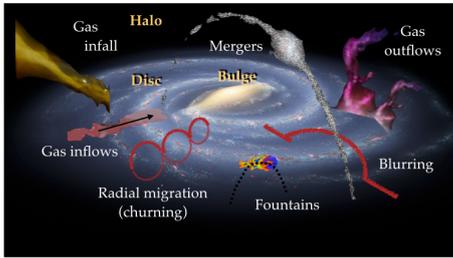


Galactic Archaeology



The goal of this module is to present the current views of the Milky Way formation and evolution history that are based on the study of the individual stars composing the different Galactic populations. Lectures on the Galactic stellar populations characteristics, on Galactic dynamics and the chemical evolution of the Milky Way will be presented. The main Galactic Archaeology surveys from ground and space will also be described, together with their main results. Finally, practical applications of the analysis of real data provided by such surveys will be performed by the students.

Theory

by P. DE LAVERNY AND
A. RECIO-BLANCO

Galactic Archaeology expects to reconstruct the history of the Milky Way by analysing stars, just as the history of life was deduced by examining rocks. Stars record their past in their ages, chemical compositions and kinematics and can provide unprecedented constraints on the early phases of galaxy formation back to redshifts greater than two (a look-back time of about 10 billion years). How did our galaxy form? What is its place and ours in the cosmic evolution? These are part of the questions that this METEOR will present. We will also deeply discuss how these questions could be solved owing to the several on-going and planned spectroscopic surveys of the Milky Way, culminating in the European Space Agency Gaia mission, that are revolutionizing our knowledge about Galactic stellar populations.

The theoretical part of these lectures will focus on Galactic dynamics and chemical evolution, the main tools available for Galactic Archaeology research.

They will be organised as follows:

- Near field cosmology - Overview of the Milky Way as a

spiral galaxy. Main properties, stellar populations and local environment

- Stellar evolution, nucleosynthesis and chemical yields
- Chemical evolution of the Milky Way
- Introduction to Galactic dynamics
- Galactic Archaeology surveys from ground and space
- Origin and chemo-dynamical properties of Galactic populations as revealed by current surveys

Applications

by A. RECIO-BLANCO AND
M. SCHULTHEIS

Practical studies on the characterisation the Galactic disks and bulge based on very recent Gaia-ESO Survey and Gaia data will be performed by the students. The main topics covered will be: (i) Statistical analysis of large samples of stellar chemo-dynamical properties, (ii) Derivation of Galactic chemical gradients, metallicity distributions, ... and (iii) Constraints to model formation of the disks and bulge.



See also

Nucleosynthesis and chemical evolution of galaxies, Pagel, 2009
Galactic dynamics, Binney & Tremaine, 1987
The origin of the Galaxy and Local Group, Bland-Hawthorn, Freeman & Matteucci, 2013, Springer
The chemical evolution of galaxies, Matteucci, 2013, Springer
Star-formation histories, abundances, and kinematics of dwarf galaxies in the Local Group, Tolstoy et al., 2009, ARAA, 47, 371
Nucleosynthesis in stars and the chemical enrichment of galaxies, Nomoto et al., 2013 ARAA, 51, 457

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