



# Biomaterials, Biological Materials & Regenerative Engineering Lab

Center for Biomedical Technology  
Universidad Politécnica de Madrid

# Research Lines

## RESEARCH

- Silk fibers & silk-based biomaterials
- Mechanics of Soft Tissues
- Cell Mechanics
- Bio-functionalization



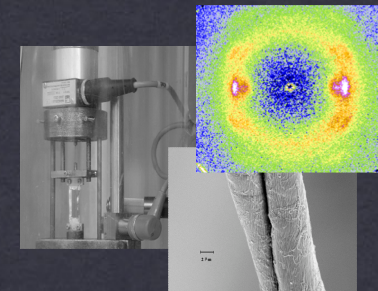
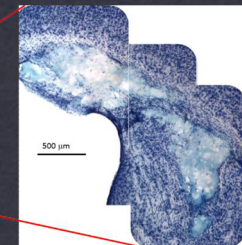
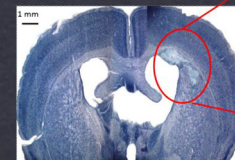
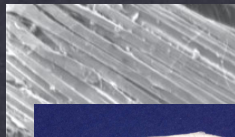
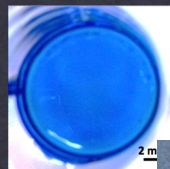
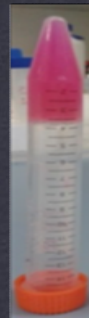
# Research Lines

## Silk fibers & silk-based biomaterials

### RESEARCH

- BASIC Res. : Microstructure/Composition  
: /Properties
- APPL. Res. : Scaffolds for T.E.  
(CTB D.González, M. Ramos)

- Fiber/thread
- Membrane
- Tube
- Film
- Gel

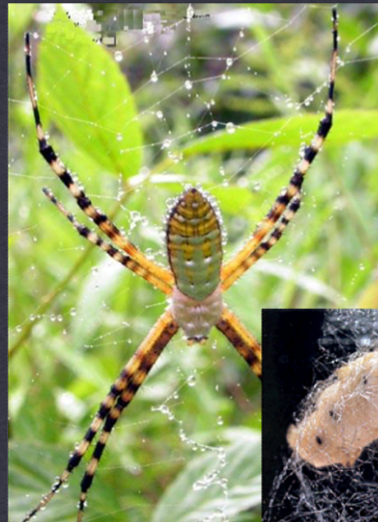




# Silk fibers & silk-based biomaterials

Research Lines

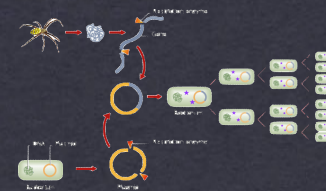
Native



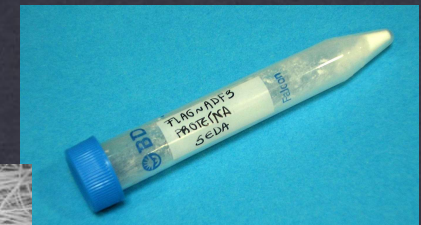
Regenerated



Fibers



Artificial





# Silk fibers & silk-based biomaterials

## Research Lines

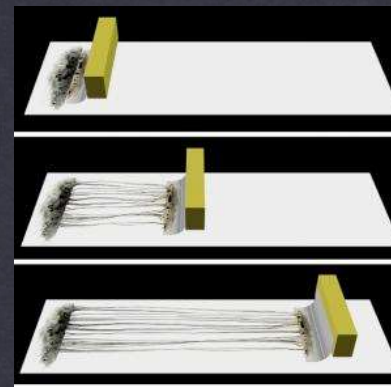
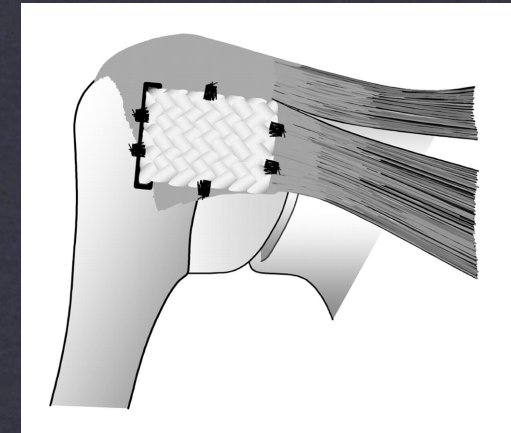
-Demanding Tissues

Tendons & Ligaments:

Strength at short times

Nerves:

Strong &  
Thin Guide



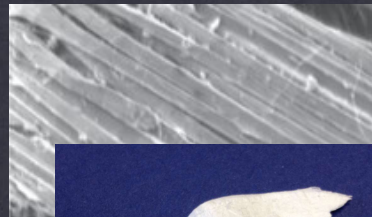


# Silk fibers & silk-based biomaterials

## - Scaffolds for Tissue Engineering

Research Lines

Threads



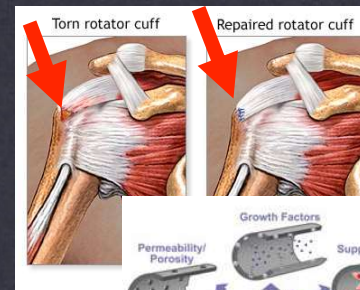
Mats



Tubes

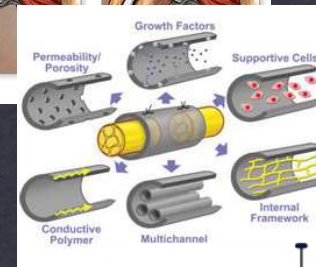


Foams, Films & Hydrogels

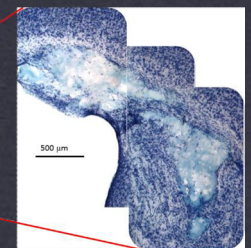


tendon

nerve



CNS

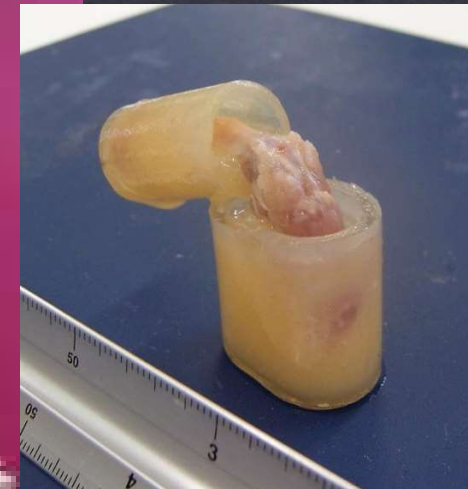
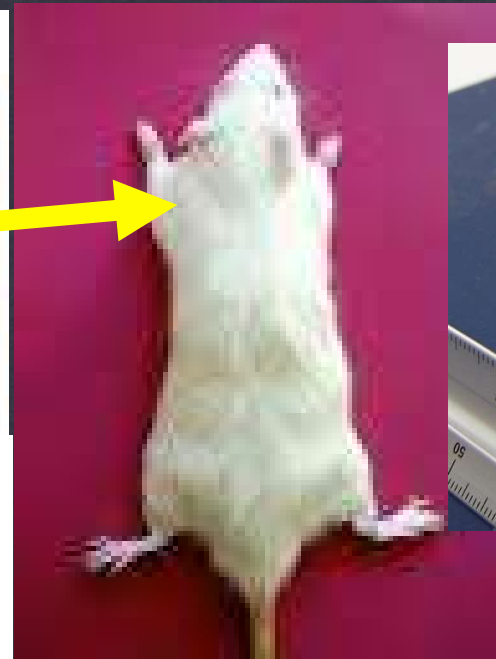
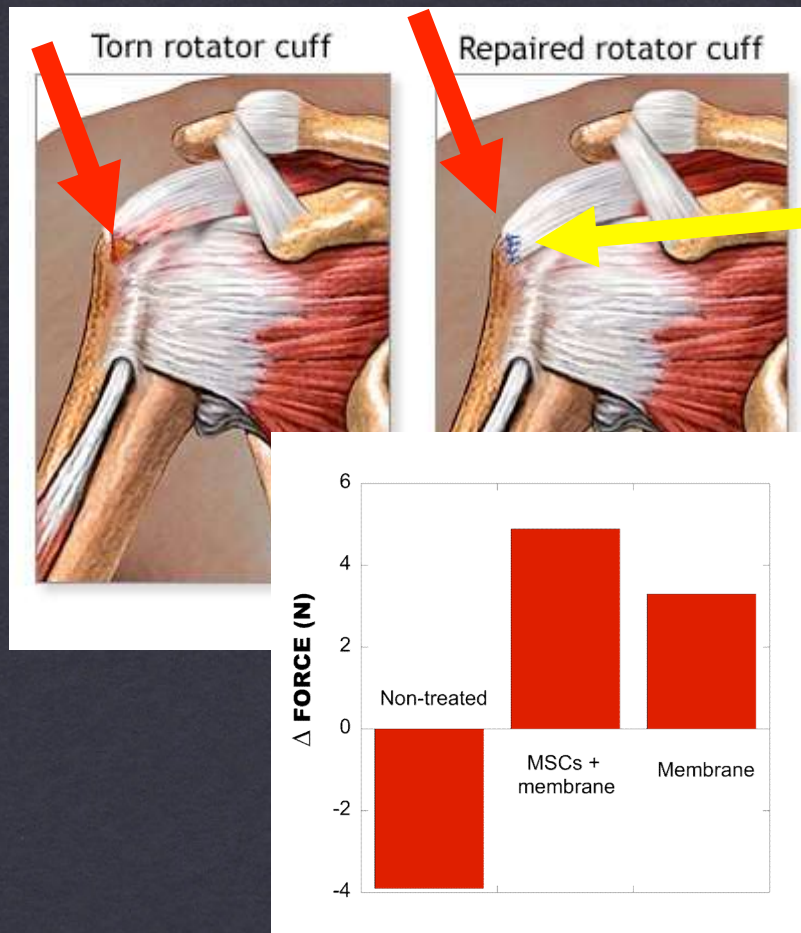




# Biol./Biom. Fibers

## - Tendon repair

RESEARCH



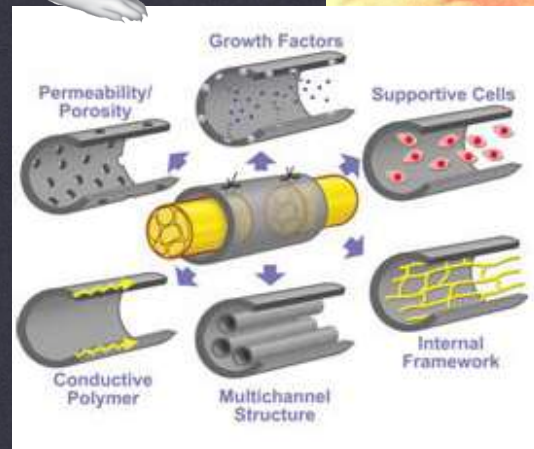
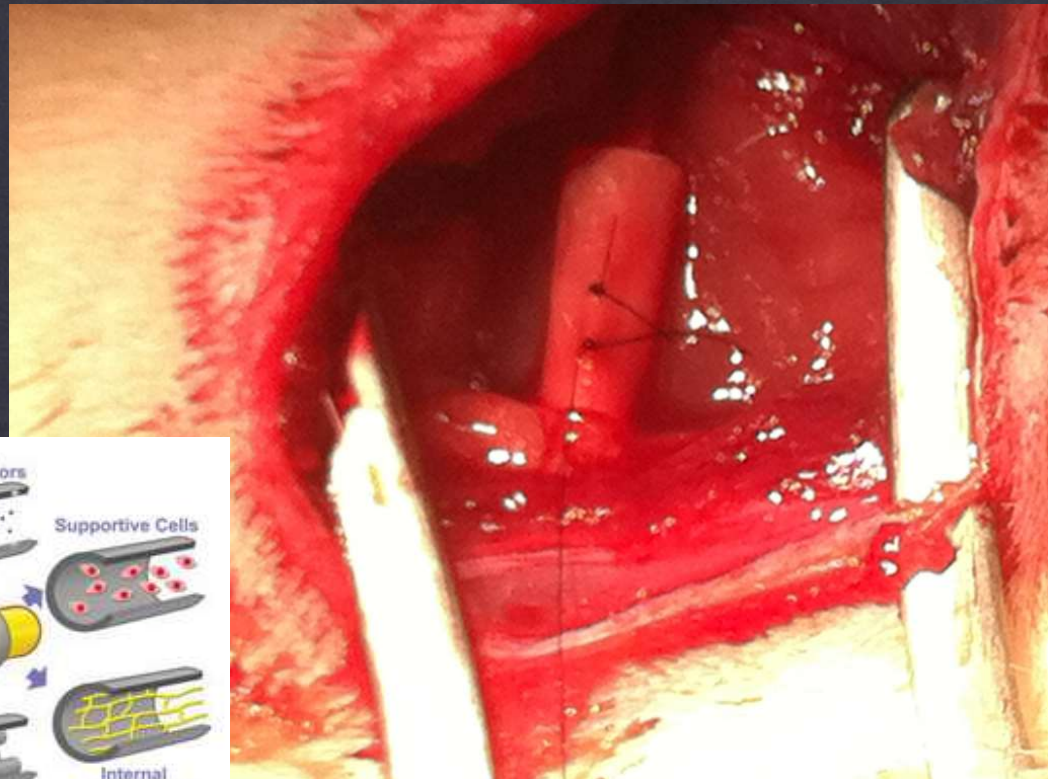
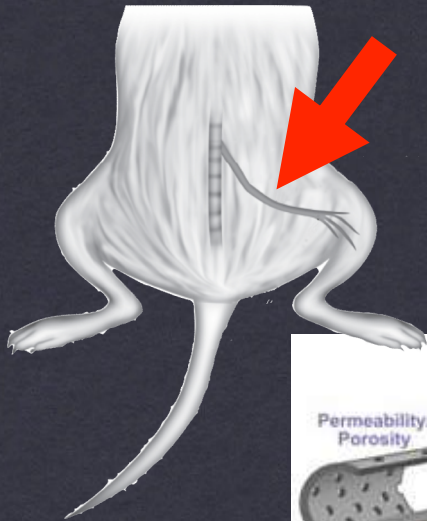
$$\Delta F = \text{Case} - \text{Control}$$



# Biol./Biom. Fibers

## - Peripheral Nerve repair

RESEARCH





# Research Lines

## Silk fibers & silk-based biomaterials

RESEARCH

### RESULTS :

- Tailoring mech. properties
- New spinning method ( straining-flow)
- New scaffolds for CNS

Injectable Bio-hybrids

In situ (retarded) gelation

Biodegradable



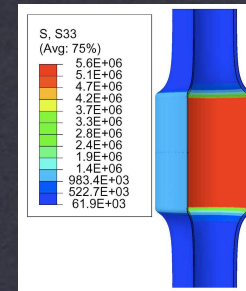
# Research Lines

## Mechanics of Soft Tissues

Collagen  
membranes  
Blood vessels  
Tendon & ligament

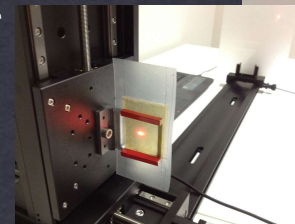
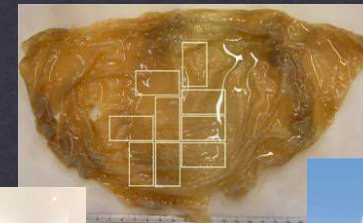
RESEARCH

- BASIC Res. : Microstructure/Composition  
/Properties



- APPL. Res. :

Non destructive assessment  
Durability

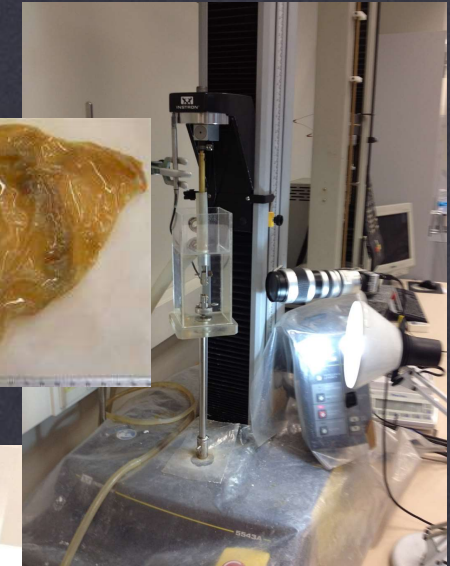
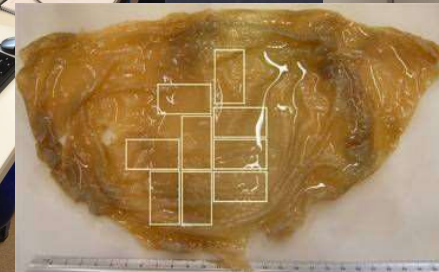
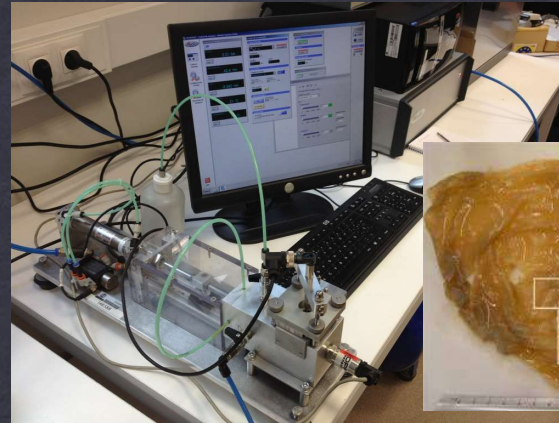




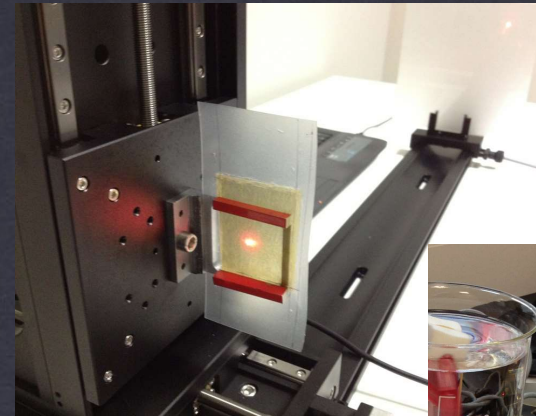
# Mechanics of Soft Tissues

## Research Lines

-Fatigue &  
Biaxial Tests



-Small Angle Light  
Scattering



-Biochem & Histology





# Research Lines

## Mechanics of Soft Tissues

### RESEARCH

#### RESULTS :

- Improved SALS technique
- Mechanical evaluation

Tendon repair treatments  
Arterial diseases & aging  
Collagen membranes

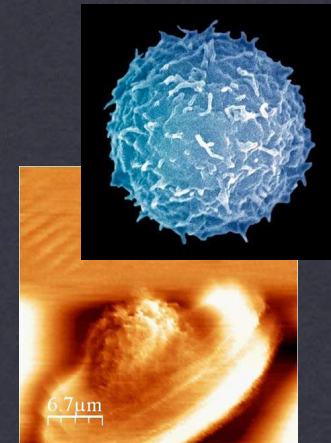
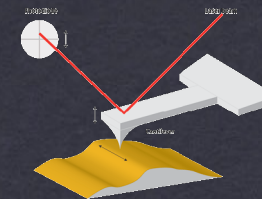
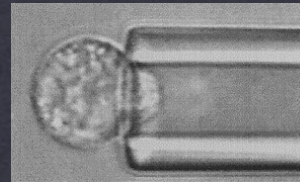


# Research Lines

## Cell Mechanics

### RESEARCH

- BASIC Res. : Microstructure/Composition  
/Properties



- APPL. Res. :  
Mechanical Biomarkers





# Cell Mechanics

## Age Mechanical Biomarker

Research Lines

Stiffness  
of Lymphocytes





# Research Lines

## Cell Mechanics

### RESEARCH

#### RESULTS :

- Improved micropipette-aspiration method
- Lymphocyte stiffness as age biomarker
- Mechanical evaluation

Lymphocytes

Cardiac stem cells

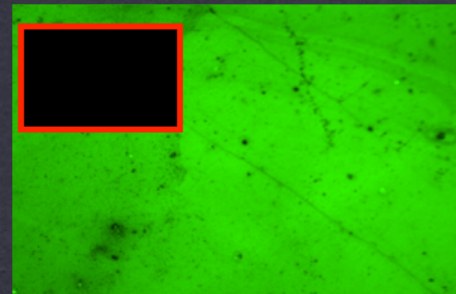


# Research Lines

## Bio-functionalization

RESEARCH

- APPL. Res. Development new Activated Vapour Silanization technique





# Research Lines

## Bio-functionalization

### RESEARCH

#### RESULTS :

- Activated Vapour Silanization (AVS) proprietary device
- Immobilization non-adherent cells for AFM
- Prosthesis biofunctionalization





# Contact:

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