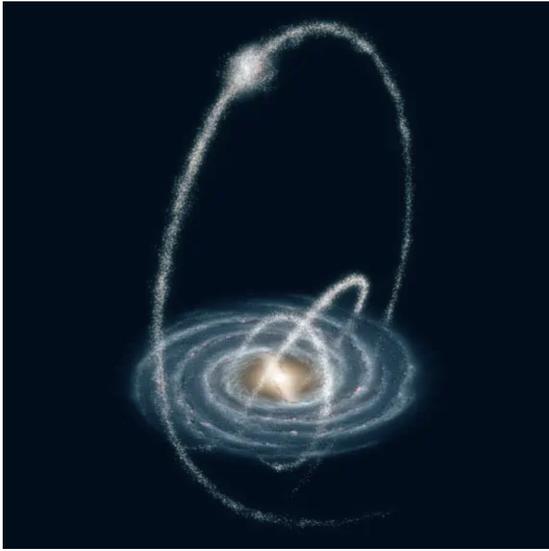




METEOR-Ancient stars in dwarf galaxies



(Credit: NASA / JPL-Caltech / R. Hurt, SSC & Caltech)

SUMMARY.

The Milky Way is an environment rich with satellite galaxies, stellar streams, and accreted systems. Encoded in these structures is the formation and evolution of our Galaxy throughout cosmic time. The smaller dwarf galaxies are of particular interest as their stellar populations are predominantly old and metal-poor. They can be observed star-by-star, allowing us to look back to the earliest star formation and chemical enrichment in the Universe. The aim of this METEOR project is to analyze the spectra of ancient and metal-poor stars in dwarf galaxies. By determining their chemical abundances, we can understand what kind of chemical enrichment they underwent. The final objective is to put the results into context with the overall chemical evolution history of these dwarf galaxies. The student will get an in-depth introduction to Galactic Archaeology, a fast-growing field where millions of stellar spectra are expected to be obtained in the following decade.

OBJECTIVES

- **Galactic Archeology:** Understand the basics of both stellar nucleosynthesis, and the chemical evolution of the Milky Way and its dwarf galaxy satellites.
- **Spectral analysis:** Learn how to determine stellar atmospheric parameters and chemical abundances of metal-poor stars.
- **Global view:** Put the measured chemical abundances of stars in context with the chemical evolution of their host galaxy.

INSTITUTE

- Department of Physics and Astronomy, University of Florence.
- Institute URL

THEORY

by ÁSA SKÚLADÓTTIR

- **Stellar nucleosynthesis (A):** Understanding the main elemental groups, and their nucleosynthetic production sites, such as core-collapse supernovae, supernovae type Ia, asymptotic giant branch stars, and neutron star mergers.

Galactic archeology (B):

The hierarchical galaxy formation history of our Galaxy and its satellite galaxies. Basics of chemical evolution models explained.

APPLICATIONS

by ÁSA SKÚLADÓTTIR

The student will analyze spectra of metal-poor stars in dwarf galaxies, starting by evaluating the stellar atmospheric parameters. Next steps will be to measure the chemical abundances of selected key elements such as C, Mg, Fe and Ba. Finally, the results will be compared to abundances from the literature and put into context with the chemical evolution history of the host dwarf galaxy.



Astronomy Institute in Florence

MAIN PROGRESSION STEPS

- Week 1-3: Courses A and B
- Weeks 4-8: Research project
- Weeks 9: Oral exam and preparation of defense

EVALUATION

- **Theory grade [30%]**
 - Oral exam (50%)
 - Presentation of an article (50%): critical spirit, clarity, answering questions.
- **Practice grade [30%]**
 - Initiative and work ethics
 - Progress and analysis
 - Results and interpretation
- **Defense grade [40%]**
 - Oral and slides quality
 - Context
 - Project / Personal work
 - Answers to questions

BIBLIOGRAPHY & RESOURCES

- Skúladóttir et al. 2021
- Skúladóttir et al. 2023
- Tolstoy et al. 2009

CONTACT

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