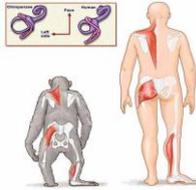


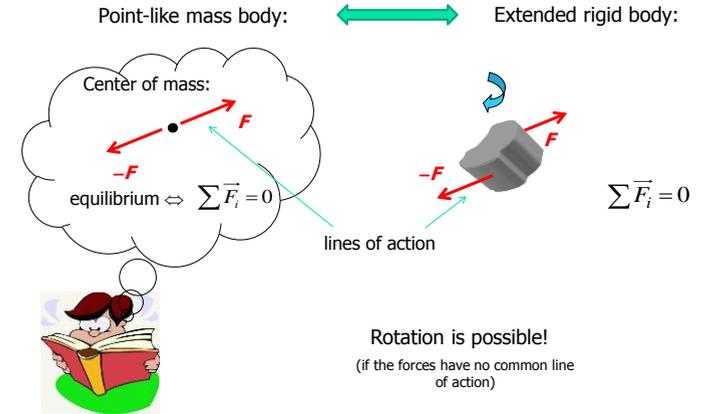


Biomechanics



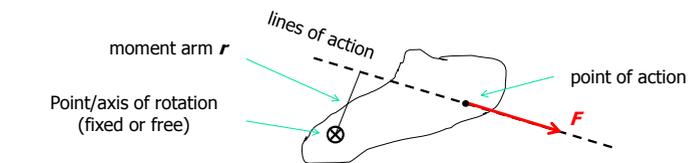
1

Statics of the rigid body



2

Statics of the rigid body – torque



torque (M):

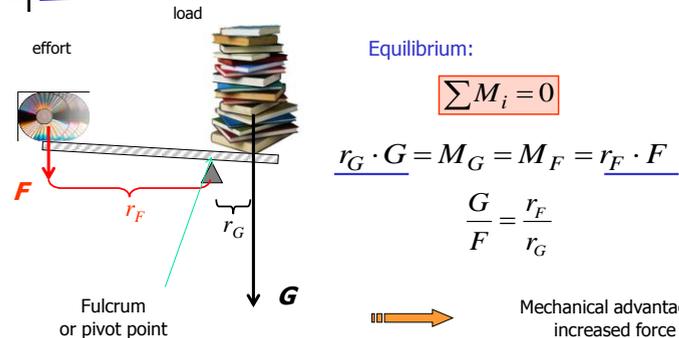
(moment or moment of force
- tendency of a force or forces to rotate an object)

$$M = r \cdot F \quad \text{Unit: Nm}$$

$$\text{equilibrium} \Leftrightarrow \sum \vec{F}_i = 0 \text{ and } \sum M_i = 0$$

3

Lever: a simple machine



$$\frac{G}{F}$$

4

Examples



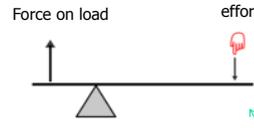
5

Types



Class 1

Fulcrum between the effort and load.



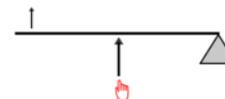
Class 2

The effort and load on the same side.



Class 3

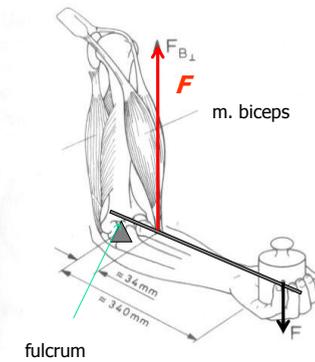
mechanical disadvantage, distance moved by the load is greater.



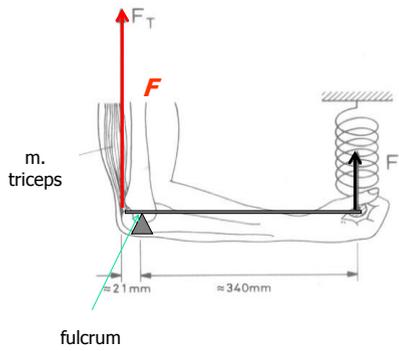
6

In the human body

Arm:



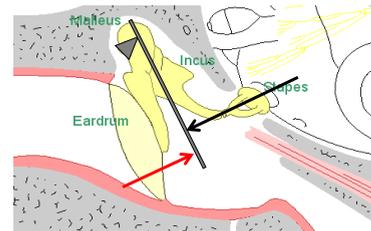
Class 3



Class 1

7

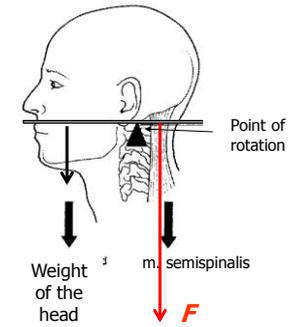
Ear bones:



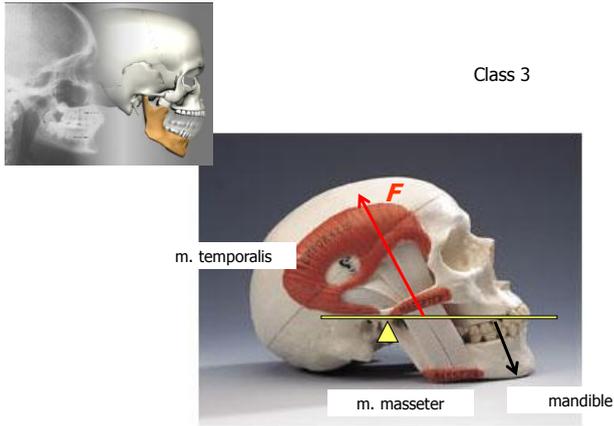
Class 2

Holding the head:

Class 1



8



9

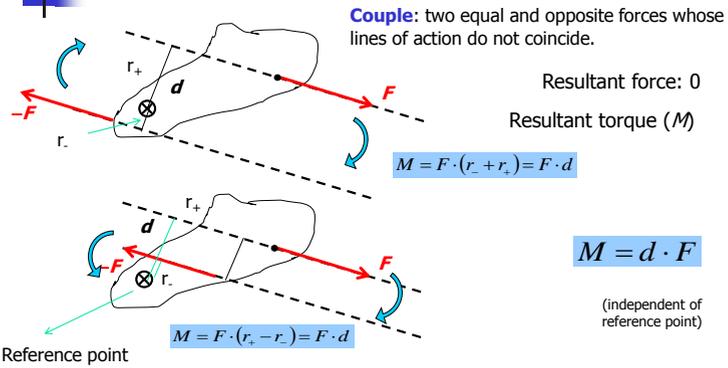
In dentistry



Class 1

10

Couple, replacement of system of forces

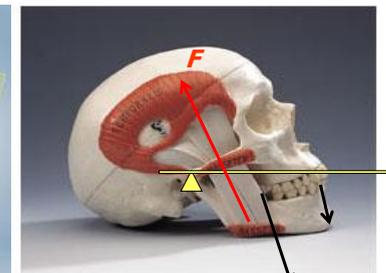


Any system of forces may be replaced by a force and a couple.

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Masticatory force

Jaw elevators and depressors



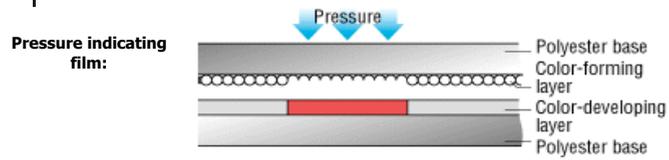
about 10 000 N

Force system

(Guinness: human - 4000 N)

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Measurement of the masticatory force

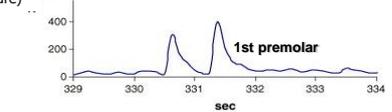
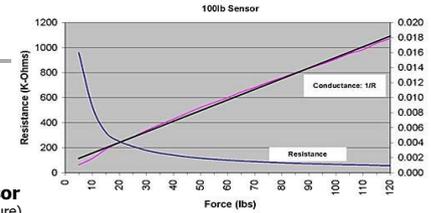
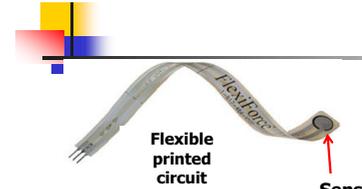


micro-encapsulated color forming and developing material

Piezoelectric sensor:
(look at piezoelectric effect!)



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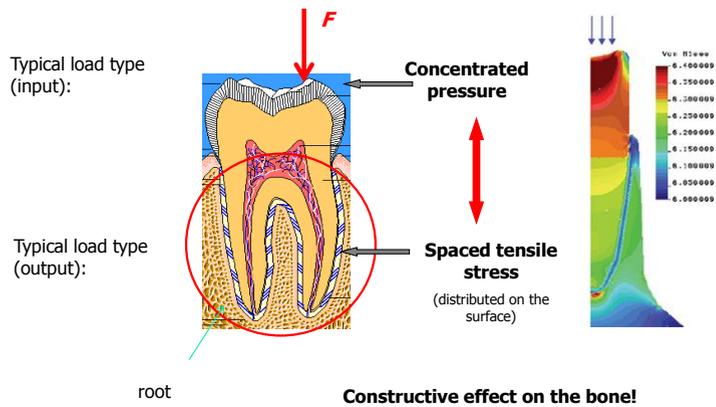


Other (subjective) methods:



14

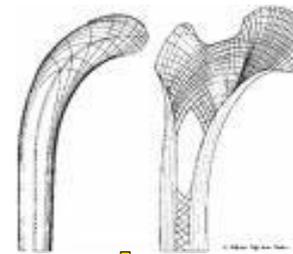
Transmission of forces to the bones



15

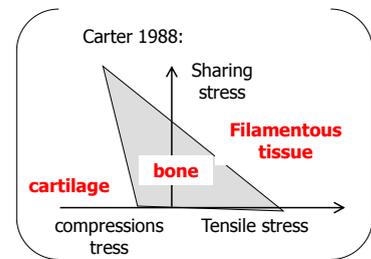
Bone remodeling

Wolff's law 1870: the bone in a healthy person will adapt to the loads.



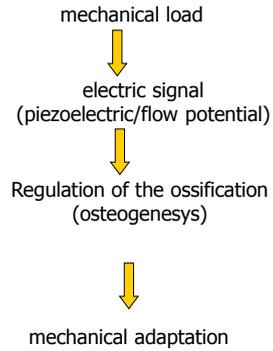
The role of the load

Compression stress \Rightarrow bone resorption
Tensile stress \Rightarrow ossification

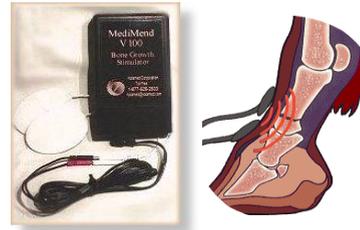


16

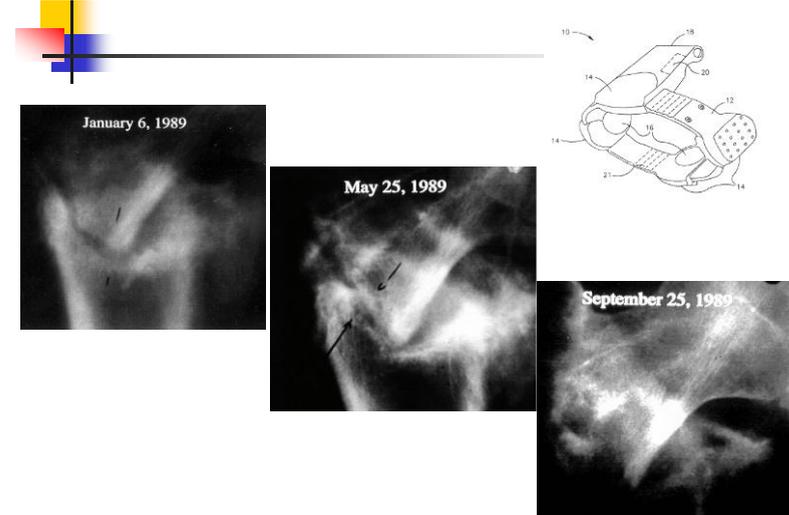
Mechanism of bone remodeling



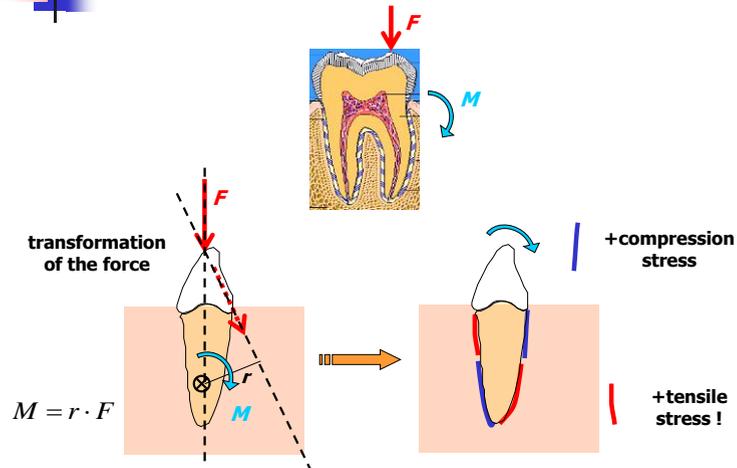
Application of electric fields in the stimulation of bone healing:



17

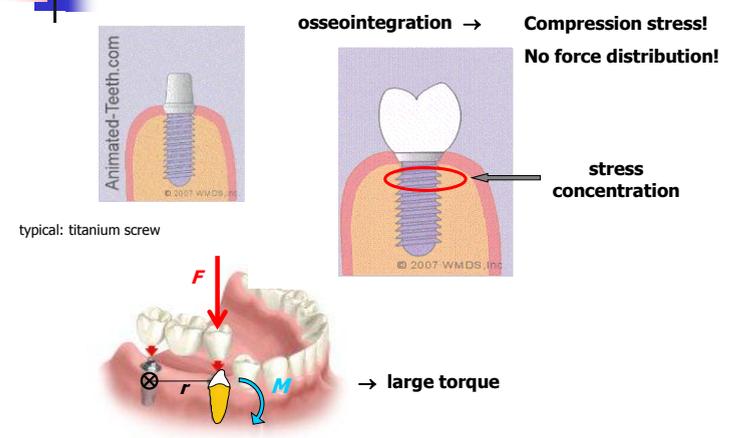


Torque of the masticatory forces



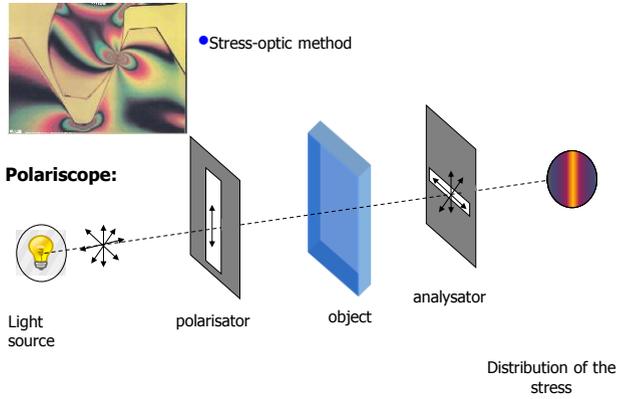
19

Force transmission of dental implant



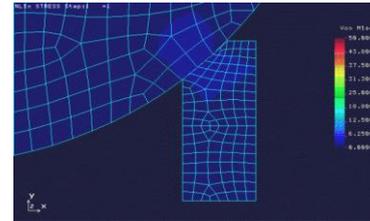
20

Physical testing methods in implantology



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Computer based method

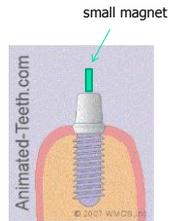


Calculation on a model.

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Stability test

- **Resonance Frequency Analysis (RFA)** is a method used to determine stability in dental implants.



magnetic pulses are applied to a small magnet and the resonance is analysed.

- **Periotest**

Electrically driven head percusses the implant and the response is monitored.



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