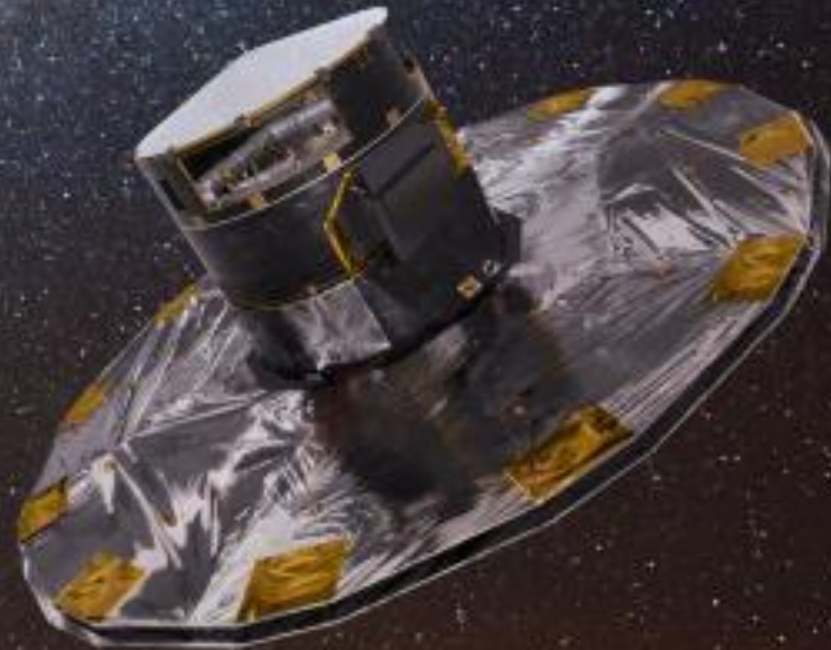


Gaia

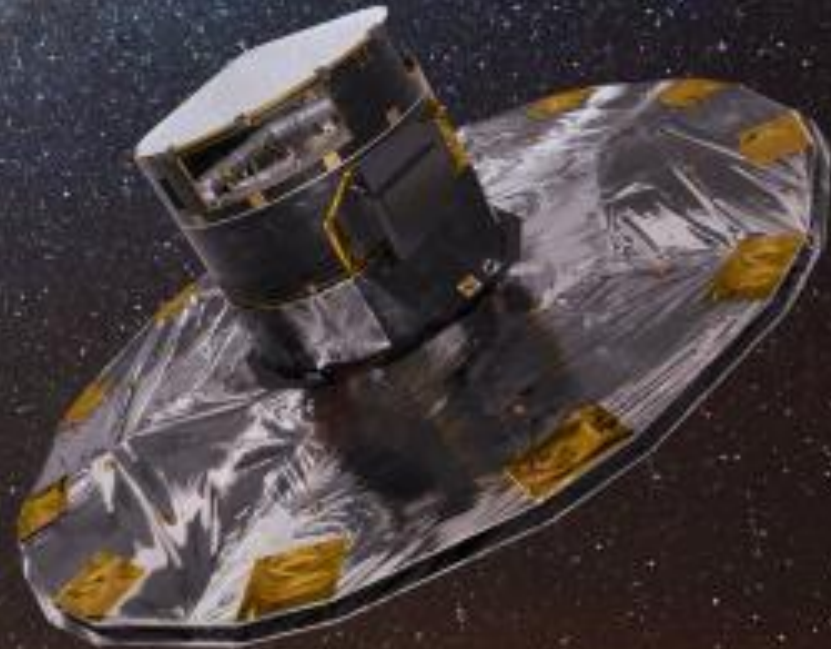
Mark Cropper

ESA's Gaia Mission

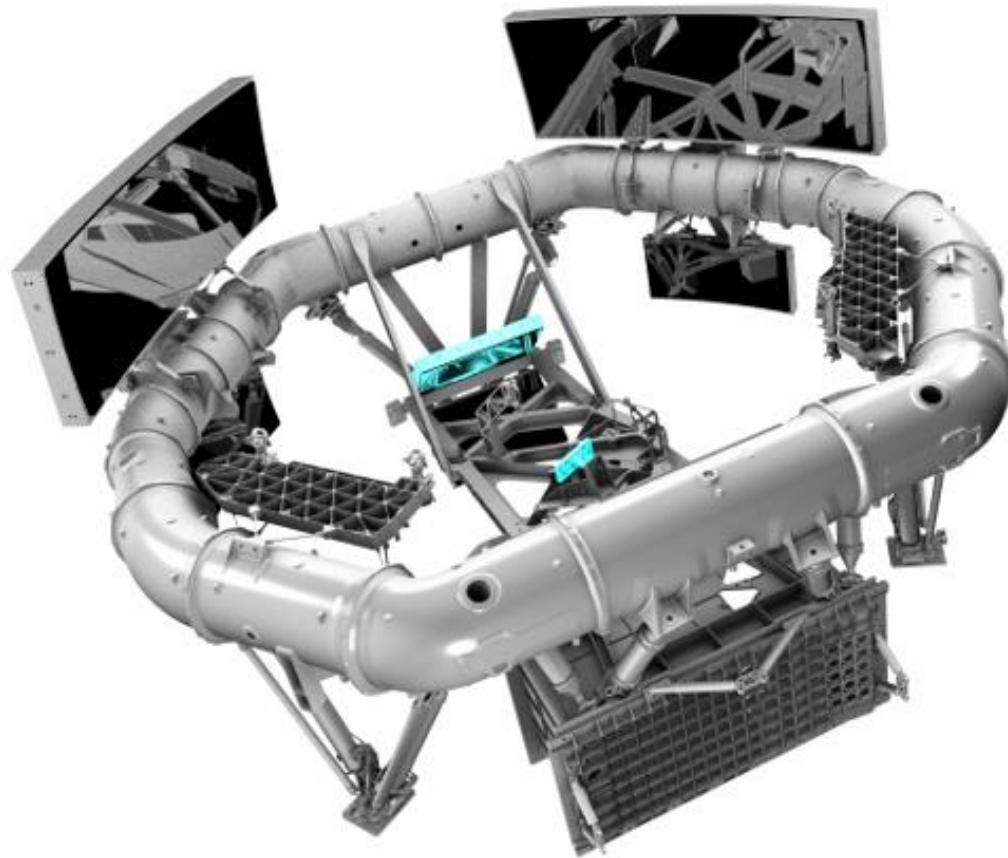


ESA's Gaia Mission

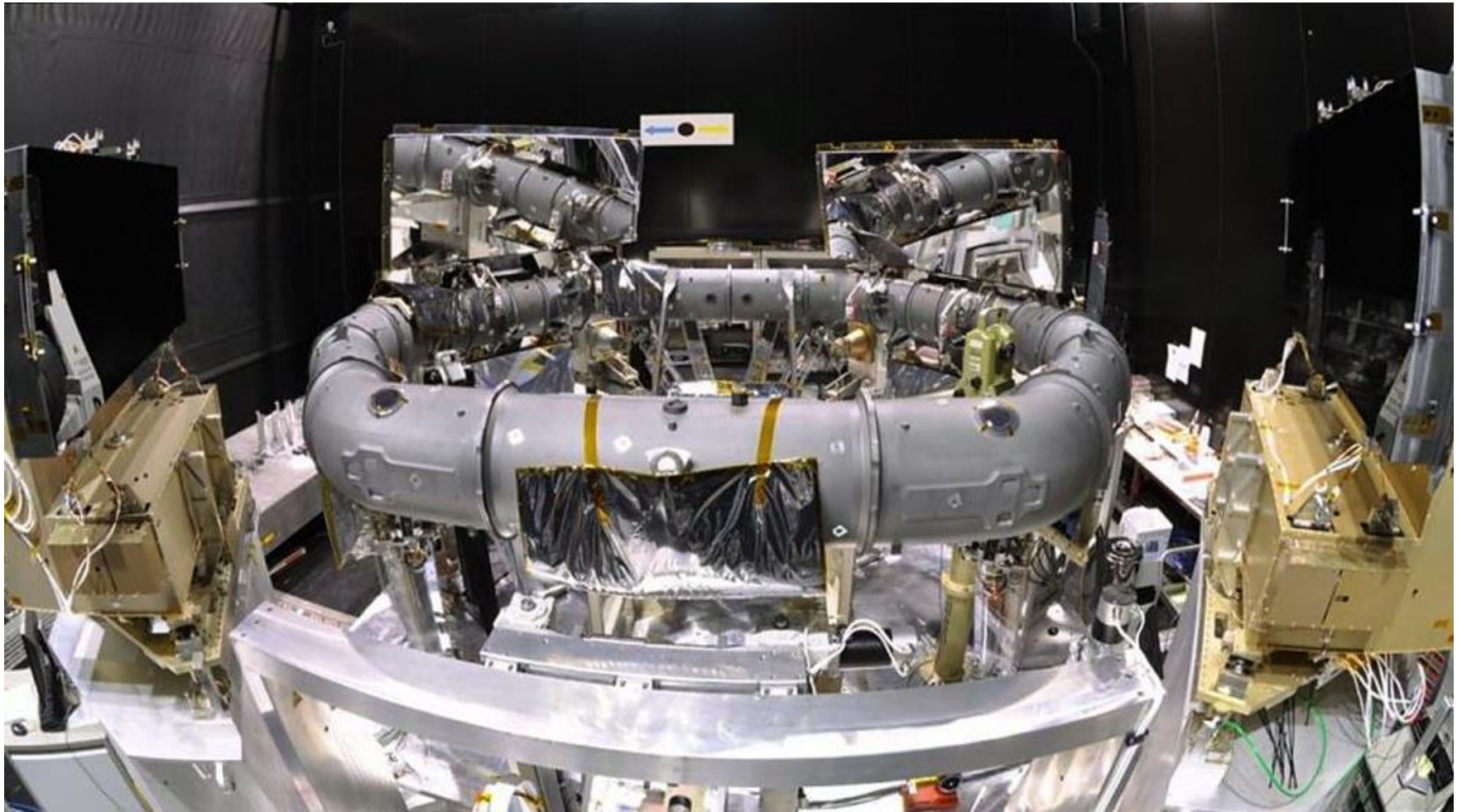
Aim: to understand the formation and evolution of the Milky Way through the motions of the stars within it, and their chemical signatures



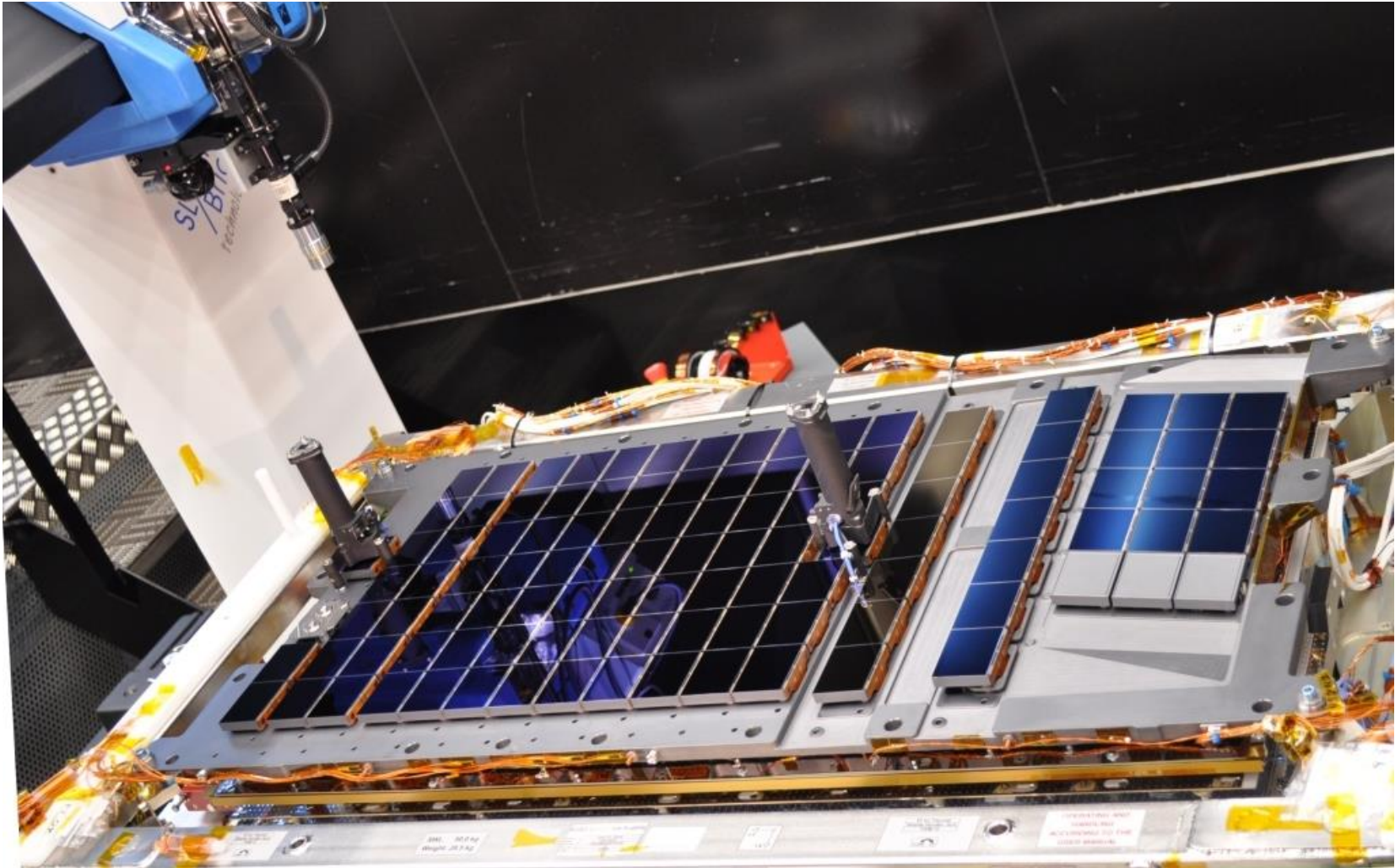
A unique arrangement of two telescopes and the biggest detector array flown in space



During fabrication at Astrium



106 detectors for astrometry and spectroscopy

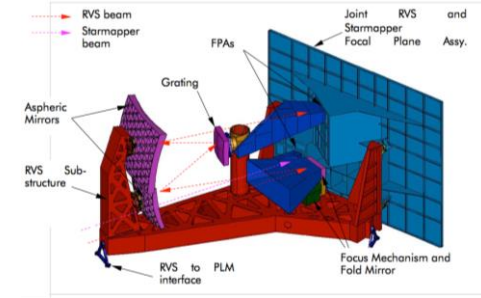


A complete Galaxy toolkit

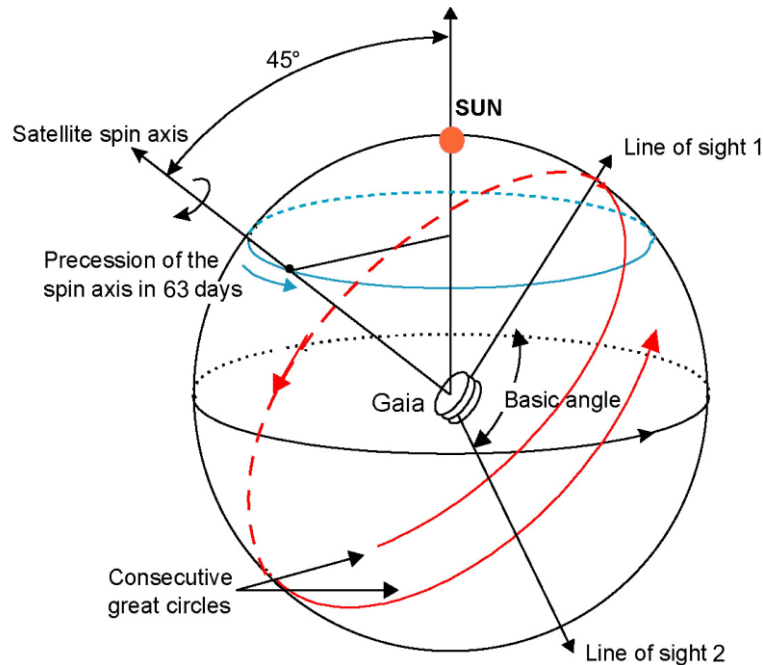
- Astrometry measures 5 of 6 motions
 - positions on the sky
 - distance (through parallax)
 - velocities in plane of the sky
 - Spectrometry (Radial Velocity Spectrometer) measures
 - 6th motion: velocity in line of sight (Doppler)
 - atomic abundances of stars, ages
 - Photometry measures
 - total luminosity, temperatures, density
- ...everything we need to know (almost!) to understand the formation and evolution of the Milky Way through the motions of the stars within it, and their chemical signatures

UCL Contribution to Gaia

- Conceptual design of Radial Velocity Spectrometer and science performance contract for production
- Proximity Electronics Modules for the CCD detectors
(contract ultimately unsuccessful but paved the way for Euclid)
- Calibration of all 150 CCDs and Proximity Electronics Modules for flight
- Major role in the data processing for the Radial Velocity Spectrometer



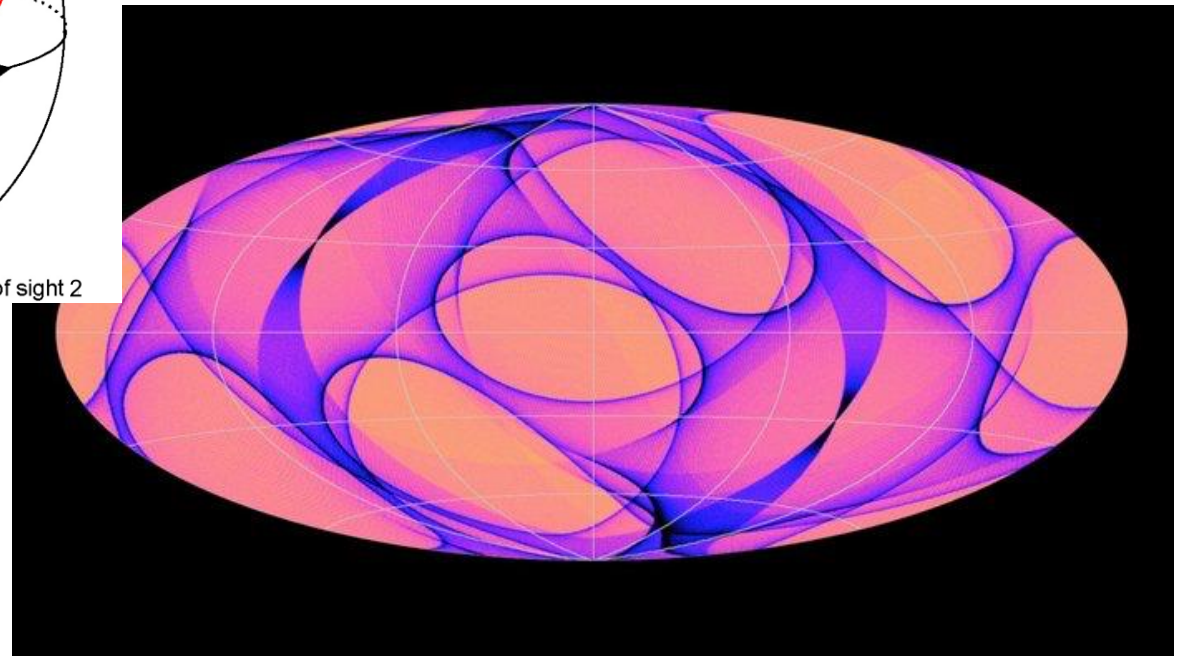
Gaia Observing

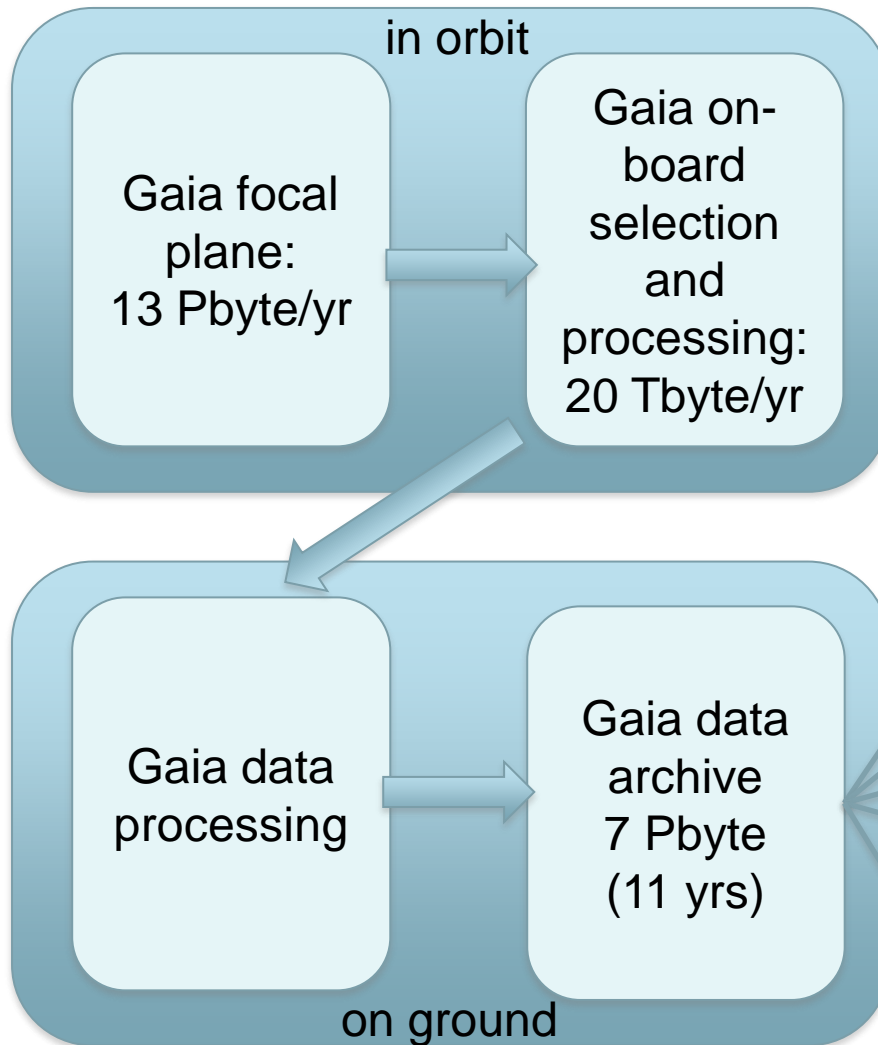


Gaia scans the sky continuously

- covering the entire sky every 2 months in both telescopes
- designed to cover the sky as evenly as possible

Scanning coverage after 14 months





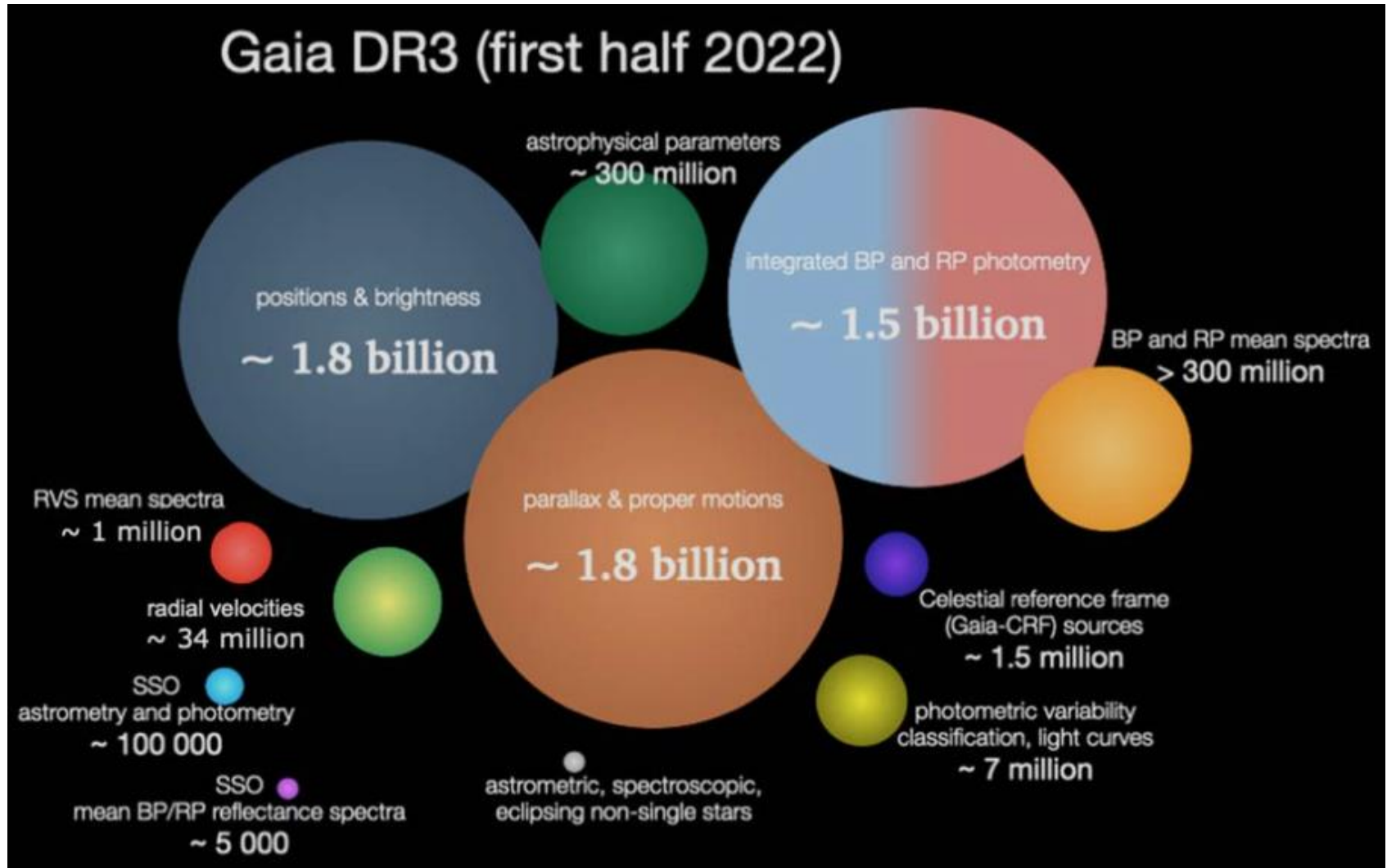
Gaia Data

- 1.5 billion star positions and brightness measured 1400x each
- 1.5 billion star colours measured 280x each
- 150 million spectra measured 60x each
- derived positions, velocities, astrophysical parameters, variability, binarity, solar system objects
- other intermediate data

Extracting the information from the Gaia data

- The astrometric core solution is a simultaneous least-squares estimation of half a billion parameters – a highly innovative solution was developed to deal with the scale of the problem
- Large scale simulations of exceptional fidelity were developed in order to validate the Gaia data processing approach, accuracy and error calculations
- Advanced galaxy models and statistics are required to interpret the data

Gaia data products so far...



ESA's most successful mission so far

