3D printing of titanium alloys for biomedical and robotic applications

M. de Wild

University of Applied Sciences Northwestern Switzerland
School of Life Sciences
Institute for Medical Engineering and Medical Informatics IM^2
CH-4132 Muttenz

michael.dewild@fhnw.ch

Zahlen 2017

→ Zahlen und Grafiken im Detail:
www.fhnw.ch/jahresbericht2017

12 230
Studierende

84 % Bachelor
16 % Master

50 % weiblich
50 % männlich

2873
Mitarbeitende

2064
Stellen

530 Professorinnen
und Professoren

55 % Männer
45 % Frauen

Herkunft der Studierenden

Kanton Aargau	Kanton Basel-Landschaft	Kanton Basel-Stadt	Kanton Solothurn
27 %	17 %	11 %	11 %

Übrige Schweiz	Ausland
25 %	9 %

Studierende & Mitarbeitende an den Standorten

3587
816
Basel-Stadt

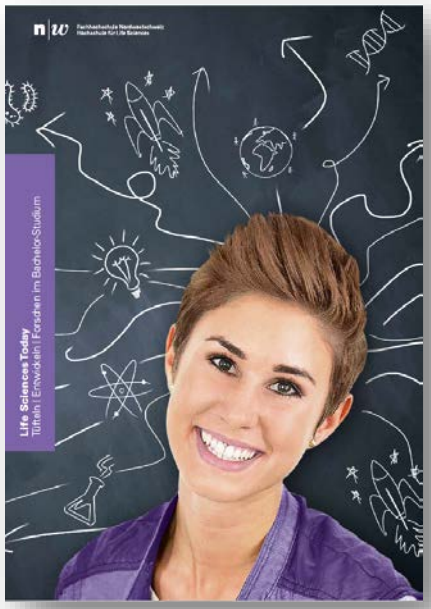
1762
467
Basel-Landschaft

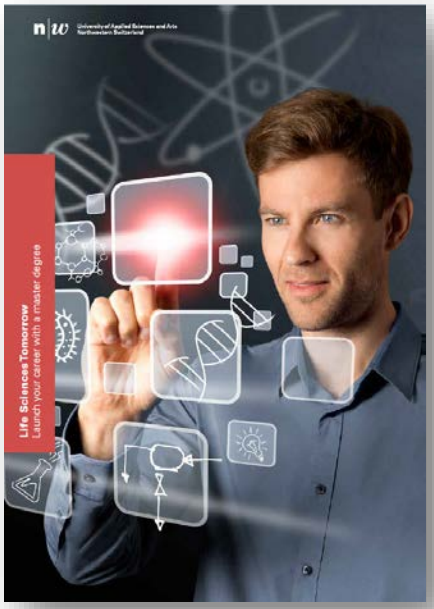
3711
998
Aargau

3170
592
Solothurn

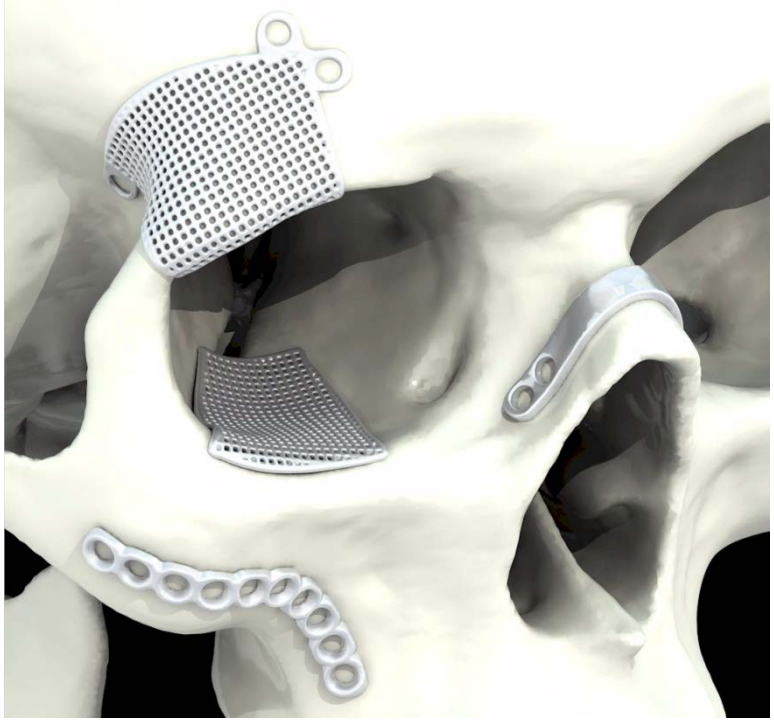
University of Applied Sciences and Arts Northwestern Switzerland
School of Life Sciences

University of Applied Sciences Northwestern Switzerland
School of Life Sciences





Open-porous shape memory implants for temporary or permanent bone replacement



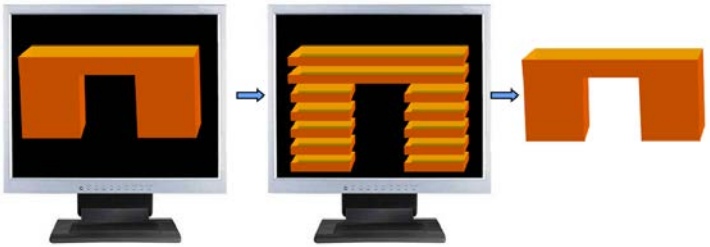
virtual representation

physical representation

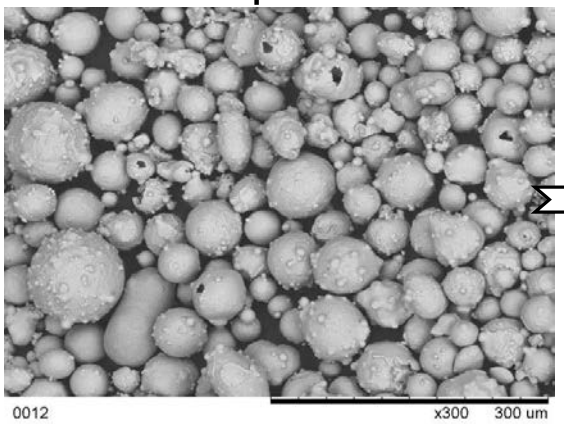
R. Schumacher, M. de Wild, S. Fabbri, A. Yildiz, E. Schkommodau, *Rapid Manufacturing of Individualized Ti-6Al-4V Bone Implants*, European Cells and Materials Vol. 17/22, 1 (2009).

R. Schumacher, M. de Wild, E. Schkommodau, D. Hradetzky, *Massgeschneiderte Knochenimplantate aus dem 3D-Drucker*, BaZ-Sonderbeilage "Life Sciences" vom 12. Mai (2012).

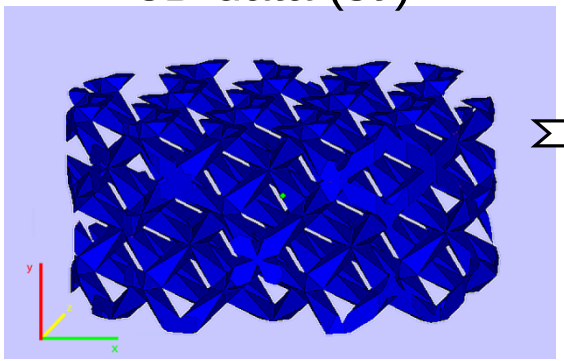
Fabrication of NiTi samples by selective laser melting



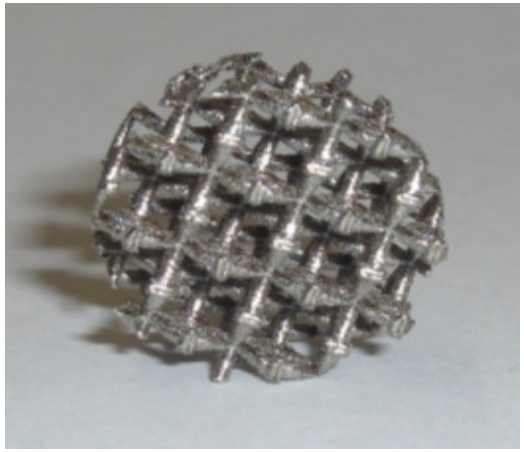
NiTi powder



3D data (stl)



Post processing if necessary (e.g. heat treatment, etching)



Processing parameters

Bormann T. *et al.*, eCells Mater 20 (Suppl 1): 13, 2010.

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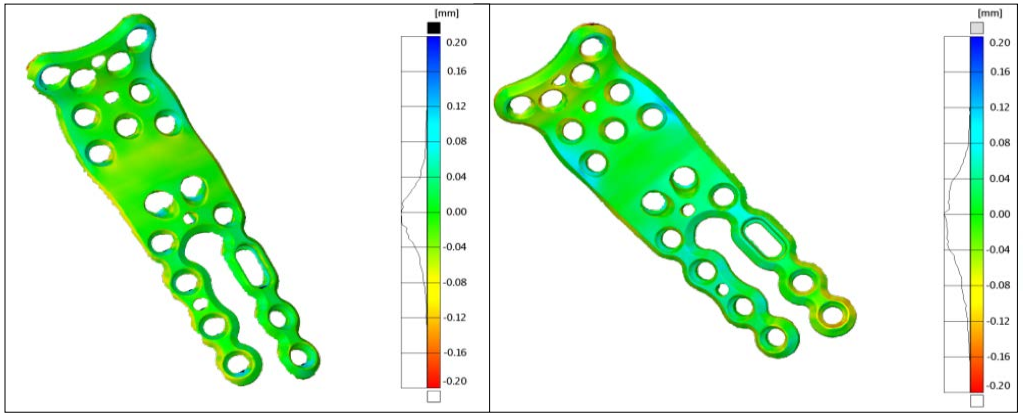
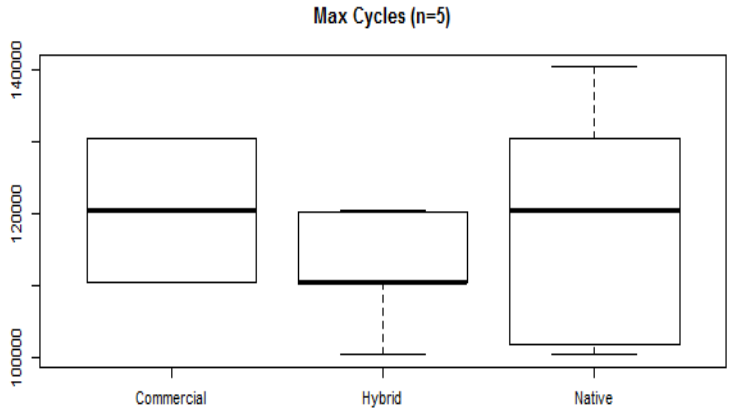
Individualized implants for temporary or permanent bone replacement

Left: Medartis® wrist fusion plate spanning the radio-carpal and mid-carpal joint. Right: SLM replica.



Geometrical accuracy check. Left: before heat treatment. Right: after heat treatment.



Fatigue test: Comparison between commercially machined plates and SLM plates.

medartis®

R. Schumacher, P. Lamprecht, S. Zimmermann, M. de Wild, A. Spiegel,
Comparison of SLM and conventionally produced implants using dynamic biomechanical loading, RapidTech Erfurt, 2013.

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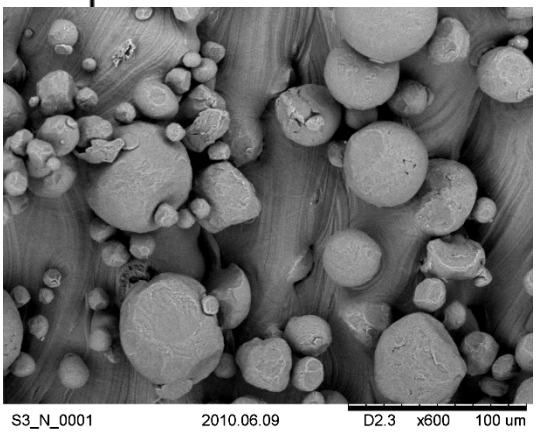
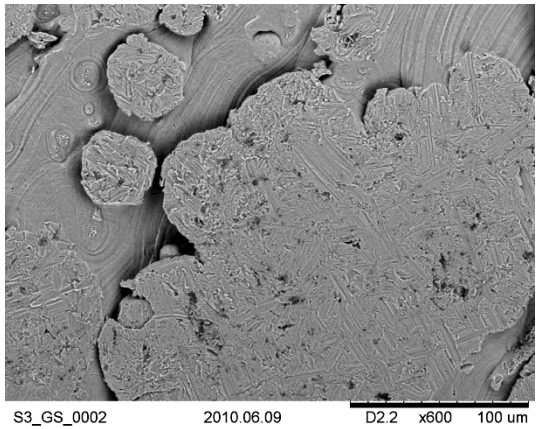
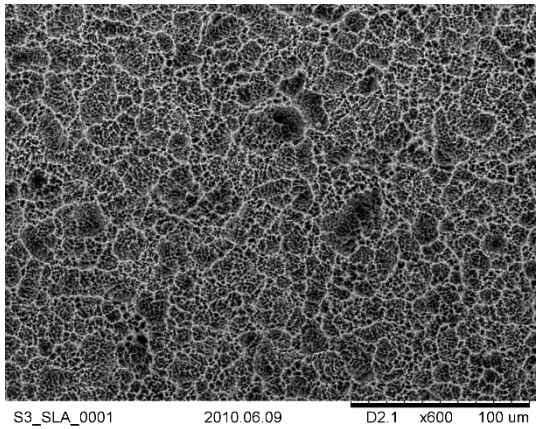
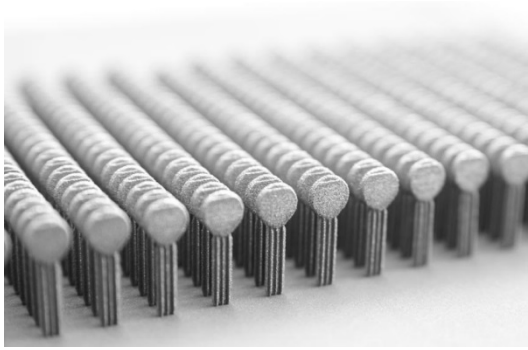
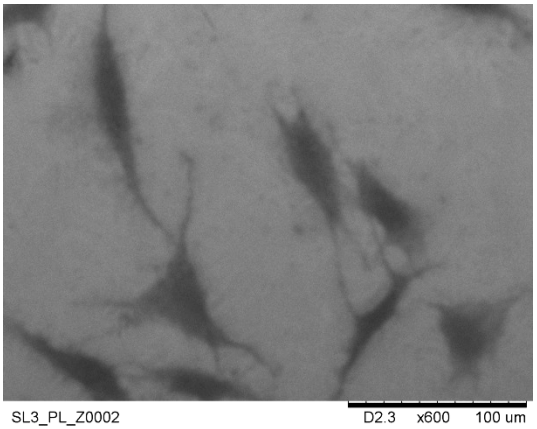
Cytocompatibility

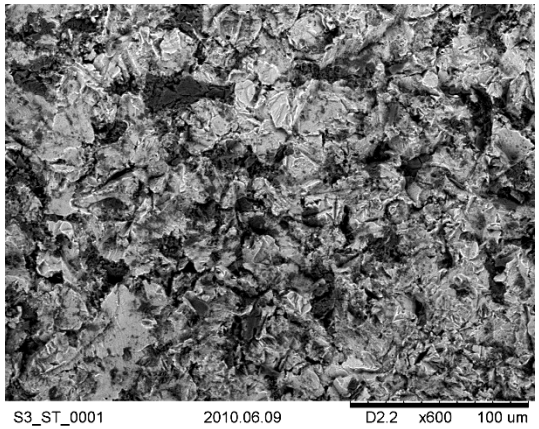


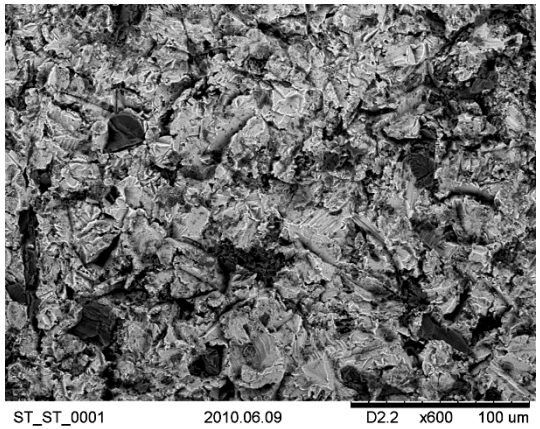


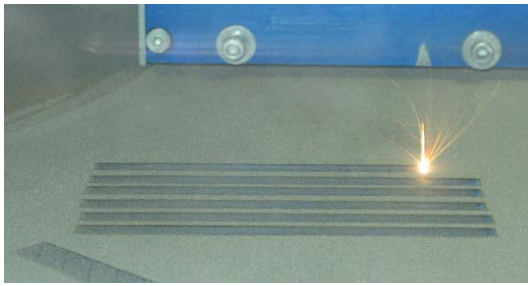


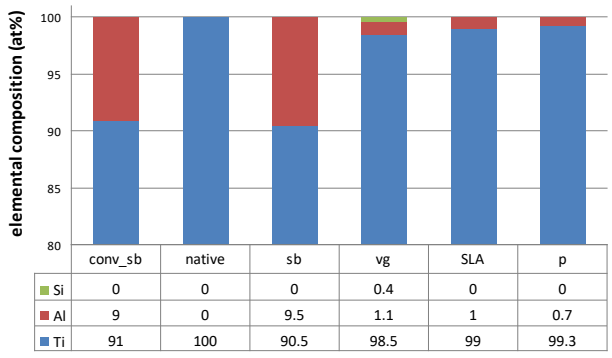






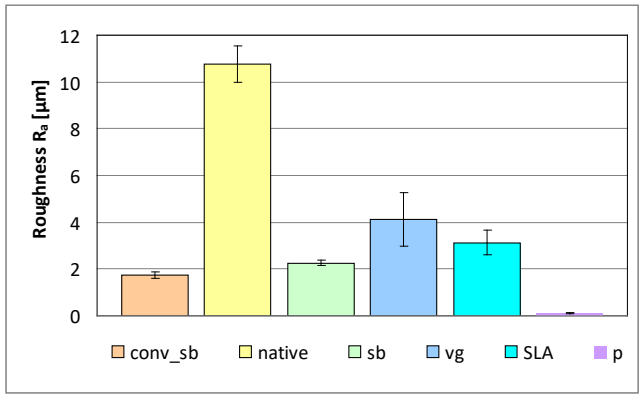




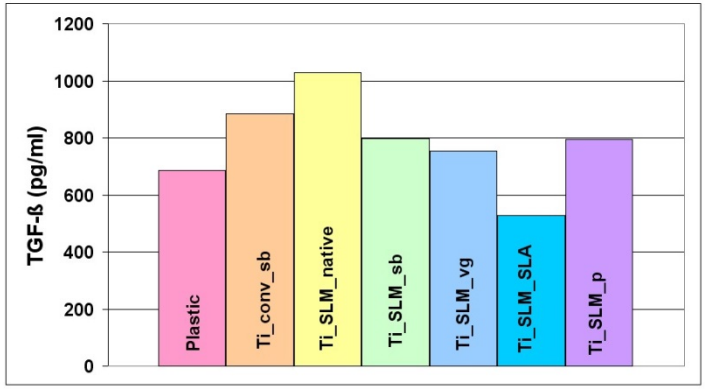


	conv_sb	native	sb	vg	SLA	p
Si	0	0	0	0.4	0	0
Al	9	0	9.5	1.1	1	0.7
Ti	91	100	90.5	98.5	99	99.3

EDX elemental analysis.



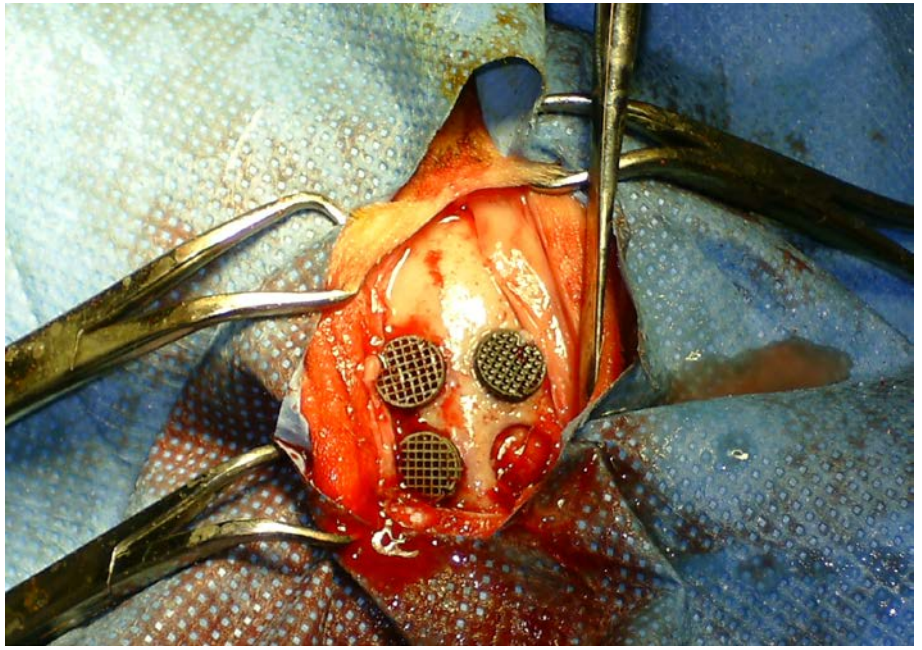
Roughness analysis.



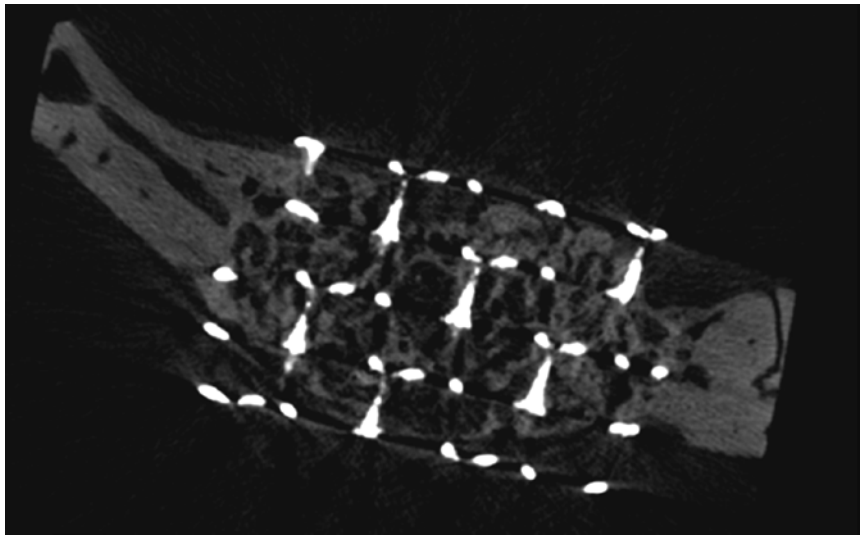
TGF-β expression of MG63 cells on different surface topographies after 14 days.

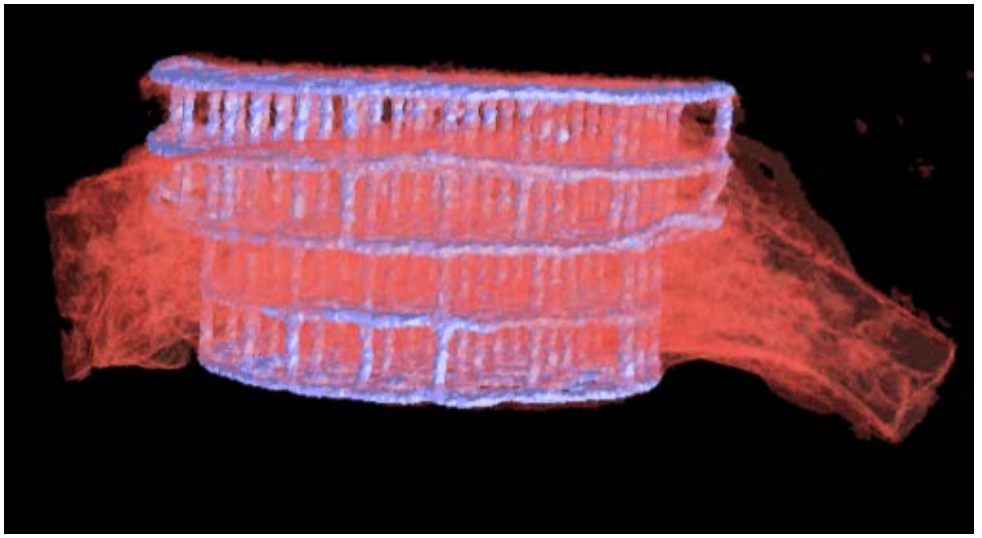
M. de Wild, et al, *Surface Modification and In-vitro Investigation of Generatively Produced Implants*, Biomaterialien, 11, 157 (2010).

Titanium



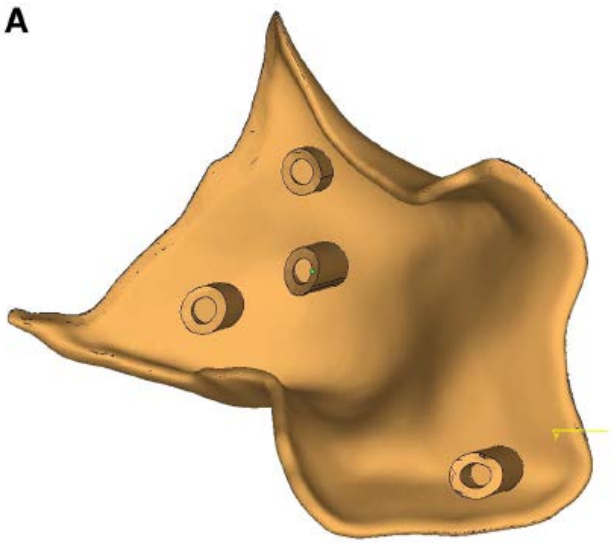
porous cpTi implants

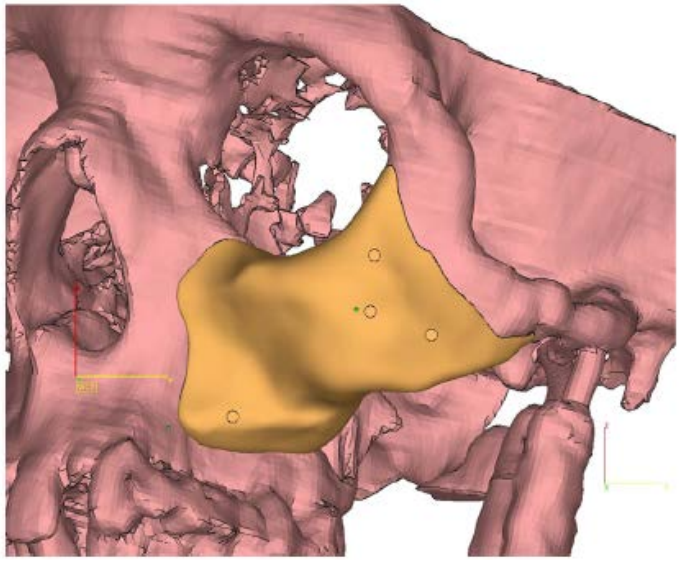




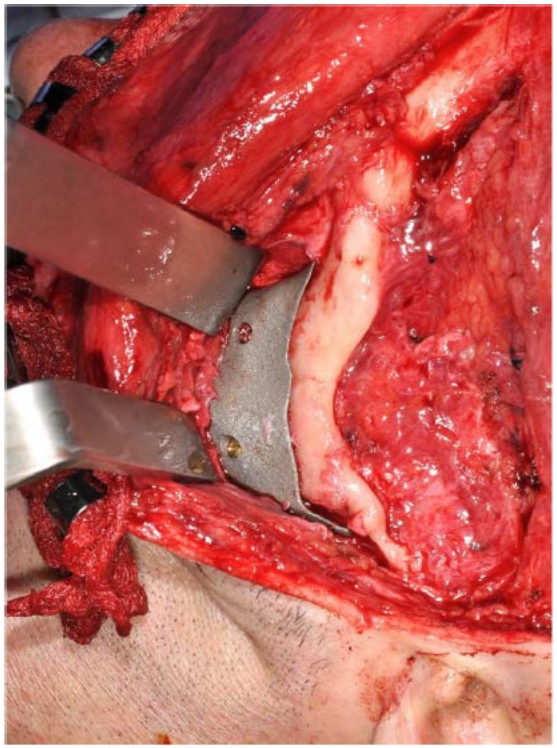
M. de Wild, R. Schumacher, K. Mayer, E. Schkommodau, D. Thoma, M. Bredell, A. Kruse, K.W. Grätz, F.E. Weber, *Bone regeneration by the osteoconductivity of porous titanium implants manufactured by selective laser melting: A histological and µCT study in the rabbit*, Tissue Engineering Part A, 19(23-24):2645-54 (2013).

trauma event during which the bone segments were lost





The virtual zygoma implant. (A) Internal side with fixation rods. (B) Position on the skull.



Intraoperative placement and fixation of the implant using 2.0-mm titanium lag-screws(arrows).

Postoperative axial CT scan showing the restoration of the symmetry of the zygomatic bone.

Rotaru et al., *Selective laser melted titanium implants: a new technique for the reconstruction of extensive zygomatic complex defects*, Maxillofacial Plastic and Reconstructive Surgery (2015) 37:1

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Medartis kauft Mimedis

Fr 07.07.2017 - 11:00 Uhr | Aktualisiert 07.07.2017 - 11:00
von Tamara Schüle

Medartis hat das Start-up Mimedis aufgekauft. Beide Hersteller von medizinischen Produkten haben ihren Hauptsitz in Basel.

Basel

Medizintechnik-Spinoff Mimedis an Medartis verkauft

06.07.2017 09:31 Mario Brunner

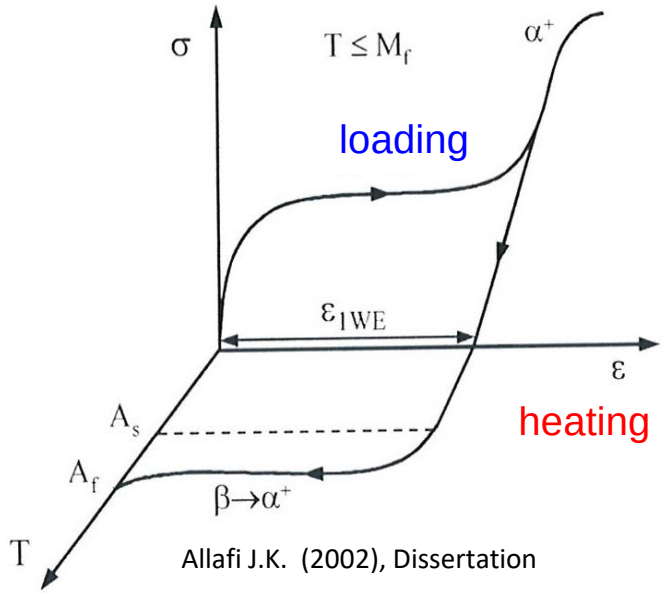
Das Basler Medizintechnik-Jungunternehmen Mimedis ist an den Implantat-Spezialisten Medartis verkauft worden. Das Fachhochschul-Spin-off Mimedis hat eine neue Technologie mit 3D-Druckern entwickelt, die exakte individuelle Implantate schnell verfügbar macht.

netzwoche

telebasel

The shape memory effect

http://www.tradekorea.com/products/spinal_implant.html



Allafi J.K. (2002), Dissertation

SLM fabricated sample

Elongated sample

Sample after heating

Therese Bormann, et al., *Determination of strain fields in porous shape memory alloys using micro computed tomography*, Proc. of SPIE Vol. 7804 78041M-1-9 (2010).

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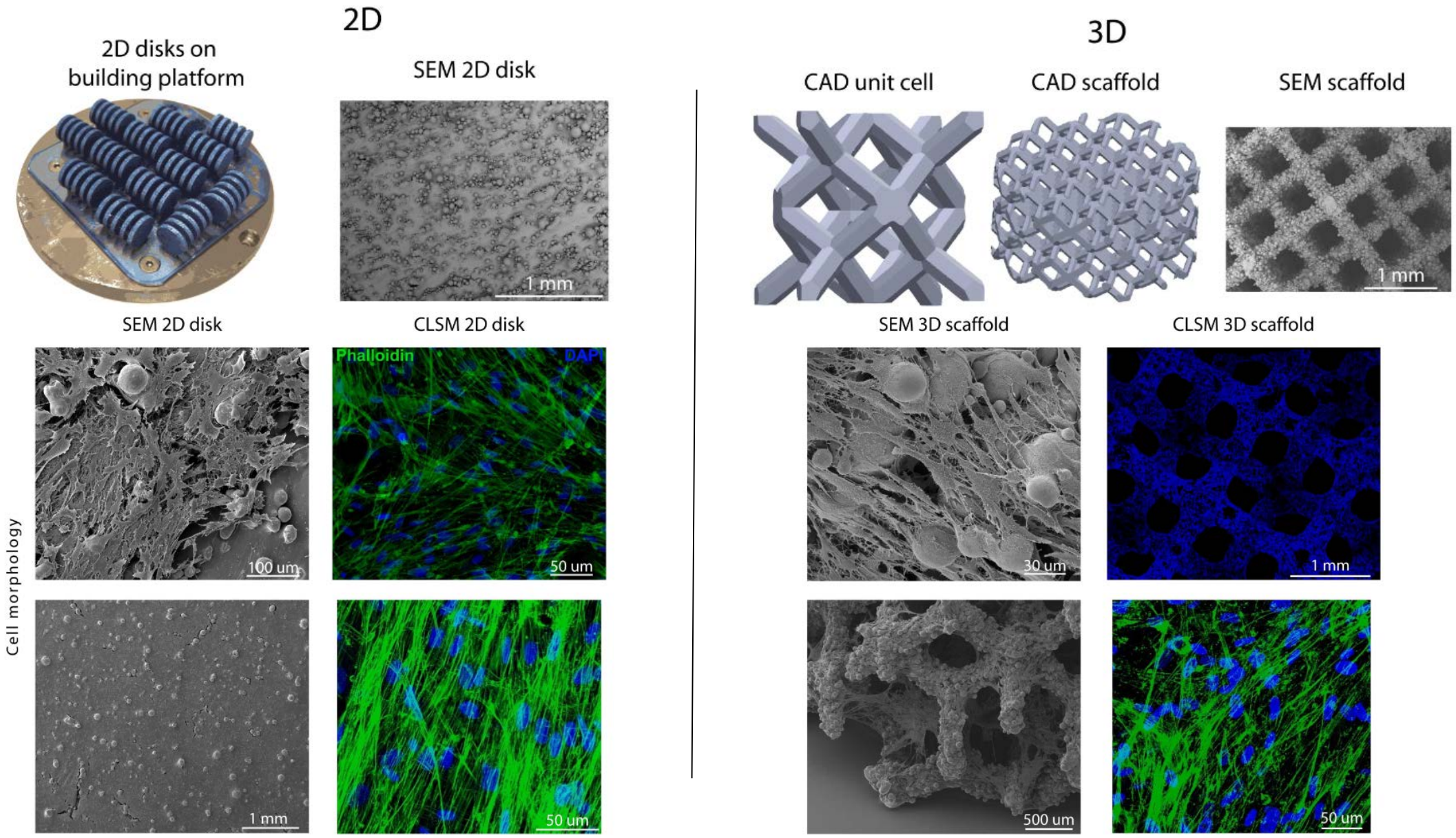
Smart NiTi constructs for 3D cell culture applications



W. Hoffmann, et al., *The interplay between NiTi-SMA and human bone marrow-derived mesenchymal stromal cell*, Proceeding p. 46-47 of the 4th International Symposium Interface Biology of Implants IBI, 9.-11. May 2012, Warnemünde/Rostock (Germany).

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES STRASBOURG

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UMM UNIVERSITÄTSMEDIZIN MANNHEIM

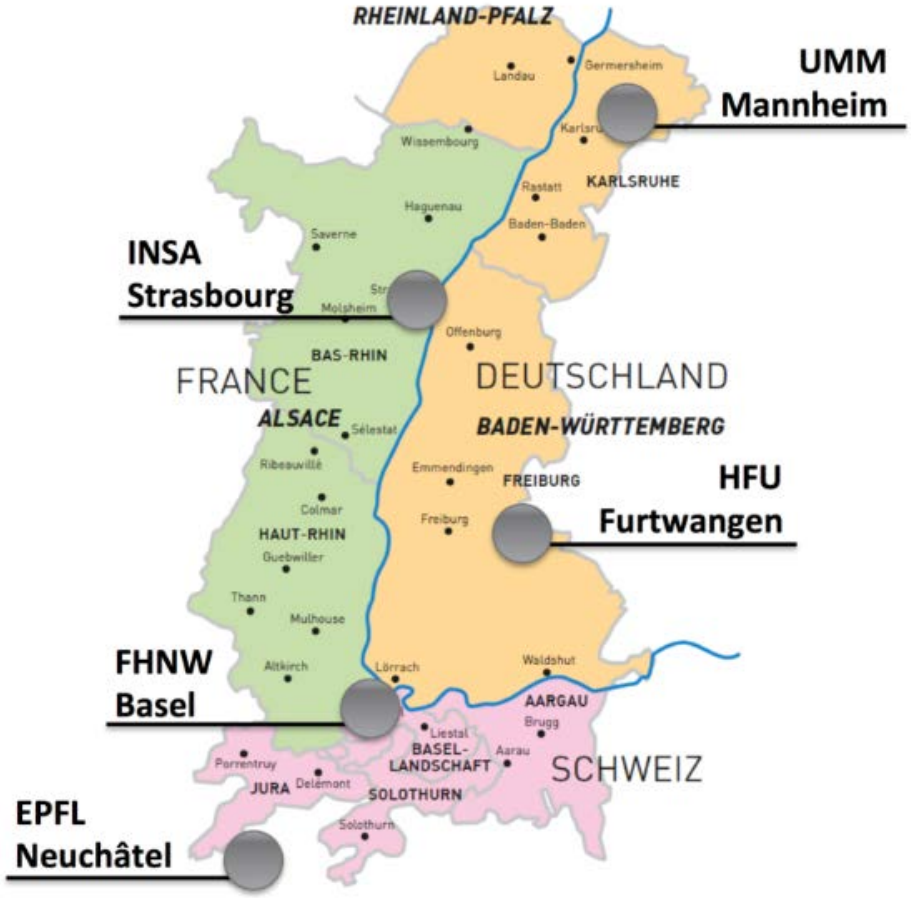
n|w Fachhochschule Nordwestschweiz

EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Kantonsspital Baselland

spirits

SPIRITS: Smart Printed Interactive Robots for Interventional Therapy and Surgery



Cofinancé par l'Union européenne
Fonds européen de développement régional (FEDER)
Von der Europäischen Union kofinanziert
Europäischer Fonds für regionale Entwicklung (EFRE)

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

KANTON AARGAU

Kanton Basel-Stadt

BASEL LANDSCHAFT

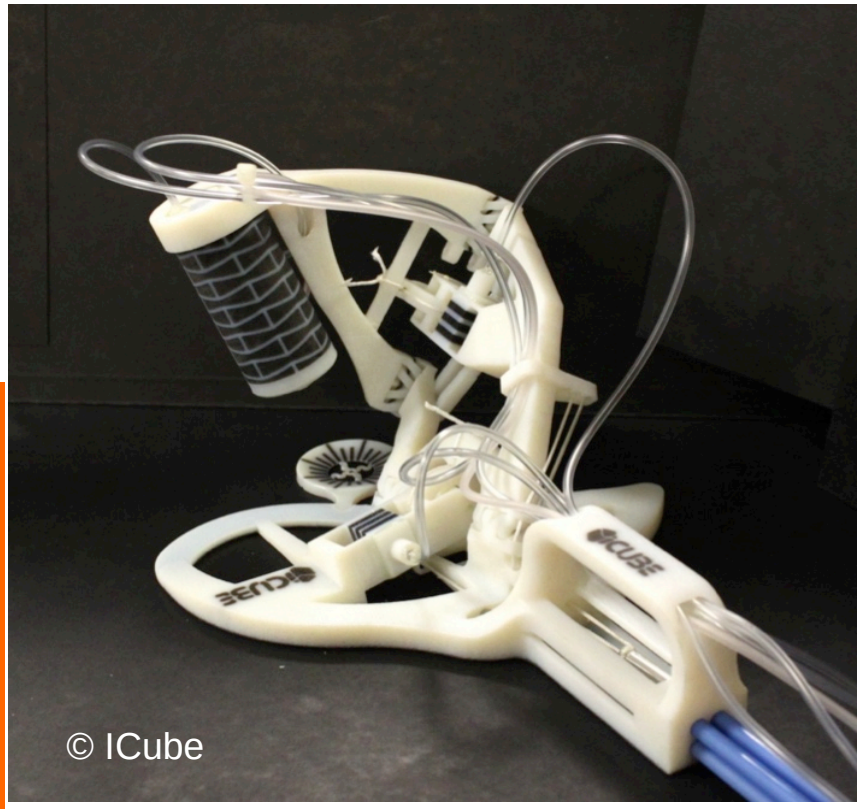
GrandEst

RheinlandPfalz

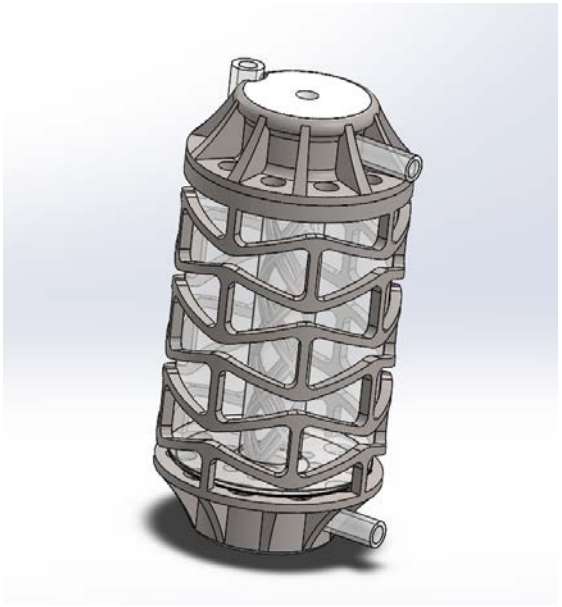
Baden-Württemberg

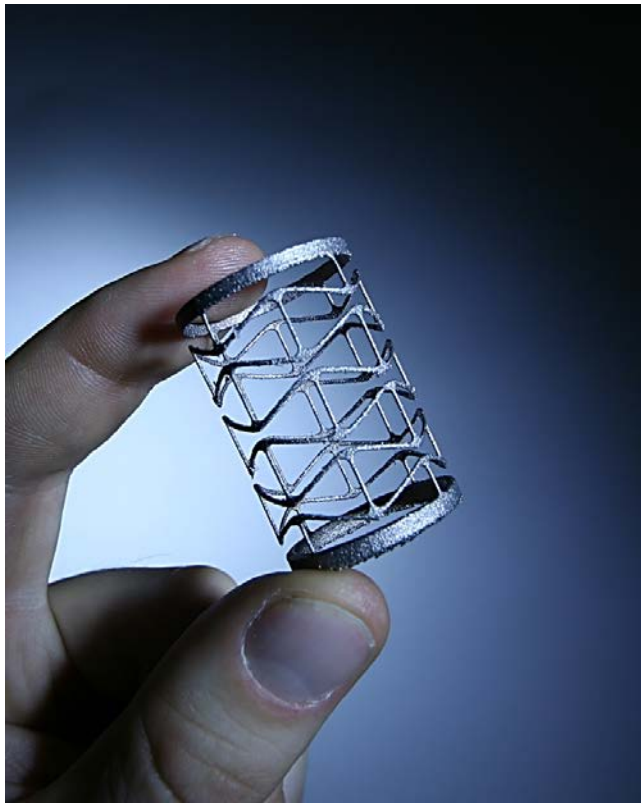
http://spirits.icube.unistra.fr

Innovative robotics for interventional radiology and image-guided surgery



A multimodal versatile robotic device for smart needle manipulation





schematic CAD design of an auxetic drive structure for biopsy needles

M. de Wild, *SPIRITS: Ein neues Roboter-Unterstützungssystem für die interventionelle Radiologie, Grenzüberschreitende Zusammenarbeit*, Regio Basiliensis, RegioInform 01/18, 6, Januar Ausgabe (2018).

Swiss Society for Biomaterials + Regenerative Medicine
Société Suisse des Biomatériaux + Médecine Régénérative
Schweizerische Gesellschaft für Biomaterialien + Regenerative Medizin
Società Svizzera di Biomateriali + Medicine Rigenerative

Abstract Deadline: March 25, 2019

25th Annual Meeting of the Swiss Society for Biomaterials and Regenerative Medicine

22./23. May 2019, University of Applied Sciences Northwestern Switzerland FHNW, Muttenz, Switzerland

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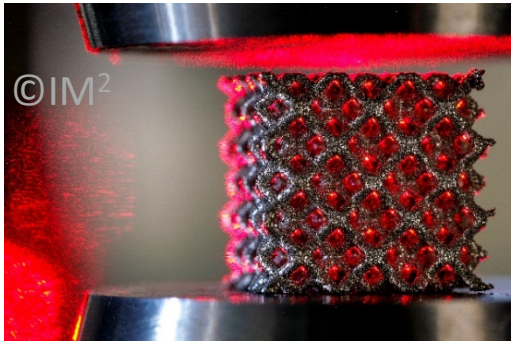

- **Prof. Dr. Regine Willumeit-Römer** (Helmholtz-Zentrum Geesthacht, Germany)
  "The Interplay Between Biodegradable Mg Implants And Cells And Tissues"
- **Dr. Thomas Hefti** and **Mrs. Philine Baumann-Zumstein** (Vascular Interventions, Biotronik AG, Bülach)
  "Resorbable Magnesium Scaffolds For Coronary Vascular Intervention; From Bench To Clinics"
- **Dr. Joëlle Amédée-Vilamitjana** (Tissue Bioengineering, Université de Bordeaux)
  "Vascularisation and innervation in regenerative medicine"
- **Dr. Maurizio Gullo** (FHNW, Institute for Medical Engineering and Medical Informatics IM²)
  "Challenges In 3D Biofabrication - From Organs On Chip Towards Organ Replacement"
- **Prof. Dr. Martin A. McNally** (University of Oxford, President of the European Bone and Joint Infection Society)
  "Biodegradable Antibiotic Carriers In Prevention And Treatment Of Bone And Joint Infections"
- **Prof. Dr. Leonard Charles Marais** (Orthopedic Surgery, University Kwazulu-Natal, Durban, South Africa)
  "Reconstruction Of Bone Defects".

Conference dinner:
WERK 8

Scientific Committee:
Dr. med. Mario Morgenstern (University Hospital Basel)
PD Dr. Arnaud Scherberich (Departement Biomedizin, University Basel)
Prof. Dr. Michael de Wild (Institute for Medical Engineering and Medical Informatics IM², FHNW)

Universität Basel

Thank you for your attention!