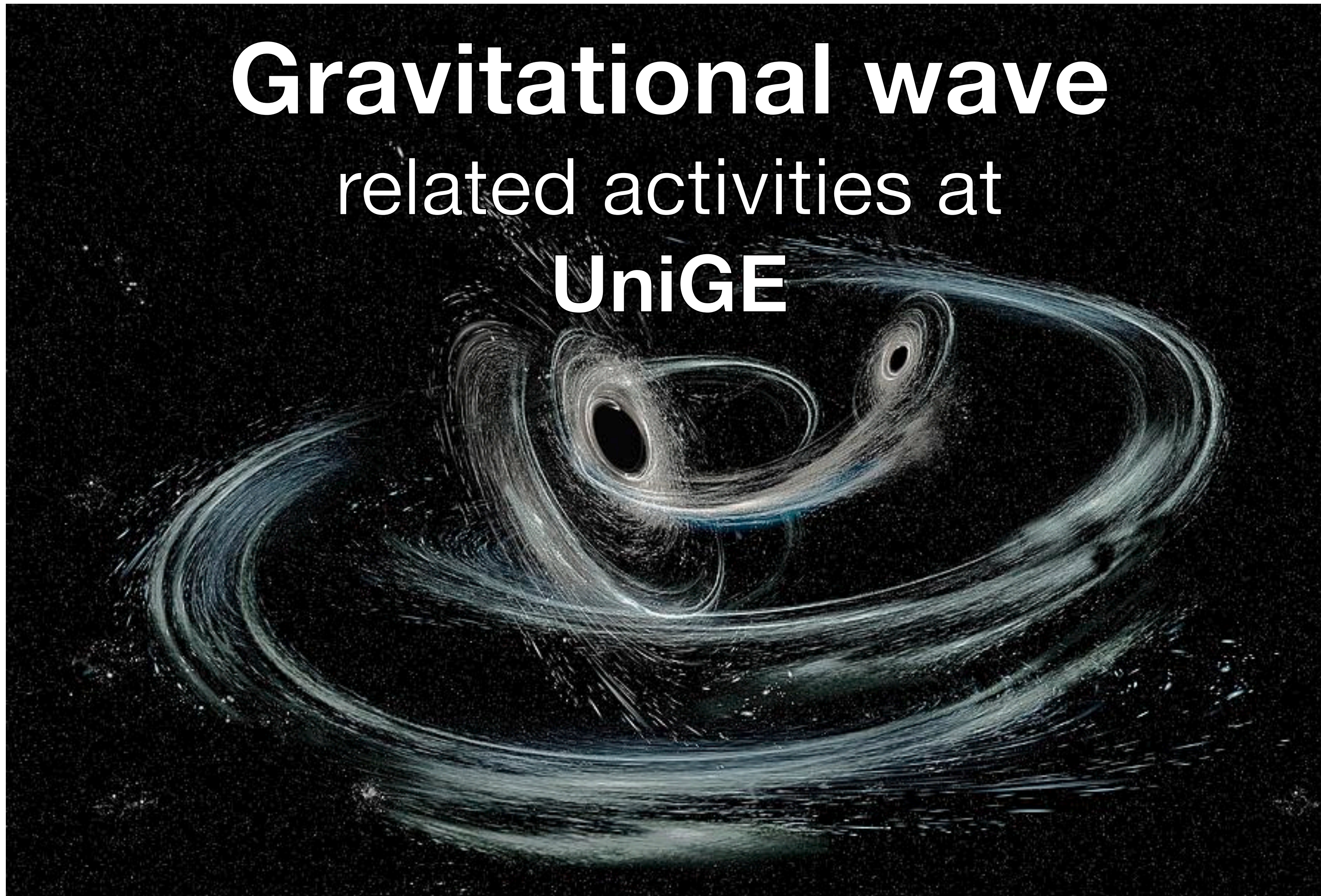


# Gravitational wave related activities at UniGE



Anastasios Fragkos

on behalf of the GWSC Executive Board

24/10/2022

# Research areas in Gravitational-Wave Science

in the Departments of Astronomy, Theoretical Physics, and Particle & Nuclear Physics

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## **Astrophysics**

- Formation and evolution of coalescing binary compact objects and compact binaries - Fragkos
- Population studies of gravitational-wave sources - Fragkos
- Stellar-interior and binary-evolution physics and their imprints to GW source properties - Meynet, Fragkos
- Formation of intermediate-mass black holes - Charbonnel

## **Cosmology & theoretical physics**

- Study of large-scale structure, dark energy and dark matter physics with gravitational waves - Maggiore, Riotto, Caprinni, Foffa, Bonvin, Kunz, Lombriser
- General relativity and modified gravity - Maggiore, Foffa, Bonvin, Kunz, Lombriser
- Primordial black holes - Riotto

## **Data analysis**

- Astrophysical parameter estimation of gravitational-wave sources - Maggiore, Hoffa
- Machine learning methods in data analysis - Schramm
- Gravitational-wave source population inference - Riotto, Fragkos

## **Multi-messenger astronomy**

- Observations of Gamma-ray bursts - Integral Science Data Center - Paltani, Ferrigno
- Future high-energy missions: Athena, Thesaurus - Paltani, Eckert, Bozzo

# Gravitational-Wave Science Center (GWSC) at UniGE

<https://gwsc.unige.ch>



*“GWSC aims at consolidating the existing GW-related activities within UniGE, stimulating new, interdisciplinary research in the domain, and federating the efforts for a Swiss involvement to future GW observatories, such as the Einstein Telescope.”*

Proposal approved on December 22<sup>nd</sup>, 2021

Executive Board: M. Maggiore (DPT; Coordinator), A. Fragkos (ASTRO; Vice-Coordinator), S. Schramm (DPNC), Georges Meynet (ASTRO), A. Riotto (DPT), F. Sanchez Nieto (DPNC)  
4 PhD student and 4 Postdoctoral & Senior Researcher Members, 5 Affiliated Members

## Activities

**Over a dozen of scientific papers** published or in the review process

### 51st Saas-Fee Advanced Course in Astrophysics

Week-long school on “Compact-Object Astrophysics in the Era of Multi-Messenger Astronomy” targeted to early-career researchers.

### Applications of AI to gravitational wave science

Mini virtual workshop, bringing together Swiss GW and AI community with international domain experts. Plans to be repeated as an in-person event.

### GWSC Colloquium Series - Co-hosted by Astro/DPT/DPNC

Most recent, by Max-Planck Institute for Astrophysics Research Director, Dr. Selma E. de Mink, on Stellar progenitors of gravitational wave sources

### CERN-GWSC Gravitational-Wave meeting

A monthly science meeting attended by UniGE Astro/DPT/DPNC and CERN researchers related to GWs, where we exchange ideas related to ongoing local research projects and recent developments in the field.

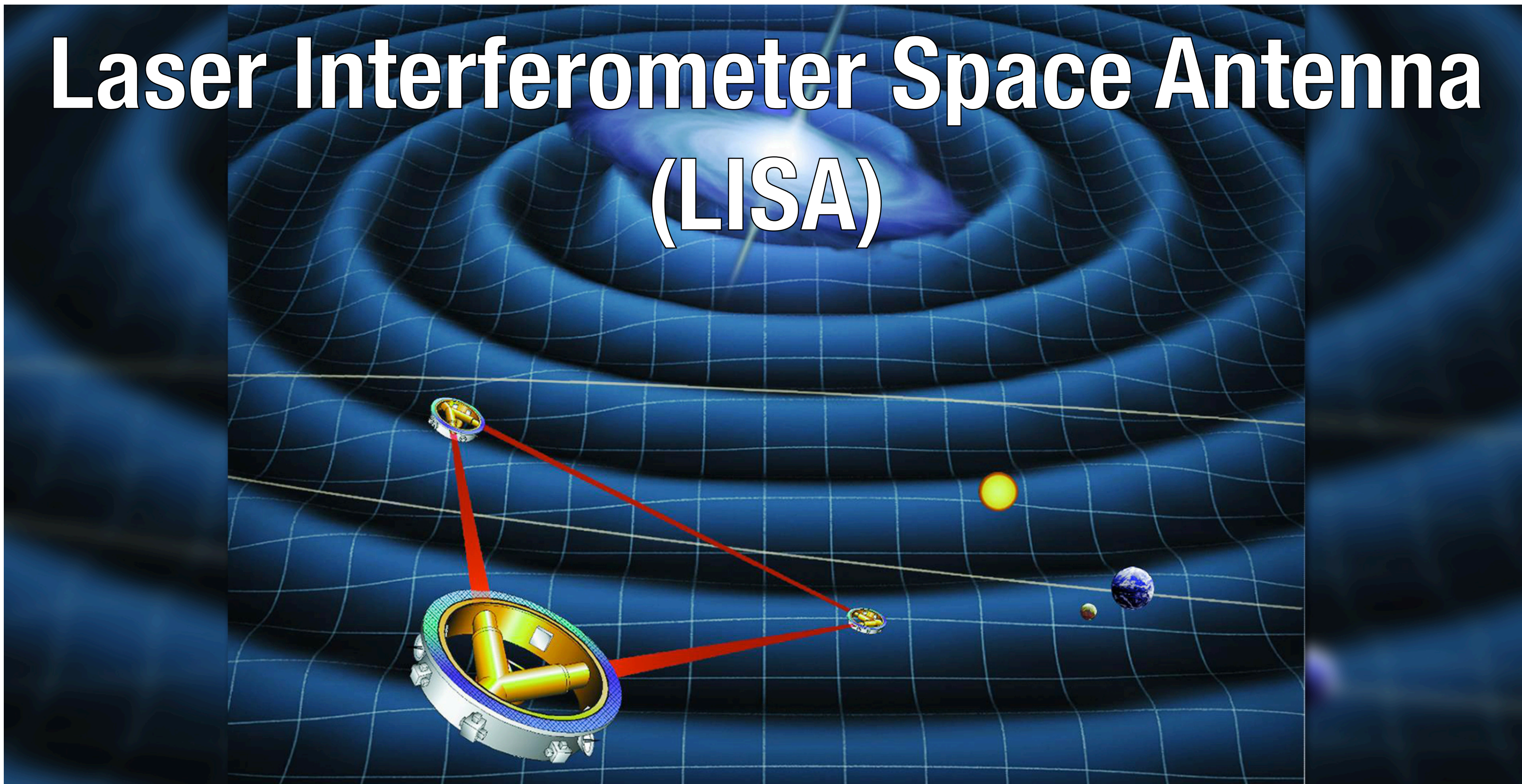
## Projects

- ◆ **4 SNSF Projects and 1 ERC** related to GWs awarded to GWSC Executive Board Members
- ◆ European **INFRA-DEV project** (co-funded by SERI) on the Einstein Telescope Preparatory Phase (Swiss PI: Fragkos)
- ◆ **1 Boninchi Foundation** Research grant (PI: Riotto)

## Pending Proposals

- ◆ **SNSF Sinergia Grant** on GWs and Machine learning (PI: Fragkos, Co-Is: Maggiore, Mayer, Hofmann)
- ◆ **2 Proposals to the Boninchi Foundation** (PIs: Schramm, Fragkos, Maggiore, Meynet) - **to be co-financed by Dept. Astro. And DPNC.**

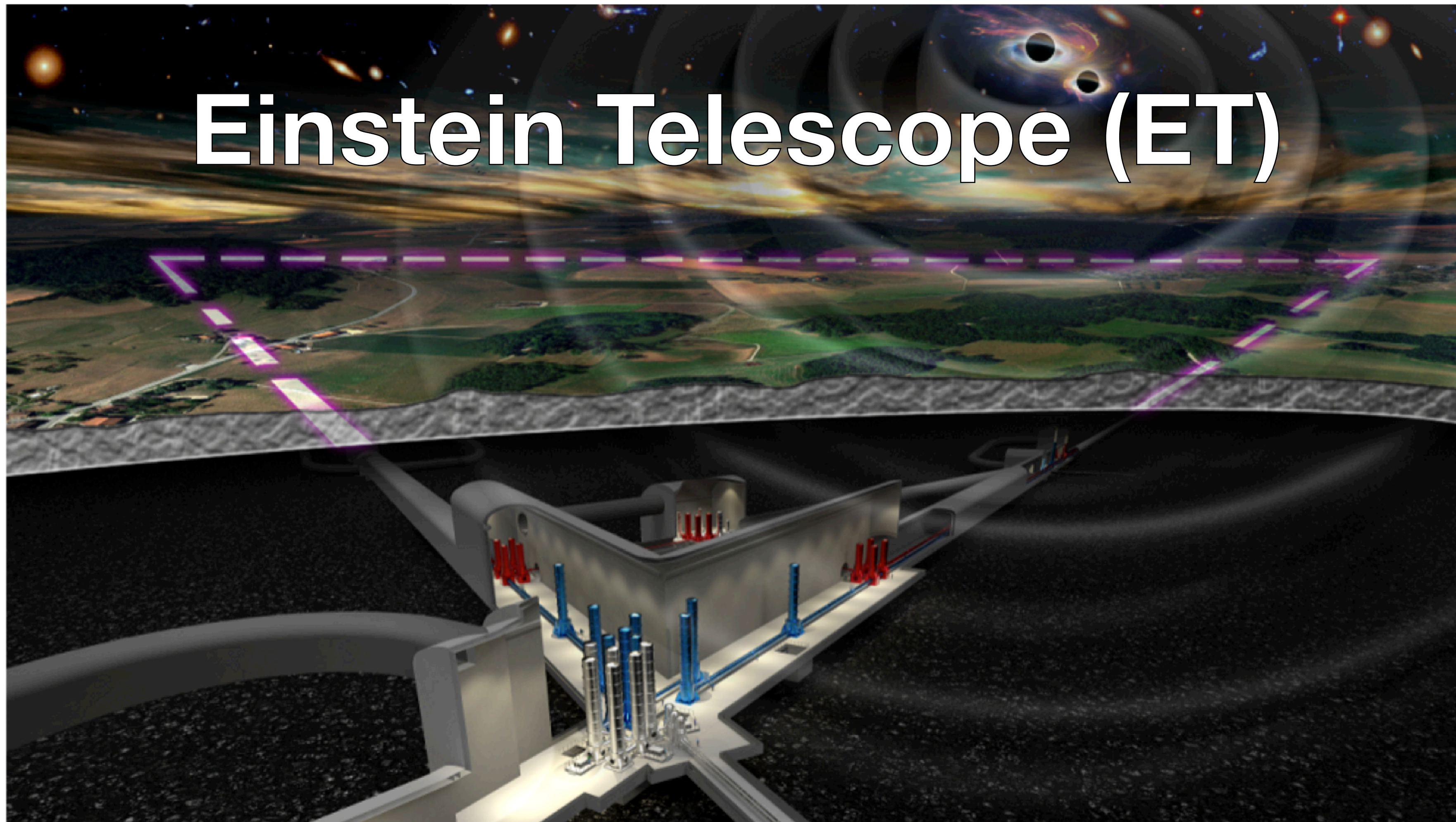
# Laser Interferometer Space Antenna (LISA)



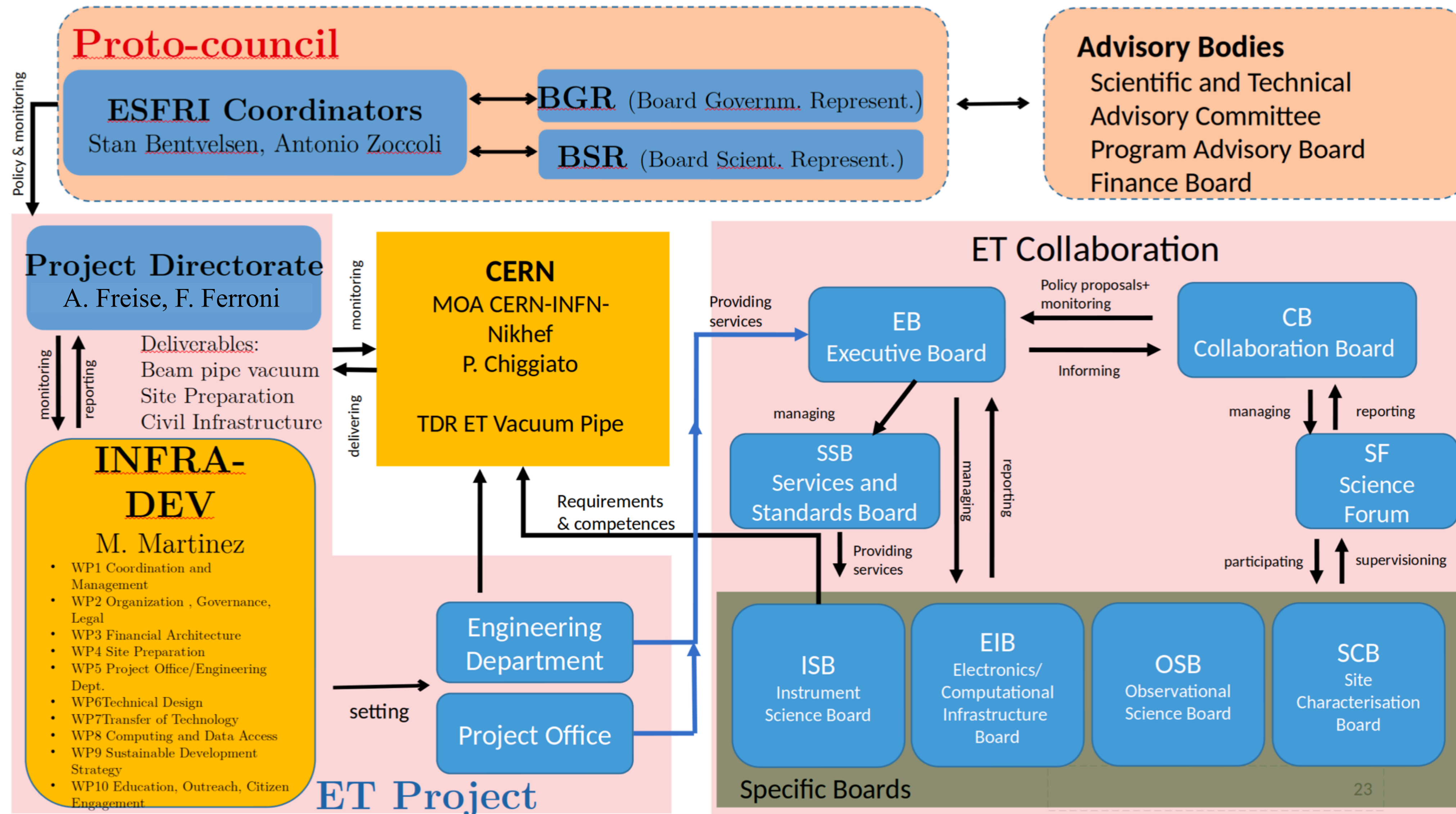
Consortium members: Caprini, Fragkos, Foffa, Maggiore, Paltani

**Active in LISA Astrophysics Working Group & LISA Cosmology Working Group**

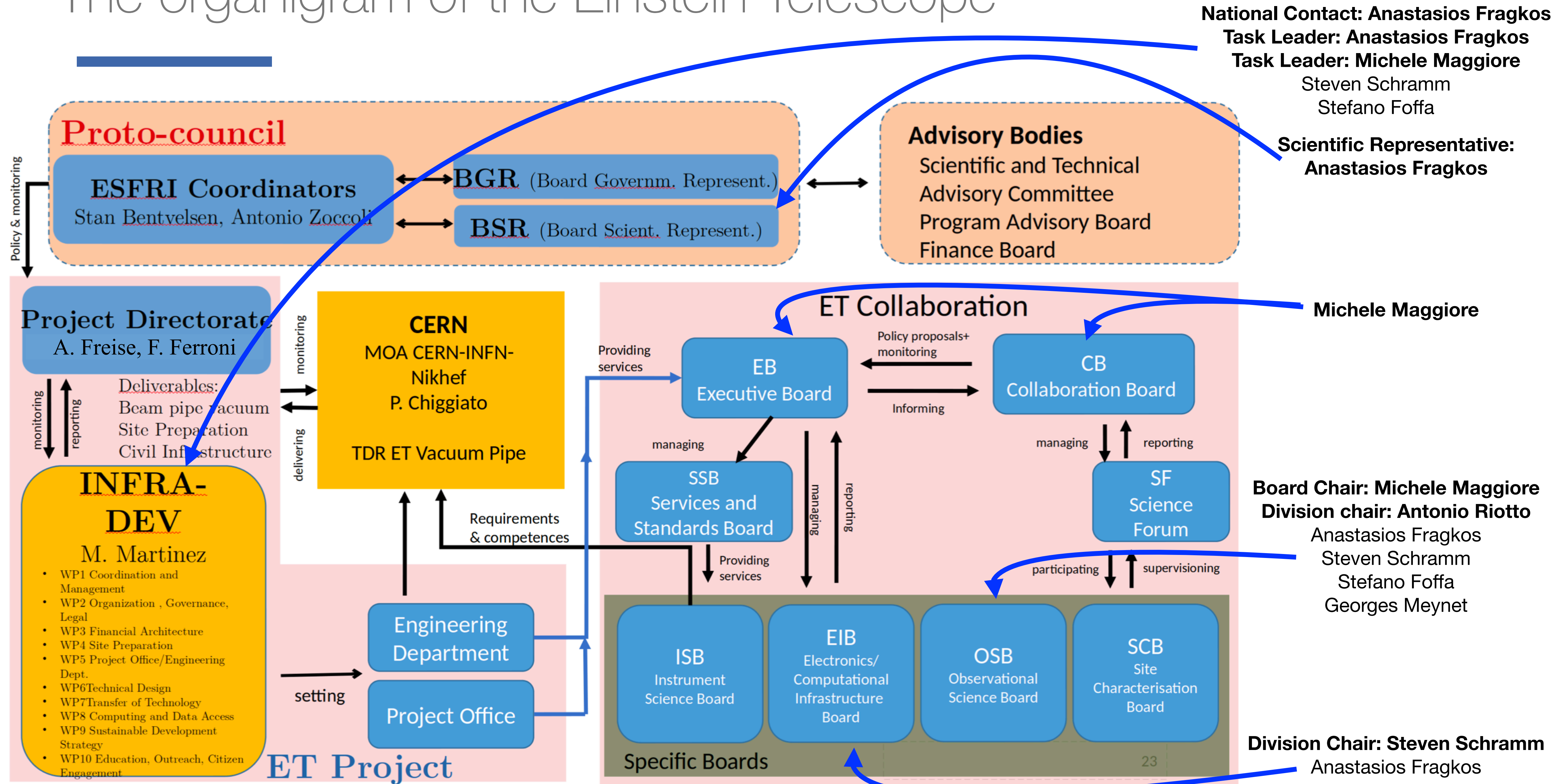
# Einstein Telescope (ET)



# The organigram of the Einstein Telescope

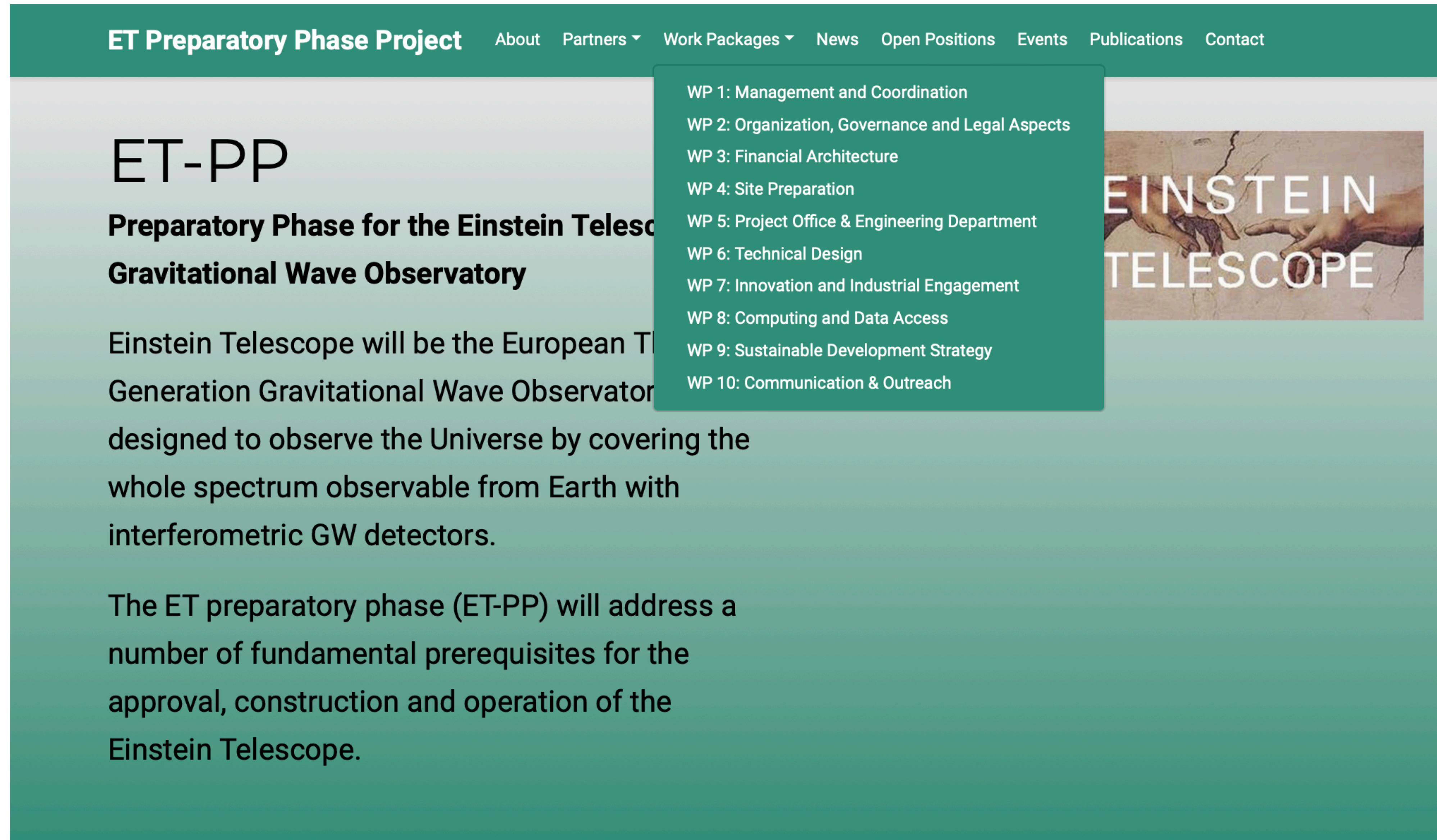


# The organigram of the Einstein Telescope



# Einstein Telescope Preparatory Phase (ET-PP) INFRA-DEV Project

LINK: <https://etpp.ifae.es/>



**ET Preparatory Phase Project** About Partners ▾ Work Packages ▾ News Open Positions Events Publications Contact

## ET-PP

### Preparatory Phase for the Einstein Telescope Gravitational Wave Observatory

Einstein Telescope will be the European Third Generation Gravitational Wave Observatory designed to observe the Universe by covering the whole spectrum observable from Earth with interferometric GW detectors.

The ET preparatory phase (ET-PP) will address a number of fundamental prerequisites for the approval, construction and operation of the Einstein Telescope.

- WP 1: Management and Coordination
- WP 2: Organization, Governance and Legal Aspects
- WP 3: Financial Architecture
- WP 4: Site Preparation
- WP 5: Project Office & Engineering Department
- WP 6: Technical Design
- WP 7: Innovation and Industrial Engagement
- WP 8: Computing and Data Access
- WP 9: Sustainable Development Strategy
- WP 10: Communication & Outreach

**EINSTEIN TELESCOPE**



# Einstein Telescope Preparatory Phase (ET-PP) INFRA-DEV Project

LINK: <https://etpp.ifae.es/>

The image shows a screenshot of the website for the Einstein Telescope Preparatory Phase (ET-PP) project. The website has a green header with the title "ET Preparatory Phase Project" and a navigation menu including "About", "Partners", "Work Packages", "News", "Open Positions", "Events", "Publications", and "Contact". The main content area features the title "ET-PP Preparatory Phase for the Einstein Telescope Gravitational Wave Observatory" and a description of the project. A list of work packages (WP 1 to WP 10) is visible in a sidebar. A large, tilted, black-bordered box is overlaid on the page, containing a recruitment announcement in blue text: "As part of the Swiss contribution to ET-PP (funded by SERI) a position of a Senior IT/Computing Architect will open at GWSC TODAY!". The background of the website includes a faint image of Michelangelo's "The Creation of Adam" and the text "EINSTEIN TELESCOPE".

**ET Preparatory Phase Project** About Partners Work Packages News Open Positions Events Publications Contact

## ET-PP

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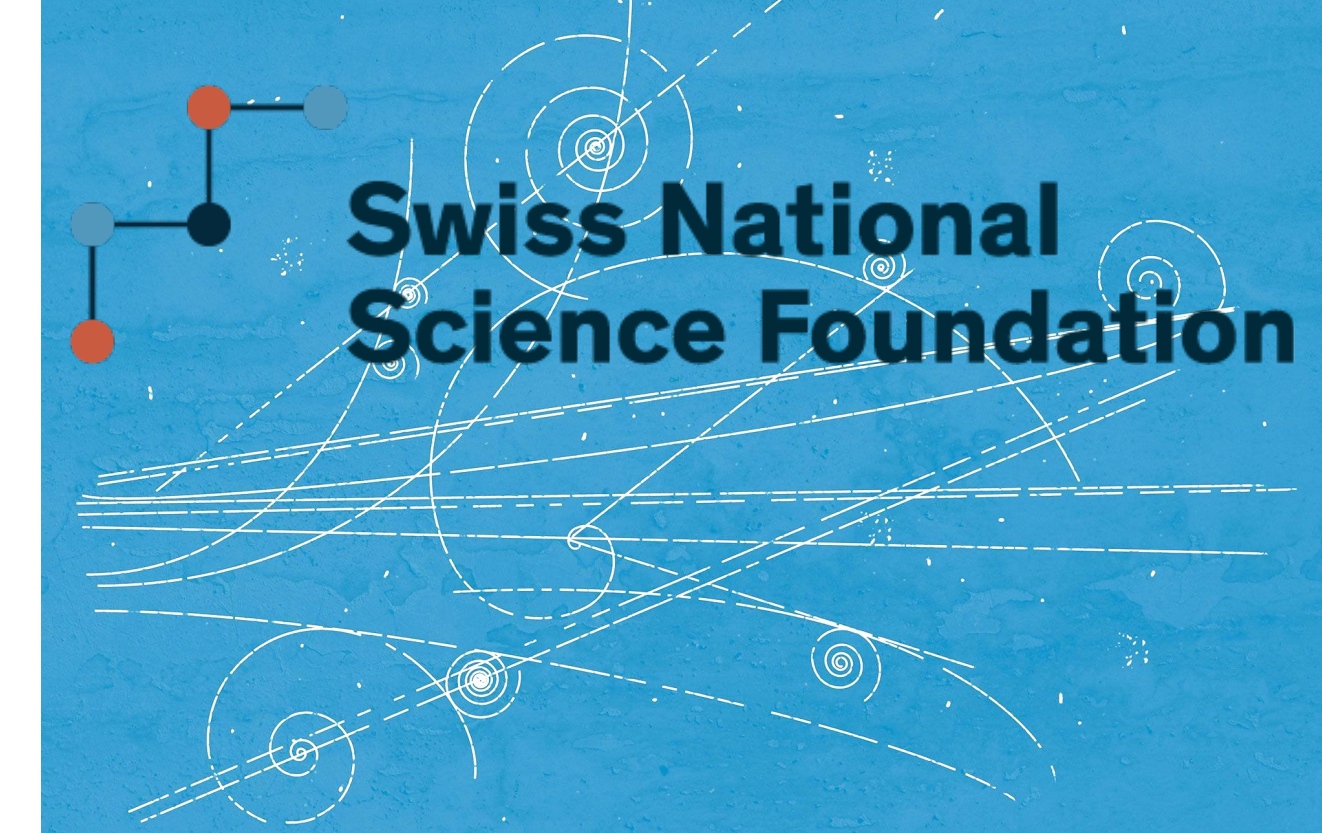
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**As part of the Swiss contribution to ET-PP (funded by SERI) a position of a Senior IT/Computing Architect will open at GWSC TODAY!**

EINSTEIN TELESCOPE

# Funding for **L**arge international **R**esearch projects Planned FLARE project for Einstein Telescope

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At UniGE, we plan to submit a proposal for a FLARE project related to Einstein Telescope (led by the Astronomy Department and in collaboration with the Particle Physics Department)

**Period:** initial project for 2023-2024, but long-term involvement envisioned.

**Topic:** Input/output optics systems components for the low-frequency interferometer, which will operate at a new laser frequency of 1550nm.

**Competences required:** Optical engineering, thermo-mechanical engineering, electronics.

**Budget:** TBD, for 2023-2024 significantly less than the budget requested to SERI for ET for the period 2025-2028 (~1M per year)