



# UNIVERSITÀ DEGLI STUDI DI MILANO

## Corso di Dottorato in Scienze della Terra



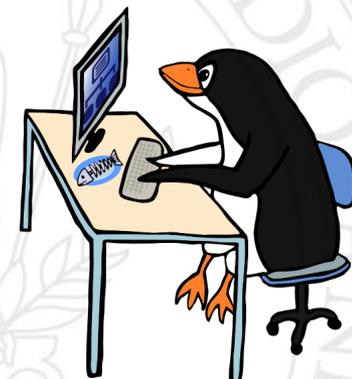
**24-26<sup>th</sup> October 2022 - Short course (3 cfu, 15 hours) – Room XX**  
**Dipartimento di Scienze della Terra “A. Desio”, via Mangiagalli 34, Milano**



### Cave and subglacial carbonates: The «dark» record of Earth’s climate history by Prof. Silvia Frisia

#### PROGRAM

- Day 1 – Speleothems (environments, crystallization pathways)
- Day 2 – Overview of Methodologies
- Day 3 – Subglacial carbonates from Antarctica and the Alps



**Prof. Silvia Frisia**  
Conjoint University of  
Newcastle, Australia  
Honorary UNSW, Sydney,  
Australia

J. Hellstrom and A. Hartland sampling  
Stalagmites in the Cook Islands

**Per informazioni e iscrizione contattare:**  
**Prof. Giovanna Della Porta ([giovanna.dellaporta@unimi.it](mailto:giovanna.dellaporta@unimi.it))**

## Course description and schedule

- **24/10 - Speleothems (cave deposits).** Environments of formation; Crystallization pathways; Physical and chemical proxy data of climate and environmental change; Diagenesis.
- **25/10 – Overview of methodologies.** Optical and Electron microscopy, fluorescence microscopy, Synchrotron radiation-based X-Ray fluorescence spectroscopy, Mass Spectrometry (isotopes and trace elements), Radiocarbon and U-series dating, fluid inclusions analyses - homogenization temperature and isotope ratios  
Microstratigraphy, fabrics, Speleothems and Earth's history. Examples from the world.
- **26/10 – Subglacial carbonates from Antarctica and the Alps.**  
Assessment (self assessed): designing speleothem-based/subglacial carbonate-based palaeoclimate research.

## Learning outcomes

*Students will obtain an overview about the wealth of past-climate information encoded in carbonates that formed in dark, extreme environments, such as caves and subglacial settings. The physical and chemical properties of these carbonates from the “dark” will be explored. New concepts, such as non-classical nucleation and growth of crystals will be introduced to explain features relative to lateral heterogeneity of chemical data. Practical tests and assessments will be provided. These will be self-assessed and/or discussed with the aim to foster self-critique and focus on what is really important.*

