Introduction/Advertisement of
International Leading Research (JSPS grant)

Development of the Energy Frontier and International Human Resources toward Unified Understanding of Interaction

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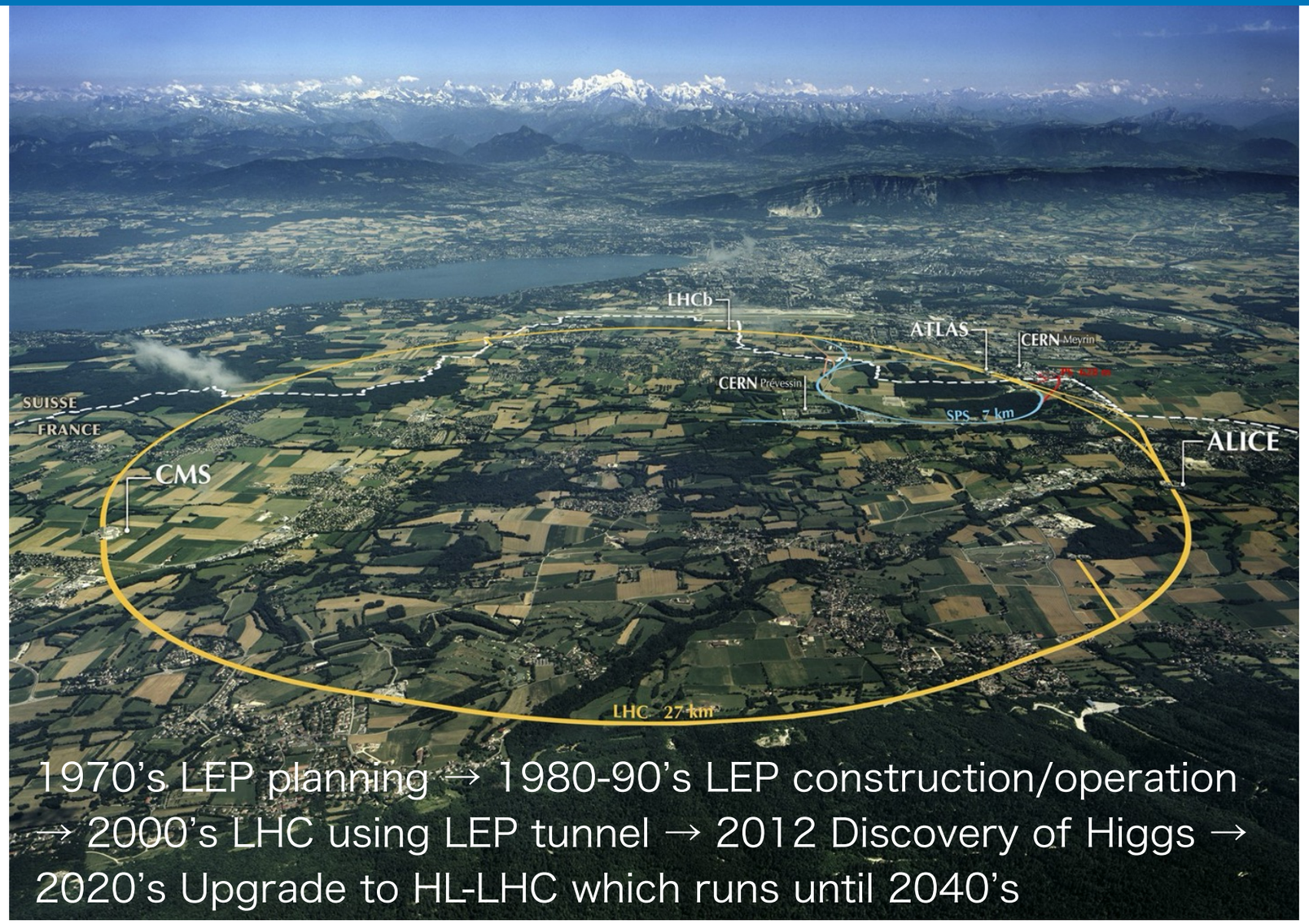
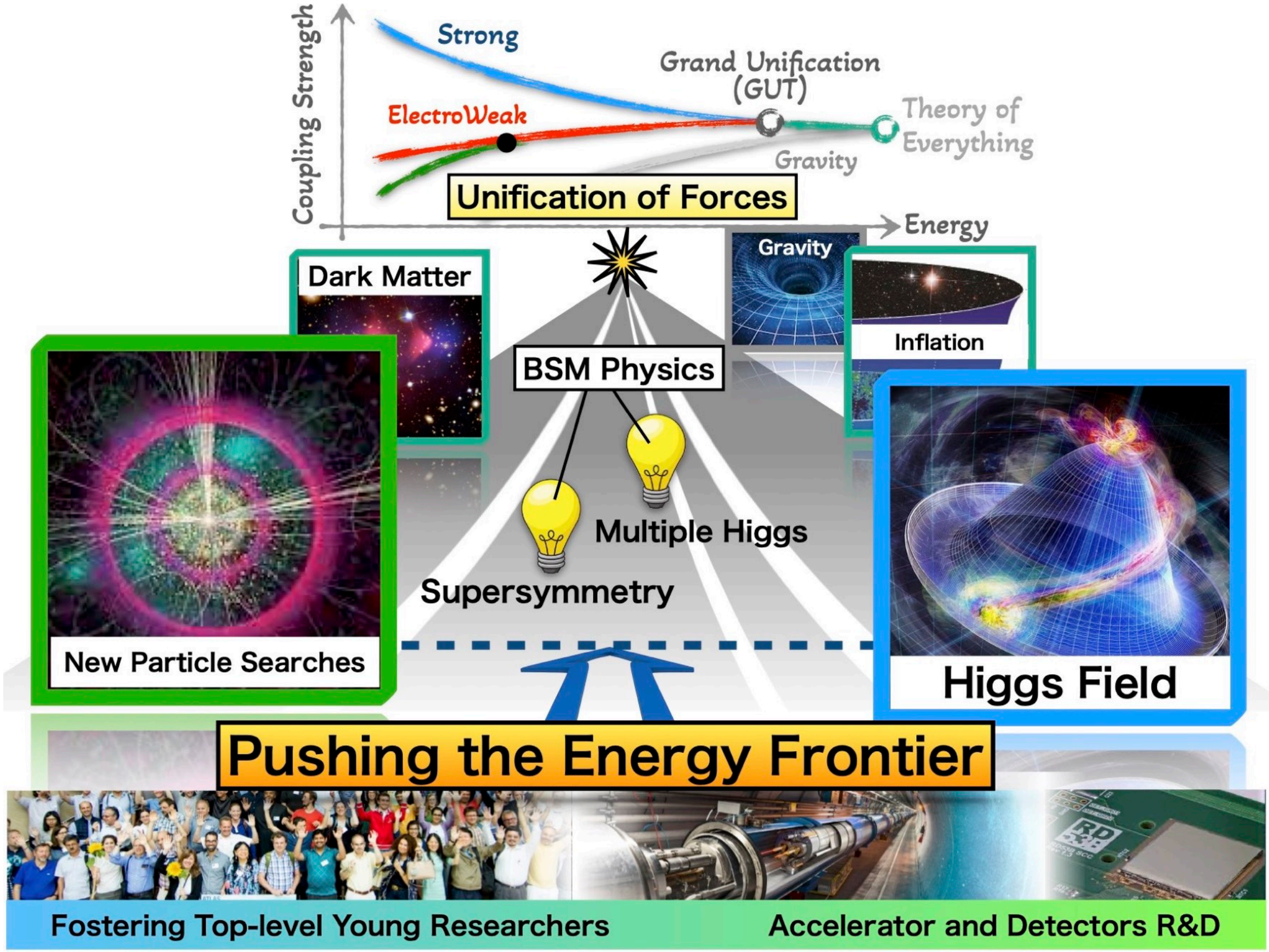
Energy Frontier Experiment is like Sagrada Familia



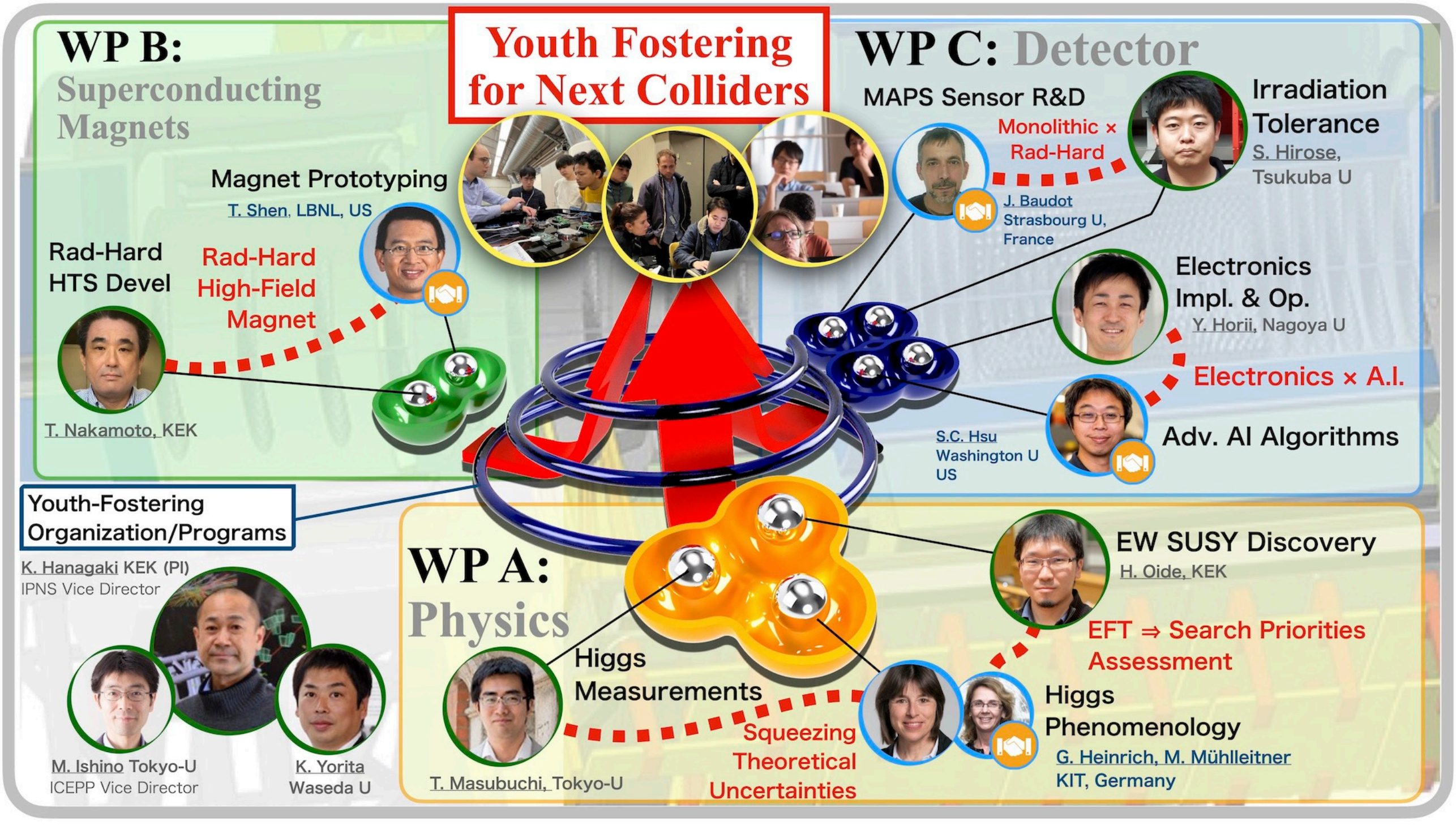
1970's LEP planning → 1980-90's LEP construction/operation → 2000's LHC using LEP tunnel → 2012 Discovery of Higgs → 2020's Upgrade to HL-LHC which runs until 2040's

- Energy frontier is large scale in both space and time
  ⇐ Important to have strategic research planning and fostering young researchers based on long term vision
- The objectives of research program supported by this grant
  - Physics : Deepening understanding of Higgs and heavy particle search
  - Development of technology relevant to next generation Higgs factory

Our Dream


Coupling Strength
Strong
ElectroWeak
Grand Unification (GUT)
Theory of Everything
Gravity
Unification of Forces
Energy
Dark Matter
Gravity
Inflation
BSM Physics
Multiple Higgs
Supersymmetry
New Particle Searches
Higgs Field
Pushing the Energy Frontier
Fostering Top-level Young Researchers
Accelerator and Detectors R&D

Framework


Youth Fostering for Next Colliders
WP B: Superconducting Magnets
Magnet Prototyping
T. Shen, LBNL, US
Rad-Hard HTS Devel
Rad-Hard High-Field Magnet
T. Nakamoto, KEK
WP C: Detector
MAPS Sensor R&D
Monolithic × Rad-Hard
J. Baudot
Strasbourg U, France
Irradiation Tolerance
S. Hirose, Tsukuba U
Electronics Impl. & Op.
Y. Horii, Nagoya U
Electronics × A.I.
S.C. Hsu
Washington U
US
Adv. AI Algorithms
Youth-Fostering Organization/Programs
K. Hanagaki KEK (PI)
IPNS Vice Director
M. Ishino Tokyo-U
ICEPP Vice Director
K. Yorita
Waseda U
WP A: Physics
EW SUSY Discovery
H. Oide, KEK
EFT ⇒ Search Priorities Assessment
Higgs Measurements
T. Masubuchi, Tokyo-U
Squeezing Theoretical Uncertainties
Higgs Phenomenology
G. Heinrich, M. Mühlleitner
KIT, Germany

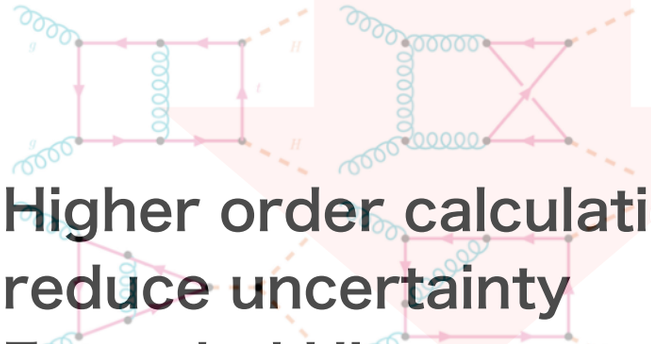
Work Package A　～Physics～

<u>Higgs Sector</u>
Tatsuya Masubuchi (Osaka)

- Higgs pair production
  → self-coupling
- Second generation Yukawa
- Improvement of Particle ID

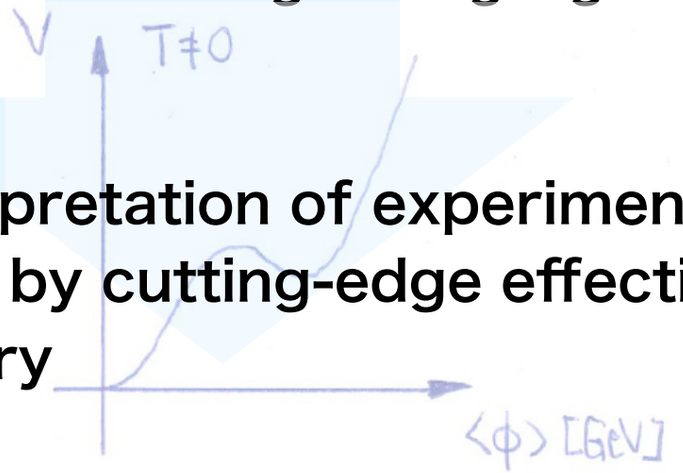
<u>Electroweakino Search</u>
Hideyuki Oide (KEK)

- Development of reconstruction of
  - low momentum lepton
  - missing track
- Search for long-lived gaugino



G.Heinrich, M. Mühlleitner

- Higher order calculation to reduce uncertainty
- Extended Higgs sector
- Phenomenology



- Interpretation of experimental data by cutting-edge effective theory

Understanding of Higgs field / Vacuum structure
Baryogenesis, Pathway to unified theory, Dark matter

New proposal for joint research is welcome

Support for Young Researchers

- Support international travel for young researcher (those who belong to institute in Japan…)
  - Non-permanent position and less than 8 years after getting Ph.D
  - Students
  - Three open calls a year

- Course 1 (short or middle term)
  - Theorist or Experimentalist for Work Package either A, B, or C, or related area
    - For theorist, the research topic can be wider
      - Interdisciplinary area such as gravitational wave is also welcome
  - Travel not restricted to the member's institute
  - Two sub-categories
    - Up to ~800 kJPY
    - Up to ~1,500 kJPY
  - So far 6 researchers are selected
    - Two out of six are theorists (one student and one assistant professor)

- Course 2 (long term)
  - Experimentalist

Final Remarks

- For sustainable development of the field
  - New idea for change
    - Deep collaboration between experiment and theory crucial
  - Interests or passion by young people

- Hope this program will contribute to the points above, and push the energy frontier forward, although it might be a small step