

The Stellar Astrophysics team (AS)

Team Overview

(01/2011-06/2013)

Dahbia Talbi on behalf of the Team

AERES committee visit

January 20-22, 2014

Scientific quality and outputs

Academic reputation and appeal

Interaction with the social, economic and cultural environment

Organization and life

Involvement in training through research

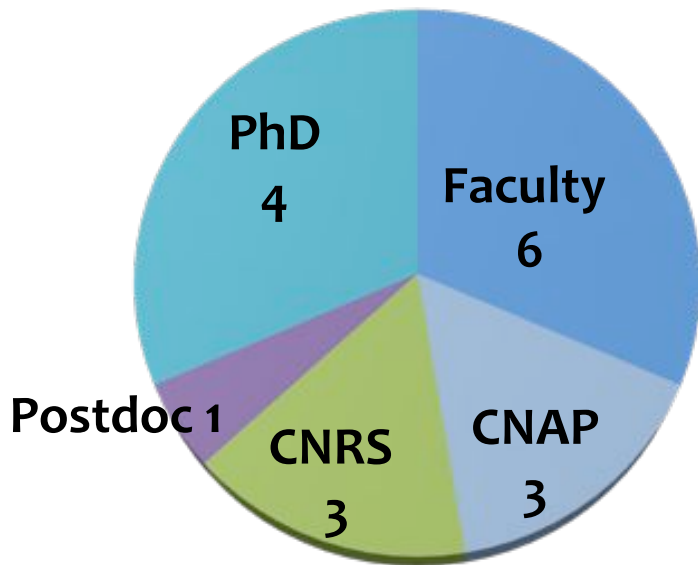
Strategy and the five-year plan

The Stellar Astrophysics team

Research: Stellar physics + astro-chemistry and primordial universe

Tools: modeling + numerical simulations + observations

as of 30/06/2013



Unit workforce	as at 30/06/13
N1: Permanent Professors and similar	9
N2: Permanent researchers	3
N5: Other researchers (Postdoc)	1
Doctoral students	4
Theses defended	2
Number HDR taken	1
Supervisors with an HDR	7

Jan. - Aug. 2011: 1 ATER
*Temporarily attached assistant
for teaching and research*

2012, 2013 : retirement of 2 Assistant Professors followed by 2 young recruitments

A combination of expertise focused on the same goal
understanding the **evolution of various type of stars**

- Development of two stellar evolution codes
 - non-standard macroscopic transport processes*
 - microscopic transport processes*
- Modeling of stellar atmospheres
 - test and improve the predictions of evolutionary models*
- Observations: infrared, optical, radio
 - provide constraints on factors affecting the evolution of stars*
- State of the art method of theoretical chemistry
 - chemistry and molecular data to probe stellar and interstellar media*

The Pollux database of synthetic stellar spectra & spectral energy distributions

- Development and maintenance: 2 AS astronomers/duty services

Data production: contribution of the AS team

Software development: contribution of an LUPM engineer

Local initiative
INSU Label
Service of the V.O.
Included in OV-GSO



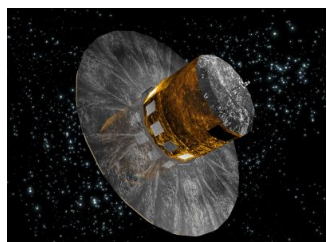
Involvement in the Gaia Data Processing & Analysis Consortium

1 AS astronomer/duty service

- Leader of TWP640 : Radial Velocity Zero-Point calibration of the RVS

Software development: contribution of an LUPM engineer

- Member of CU6 Steering Committee: Spectroscopy Processing



Gaia launched 19/12/2013

TWP: Top level Work Package

CU: coordination unit

58 publications in referenced journals (A&A, APJ, MNRAS, CPL, JCP, JPC)

2 book chapters

7 invited conferences

45 international conference contributions

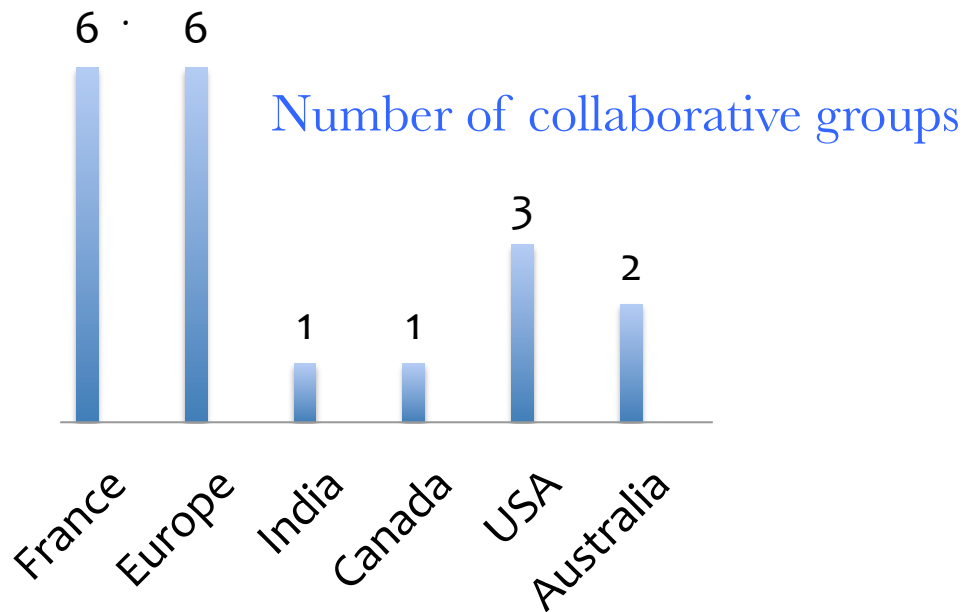
Other

9 technical reports (*Gaia*)

as of January 2014

70 publications in referenced journals

INSU press release <http://www.insu.cnrs.fr/node/4660>



Invitations from foreign universities

- Brussels
- Lund
- Montreal
- Western Australia

Collaborations

International projects

- BinaMIcS (*binarity and magnetic fields in star's evolution; 70 scientists*)
- MiMes (*magnetism of hot massive stars; 40 scientists*)
- Bcool (*dynamo generation of magnetic fields in cool stars; 50 scientists*)
- Kida (*the Kinetic database for Astrochemistry; 15 scientists*)

National projects

- INSU national programmes
PI and *Co-I* of PNPS, PNCG, PCMI projects
- LabEx OCEVU (*Origines, Constituants, EVolution de l'Univers*)
PI of the « Dark Energy » project

Visibility & Attractiveness

Organization of scientific events

- Wide range of international conferences (Co-organizer, SOC, LOC)
 - *Stellar physics*: New advances in stellar physics, Roscoff 2013 (70 participants)
 - *Molecular physics*: DR2013, Paris 2013 (80 participants)
 - *High energy physics*: CRISM2011, Montpellier 2011 (70 participants)
 - *Exobiology*: Origins2011, Montpellier 2011 (400 participants)
- Meeting of the “*Société Française d’Astronomie & d’Astrophysique*”, Montpellier 2013 (350 participants)

Other indicators

- 1 PhD student applied with his own ENS grant
- 1 PhD student applied through a competitive French-Lebanon grant
- 1 Postdoc for 2 years with a PhD from Belgium
- 85% of our PhD grants from external sources (ANR, ENS, foreign institutions)

- AERES evaluation committees (2 members)
- CNRS section 17 (1 member elected)

Expertise & Recognition

Requests for peer evaluation processes

- Recruitment of lecturers
- Evaluation of scientific proposals
 - ANR, INSU national programmes
 - National & International telescopes
 - National & International computing facilities

Funds

- ANR projects
 - PI - TUMSE** (2011-2014) (*Towards an Understanding of Massive Stars Evolution*)
 - Co-I - TOUPIES** (2011-2015) (*TOwards Understanding the sPIn Evolution of Stars*)
- CNRS interdisciplinary program PEPS-PTI
 - PI - TPCECAM** 2013 (*Théorie des Processus Collisionnels Electron-Cations pour l'Astrophysique Moléculaire*)

Journal's Referees

- Astrophysics, Chemical Physics & Physics

Communication

Astronomy

one of the most popular science - from children to adults/seniors

Participation of all members of the team

- Regular actions in schools, high schools, secondary schools, planetarium, bar des sciences, science fairs
- Articles and interview for media
- Regular participation to radio broadcast (weekly 2011-2012)
- Exhibitions
- Movie scenario (planetarium)
- Collaboration with cultural associations
- In charge of the astronomical collection of the UM2



7^e nuit Les yeux dans les étoiles (12 août)



Team life organization

Structure

- 1 group
- different research topics around the same goal
- transverse expertise

Scientific animation

- twice a month informal seminars: “**astrocafé**”
scientific talks (conference, paper)
- once a year (July): “**Journée AS**”
devoted to our sciences and projects

Diffusion of informations

- every week “**Wednesday morning team coffee break**”
latest info after a Laboratory council, meeting with the direction ...
administrative info
always room for latest scientific news

Decisions

- few times a year formal **group meetings**
 - recruitment
 - scientific orientations
 - budget (*LUPM resources*)
 -

Budget (*LUPM resources*)

- Previsions: forms filled by each member with needs, existing co-financing, priorities
- Attributions: collective decision

LUPM representation

- Participation in the Scientific council and the Laboratory council
- Budget discussion & attribution
- Recruitment discussions & decisions

Access to shared resources

- Section on the Webpage of LUPM
- LUPM computer cluster
- National and international **computer** and **telescope** facilities: *competitive reviewing process*

PhD training

12 permanent researchers **7** HDR (1 defended January 2013) *3 HDR in preparation for 2014*

2 PhD defended

December 2011 Postdoc @Observatory of the Canaries

December 2012 Postdoc @University of Lund

4 PhD ongoing

*co-supervision **French-Australian** (2010-2014) Australian grant*

*co-supervision **French-Swiss** (2012- 2015) ANR TOUPIES grant*

*co-supervision **French-Lebanese** (2012-2015) CNRS Lebanon/MEN grant*

supervision (2012-2015) ENS Cachan grant

2011-2013 period PhD/permanents = 50%

Our students follow

- Summer schools
- Present their results in national and international conferences (*at least once a year*)
- Participate to the outreach activities of the team

Teaching

75% of the AS permanent staff involved in teaching

Teaching responsibilities in the Physics Department: *Master level*

- Responsible of M1 teaching units
“Cosmologie I”, “Astrophysique Observationnelle I”, “Astrophysique I”
- Responsible of M2 teaching units
“Astrophysique Observationnelle II”, “Astrophysique II”

Teaching contributions abroad

- Space Science master: “Université des Sciences et Techniques de Hanoi”, Vietnam
- Astrophysics Master program: Notre-Dame University, Lebanon

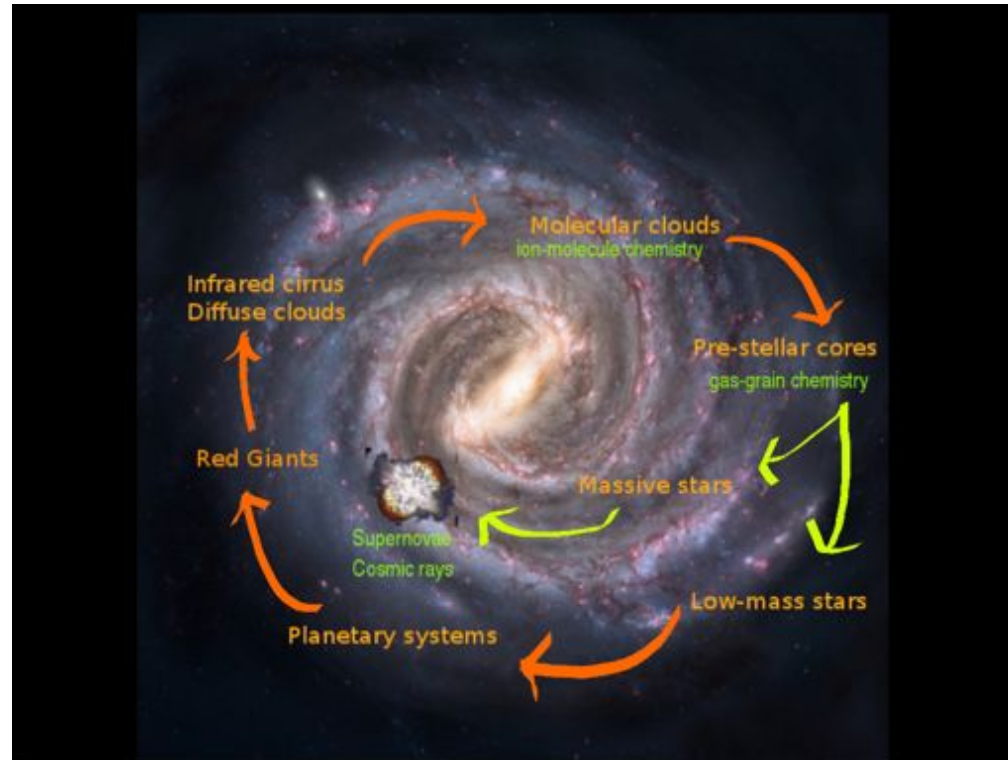
Summer schools

- École Evry Schatzman
- Awareness conference
- Ecole VLTI

Master and high school training students

- 5 at the M2 level and 14 at the M1 level for the 2011-2013 period
- The AS team welcomes all the high school students visiting every year the LUPM

Stars contribute to the **Dynamical** and **Chemical** evolution of galaxy (ies)
supernovae, planets, ...molecules, grains & life !



Evolution of stars: a central issue in astrophysics

Project

**The understanding and the constrain
of the stellar evolution of various type of stars**

The understanding and the constrain of the stellar evolution of various type of stars

continuity & widening of our scientific scope

1-Stellar rotation and transport processes

2-Stellar magnetism

3-Binarity

4-Mass-loss

5-Astro-chemistry

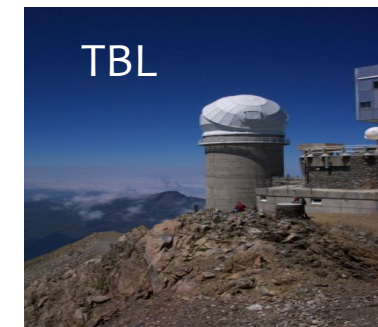
6-Initial conditions for the formation of the first stars

- Improve our stellar evolution and stellar atmosphere models (1)
- Provide better prescriptions for evolution models (1-4)
- Provide molecular parameters to probe stellar media (4,5)
- Test the role of primordial molecules in the formation of the first structures (5,6)

The understanding and the constrain of the stellar evolution of various type of stars

Our assets

- Complementarity of our skills
- 2 recent recruitments (university positions) for a wider expertise
magnetism and spectropolarimetry
astro-chemistry
- PhD students
- Present/near future observational facilities & participation in “large programs”



The Pollux database and the preparation for the *Gaia* exploitation through the duty services of our 3 astronomers

- Enrich the theoretical database of synthetic spectra
with the help of the AS team
- Develop softwares based on V.O. protocols
with the help of an engineer

- Prepare for the scientific exploitation of *Gaia*
with the contribution of 1 PhD student 2013-2016
- Prepare future *Gaia* intermediate releases (CU9)
with the help of an engineer



Final release of the Gaia archive expected for 2021

Strengthen interactions with other teams

- Hydrodynamic & Magneto-Hydrodynamic Simulations (*EMA, IFAC*)
- Cosmic Rays and Astro-chemistry (*EMA*)
- Dark Matter (*EMA, IFAC*)

S.W.O.T

Strengths & Weaknesses

- ✧ Wide expertise for stellar evolution studies
- ✧ Active development of private modeling tools
 - numerous requests for collaborations at an international level

- Small number of permanent scientists around some of our federative topic
 - atmosphere modeling of cool and hot massive stars, formation of first structures ...
- The unsteadiness of technical support for the CNAP duty services

Opportunities & Threats

- ✧ ANR and LabEx
- ✧ OSU association

- Loss of visibility from INSU