**Structural Geology:**

The Place of Structural Geology in Sciences

Science is the search for knowledge about the Universe, its origin, its evolution, and how it works. Geology, one of the core science disciplines with physics, chemistry, and biology, is the search for knowledge about the Earth, how it formed, evolved, and how it works. Geology is often presented in the broader context of Geosciences; a grouping of disciplines specifically looking for knowledge about the interaction between Earth processes, Environment and Societies.

Structural geology, Tectonics and Geodynamics form a coherent and interdependent ensemble of sub-disciplines, the aim of which is the search for knowledge about how minerals, rocks and rock formations, and Earth systems (i.e., crust, lithosphere, asthenosphere ...) deform and via which processes

**Structural Geology** aims to characterise deformation structures (geometry), to characterize flow paths followed by particles during deformation (kinematics), and to infer the direction and magnitude of the forces involved in driving deformation (dynamics). A field-based discipline, structural geology operates at scales ranging from 100 microns to 100 meters (i.e. grain to outcrop).

**Tectonics** aims at unraveling the geological context in which deformation occurs. It involves the integration of structural geology data in maps, cross-sections and 3D block diagrams, as well as data from other Geoscience disciplines including sedimentology, petrology, geochronology, geochemistry and geophysics. Tectonics operates at scales ranging from 100 m to 1000 km, and focusses on processes such as continental rifting and basins formation, subduction, collisional processes and mountain building processes etc.

**Geodynamics** focusses on the forces that drive mantle convection, plate motion and deformation of Earth's material. Geodynamics is concerned with deep mantle processes such as mantle convection, cold drips, hot plumes and their links to plate motion, including dynamic plate subsidence and uplift, and plate tectonic processes. Geodynamics involves working at scales > 100 km. Numerical modeling is at the core of modern geodynamics

•Structural geology is at the core of hydrocarbon and mineral exploration, as structures control the migration, trapping and escape of hydrocarbon fluids. Structural geology is the first stage to any regional geophysical and geochemical surveys aiming at identifying new mineralized provinces. It is also critical for the interpretation of geophysical, geochemical, and geochronological data. At the mine camp scale, structural geology guide the mining process.

•Structural geology is at the core of geotechnical site assessment for bridges, dams, tunnels, nuclear reactors, waste disposals etc. • Because of the obvious relationship between faults and earthquake , structural geology is that core of earthquake prevention and earthquake seismology. •Structural geology is central to any study of past and present mountain belts and sedimentary basins. No geological, geochemical or geophysical study can be done without the input of structural geology.

Structural Geology and Tectonics combines two aspects:

**1/ Description and analysis of 3D structures and microstructures** (Structural Geology sensu stricto): Structural geologists are concerned with features resulting from deformation. These include fractures, faults, folds, boudins, shear zones, cleavages (also knows as schistosities), foliations and lineations. From the analysis of these structures, they aim at understanding finite strain (i.e., the ultimate product of long, sometimes polyphased deformation histories), and incremental strain (i.e., the small increments of deformation, the accumulation of which leads to the finite strain). They are interested to understand “strain fields” by mapping deformation features such as foliations and stretching lineations that tell us the orientation of the principal shortening direction and principal lengthening direction respectively. In the case of faults and shear zones, they are interested to understand their kinematics (i.e., the relative sense of motion of the blocks they separate), and the magnitude of the displacement involved. They are interested to infer the direction of maximum and minimum stress directions from small deformation features such as centimeter-scale extensional fractures and associated stylolitic joints.

**2/ Design of tectonic models (Tectonics):** The purpose of these models is to explain the deformation history that led to the observed 3D strain fields. Tectonic models incorporate a broad range of data from other disciplines. No matter how tectonicists design these models (following hours of pure rational thinking or via flashes of insight after a heavy night), tectonic models should always be:

•Physically valid: They must be obey the law of physics, sounds trivial but not easy to meet this requirement without computational modeling

. •Testable: They must provide testable predictions (structural, sedimentological, petrological, geochemical, geophysical ...) that can be verified.

•Robust: They must explain a large number of unrelated facts,

•Lean: Hypotheses should be kept at a minimum compared to the number of fact models explain.

Questions:

read the text [structural geology and tectonic](https://elearn.univ-oran2.dz/mod/resource/view.php?id=27514) and answer the following questions:

1)extract a summary of the text and translate it to french

2)explain the terms written in red in both language (English and french)

3)what are the objectives of structural geology?

4) explain the objectives and criteria of tectonic modeling

5)write a text about what was mentioned in the video