Mechanics and Physics of Porous Solids

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Based on a lecture from O. Coussy and M. Vandamme

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Brief history of poromechanics and science of porous solids

Karl von Terzaghi (1883, 1963)
The father of Soil Mechanics

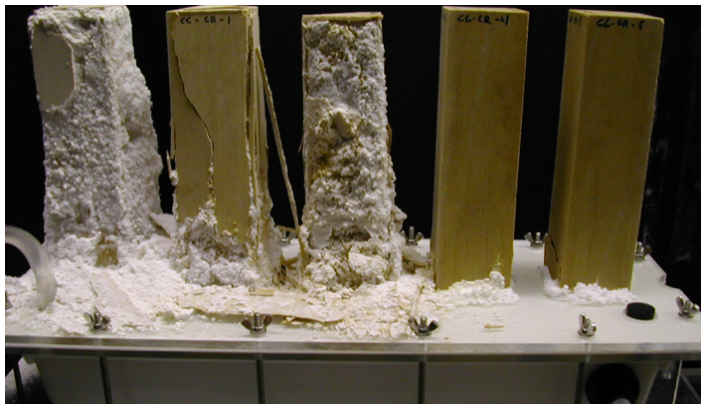
Maurice Biot (1905, 1985)
First consistent theory of poroelasticity

Olivier Coussy (1953-2010)
Modern theory for porous media

Science of porous solid come from two different areas: oil&gas technologies and civil engineering

The strange world of porous solids: Capillarity

The strange world of porous solids: Weathering



G.W. Scherer

Salt weathering in Gozo, Malta

Salt wheatering, image Rob Van Hees

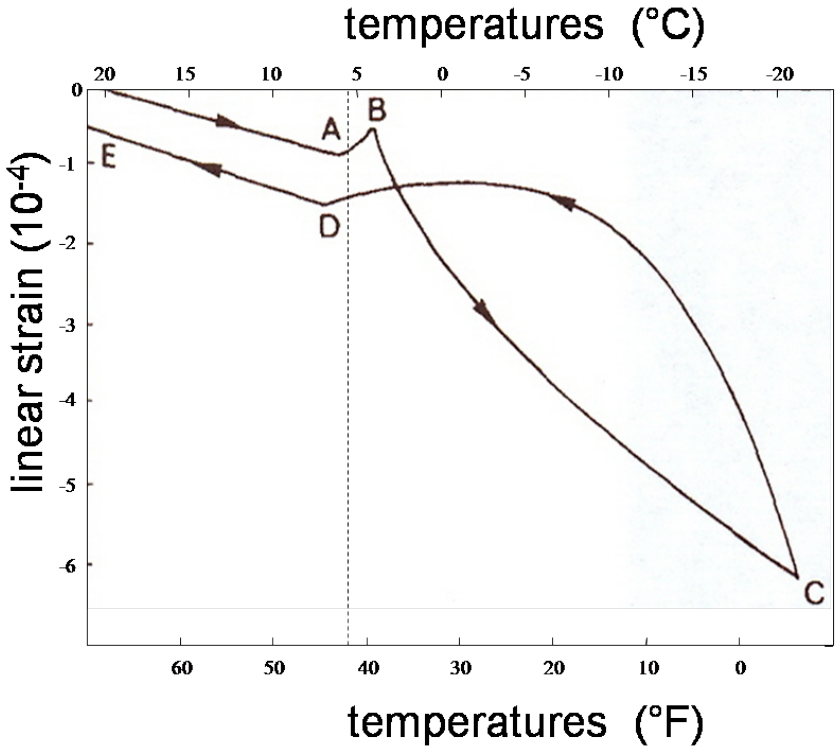
Freeze-thaw scaling of a railroad bridge [Paul Stutzman, NIST]

Courtesy of Dr. Moon Won Texas Tech University

The strange world of porous solids: shrinking and drying

Fracture patterns created by the drying of the water from the pores of the medium

The strange world of porous solids: non-intuitive behavior



Benzene contrary to water contracts upon freezing

But a concrete sample filled with benzene expands !

We are surrounded by porous media

- Rocks
- Concrete
- Wood
- Foam
- Bone
- Living tissues
- ...

- Porosity and pore modeling
- Tortuosity and connectivity
- Poroelasticity and effective stress
- Transport laws in porous media and permeability
- Surface energy and capillarity
- ...

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