

The Swiss Quantum Initiative

Swiss Quantum Days 2024

January 31, 2024

SQI governance and funding

The Swiss Quantum Initiative (SQI) is

- mandated by the Swiss Confederation via SERI,
- hosted by the Swiss Academy of Sciences SCNAT and
- coordinated and led by the Swiss Quantum Commission (SQC) on a voluntary basis

Cooperation with the Swiss National Science Foundation SNSF and Innosuisse



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Innosuisse - Swiss Innovation Agency



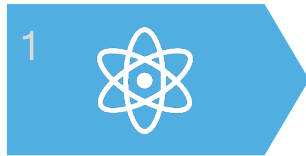
Schweizerische Eidgenossenschaft
Confédération suisse
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**State Secretariat for Education,
Research and Innovation SERI**



More than a scientific initiative: simplified* view on the "Quantum Value Chain"

Illustrative



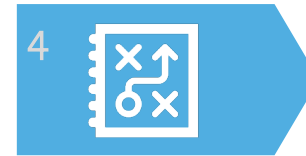
1
Basic
research



2
Applied
research



3
Tech transfer &
prototyping



4
Commercial
startup



5
Industrial
scaling

SQI goal: "Strengthen Switzerland's leading position
across the entire value chain"

* Illustrative. Not strictly linear.

Swiss Quantum Commission (SQC)



Nicolas Gisin (president)
University of Geneva/
Constructor Uni.



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Arts



Heike E. Riel
IBM Rüschlikon

What the commission did in 2023

1. 10 meetings, including one with 8 quantum industries and one with 7 investors and ecosystem players (incl. Innosuisse, SATW, GESDA, QAI Ventures, Constructor, Verve Ventures, Swisscom Ventures)
2. answer tons of questions and requests
3. define the field
4. define regulations (physicists versus lawyers & bureaucrats 😊)
5. sponsor and contribute to conferences / events
6. formulate strategic considerations in view of the 2nd phase, in particular the budget

The field(s) of quantum

document available on our web page
quantum.scnat.ch

*Mastering quantum systems
on the individual quanta level and engineered entanglement*

Fields of applied research and development

- Quantum communication
- Quantum computation
- Quantum simulation
- Quantum sensing and metrology

Fields with a cross-sectional or foundational character

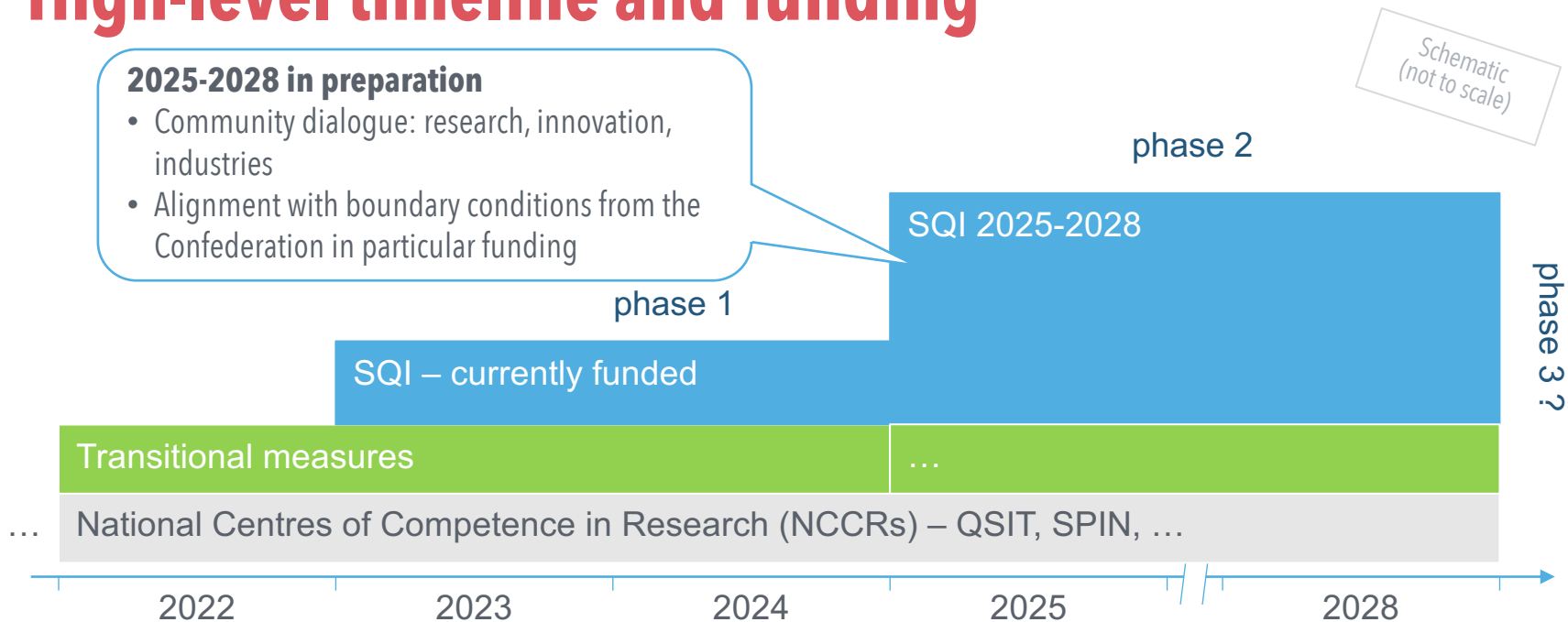
- Materials for quantum technologies
- synthetic quantum materials exhibiting entanglement
- Quantum control hardware
- Computer sciences
- Quantum theory
- ...

SQC recommendations for 2025-2028 (selection)

- Overall, we are (still) in a time that calls for more **curiosity-driven research and innovation**
- SQI funding for **scientific research** in 2025-28 should be bundled into **one larger call**, ca. in 2027
- Significant attention should be given to **infrastructures** and emerging platforms for quantum (both with fundamental and applied characters)
- There is a need to **support innovation** and **young companies** without interfering excessively in market dynamics with taxpayers' money

document available on our web page
quantum.scnat.ch

High-level timeline and funding



Current SQI funding: 20 Mio. CHF for 2023-2024

Further funds planned for 2025-2028: ca. 80 Mio. CHF

Limited to accredited institutions
(Some exceptions possible via Innosuisse)

Proposed distribution and numbers per year

SQL

~ 1/3 for research

~ 1/6 for innovation

~ 1/2 for infrastructure,
platforms + events +
voucher model +
ind. PhD + workforce,
education + initiative
overhead, SQL office at
SCNAT

	2025	2026	2027	2028	TOTAL	%
SNSF	-	-	13.7 ²⁾	13.8 ²⁾	27.5	33%
Innosuisse	2.0 ³⁾	2.0	6.0 ⁴⁾	4.1	14.1	17%
SCNAT	4.0	14.0	9.1	14.5	41.6	50% ⁵⁾
SQL TOTAL¹⁾	6.0	16.0	28.8	32.4	83.2	100%

- 1) Given as a boundary condition for the SQL in 2025-2028 (see: ERI dispatch); basis for this document.
- 2) One SQL research project call foreseen in 2027 to combine volumes for 2027 and 2028: 27.5 Mio. CHF.
- 3) First SQL innovation instrument launch foreseen for 2025: 5.0 Mio. CHF (with 2.0 Mio. CHF in 2025; 2.0 Mio. CHF in 2026 and 1 Mio. CHF in 2027).
- 4) Second SQL innovation instrument launch foreseen for 2027: 9.1 Mio. CHF (with 5 Mio. CHF in 2027 and 4.1 Mio. CHF in 2028).
- 5) Mainly for quantum infrastructures and platforms; also including SQL strategy, steering and support for events and conferences.

Funding instruments, announcements:

quantum.scnat.ch

- **Research:** Swiss Quantum Call 2024; via SNSF (submission date tomorrow)
- Call for 2-pager ideas on **national quantum infrastructures** developments with a national & industrial relevance
- Support for **events and conferences**

In preparation:

- **Voucher model** to utilize existing, shared **infrastructures for quantum**
- Financing **industry PhDs**
- **Innovation** support; via Innosuisse

New “voucher model” for broader access to infrastructures and fostering collaborations

- Make more use of existing capabilities and infrastructures
- should have interest from academia and industry
- Short-term support starting in 2024/25; smaller-sized vouchers (suggested: $\leq 50k$ CHF)
- Learning from the process; input for informed (larger) investment strategies
- Combinations possible
- Individual bilateral agreements (not a top-down enforced effort)
- Next steps: preparation and launch in 2024 as a pilot

“Industrial PhD”

- Demand articulated jointly by the research, innovation and industry community
- Proper, professional mentorship from industry required; not just marketing
- Combinations should be possible: one or more industry partner
- Specific support model TBD
- In any case: hosted by accredited Swiss institutes of higher education

Call for 2-pager ideas for quantum infrastructure with a triple value: academic - industrial - national

- Part of the strategic dialogue with the Swiss Quantum Community
- No funding decisions in this phase (it is about *ideas* and a *dialogue*)
- 14 papers submitted so far with 20 ideas from academia and industries
- Broad range of national infrastructure topics / ideas / projects including: materials science, preparation and testing; cleanrooms; device fabrication; communication networks / links; computing services / platforms; algorithm development (sample key words for illustrative purposes only)
- Next step: first review; strategic round-table, Villars-sur-Ollon, February 1, 2024

Dialogue with the Swiss quantum community

Questions for the way ahead (examples)

- **WHAT** are the most important topic areas for the next years?
 - Deep scientific questions
 - Designing and building useful machines
- **HOW** shall we foster the field?
 - Instruments etc.
 - ... SQI Logo (?)
 - ... and many more to discuss!

... best idea will receive a price





INTERNATIONAL YEAR OF Quantum Science and Technology

100 years of quantum is just the beginning...



To be decided
by the UN General Assembly



<https://quantum2025.org>



University of
Zurich^{UZH}

SWISS PHOTONICS

... and more

Swiss Quantum Days · SQI · Villars-sur-Ollon · January 31, 2024

Thank you



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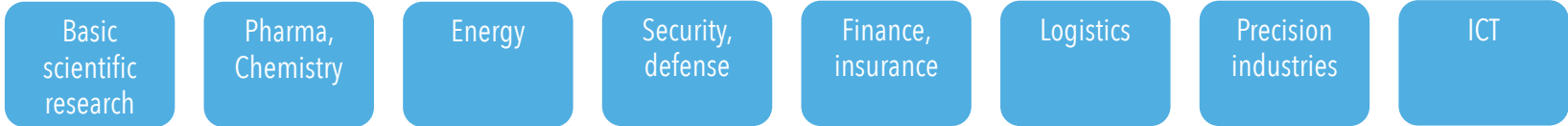
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Supplementary Material

SQI topic landscape

Illustrative

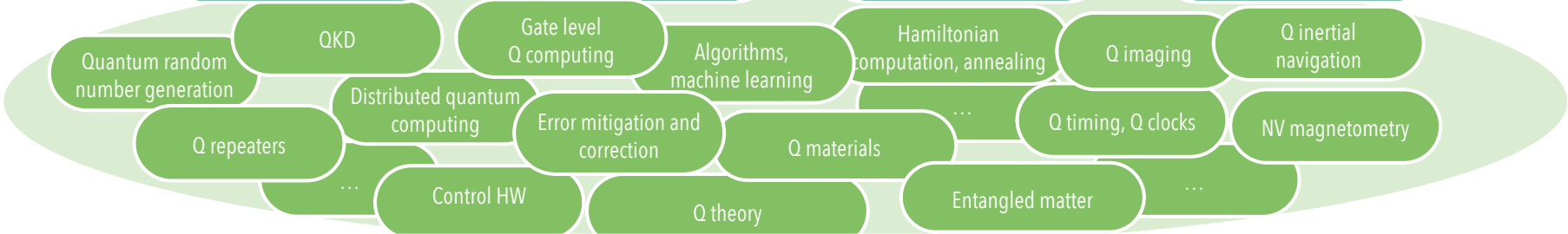


Q communication

Q computation

Q simulation

Q sensing and metrology



Quantum Centers, Academia, Industries, ...

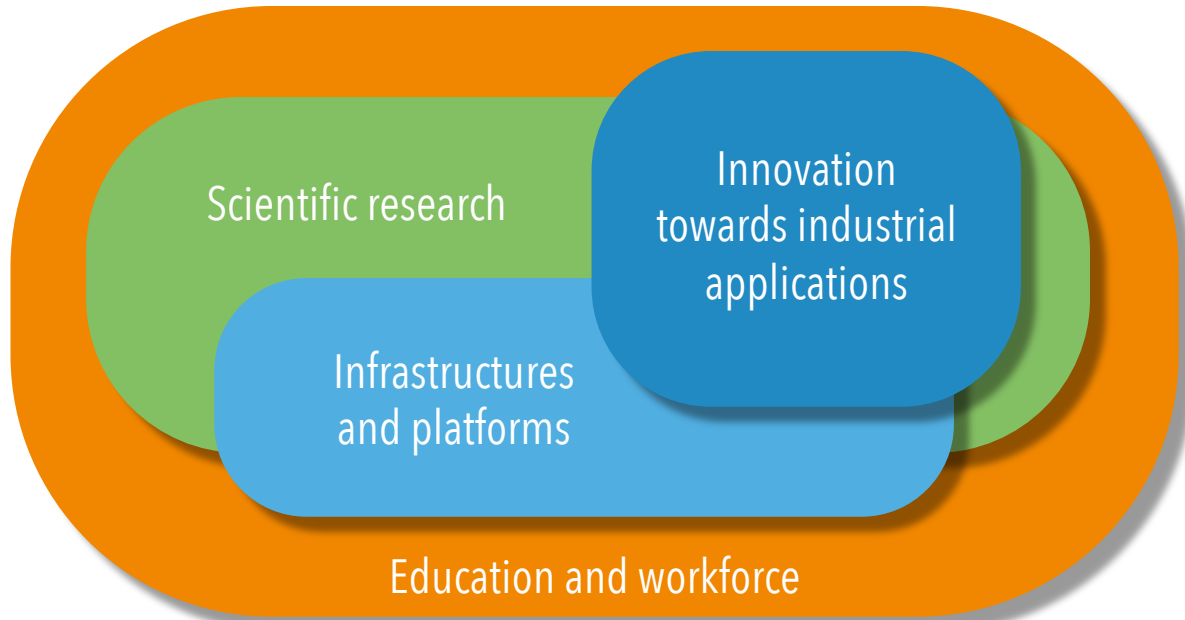
"Mastering quantum systems on the individual quanta level and engineered entanglement"

4 specific goals for the Swiss Quantum Initiative

- (i) **Promoting scientific research:** Breakthroughs in scientific discoveries
- (ii) **Fostering innovation:** Fertile environment for ideas and projects to grow and mature into solutions of industrial size
- (iii) **Developing infrastructures and platforms:** Connect quantum research to real-world applications with the goal to offer benefits for society and impact on the economy
- (iv) **Giving impulses for education and workforce:** Improve quantum literacy at all educational levels; in particular quantum engineering skills

Education as an underlying topic for all fields of action within the Swiss Quantum Initiative

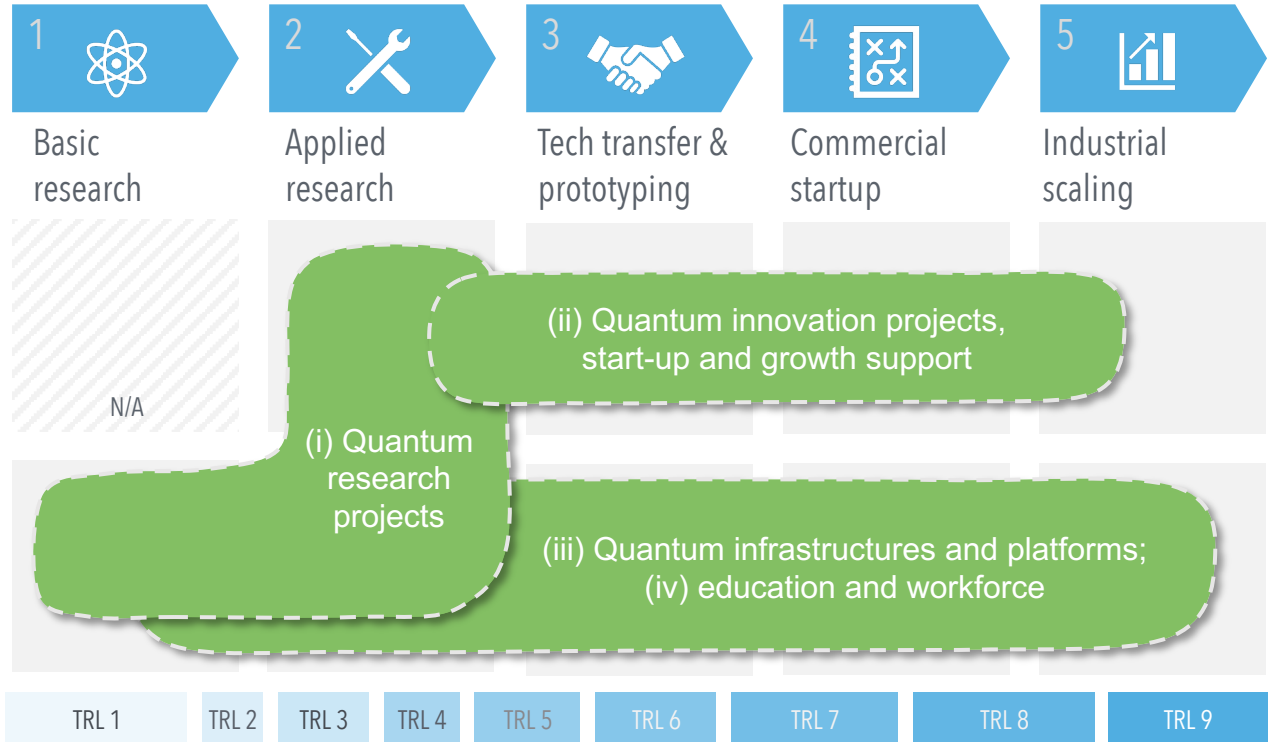
Illustrative



International aspects and communications embedded in all themes

Main fields of action - jointly with SNSF, Innosuisse

ILLUSTRATIVE
- not to scale -

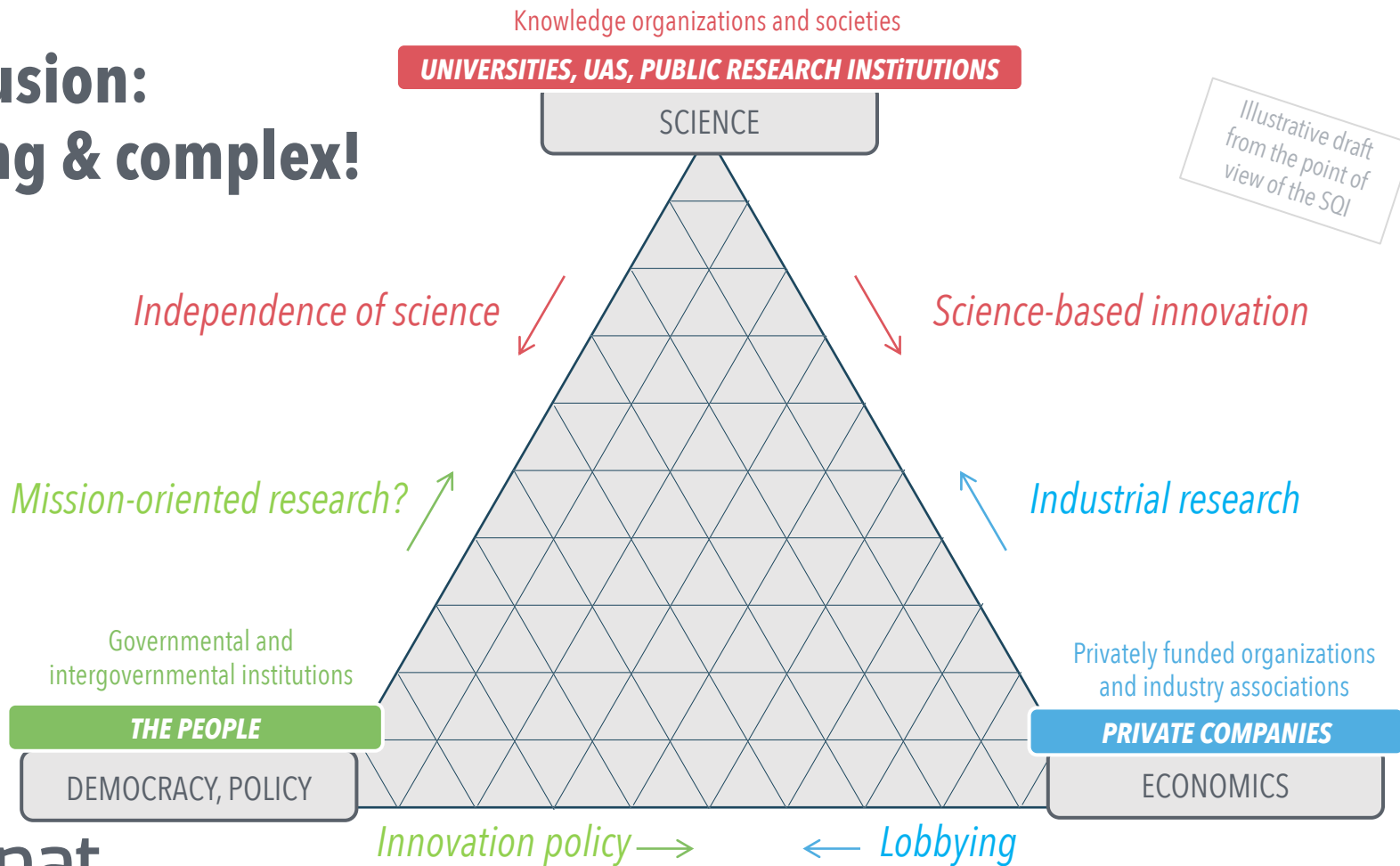


Outcome-focus: towards specific applications. Outcomes targeted at specific projects or beneficiaries (e.g. startup project funding)

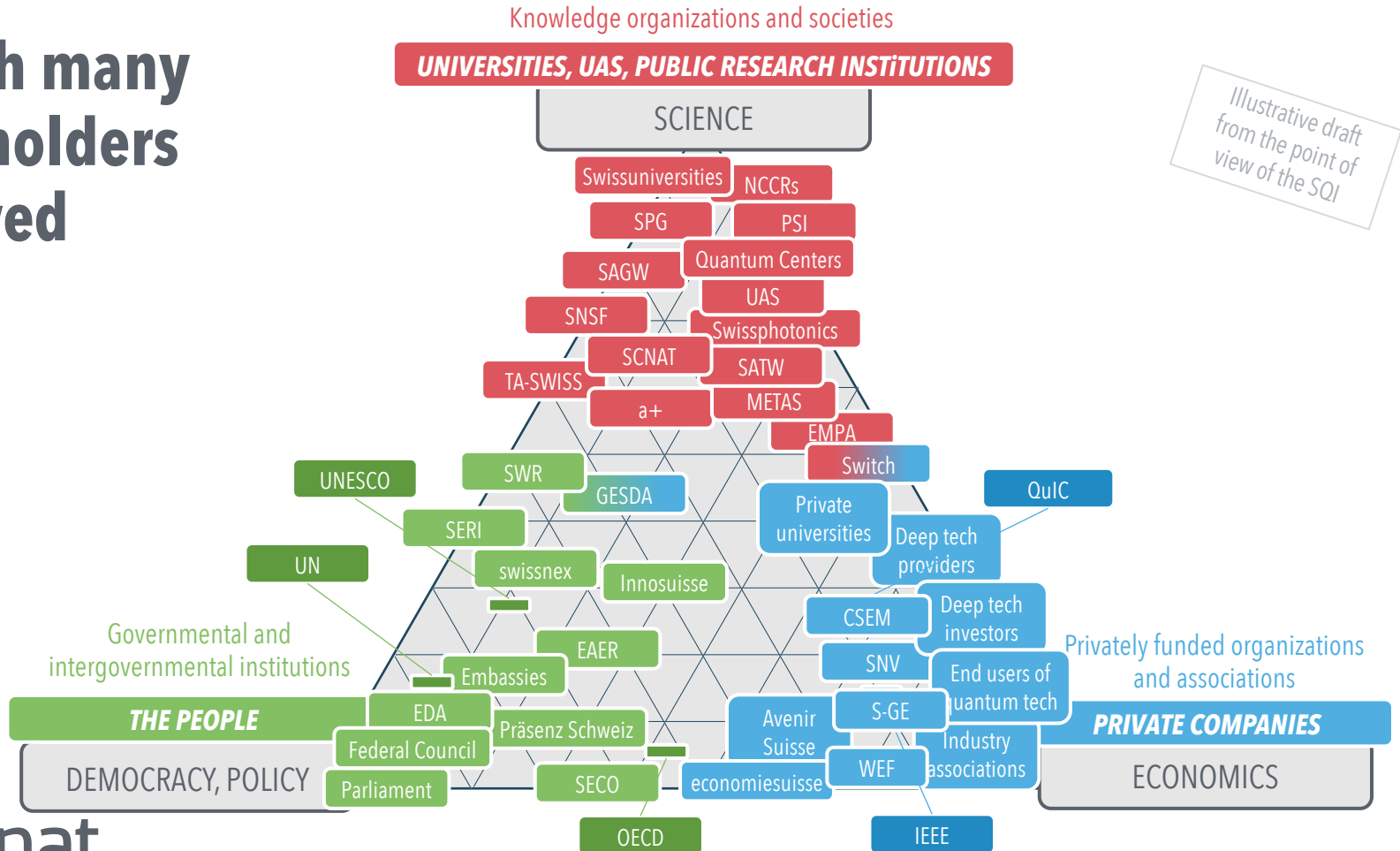
Fundamental research and foundations: agnostic to specific beneficiaries or direct commercial outcomes (e.g. quantum infrastructure support)

Typical technology readiness levels (TRL):

Conclusion: Exciting & complex!



... with many stakeholders involved



Swiss Quantum "Ecosystem"

<https://swissnex.org/boston/news/new-mapping-of-swiss-quantum-ecosystem/>
quantum.scnat.ch

