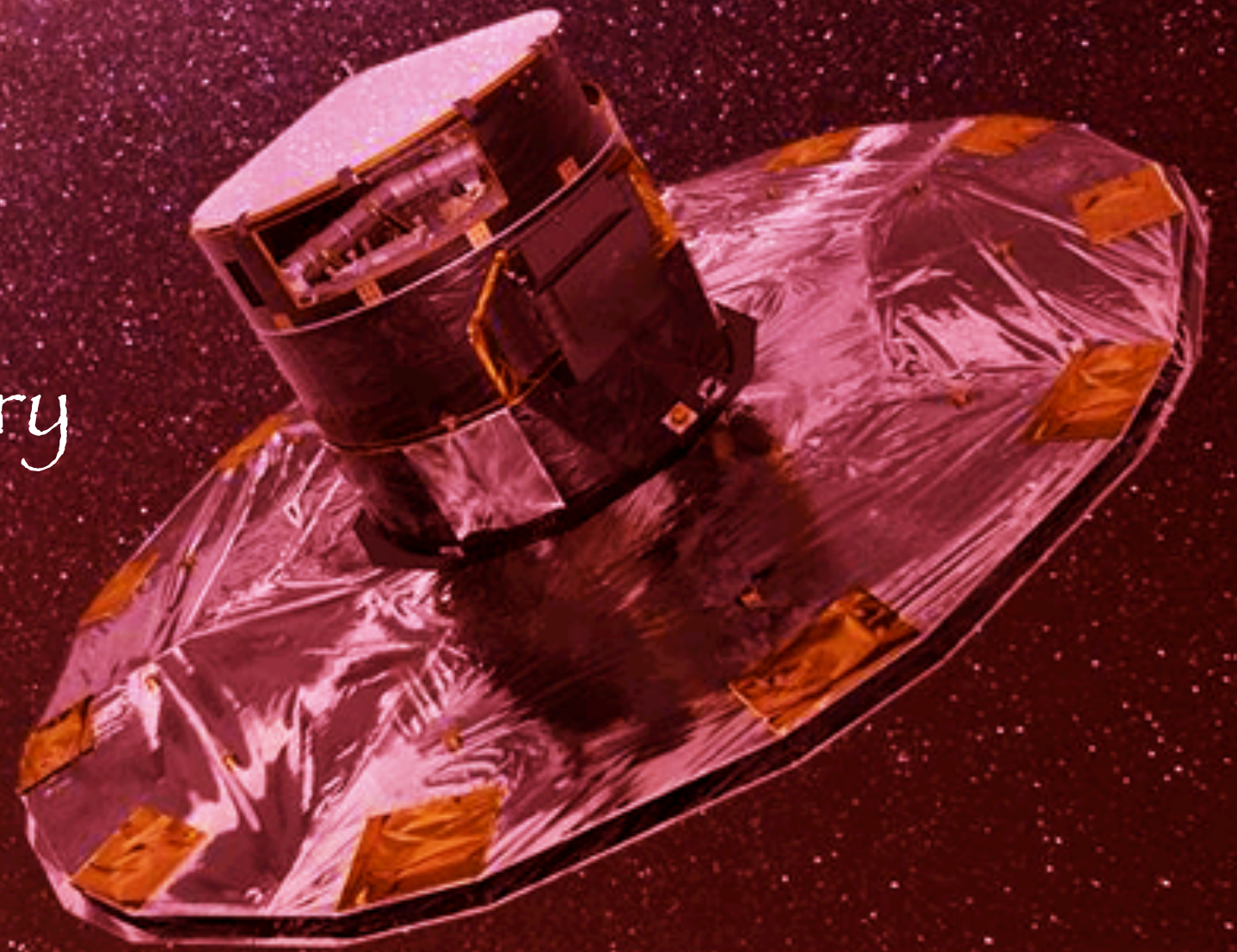


The GaiaNIR mission and the hidden regions of our Galaxy

Building the community

David Hobbs
Lund Observatory
Sweden



A GaiaNIR Consortium

- ◆ The ESA Ministerial Council meeting is in November 2025 and ESA will get its new budget!
- ◆ We may have to make a proposal in 2026/27 for GaiaNIR
- ◆ Currently we are working on a new White Paper focused on technical performance of GaiaNIR
- ◆ Each country will have at least one co-PI (S, M, L)
- ◆ The co-PI must interact with the funding agencies and SPC representatives to put GaiaNIR on the map



Small external contributions from: Algeria, Brazil, Chile, China, Israel, United States, European Southern Observatory

Gaia DPAC - 2017 - all countries in dark blue participate in Gaia DPAC

GaiaNIR Working Groups

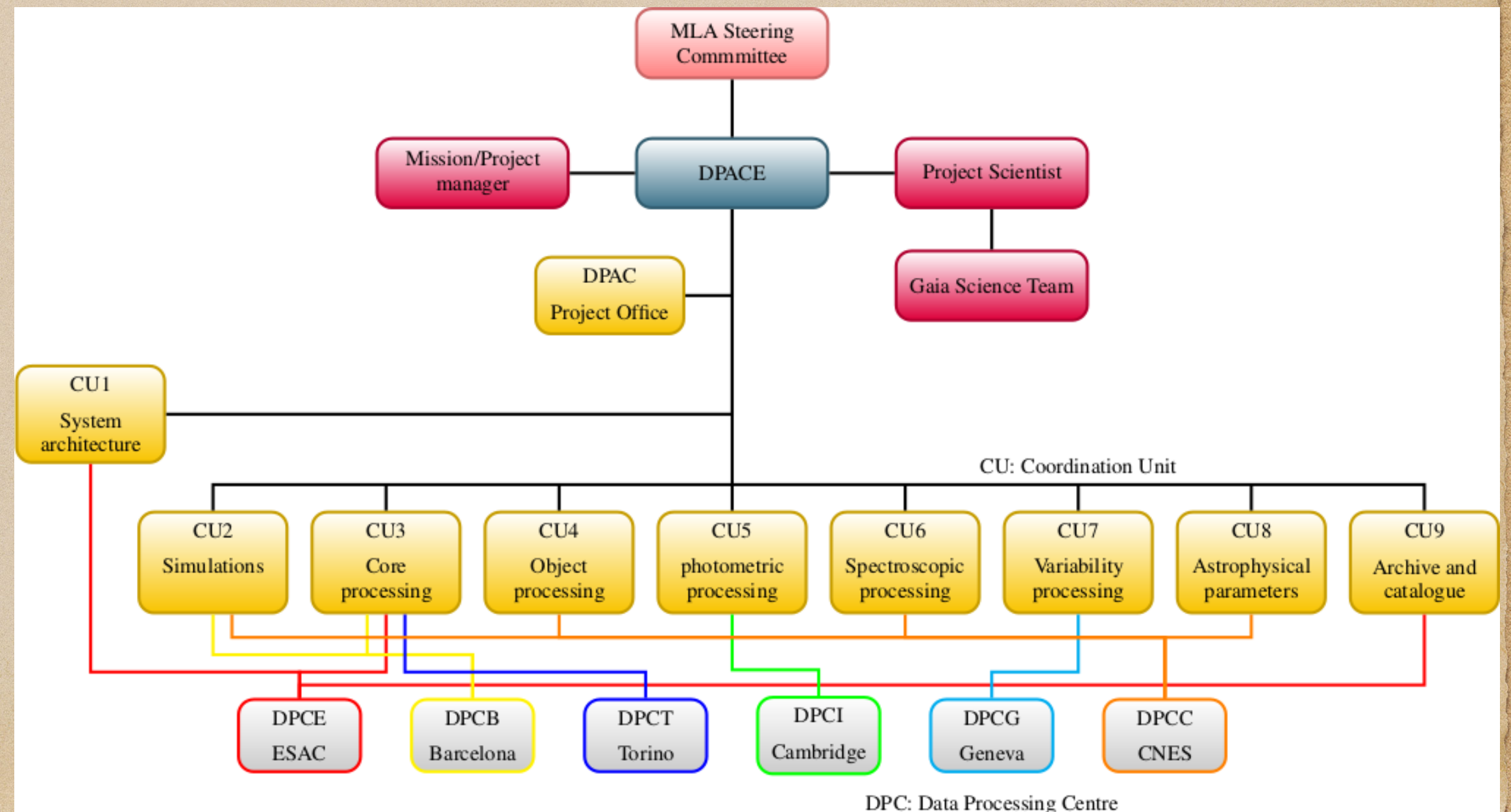
- ◆ Galactic Structure and Dynamics
- ◆ Relativity & Fundamental Physics
- ◆ AGN & Reference Frame
- ◆ Extragalactic
- ◆ Solar Neighbourhood
- ◆ Stellar Physics & Stellar Types
- ◆ Grouping, clouds, associations & clusters
- ◆ Exoplanets
- ◆ Binaries
- ◆ Solar System
- ◆ Technology - Detectors
- ◆ Spectroscopy - RVS
- ◆ Spectroscopy - RV
- ◆ Photometry
- ◆ Astrometry
- ◆ Crowding
- ◆ Variables
- ◆ Transients
- ◆ Dark Matter
- ◆ Cosmology
- ◆ Multi-messenger
- ◆ White papers
- ◆ Proposals
- ◆ Webpage
- ◆ Outreach

GaiaNIR DPAC

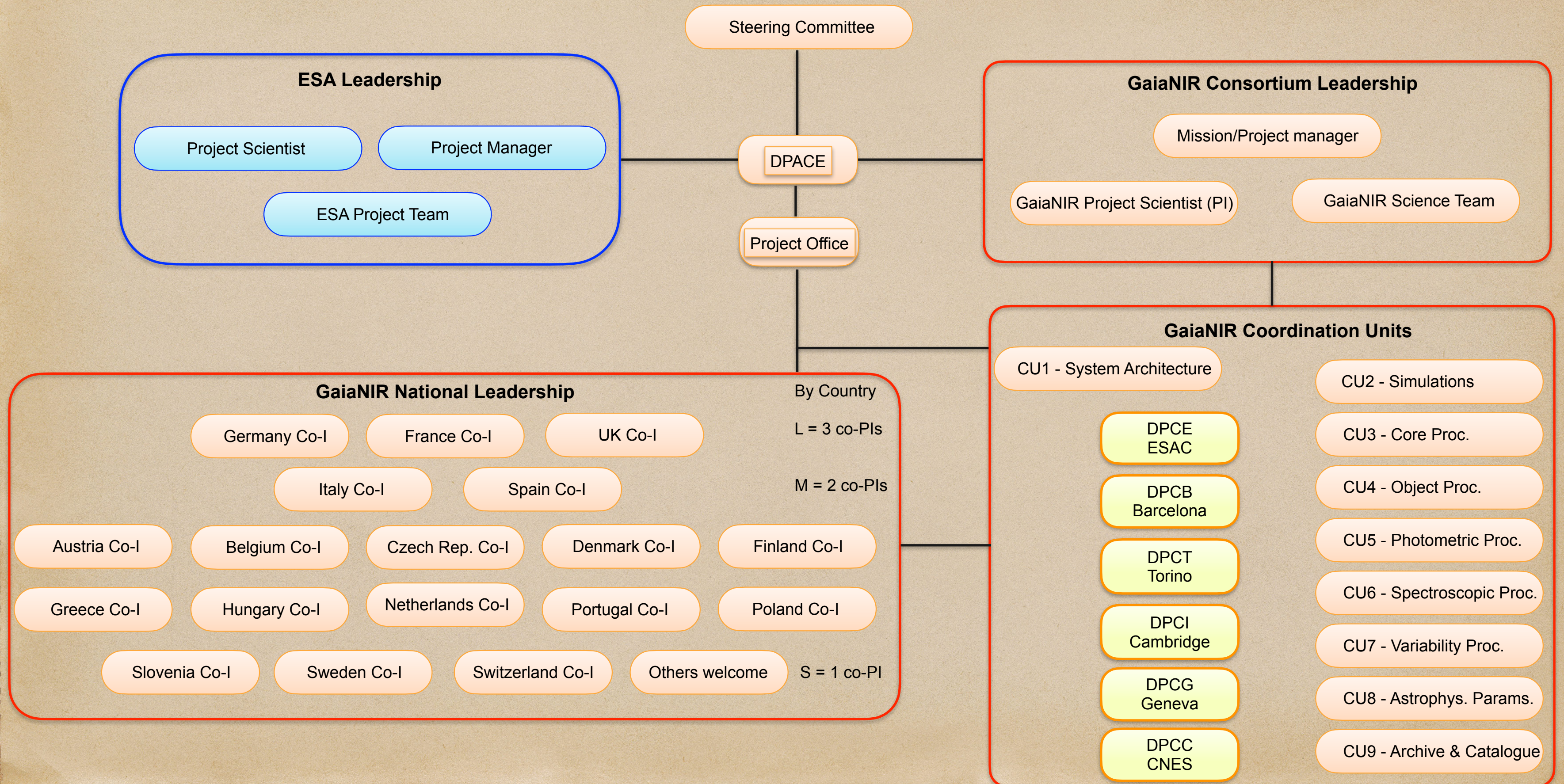
What are the lessons learned from Gaia's organisation?

What do we want to change?

What do we want to keep?



Consortium Structure



The Consortium

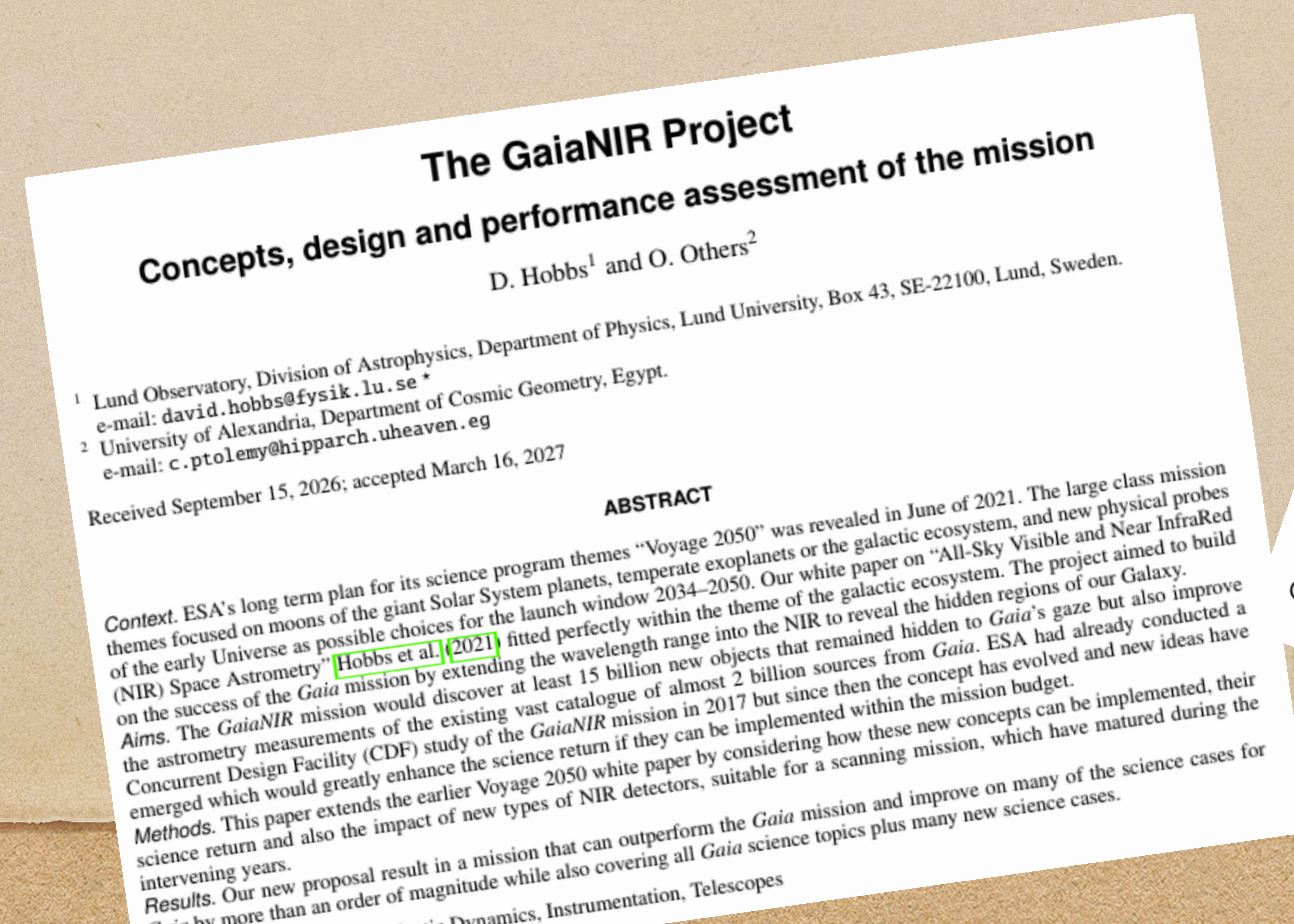
- ◆ A basic version of the GaiaNIR consortium needs to be in place next year
- ◆ Gaia will end in early 2030's and we want to retain people and knowledge for GaiaNIR
- ◆ Establishing a consortium with Co-I's in each country will allow people:
 - to begin discussions with funding agencies for a long term commitment if selected
 - to ask their funding agencies for student and postdoc grants
- ◆ Co-I's must actively engage with the funding agencies and SPC representatives to put GaiaNIR on the map



GaiaNIR meeting in Heidelberg 2050

White papers

- A new White Paper focused on technical performance of GaiaNIR is being prepared and we want to use this to attract people to work on GaiaNIR
- The older White paper mainly on science cases needs to be updated
- Both papers will form the basis for a detailed proposal in a few years



Webpage

- ◆ We have a basic webpage but it is only maintained by myself
- ◆ We need to brain storm about how to develop this more
- ◆ You can sign up to register your interest in GaiaNIR under “The Consortium” tab:

<https://www.astro.lu.se/form/register-your-interest-gaianir>

- ◆ The main url is:

<https://www.gaianir.org/>

All-Sky Visible and Near Infrared Space Astrometry

Department of Astronomy and Theoretical Physics, Lund University

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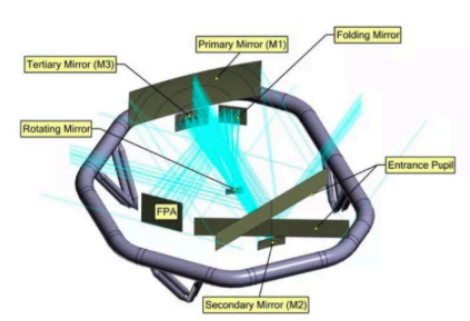
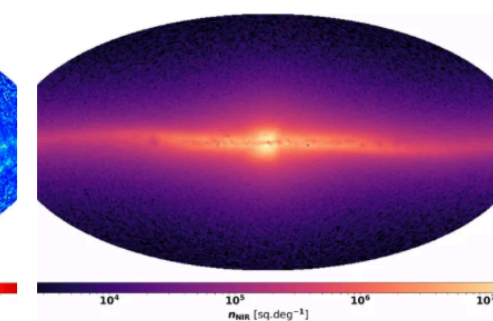
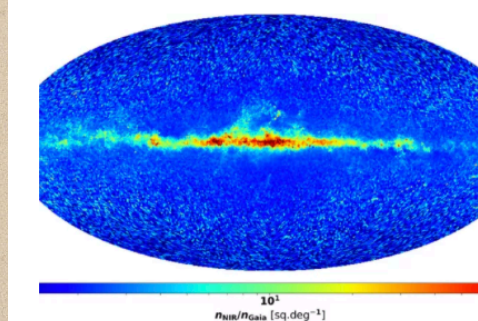
[The Vision](#)

[Mission Summary](#)

[The Consortium](#)

[Science and technology roadmap for \$\mu\$ as studies of the Milky Way](#)

[The Art of Astrometry and Computation](#)



[Science Cases](#)

All-sky NIR astrometry to peer through the dust of the Milky Way to reveal the hidden regions of the Galaxy.

All-sky visible astrometry to combined with the older Gaia catalogue and a 20 year interval will give very accurate proper motions and improved parallaxes needed to measure larger distances.

Re-initialise the slowly degrading accuracy of the Gaia visible reference frame back to maximal accuracy.

[Mission Design](#)

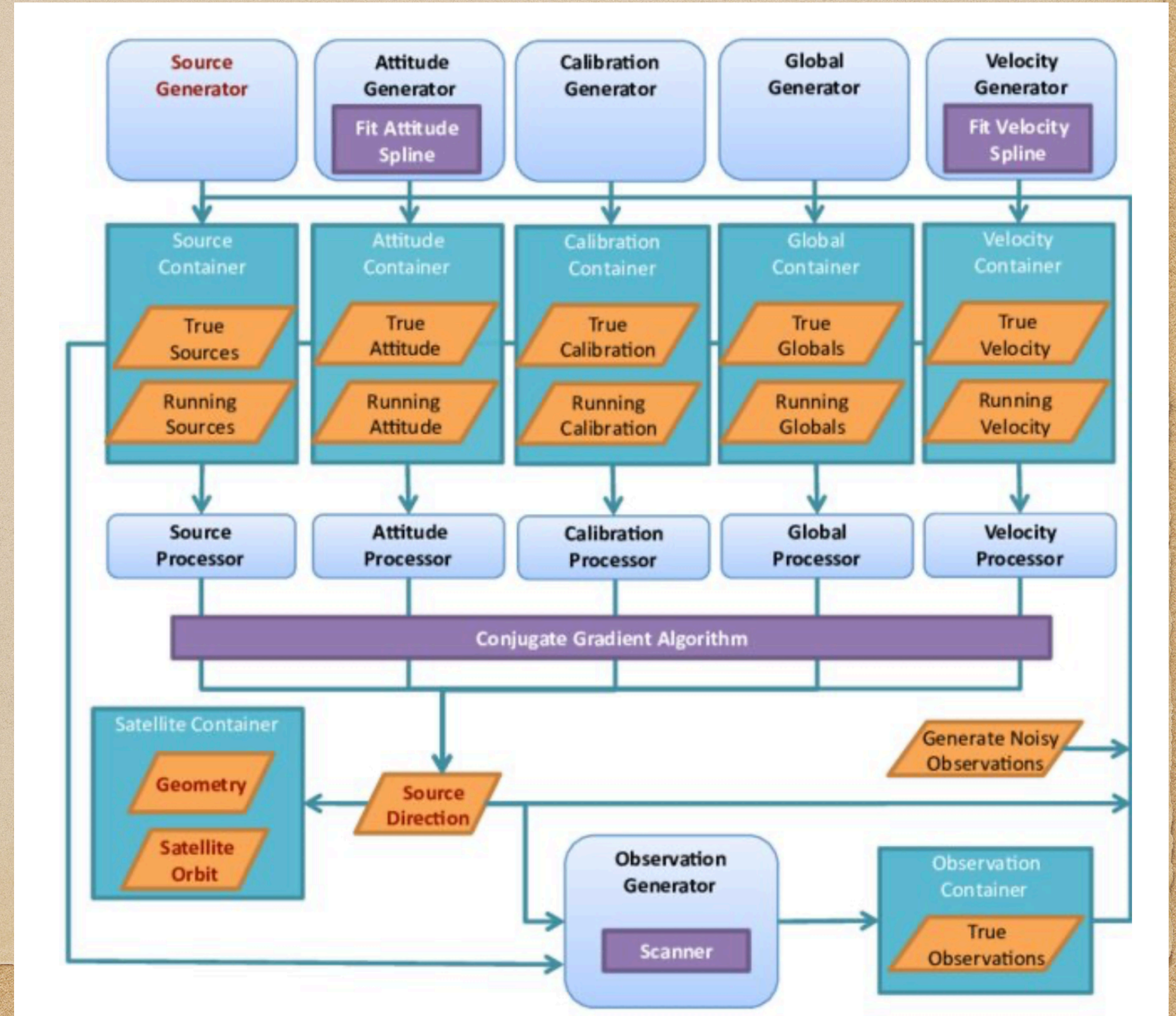
The space telescope will be based on an off-axis $f=35$ m Korsch telescope similar to that used for Gaia. New detectors are being developed that will enable Near InfraRed astrometry and will operate in Time Delayed Integration mode to accumulate the faint stellar light as the telescope scans the entire sky.

[The Timeline](#)

Ideally the telescope should be launched around 2045 to allow a sufficient time gap between Gaia and the new mission. The long time baseline will ensure that the accuracy of the proper motions will benefit. The mission aims to include international partners and will be suitable as an ESA Large-class or medium-class mission.

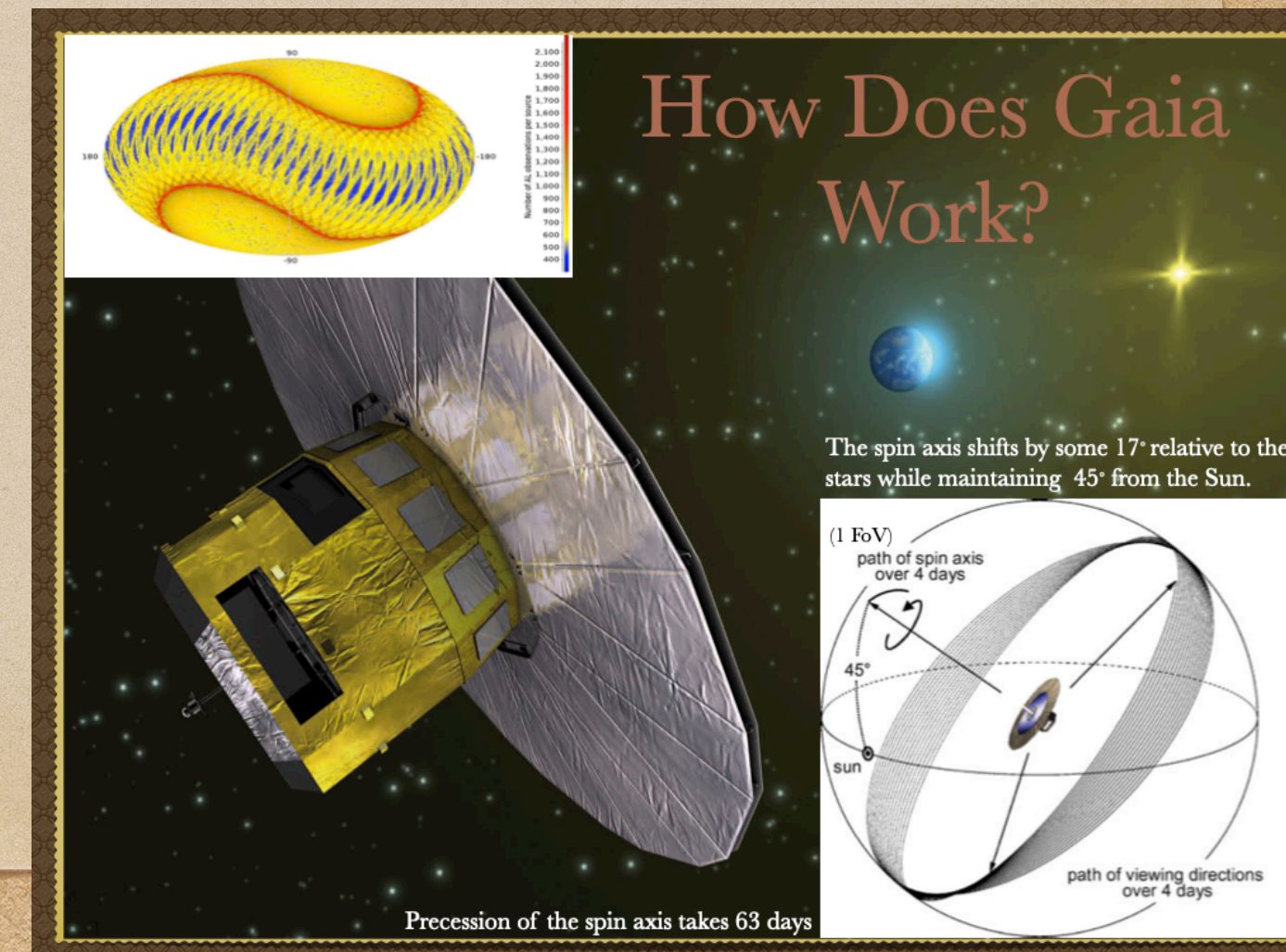
GaiaNIR Data Processing

- ◆ For Gaia we developed AGISLab as a scaled down simulator for Gaia observations
- ◆ This was very important for developing the algorithms of the core astrometric solution for Gaia
- ◆ For GaiaNIR we need a similar tool but.... what did we learn?
- ◆ Gaia could have been easier if we had thought about this before



GaiaNIR Data Processing

- ◆ GaiaNIRLab should be able to operate in two ways
 - In scaled down simulation mode using simulated data as input. This will be used for developing algorithms and testing ideas
 - In unscaled operational mode using real data as input. This will be used for operational runs
- ◆ Most code should be common and developed in a common scientific language. At the moment Python is the only viable option although others may emerge



GaiaNIR Data Processing



♦ Challenges:

- Most code is developed by students who are not used to ESA standards of development, testing and documentation
- The code will be developed in a distributed university environment where the priority is to get a Phd or paper not a catalogue
- The code must be designed to allow students to work in parallel developing ideas that may or may not be used for operations
- Lessons could be learned from other projects, for example, the Vera Rubin project

Gaia Science Tree

Michael Perryman (v2, Jan 2025)
Essays 1-209 (Jan 2021-Dec 2024)
end nodes are hyperlinked to (Zenodo-hosted) essays

see also: [michaelperryman.co.uk/essays](https://ui.adsabs.harvard.edu/abs/2024BAAS...56a.008P)

<https://ui.adsabs.harvard.edu/abs/2024BAAS...56a.008P>

