



Science Meeting – Scientific Report

Scientific report (one single document in WORD or PDF file) should be submitted online within two months of the event. It should not exceed seven A4 pages.

Proposal Title: EES2013 Stellar Ages

Application Reference N°: GREAT School - Science Meeting 4723

1) Summary

The project of a school on stellar ages was proposed by Y. Lebreton, D. Valls-Gabaud and C. Charbonnel to the Scientific Council of the PNPS as the 2013 Ecole Evry Schatzman of stellar physics (EES). It received support from INSU (CNRS), PNCG, CNES, Paris Observatory, AS Gaia and the GREAT network (ESF). 65 participants gathered in Roscoff from September 29 to October 4, 2013. This was the best-attended EES school since its creation in 1989. The lecturers reviewed the different fields where the ages of stars play a key role, from cosmology to stellar seismology, through galactic evolution and exoplanets. Both theoretical and observational aspects were covered, including statistical techniques and applications to datasets from CoRoT, Kepler and Gaia. The presentations were made available to all participants, and the proceedings will be published in the European Astronomical Society Series (EdP).

2) Description of the scientific content of and discussions at the event

The school took place at the Station Biologique de Roscoff from September 29 to October 4, 2013. Of the 65 participants, 33 were PhD students, 7 post-doctoral researchers and 25 astronomers from CNRS, observatories and/or universities. This was the best attended ever school of the series created by Evry Schatzman back in 1989.

The lecturers reviewed the many fields of astrophysics where the estimations of ages are required, either individually or in clusters, such as exoplanetology, stellar physics, the dynamics and evolution of the Galaxy, but also galaxy evolution in general as well as in cosmology. Stellar ages are being determined thanks to measures of key parameters (and the future will bring further data from the Gaia mission) and the French community is leading many of these efforts. One of the aims of the school was to have the PhD students aware both of the variety of measures and the state of the art techniques used to infer stellar ages. A second aim was to have them become aware of the many data which are coming from the many space missions such as CoRoT, Kepler and Gaia, which are truly transforming many fields within astrophysics.

The many methods used to infer stellar ages were discussed in depth, and their power and limitations were quickly understood by the students. There was a very active discussion going on every day on the many aspects of understanding data and applying robust statistical techniques. All the lecturers were involved in the discussions, and the students were delighted to be able to interact with them. The lectures were made available to all participants through the dedicated website of the school <http://ees2013.obspm.fr>

3) Assessment of the results and impact of the event on the future directions of the field

At the end of the school, we issued a brief questionnaire to assess the impact of the school on the participants. The questionnaire showed that the participants were truly enthusiastic about the school, as they were taught an extensive series of statistical techniques and observational developments. The large number of attendees is also an indication of the success.

They also noted that they appreciated the interdisciplinary nature of the school, as there were not only stellar astronomers but also statisticians, cosmologists, astronomers specialised in meteorites and in galaxy evolution. These communities seldom meet.

The proportion of PhD students and postdocs was very high, and the lecturers had to adapt the level of the lectures to students with widely different backgrounds. Most lecturers stayed at the School for the full duration of the event, maximising the rate of interactions with the participants. Overall, the questionnaire reflected huge satisfaction, the only negative point being that the tutorial session which was going to be organised could not take place for lack of time. The cosmopolitan attendees were very pleased by the premises and the care with which the personnel of the Station Biologique de Roscoff dealt with them.

The proceedings will be published in 2014 by EDP Sciences within the *EAS Publication Series*, and distributed, free of charge, to all participants.

Annex 4a: Programme of the meeting

Monday 30/09/13

- 8h30- 8h45. Introduction.
- 8h45-10h15. David Valls-Gabaud: *Extragalactic physics and cosmology*
- 10h15- 10h45. Coffee break
- 10h45-11h45. Misha Haywood : *The Milky Way stellar populations and evolution*
- 11h45-12h45. Yveline Lebreton/MJ Goupil. *Uncertainties in stellar models : consequences for stellar ages precision*
- 13h15. Lunch (Gulf-Stream restaurant)
- 15h30-17h. Tristan Guillot: *Exoplanets*
- 17h-17h30 Coffee break
- 17h30- 19h - Matthieu Gounelle: *5 million years before and after the Sun formation*
- 19h45 - Aperitif and dinner (Gulf Stream restaurant)

Tuesday 1/10/13

- 8h30- 10h. Yveline Lebreton/MJ Goupil. *Uncertainties in stellar models : consequences for stellar ages precision*
- 10h-10h25 Coffee break
- 10h25-11h25. Misha Haywood: *The Milky Way stellar populations and evolution*
- 11h25-12h50. Rob Jeffries : *Empirical methods, activity, gyrochronology, lithium*
- 13h15. Lunch (Gulf-Stream restaurant)
- 15h30-17h30. Fabrice Martins: *Model atmospheres and determination of stellar parameters*
- 17h30-18h00. Coffee break
- 18h00-19h30. David Valls-Gabaud: *Ages from the inversion of the HR diagram*
- 20h. Dinner (Gulf Stream restaurant)

Wednesday 2/10/13

- 8h30- 10h. Yveline Lebreton/MJ Goupil. *Stellar ages from "à la carte" modelling : impact of asteroseismology*
- 10h-10h20. Coffee break
- 10h20-11h20. Santi Cassisi: *HRD/CMD: From theory to observations and vice versa I*
- 11h20-12h50. Rob Jeffries: *Empirical methods: activity, gyrochronology, lithium II*
- 13h - 20h. Free afternoon
- 20h. Dinner (Gulf Stream restaurant)

Thursday 3/10/13

- 8h30- 10h. Santi Cassisi: *HRD/CMD: From theory to observations and vice versa II*
- 10h- 11h. Yveline Lebreton/MJo Goupil. *Stellar ages from "à la carte" modelling : impact of asteroseismology*
- 11h00-11h30. Coffee break
- 11h30-12h30. Yveline Lebreton/MJ Goupil. *Stellar ages from "à la carte" modelling : impact of asteroseismology*

13h15. Lunch (Gulf-Stream)

- 15h- 16h. Misha Haywood: *The Milky Way stellar populations and evolution.*
- 16h-17h30. Ted von Hippel : *White Dwarf Ages and Another Look at Inverting HR Diagrams*
- 17h30-18h. Coffee break
- 18h- 19h30. David Valls-Gabaud: *Ages from the HR diagram : Bayesian methods*
- 20h. School Dinner (Gulf Stream restaurant)

Friday 4/10/13

- 9h30-11h. Fabrice Martins: *Star formation*
- 11h-11h30. Coffee break
- 11h30- 12h30. Misha Haywood: *The Milky Way stellar populations and evolution*
- 12h30- 12h45. *Conclusions*
- 13h. Lunch (Gulf-Stream restaurant)

Annex 4b: Full list of speakers and participants

Lecturers

S. Cassisi
M. Haywood
R. Jeffries
Y. Lebreton
M.J. Goupil
F. Martins
D. Valls-Gabaud

Seminars

M. Gounelle
T. Guillot
T. von Hippel

List of participants

First name	Name	Institution	Position
Javier	Alonso-García	Pontificia Universidad Católica de Chile	Post-doc
Louis	Amard	Université Montpellier 2	PhD student
Cilia	Badache-Damiani	Aix Marseille Université, CNRS, LAM	Post-doc
Jérôme	Ballot	IRAP	Staff
Kévin	Belkacem	LESIA - Observatoire de Paris	Staff
Alexander	Binks	Keele University	PhD student
Torsten	Böhm	CNRS	Staff
Diego	Bossini	University of Birmingham. School of physics and astronomy	PhD student
Giovanni	Bruno	Laboratoire d'Astrophysique de Marseille	PhD student
Laia	Casamiquela Floriach	Universitat de Barcelona	PhD student
Santi	Cassisi	INAF - Astronomical Observatory of Teramo	Staff
William	Chantereau	Observatoire de Genève	PhD student
Corinne	Charbonnel	Geneva Observatory and CNRS IRAP	Staff
Dmitry	Chulkov	Institute of astronomy of the RAS (INASAN)	PhD student
Elena-Ruxandra	Cojocaru	Universitat Politècnica de Catalunya	PhD student
Miriam	Cortés Contreras	Universidad Complutense de Madrid	PhD student
Paola	Di Matteo	Observatoire de Paris, GEPI	Staff
Boris	Dintrans	CNRS	Staff
Amy	Dobson	Keele University	PhD student
Jean-Éric	Ducet	IRFU/Service d'Astrophysique	Staff
Sivan	Duran	Istanbul University	PhD student
Florian	Gallet	IPAG	PhD student
Matthieu	Gounelle	MNHN	Staff
mariejo	goupil	Observatoire de paris	Staff
Mathieu	Grosjean	Université de Liège	PhD student
Céline	Guédé	Gepi-Observatoire de Paris	PhD student
Guillaume	Guiglion	Laboratoire Lagrange, Université de Nice Sophia-Antipolis, Observatoire de la Côte d'Azur, CNRS	PhD student
Tristan	Guillot	Observatoire de la Cote d'Azur	Staff
Misha	Haywood	Observatoire de Paris	Staff
Anthony	Hervé	LUPM	Post-doc
Mohammad	Heydari-Malayeri	LERMA, Observatoire de Paris	Staff
Delphine	Hypolite	IRAP	PhD student
Ingrid	Jean-Baptiste	GEPI	PhD student
Rob	Jeffries	Keele University	Staff
Sabine	Kimmel	CNRS	Staff
Nadège	Lagarde	School of Physics and Astronomy, Birmingham University	Post-doc
Maëlle	Le Pennec	CEA	PhD student
Yveline	Lebreton	Observatoire de Paris, GEPI et IPR, Université de Rennes	Staff
Dhiaa	Mahdi	Laboratoire d'astrophysique de Bordeaux , Universite Bordeaux1	PhD student
Fabrice	Martins	LUPM - UMR5299	Staff
Davide	Massari	University of Bologna	PhD student
Thibault	Merle	Université Libre de Bruxelles	Post-doc
Eric	Michel	Observatoire de Paris-LESIA	Staff
Giovanni	Mirouh	IRAP Toulouse	PhD student
Josefina	Montalban	Universite de Liege	Post-doc
Miguel	Montargès	LESIA / Observatoire de Paris	PhD student
Domenico	Nardiello	Department of Physics and Astronomy "Galileo Galilei" - University of Padua	PhD student
Erin	O'Malley	Dartmouth College	PhD student
Rhita-Maria	Ouazzani	LESIA observatoire de Paris	Post-doc
Raphaël	Peralta	Observatoire de Paris - LESIA	PhD student
Bernard	Pichon	Observatoire de la Côte d'Azur	Staff
Arvind Singh	Rajpurohit	Observatoire de Besancon, Institut UTINAM	PhD student
Céline	Reylé	Institut UTINAM, OSU THETA	Staff
Annie	Robin	Institut Utinam, Observatoire de Besançon	Staff
Thaïse	Rodrigues	Osservatorio Astronomico di Padova	PhD student
Alvaro	Rojas	Observatoire de la côte d'Azur	PhD student
Reza	Samadi	LESIA - Observatoire de Paris	Staff
Margarita	Sharina	Special Astrophysical Observatory RAS	Staff
Lorenzo	Spina	INAF - Osservatorio Astrofisico di Arcetri	PhD student
David	Stenning	University of California, Irvine	PhD student
David	Valls-Gabaud	Observatoire de Paris	Staff
Ted	von Hippel	Embry-Riddle Aeronautical University	Staff
Mathieu	Vrard	Observatoire de Paris - LESIA	PhD student
Renara	Zenoviene	Institute of Theoretical Physics and Astronomy of Vilnius University	PhD student
Marusa	Zerjal	University of Ljubljana	PhD student

Final Budget
EES 2013 "The Ages of Stars"

Crédits CNRS/OBS HT		origine de crédit
<i>Recettes :</i>		
dotation Formation Permanente	16'500.00	FP
dotation PNCG	2'000.00	SdB
crédits ESF/GREAT	8'000.00	SdB
crédits CNES 92532	5'000.00	SdB
crédits CS Obs. de Paris	1'000.00	Obs
crédits AS GAIA	500.00	REC
<i>Publication 2014</i> crédits PNPS (Bordeaux)	7'100.00	?
Total :	40'100.00	

Dépenses :

Date	N° cnde/mission	Désignation	Montant engagé/facturé	Origine de crédit
09.04.13	7351	BT T.von Hippel (avion)	979.05	FP
21.05.13	7425	BT C. Charbonnel	337.81	FP
10.07.13	7489	BT Y. Lebreton	110.40	FP
15.07.13	7495	BT M. Gounelle	163.00	FP
17.07.13	7500	BT S. Cassisi	458.74	FP
18.07.13	7509	BT F. Martins	262.78	FP
18.07.13	7510	BT C. Reyle	165.80	FP
18.07.13	7511	BT M. Gounelle (complément)	16.00	FP
26.07.13	7521	BT T. Guillot	385.29	FP
02.08.13	7523	BT T.von Hippel (train)	117.00	FP
02.08.13	7525	BT Valls Gabaud	123.80	FP
21.08.13	7550	BT M. Haywood	107.20	FP
29.08.13	7572	BT M. Goupil	144.60	FP
13.09.13	7595	BT S. Kimmel	178.30	FP
20.09.13	7575	facture SB Roscoff (restauration)	11'771.03	FP
20.09.13	7612	facture SB Roscoff (hébergement,salle)	14'782.22	SdB
17.07.13	2874	Frais de mission S. Cassisi	540.00	Sdb
18.07.13	2871	Frais de mission Y. Lebreton	314.75	FP
18.07.13	2877	Frais de mission C. Charbonnel	330.00	FP
18.07.13	2878	frais de mission C. Reylé	704.60	obs
18.07.13	2880	frais de mission M. Gounelle	120.00	FP
09.09.13	2907	frais de mission R. Jeffries	230.00	SdB
20.09.13	2917	frais de mission S. Kimmel (LOC)	184.16	SdB
18.07.13	2879	frais de mission F. Martins	31.00	FP
26.07.13	7522	frais de mission T. Guillot	162.00	FP
02.08.13	2884	Frais de mission T. von Hippel	300.00	REC
02.08.13	2885	frais de mission D. Valls Gabaud	31.00	FP
21.08.13	2894	frais de mission M. Haywood	0.00	SdB
21.08.13	2895	frais de mission P. di Matteo	50.00	FP
29.08.13	7573	frais de mission M. Goupil	0.00	FP
provision	devis EdP Sciences	proceedings EES 2013	7'000	PNPS
Total :			40'100.53	