility for finishing PhD students & postdocs who start mid-proposal
- ➔ However:
- Some projects last more than 4 years
  - In practice, long-term experimental efforts require continuous "rollover"
  - Overlap between experienced and new group members important for continuity
  - Some 4-year projects only become available 2 years into a 4-year proposal
  - PhD students and postdocs can finish at different times within grant period
  - Sometimes postdocs and PhD students already in place before grant starts
- ➔ Result:
- Leads to cases where a PI who has been cut must find a way to pay for existing students & postdocs
    - Financial strain on institutes & universities
    - Stress on those involved
  - Hopefully, problem solves itself in 6 months with resubmission
    - **However, if SNF decision comes only a few days before the next submission deadline, it could be a year that a group has no funding**
    - Disastrous to group expertise, continuity, responsibilities, and Swiss investment
- ➔ Suggestion: SNF system could allow flexibility and continuity of group members beyond 4 years



# Role of students / postdocs in large experiments

8. Misunderstanding in grant evaluations of PhD / postdoc roles in large experiments
  - To do the physics, and get the physics analyses, we need to commit to building, operating, detector, reconstructing data
  - For a particle physics PhD student, this means taking part in this work
    - Perhaps not directly related to PhD thesis
  - In other fields, experimental work is considered part of thesis
    - E.g., in solid-state physics, student may help put together experiment and conduct experiment
      - Directly related to PhD thesis
  - Somehow, there is a perception that in particle physics, work for the experiment done by PhD students is disconnected from the PhD student thesis
- Suggestion: PhD/postdoc responsibilities to experiment be considered a positive in grant reviews since necessary to produce physics analyses/ publications/ project goals

# New SNF funding regulations : help or not ?

## 9. New SNF funding rules

➔ PI can submit 250kCHF / year for 4 years

- Postdoc + 2 students + social costs + travel
- Smaller than many grants of established PIs
- Up to 3 projects allowed, provided one is EU consortium, etc.

▪ How can PIs on large experiments adapt to new SNF funding rules ?

➔ Problem :

- One grant typically not be enough to fulfill do physics analysis & detector responsibilities
- **Very important that SNF accept two grants on the same experiment**

➔ Submitting multiple grants may allow factorization of physics analysis & detector responsibilities

- However, a PhD student or postdoc **contributes to both** during their term
  - Not the case that we would hire a PhD student only to calibrate, or commission pixel detector
    - Would perhaps be 30% of their time
- The SNF rating criteria of the two proposals is the same
  - Will the SNF evaluators give equal weight to a proposal to search for dark matter and one that calibrates the detector to do so ?

▪ Suggestion: Some project grants could be subject to different criteria

▪ Suggestion: SNF should be able to recognize two thematically different projects from the same experiment

# General concern for fundamental science

10. General concern for fundamental science
  - ➔ SNF funding is not decreasing, but number of applications from applied science is increasing -> lower success rate in fundamental science
    - Typically, applied science grants proposed are smaller, but number is increasing
    - Does fundamental science need protection?
  - ➔ Suggestions:
    - Can fundamental science be partitioned into its own funding category?
    - Can we learn from other countries ?
      - Perhaps we can invite some experts from other countries to review our funding mechanisms ?



# Summary of suggestions

- SNF should be able to recognize two thematically different projects from the same experiment
- SNF council could consider Swiss investment in grant decisions
- SNF council could consider Swiss pledges in grant decisions
- Some project grants could be subject to different criteria
- Some fraction of project grant could be subject to different criteria
- SNF council could consider risks of cutting research projects
- FLARE could accommodate students/postdocs detector service work
- SNF could provide baseline funding level, enough to fulfill responsibilities, and encourage another submission for other goal
- SNF council could take into account relationship of theory calculations with long-term experiments
- SNF system could allow flexibility and continuity of group members beyond 4 years
- Suggestion: PhD/postdoc responsibilities to experiment be considered a positive in grant reviews since necessary to produce physics analyses/ publications/ project goals
- Invite funding agency experts from other countries to review our funding mechanisms
- Partition fundamental science into its own funding category

# BACKUPS

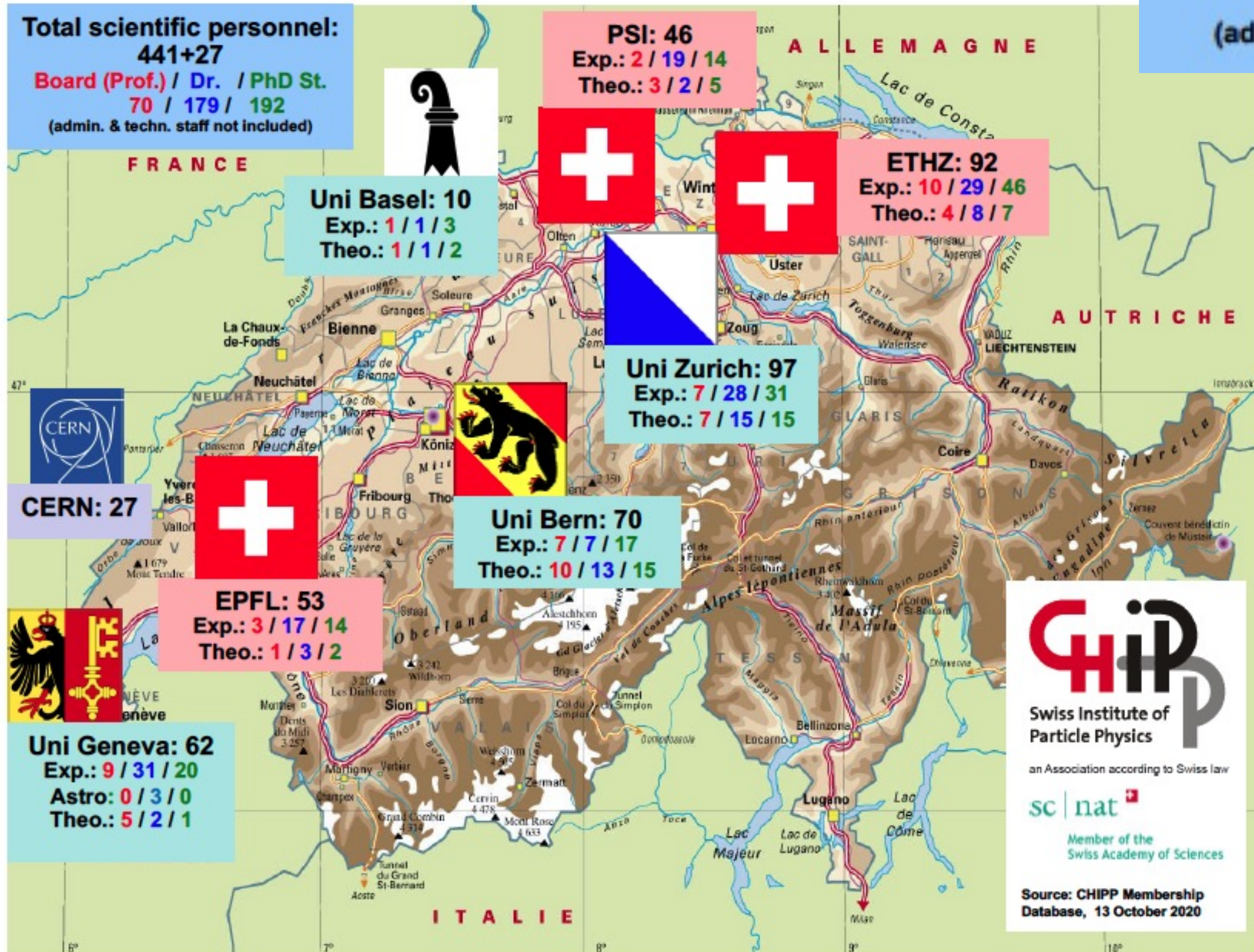
# CHIPP : future experiments

Pillar	Experiment 2025-2028 (preliminary)
High energy	ATLAS
High energy	CMS
High energy	LHCb
High energy	GBAR
High energy	NA64
High energy	FASER
High energy	SHIP
High energy	NA62
Low energy	n2EDM
Low energy	Mu3e
Low energy	PIONEER
Neutrino	T2K / Hyper-K
Neutrino	DUNE
Neutrino	LEGEND
Astroparticle	CTA
Astroparticle	DARWIN
Astroparticle	Einstein Telescope



# Swiss Particle Physics Landscape 2023

441 / 27  
**Board (Prof.) / Dr. / PhD St.**  
**70 / 179 / 192**  
 (admin. & techn. staff not included)



441 plenary members  
 70 board members

- Board & plenary elect :
- 4 executive board members
  - 1 CHIPP chair

**CHIPP**  
 Swiss Institute of Particle Physics  
 an Association according to Swiss law  
 sc | nat  
 Member of the Swiss Academy of Sciences  
 Source: CHIPP Membership Database, 13 October 2020





PARTICLE PHYSICS IN SWITZERLAND

## STATUS AND OUTLOOK OF RESEARCH AND EDUCATION

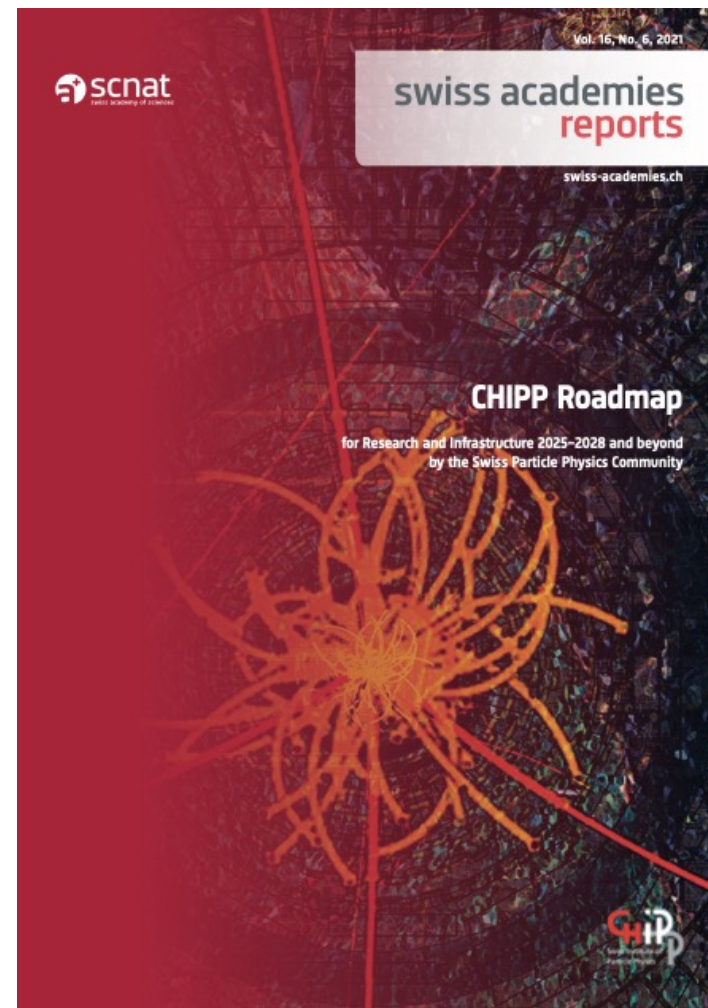
Date: 2004  
Authors: CHIPP  
Pages: 105



PARTICLE PHYSICS IN SWITZERLAND

## ACHIEVEMENTS, STATUS AND OUTLOOK: IMPLEMENTATION OF THE ROAD MAP 2005-2010

Date: 2010  
Authors: CHIPP  
Pages: 24



swiss academies  
reports

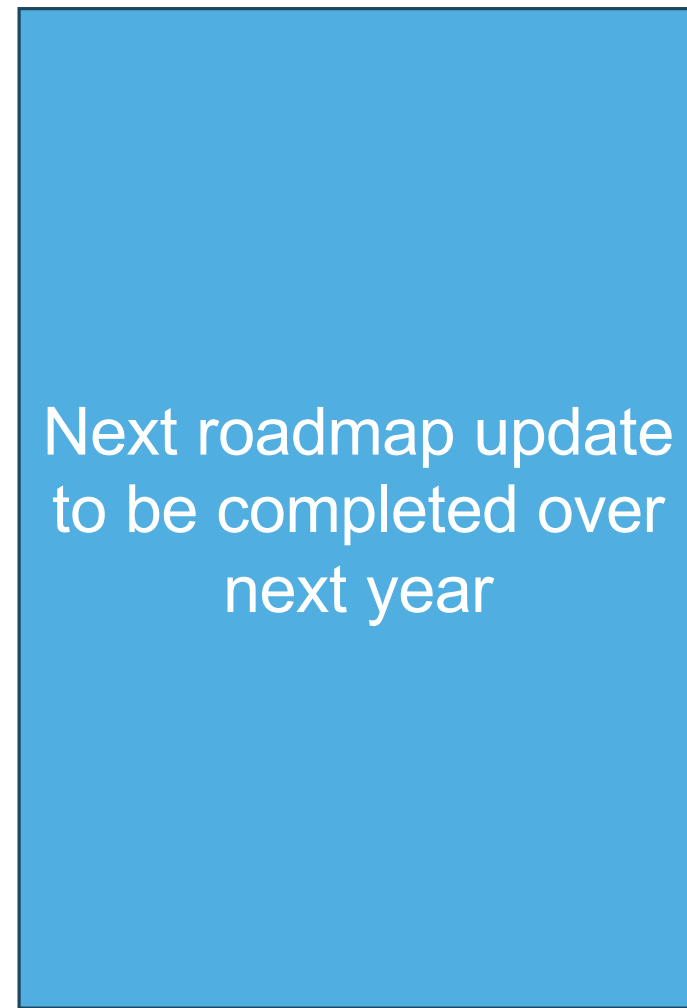
swiss-academies.ch

## CHIPP Roadmap

for Research and Infrastructure 2025-2028 and beyond  
by the Swiss Particle Physics Community

Date: 2021  
Authors: CHIPP  
Pages: 96

Roadmap 2025-2028  
& beyond



Next roadmap update  
to be completed over  
next year

Date: 2024  
Authors: CHIPP  
Pages: ~20

Roadmap update  
2029-2032 & beyond