Deciphering the Past: Sedimentary Records

Massachusetts Institute of Technology

Keywords: Earth sciences, geological records, paleoenvironment reconstruction

Recommendation: This project is aimed at students who are interested in Earth environmental science and looking for a better understanding of our Earth and its evolution. After this project, students are expected to obtain a broad view of geosciences and paleoenvironment, additionally, acquiring the practical skills of outdoor/indoor work.

Introduction: This program introduces the fundamentals of geology, including mineralogy, sedimentology, geochemistry, and geophysics, for understanding what the sedimentary records could tell us in the past and how geologists interpret it. Moreover, related practical skills are also presented in this program, which potentially improves students' knowledge of outdoor field activities and indoor lab experiments.

Topics covered in this program:

- Why are we here?
  - ✓ The significance of geosciences: importance and applications
- Geology: further steps from Geography Class in the general
  - ✓ Walther's Law, geological time scales, plate tectonics, source-sink frames
- Sedimentology: macrocosmos and microcosmos
  - ✓ Sedimentary composition, structures, and environmental interpretations
- Practical skills 1: fieldworks
  - ✓ Routine of fieldworks, outdoor tools, skills on wilderness survival
- Minerals: colorful gems and useful tools
  - ✓ Gem classification, microscopes in thin sections and SEM, XRD analysis
- Geochemical analysis on sedimentary records
  - ✓ Inorganic (elements, isotopes) & organic (biomarkers) geochemistry
- Practical skills 2: laboratory experiments
  - ✓ Laboratory safety, general Lab SOPs, the introduction of inorganic & organic labs
- Geophysics: untouched eyes for archaeology and ore/petroleum exploration
  - ✓ Explorations of ancient tombs, mine/oil fields
- Frontiers: Paleoclimatic evolutions of our earth
- Frontiers: High-resolution sedimentary records and astronomical cycles
- Frontiers: Molecular biomarkers in modern sediments and ancient rocks
- Tips on doing scientific research
  - ✓ Skills on finding literature and reading, document management