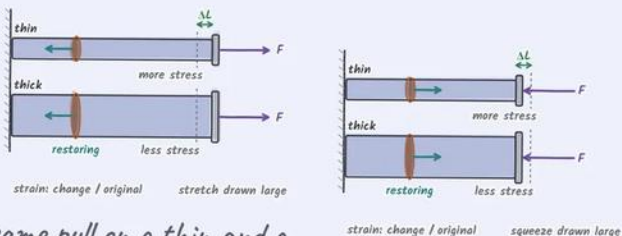


stress, strain, three moduli, and the friction that keeps two surfaces from sliding at all

Stress and strain *

- stress is the internal restoring force per unit area, N/m^2 or Pa
- strain: change in a dimension over the original, no units
- elastic: regains its shape and size once the force is removed
- plastic: it does not regain its shape
- no solid is perfectly elastic or perfectly plastic
- quartz fibre is closest to ideal elastic, putty to ideal plastic

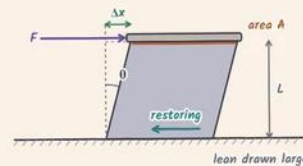


same pull on a thin and a thick rod: the thin one feels more stress, dashed is the old end

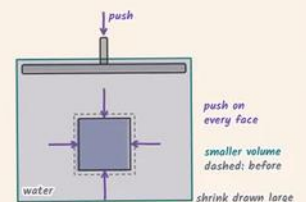
pushed instead: the rods shorten and the restoring force pushes back out

Shear and volume

- shear: a force along the top face, the foot held, the angle θ
- volume: pressure on every face alike, the size shrinks



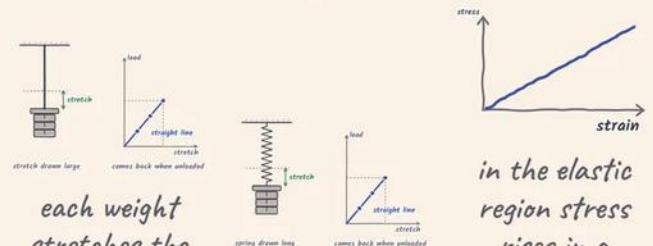
a force along the top face: the block leans through the angle θ , area A lit



a cube in water under a piston: pressure on every face, a smaller volume

Hooke's law

- within the elastic limit, stress/strain is a constant
- that constant is the modulus of elasticity
- it is the slope of the straight part of the stress strain graph
- it depends on the material, never on size or shape
- a wire's stretch is in step with its load



each weight stretches the wire the same: the load stretch graph is a straight line

a spring does the same: stretch in step with the load

in the elastic region stress rises in a straight line against strain, the slope is the modulus

Three kinds of stress and strain

Type	Stress	Strain
Tensile or compressive	F/A along the length	$\Delta L / L$
Shearing	F/A along the face	$\Delta L / L = \tan \theta \approx \theta$
Volume	pressure change ΔP	$\Delta V / V$