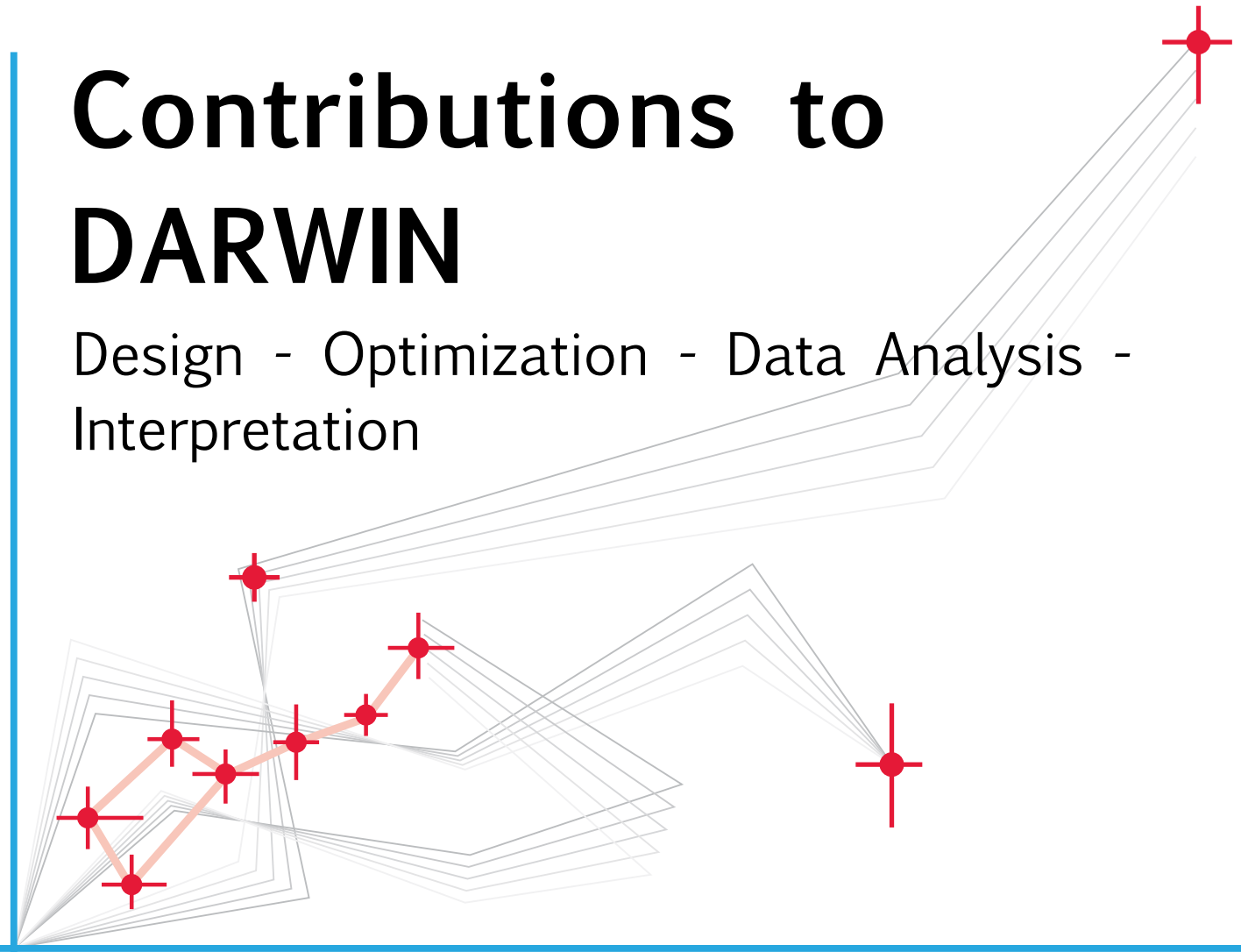
Contributions to DARWIN

Design - Optimization - Data Analysis - Interpretation



ICIC
Imperial Centre
for Inference & Cosmology

Roberto Trotta

09.12.2013 - DARWIN Meeting, Naples

Imperial College
London

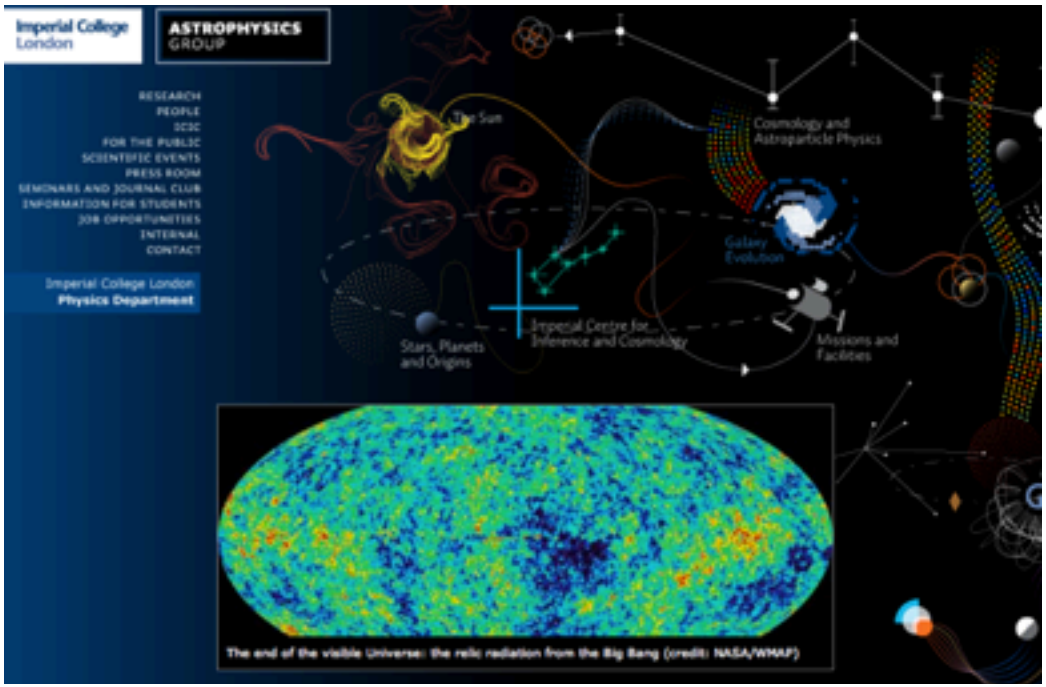
Imperial College London

Imperial College London

- Founded in 1907 and located in London, UK. It is specialized in Business, Engineering, Medicine and Science
- Main campus in South Kensington, right across from Hyde Park
- 13,000 full-time students
- 6,000 staff and researchers
- Physics Dept: 115 staff, 200 postdocs, 9 research groups

ICIC

The Astrophysics Group at Imperial



- A relatively small but active group of 9 staff, ~ 10-15 postdocs, 10-15 students
- Themes covered span a wide variety of science: brown dwarfs, solar physics, galaxy formation and evolution, high-redshift Universe, 21-cm, cosmology and CMB, astroparticle physics and dark matter, SUSY.

- **Collaborations** with the nearby Theory Group, High Energy Physics Group and Statistics Section in Maths.
- **Missions/Experiments:** Planck, Herschel, Euclid, XENON (RT is “associated” on a specific project). Future: LSST, LOFAR/SKA.

The ICIC

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- The Imperial Centre for Inference and Cosmology (ICIC) was founded in 2012
- **Mission**: to develop and apply advanced statistical methods in cosmology, astronomy and astroparticle physics.
- Key figures: Alan Heavens (director), RT, Daniel Mortlock, Andrew Jaffe and David van Dyk (stats)
- Great concentration of (mostly Bayesian) statistical expertise applied on many fronts.

- **Imperial SpaceLab:** A new cross-faculty initiative (director: Steven Schwartz), aimed at fostering cross-disciplinar research, translation and innovation on space-related themes

People

Imperial College London

Faculty

Roberto Trotta

PhD students

Charlotte Strege

4th year (Dark matter global fits, astrophysical uncertainties)

?

Hikmatali Shariff

1st year (SNIa modelling, dark energy)

Also:

Pat Scott

STFC Rutherford Fellow (starts in Apr 2014)

David van Dyk

(Stats section) + students

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Profile

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- My background is in theoretical physics, with particular emphasis on the early Universe and cosmological observations (especially CMB)
- More recently, I've been strongly involved in the "global fits" effort
- I am interested in (Bayesian) inference and data analysis applied to a variety of science subjects, particularly implications for dark matter from all available probes.
- Bayesian methods: inference, model comparison
- **Science:** Early Universe, Dark matter, SUSY, "global fits" (SuperBayeS), direct detection astrophysical uncertainties, modelling of experiment

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Contributions

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- Potential contributions to DARWIN:
  - Data analysis pipeline design and implementation
  - Prediction and optimization studies
  - Forecast of performance
  - Simulation studies
  - Data analysis: modelling, calibration
  - Inference, model checking, systematic studies
  - Astrophysical uncertainties modelling
  - Implications for theoretical models
  - Global fits

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Additional resources

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- **HPC capabilities:** Imperial's High Performance Computing centre, cluster with 12,000 CPUs. Astrophysics priority queue with ~ hundreds cores, useful for development work and small production runs.
- **Training in Bayesian methods:** experienced lecturer, participated to many postdoctoral schools
- In-kind (wo/man power) rather than experimental.

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