Intelligente Materialien zur Unterstützung der Geweberegeneration

fmz
Funktionswerkstoffe der
Medizin und Zahnheilkunde

Muskuloskelettales
Centrum
Würzburg

Entwicklung der Biomaterialforschung

Grad der Geweberegeneration

klinisch genutzte
Materialien: Reparatur

Klassische
Biomaterialien

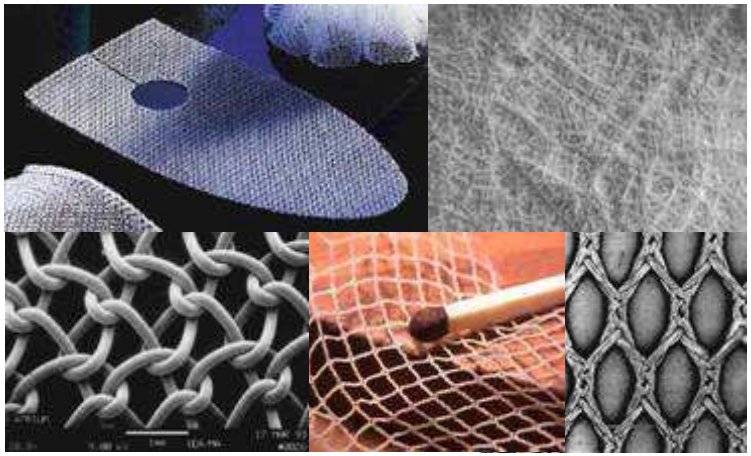
Grenzflächen-
optimierung

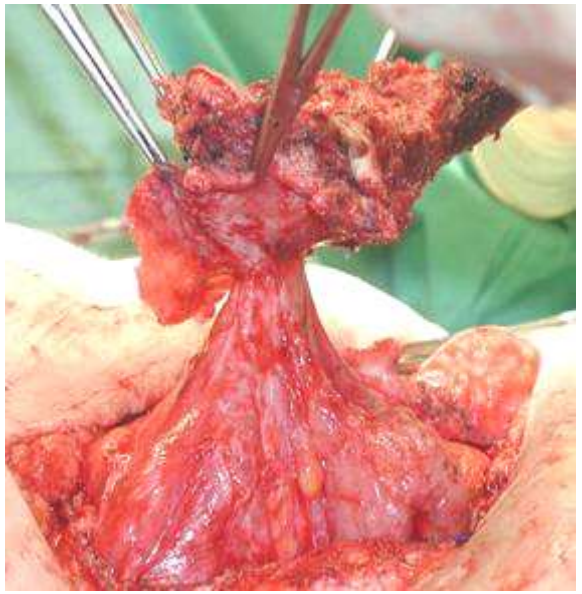
Bioaktivierung,
Abbaubarkeit

Strukturell

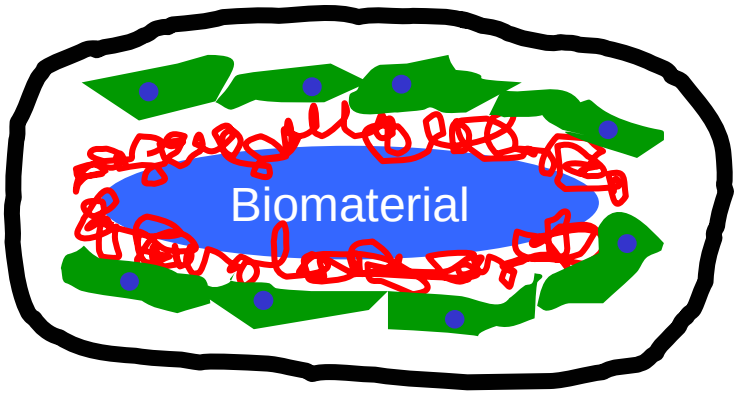
Funktional / Regenerativ

Biokompatibilität





K. Junge / G. Böhm, UK Aachen



Kollagen-Kapsel
Zellen
Proteine
Biomaterial

Regenerative Medizin

Hippokrates (ca. 460- ca. 370 v. Chr.):

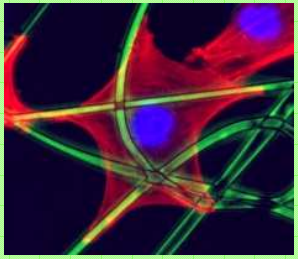
Nicht der Arzt heilt (die Krankheit),
sondern der Körper!

Die Regenerative Medizin verfolgt Ansätze, basierend auf Zellen und / oder Materialien, welche das endogene Regenerationspotential des Körpers aktivieren / stimulieren / unterstützen, um eine Regeneration funktionalen Gewebes zu erreichen.

Evolution der Biomaterialforschung

Grad der Geweberegeneration

Regenerative Medizin



Integration von (autologen) Zellen

Biomimetisches 3D-Design

Bioaktivierung, Abbaubarkeit

Regeneration

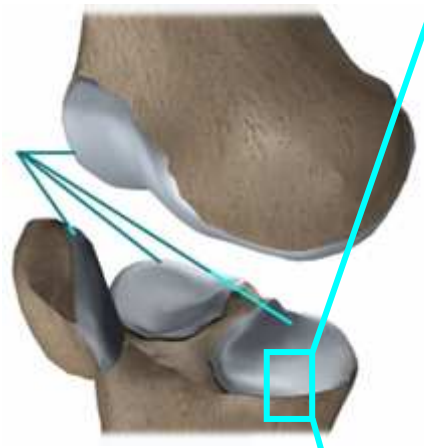
Grenzflächen-optimierung

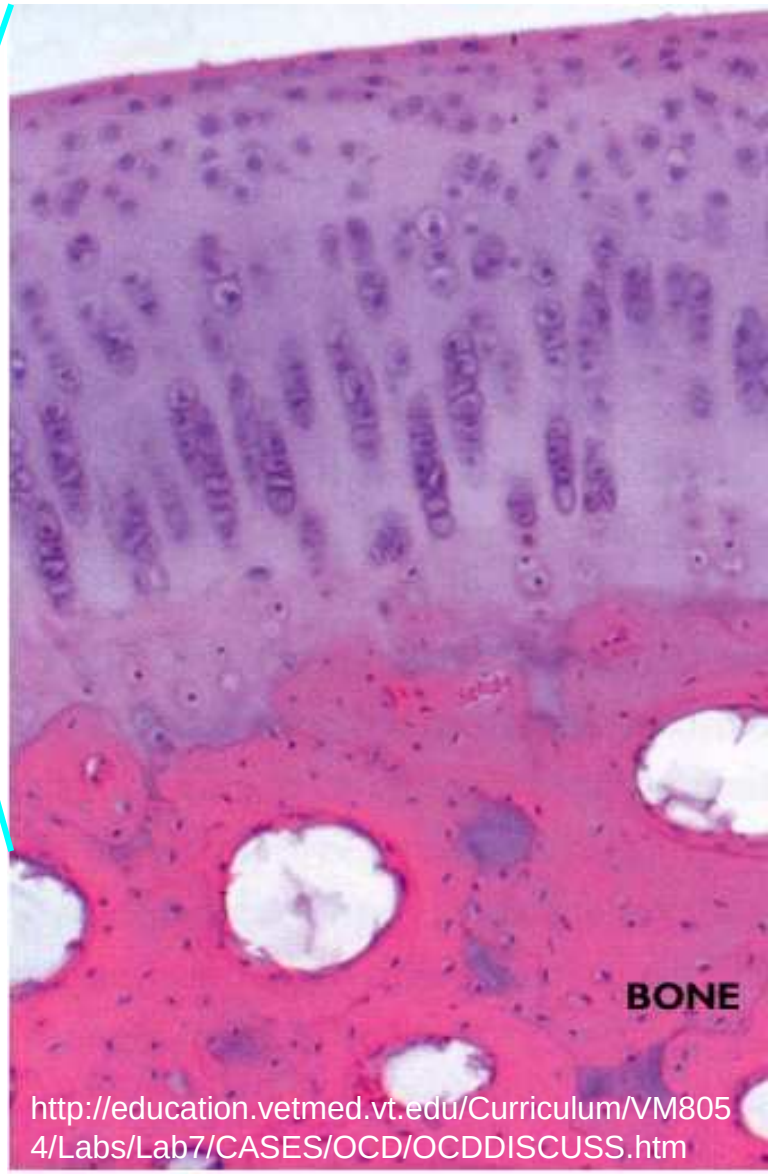
Klassische Biomaterialien

Strukturell

Funktional / Regenerativ

Klinisches Problem: Knorpel





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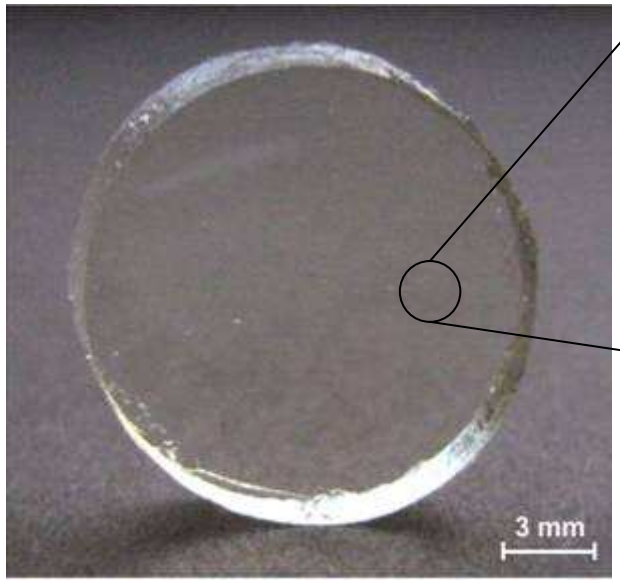
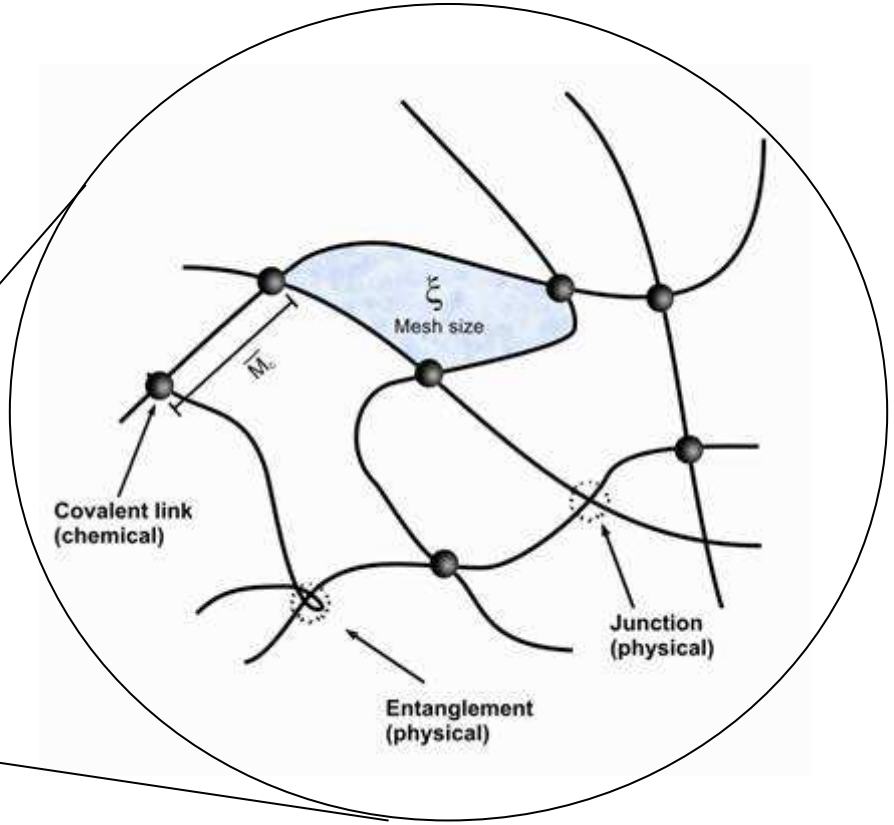
Knorpel:

Zellen + Matrix

Matrix = Hydrogel

Was sind Hydrogele?

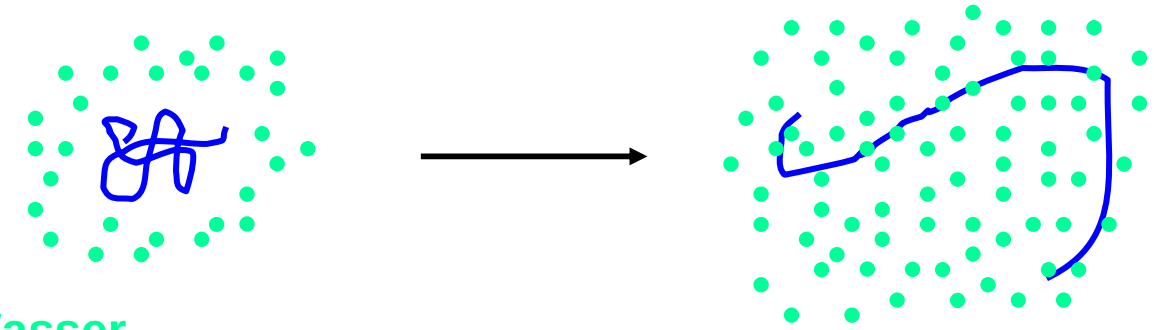




Hydrogel im Alltag

Wieso quellen Hydrogele?

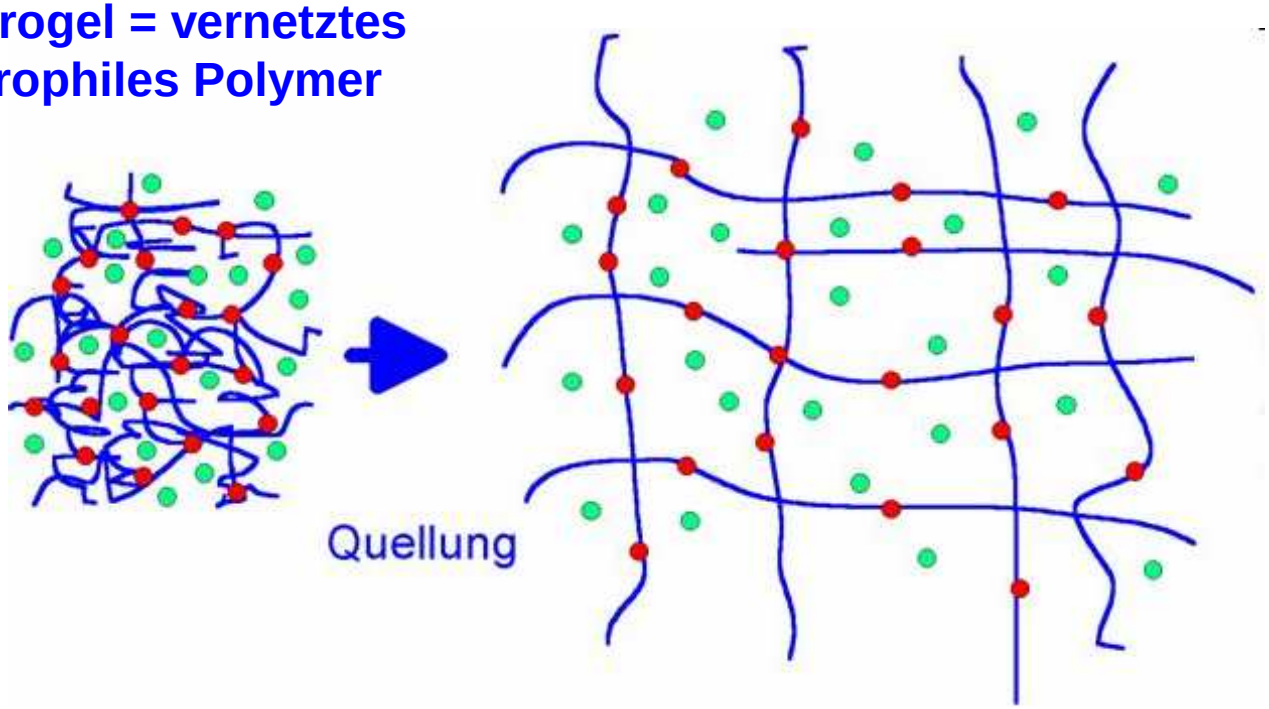
hydrophiles Polymer



Wasser

Lösung

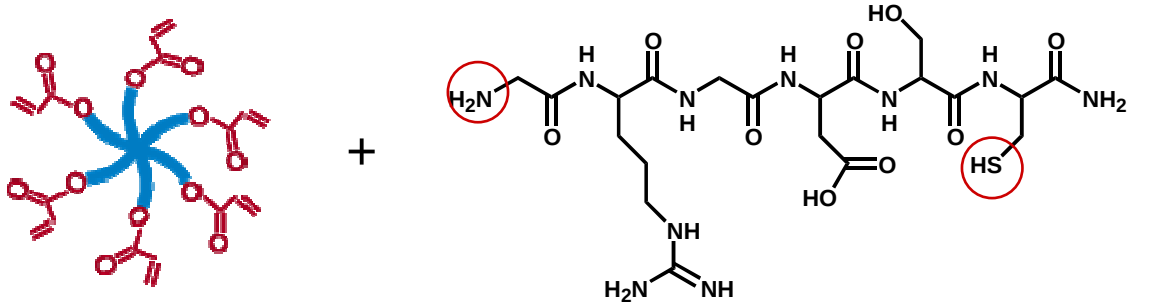
Hydrogel = vernetztes hydrophiles Polymer

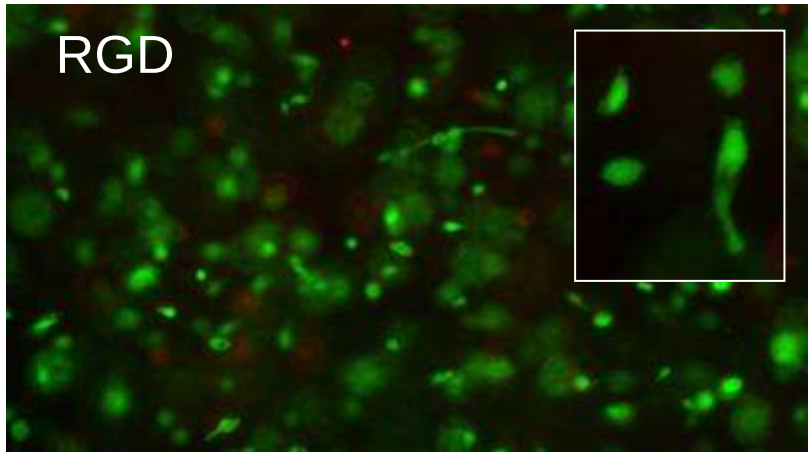


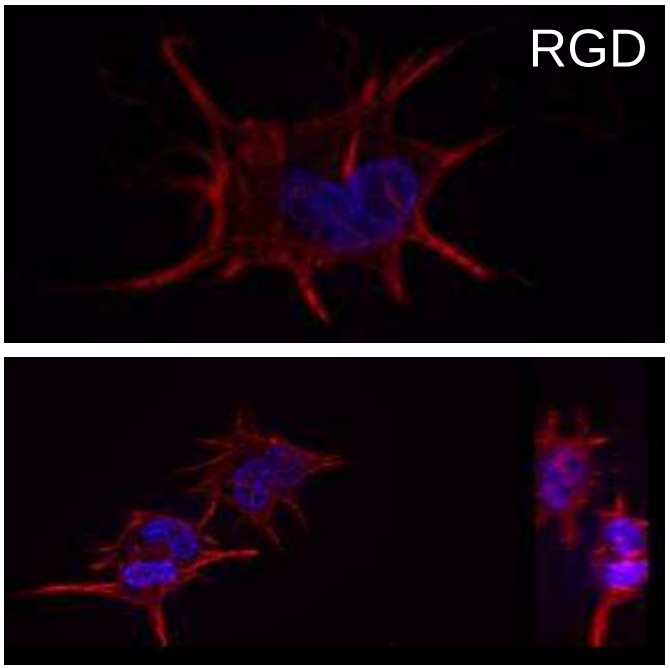
gequollenes aber festes Gel

Zellverkapselung

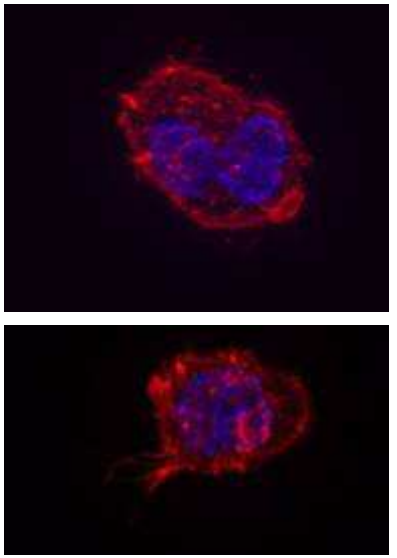
Thiolated HyA + Acr-sP(EO-stat-PO), GRGDSC or GRGESC modified



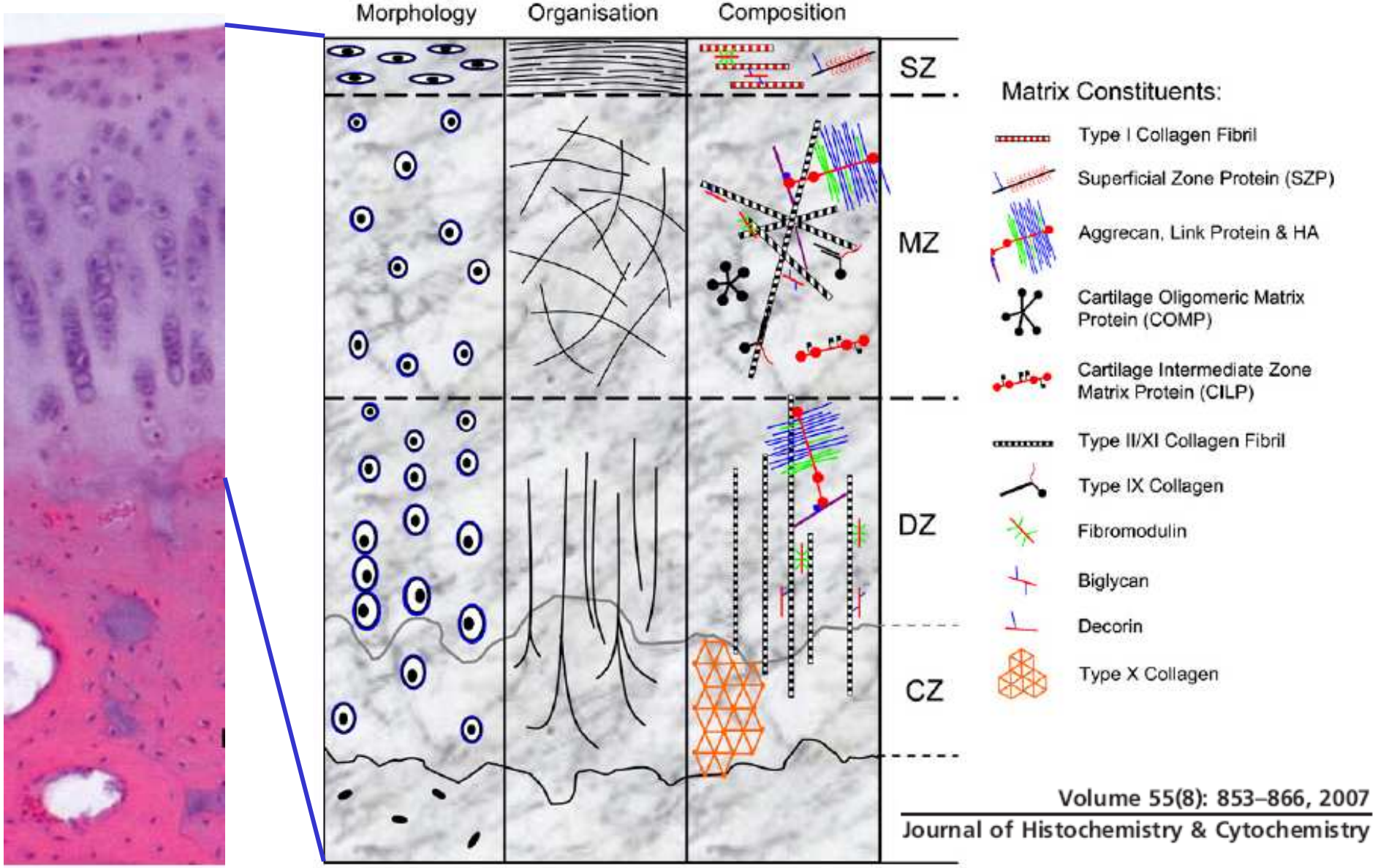




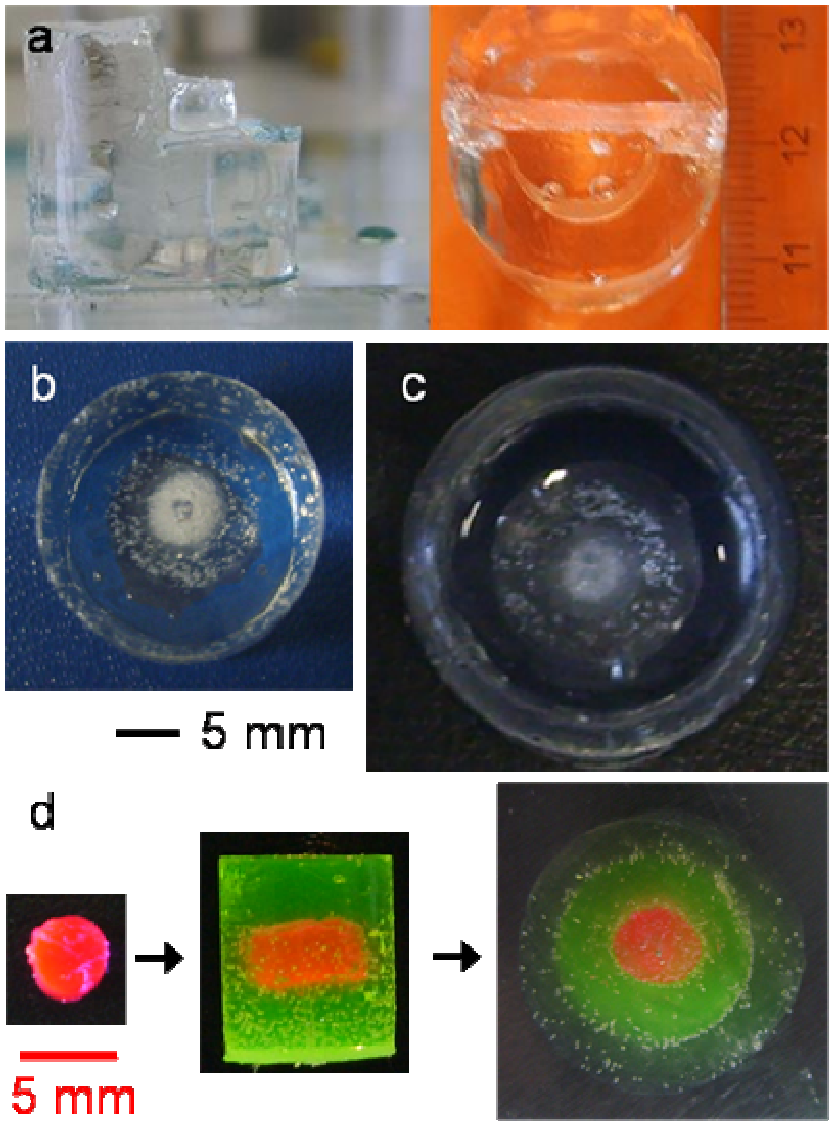
RGE

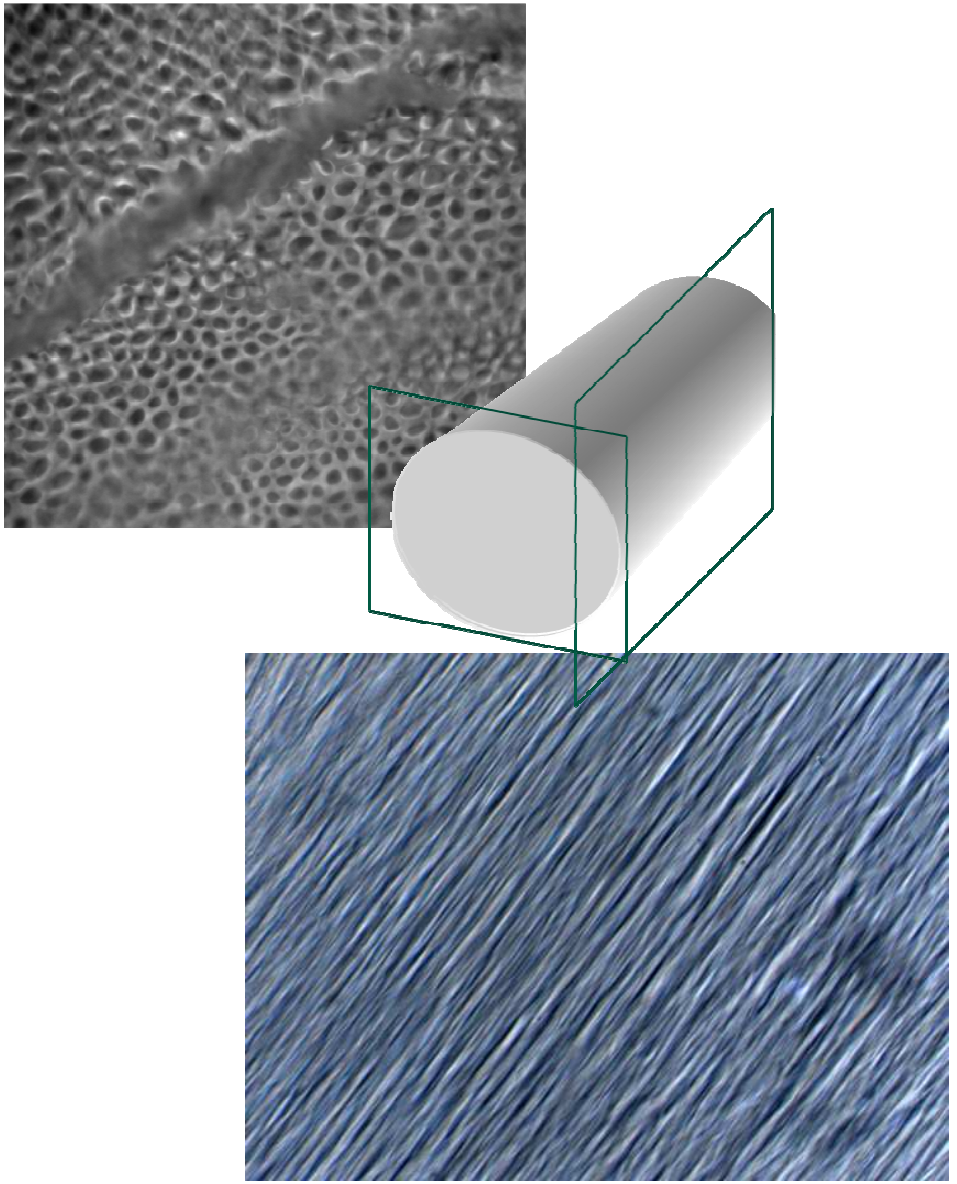


Knorpel ist heterogen / hierarchisch

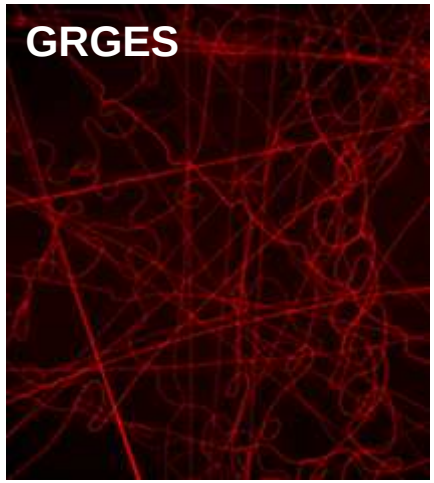


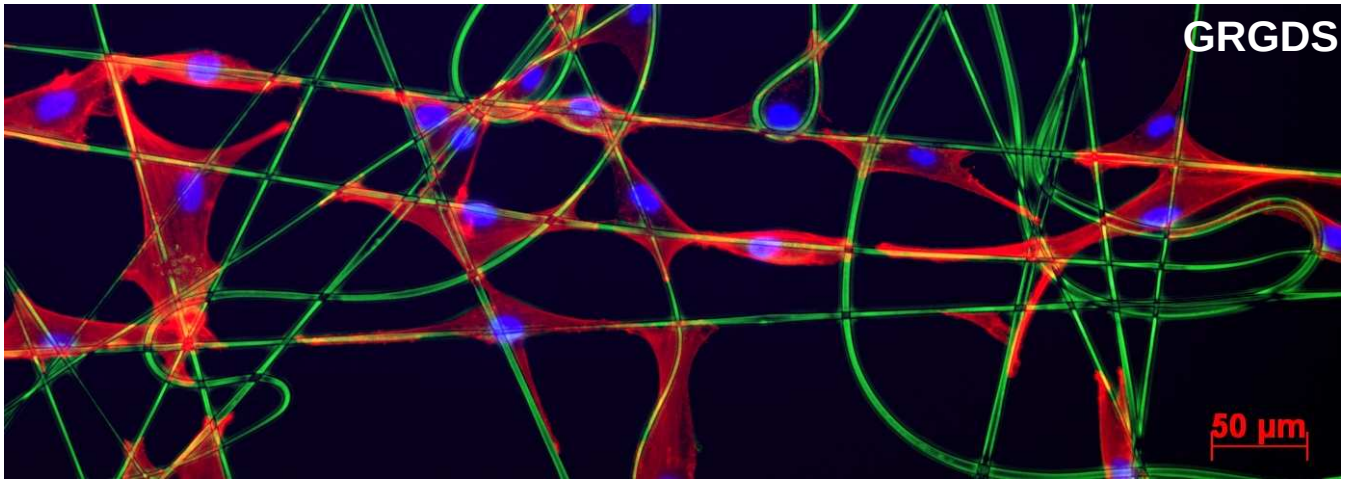
Hierarchische Hydrogele

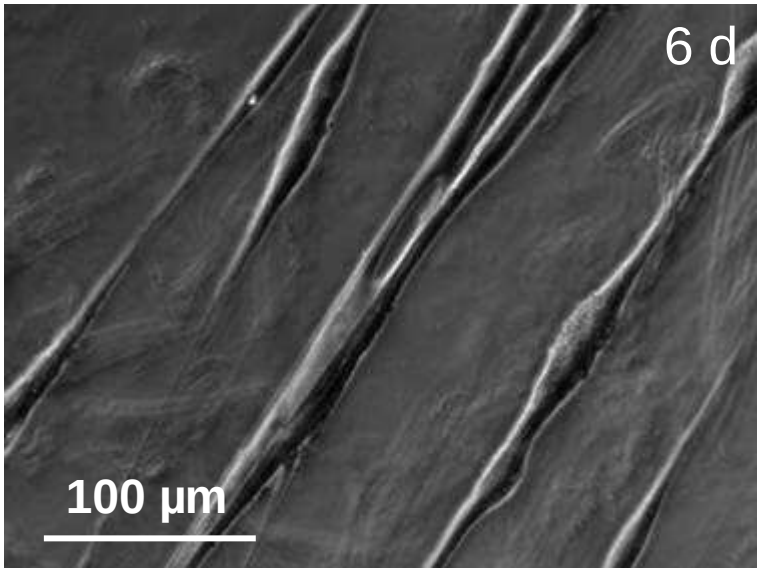


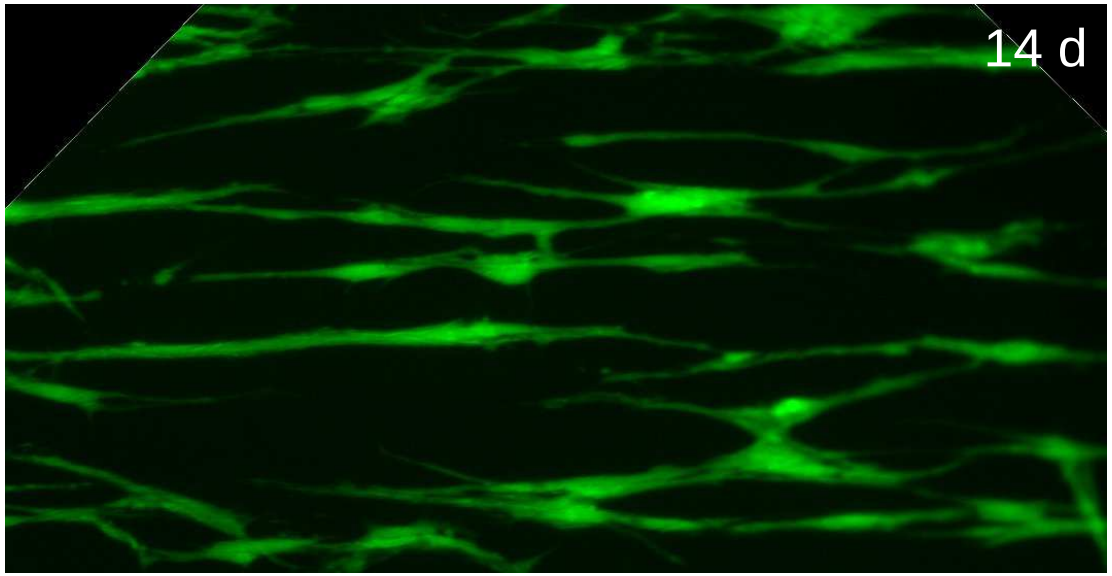


Hydrogel-Faser Komposite

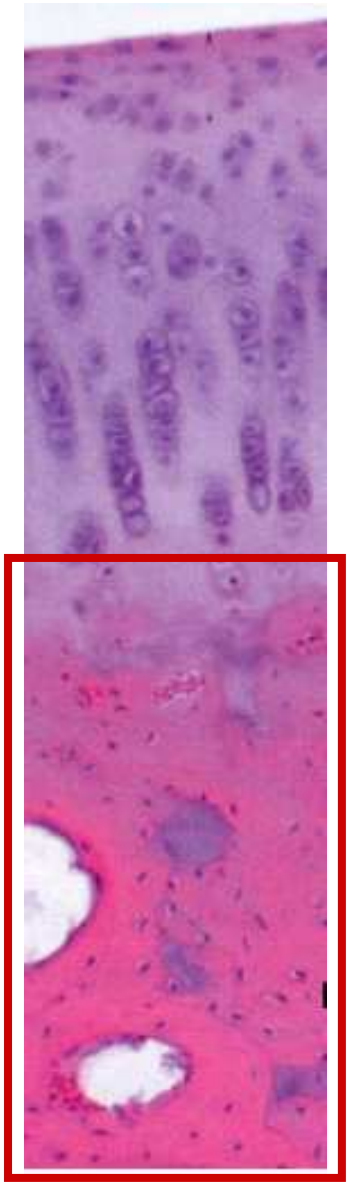


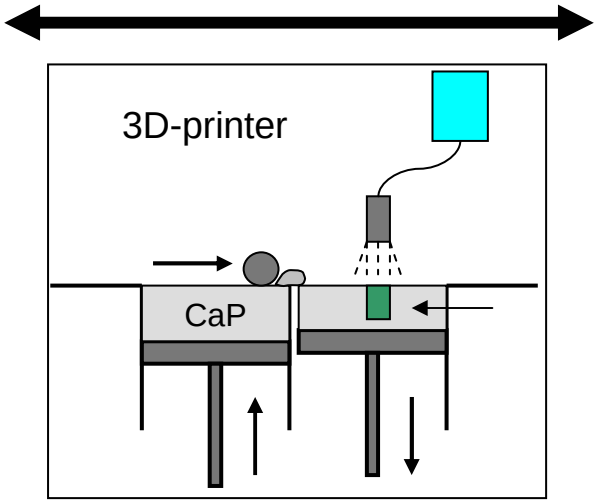






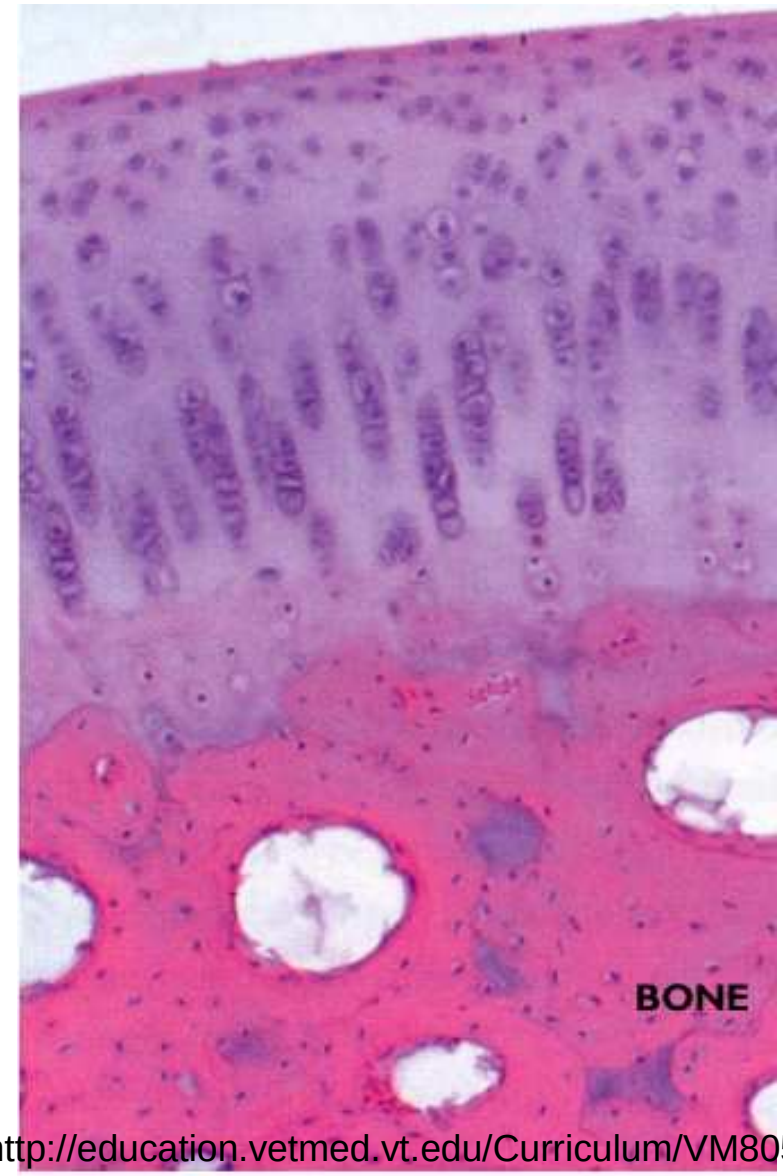
Patientenspezifischer Knochenersatz

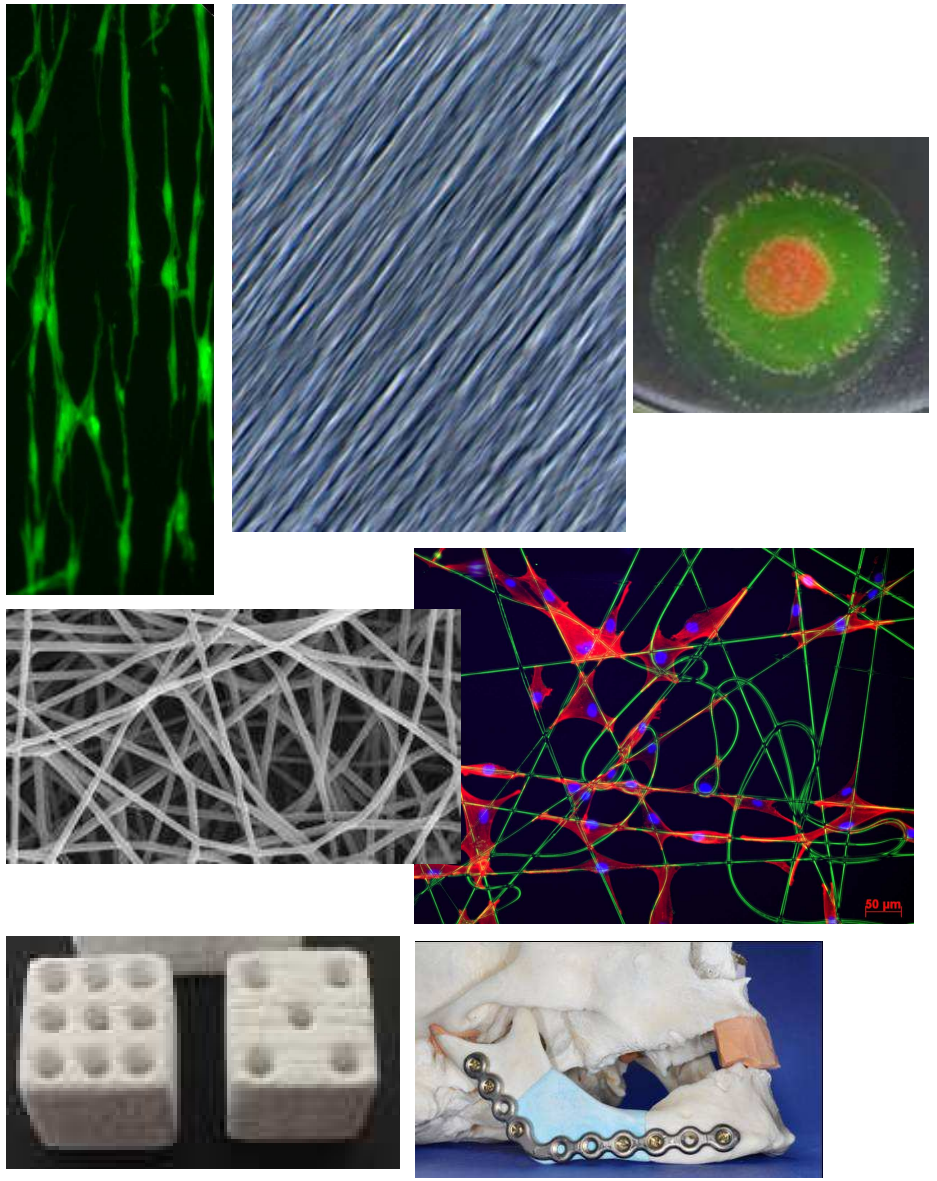




$Ca_3(PO_4)_2 + H_3PO_4 + 6H_2O \longrightarrow 3\ CaHPO_4 \times 2H_2O$

Hierarchische Biomaterialien





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