

ELSA and Gaia:

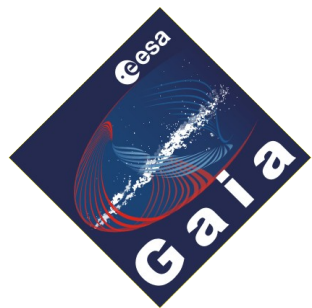
Four years of fruitful European collaboration

Lennart Lindegren

Lund Observatory, Lund University, Lund

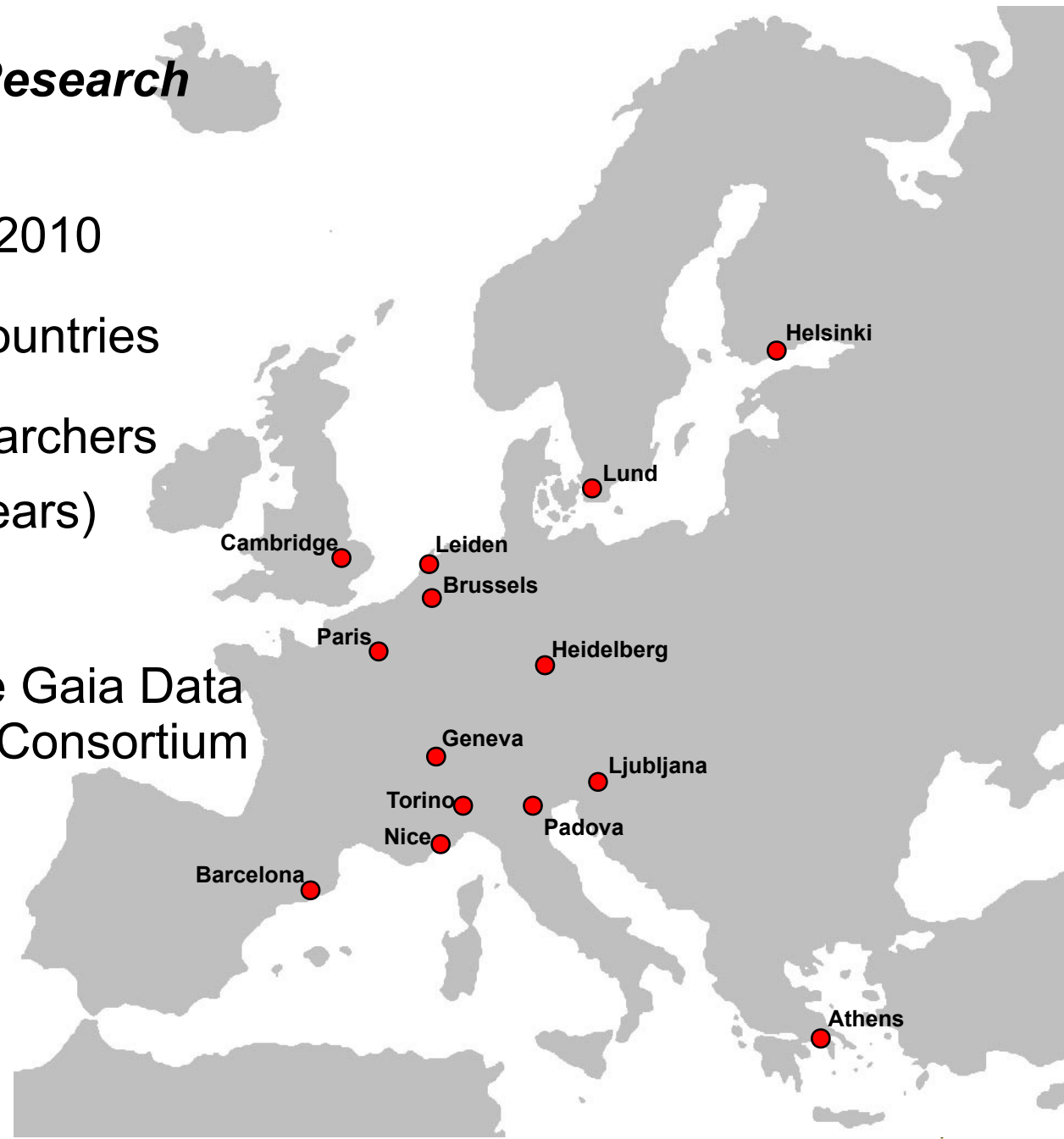


2010 June 7



European Leadership in Space Astrometry

- EU-funded Marie Curie *Research Training Network* (RTN)
- Duration Oct 2006 - Sep 2010
- Links 14 partners in 12 countries
- Employed 15 young researchers
 - ▶ 10 PhD students (3 years)
 - ▶ 5 postdocs (2+ years)
- Strong connections to the Gaia Data Processing and Analysis Consortium (DPAC)



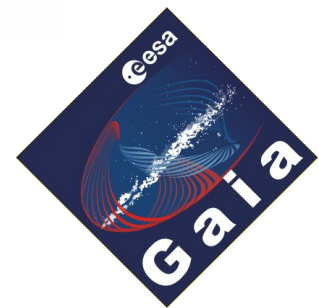
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What is a Research Training Network (RTN)?



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Lindegren: Four years of fruitful European collaboration 3

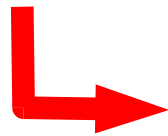


What is a Research Training Network (RTN)?

From the description in Framework Programme 6 (2002 - 2006):

These [Networks] provide the means for research teams of recognised international stature to link up, in the context of a well-defined collaborative research project, in order to formulate and implement a structured training programme for researchers in a particular field of research. Networks will provide a cohesive, but flexible framework for the training and professional development of researchers, especially in the early stages of their career.

 Gaia



Transfer of knowledge from the generation of astronomers that were involved in Hipparcos and the early Gaia studies



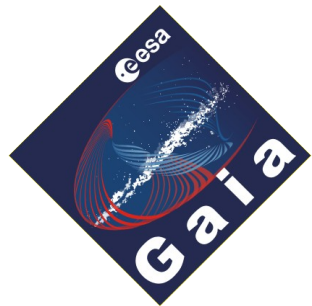
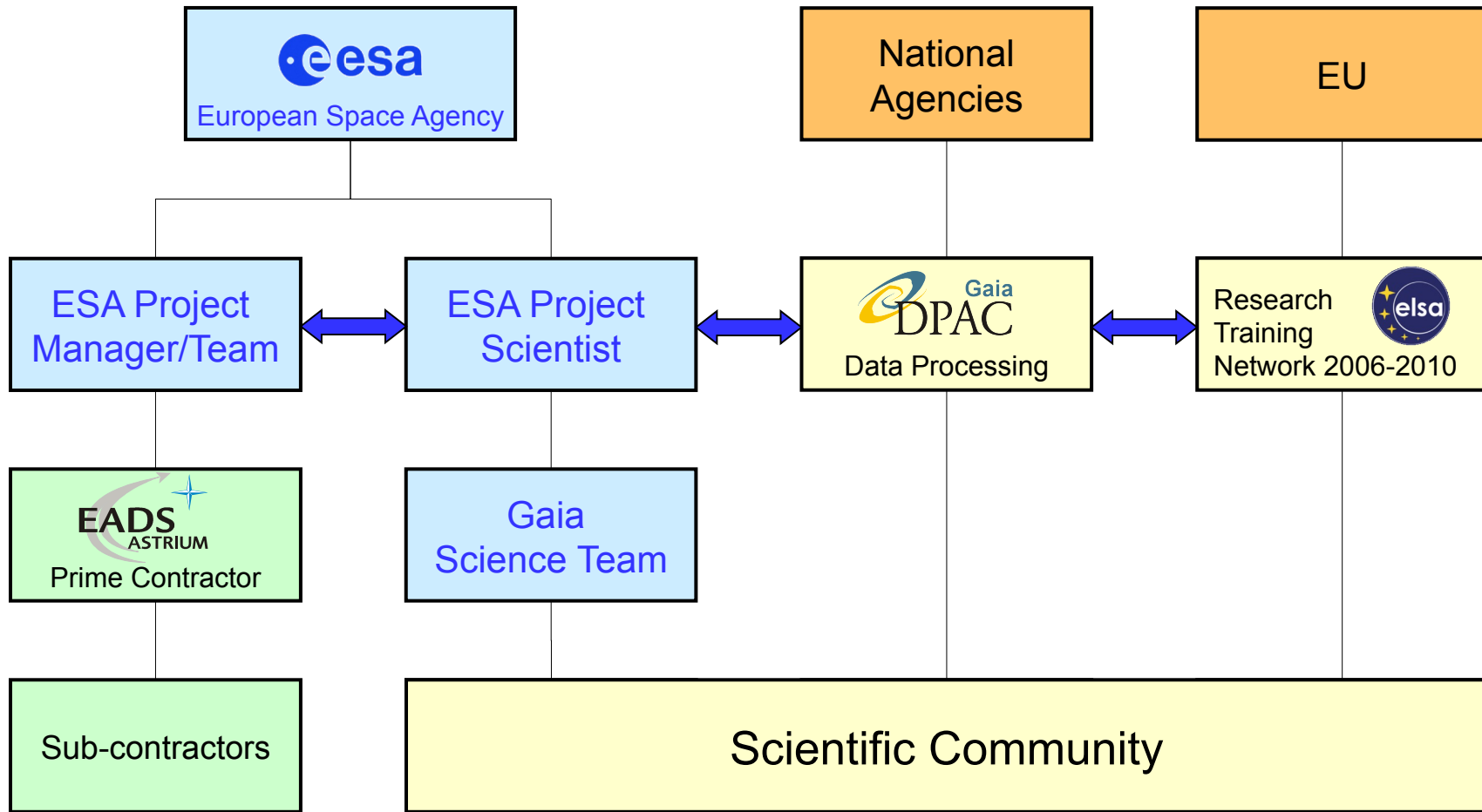
Marie Curie Actions

Human resources



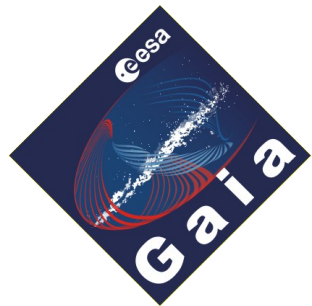
and mobility

ELSA and Gaia



The objectives of ELSA

1. Study the **principles** of astrometric, photometric and spectroscopic measurements from a self-calibrating platform in space like Gaia
2. **Model** in detail the output signal from Gaia, including the effects of radiation damage of the CCD detectors
3. Study the **numerical behaviour** of the very large systems of equations that appear in the Gaia data analysis
4. Apply advanced methods of **data processing** and management, numerical methods and statistics to these problems, contributing to the Gaia data processing system
5. **Train the next generation** of researchers in space astrometry and transfer experience from the Hipparcos mission and early Gaia studies



ELSA research topics

Astrophysical modelling

- Resolved stellar populations in other galaxies
- Refining the universe model in the Gaia simulator
- Stellar brightness asymmetries
- Synthetic and observed stellar spectra
- Tests of new input physics in stellar atmosphere models

Modelling the Gaia instrument

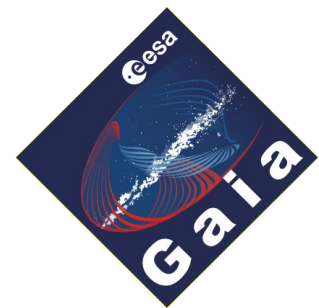
- Modelling radiation damage effects in Gaia CCDs
- Gaia Point-Spread Function modelling for simulations
- Improved attitude modelling for Gaia

Global astrometric solution

- Characterization of astrometric errors
- Alternative astrometric solution methods for Gaia
- Gaia Sphere Reconstruction

Numerical, statistical and computational tools

- High-performance computing
- Variability in large photometric surveys
- Statistical asteroid orbit computation
- Automatic classification and astrophysical parameter estimation



Time table

2004:

Oct - First outline idea

2005:

May - Proposal meeting

Sep - First-stage proposal

2006:

Feb - Second-stage proposal

Apr - Go ahead!

Oct - 4 year contract started

2007:

Jan - Positions advertised →

Oct - All positions filled



PhD Study and
Postdoc Positions



European Leadership in Space Astrometry (ELSA)

ELSA is a Marie Curie Research Training Network (RTN) funded by the EU's 6th Framework Programme. The aim is to develop new theoretical understanding and practical analysis tools for ESA's space astrometry mission Gaia (www.rssd.esa.int/GAIA), to be launched in 2011. The network, coordinated by Lund Observatory (Sweden), consists of leading research groups in 12 countries.

We seek candidates for **9 PhD study fellowships** (appointed for 3 or 4 years) and **5 postdoc fellowships** (2 years) to collaborate on several interconnected research topics ranging from theoretical and empirical investigations of detector properties, through the modelling and simulation of astronomical objects, to the calibration and analysis of observational data as generated by Gaia. Subject to RTN rules, the positions are open to candidates of all nationalities. (Candidates must normally move to a different country when taking up a position.)

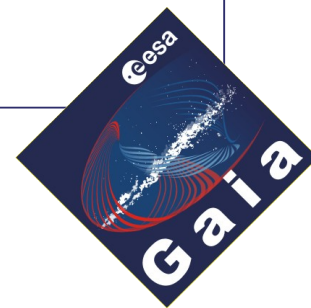
Candidates should have an excellent background in astronomy, physics, physical engineering or software engineering, must have good communication skills and the ability to work in an international environment including extended stays at collaborating institutes. All positions come with a competitive salary and full social benefits.

For a full description of research topics, host institutes and eligibility conditions please consult our web site www.astro.lu.se/ELSA.

Candidates for the **PhD study fellowships** are invited to submit applications (by e-mail) not later than **22 March 2007**. Please refer to the ELSA web pages for detailed instructions about how to apply.

We also invite potential **postdoc** candidates to visit our web pages for further information about these positions.

www.astro.lu.se/ELSA



The ELSA Fellows

PhD students:

Ms. Maya Belcheva

Ms. Maria Czekaj

Mr. Aida Fries

Mr. Berry Holl

Ms. Dagmata Oszkiewicz

Ms. Ester Pasquato

Mr. Thibaut Prod'homme

Ms. Tenay Saguner

Mr. Luca Santoro

Mr. Mihály Váradi

Postdocs:

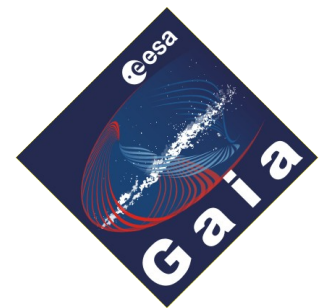
Dr. Umami Abbas

Dr. Alex Bombrun

Dr. Paola Re Fiorentin

Dr. Daniel Risquez

Dr. Michael Weiler



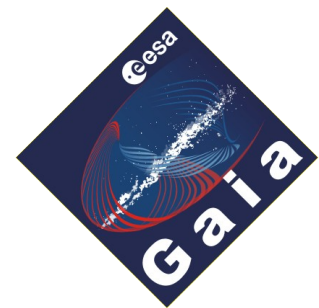
The network partners

Partners	Cntry	Scientist in Charge
1. Lund University (Coordinator)	SE	Lennart Lindegren
2. National and Kapodistrian University of Athens	GR	Mary Kontizas
3. University of Barcelona	ES	Jordi Torra
4. Université Libre de Bruxelles	BE	Dimitri Pourbaix
5. University of Cambridge	GB	Floor van Leeuwen
6. Dutch Space B.V. (Leiden)	NL	Johan de Vries
7. University of Geneva	CH	Laurent Eyer
8. University of Heidelberg	DE	Stefan Jordan
9. University of Helsinki	FI	Karri Muinonen
10. Istituto Nazionale di Astrofisica (Torino) - INAF	IT	Ronald Drimmel
11. Leiden University	NL	Anthony Brown
12. University of Ljubljana	SI	Tomaz Zwitter
13. Observatoire de la Côte d'Azur (Nice) - CNRS	FR	Frédéric Thévenin
14. Observatoire de Paris	FR	Catherine Turon

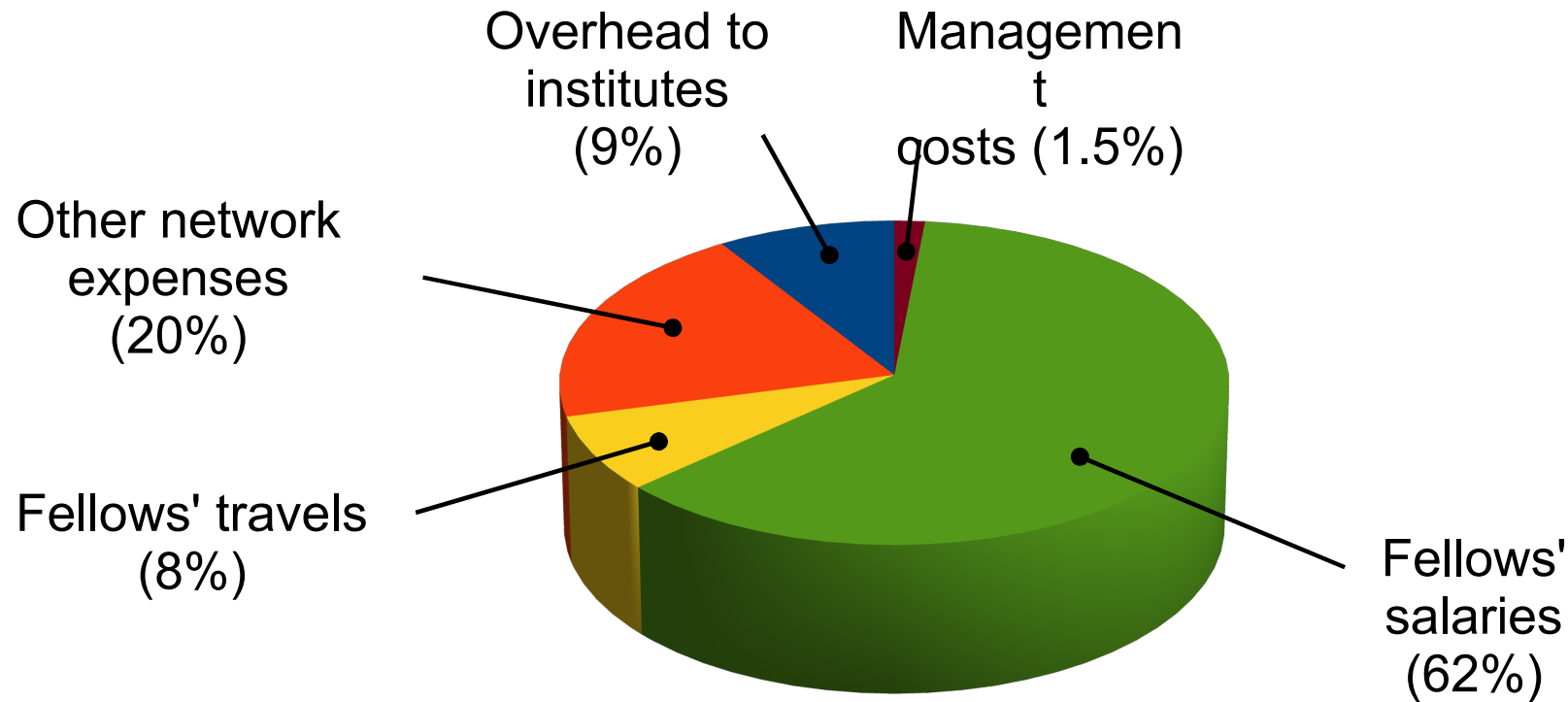


Networking activities

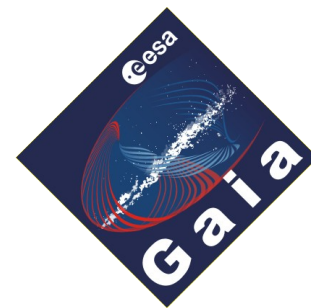
- Each fellow does "normal work" at his/her home institute
 - E.g. PhD students follow normal curriculum
- Extended visits by fellows to other ELSA institutes to foster collaboration around specific topics
- Participation by fellows in DPAC meetings and workshops
- Contacts with industry
 - Dutch Space B.V. (ELSA partner): GRID computing and CCD modelling workshop
 - e2v on CCD modelling
 - EADS-Astrium on laboratory tests of Gaia CCDs
- Fellows attend various schools and scientific meetings
 - Including annual ELSA plenary meetings



How is the ELSA budget spent?



Total budget (4 years) = 2.8 M€



ELSA annual meetings

◆ ELSA School on the Science of Gaia

- ➡ Leiden Nov 2007
- ➡ focus on scientific motivation for Gaia
- ➡ 19 invited lectures, fellow posters presentations, afternoon exercises

◆ ELSA Workshop on Software Engineering and Numerics

- ➡ Barcelona Sep 2008
- ➡ included two days of fellow presentations with feedback on presenting skills by outside professional

◆ ELSA School on the Techniques of Gaia

- ➡ Heidelberg Sep 2009
- ➡ technical challenges of Gaia instruments, mission operations

◆ ELSA Conference: Gaia At the Frontiers of Astrometry

- ➡ Paris, 7–11 June 2010
- ➡ International conference presenting results obtained by ELSA, status of Gaia, complementary theoretical tools, ground-based work, and related missions

