

# Bavarian research & innovation

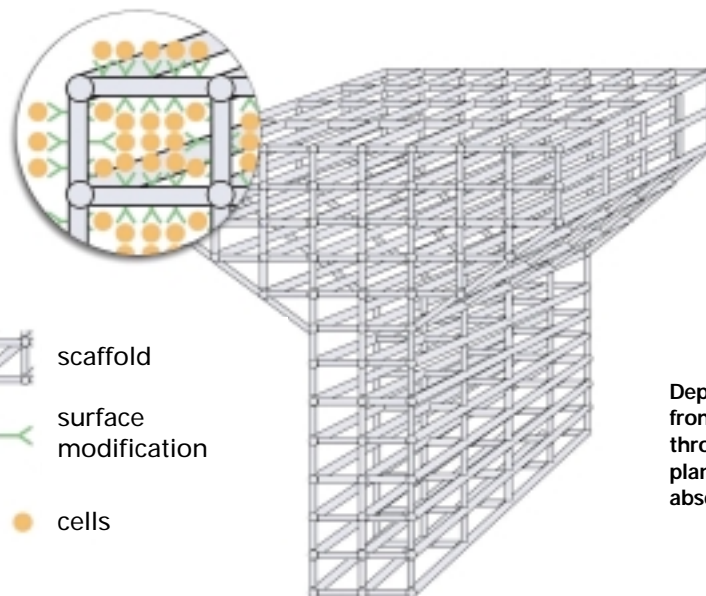


Bavarian Research Cooperation for Tissue Engineering and Rapid Prototyping

## CUSTOM IMPLANTS MADE FROM AUTOLOGOUS CELLS

**F**orTePro is developing high-strength implants populated with autologous cells and individually customised for large bone and cartilage defects of the skull and locomotor system. The implants consist of three-dimensionally structured, absorbable supportscaffolds, which are fabricated by the medical rapid prototyping (RP) methods to receive a perfect fit. The scaffolds are seeded with autologous cells (such as bone marrow stem cells, cartilage or connective tissue cells) and, on this basis, they form new, natural tissue (tissue engineering). Innovative scan technologies (3D ultrasound, holography) and mathematical methods of modelling and simulation enable individual shaping of these implants. Such implants do not cause any infection and have a minimum risk of graft rejection and, above all, have immediate mechanical strength. After a period of time, they are transformed entirely into autologous tissue. The objectives of ForTePro are the development of new process technologies and implant prototypes so that small and medium-sized companies will in future be able to manufacture custom bio-implants quickly and economically. The following universities, institutes and hospitals participate

in ForTePro: the Technical University of Munich, the Ludwig Maximilian University of Munich, the University of Bayreuth, the University of Regensburg, FORWISS Passau, the major European research centre caesar (Center of Advanced European Studies and Research) in Bonn as well as 13 SMEs as industrial partners. The University Hospital in Basle/Switzerland is the international cooperation partner.



Depiction of the process sequence from individual 3D data recording through to fabrication of the implant's basic framework, using absorbable synthetic biomaterials.

### Spokesperson:

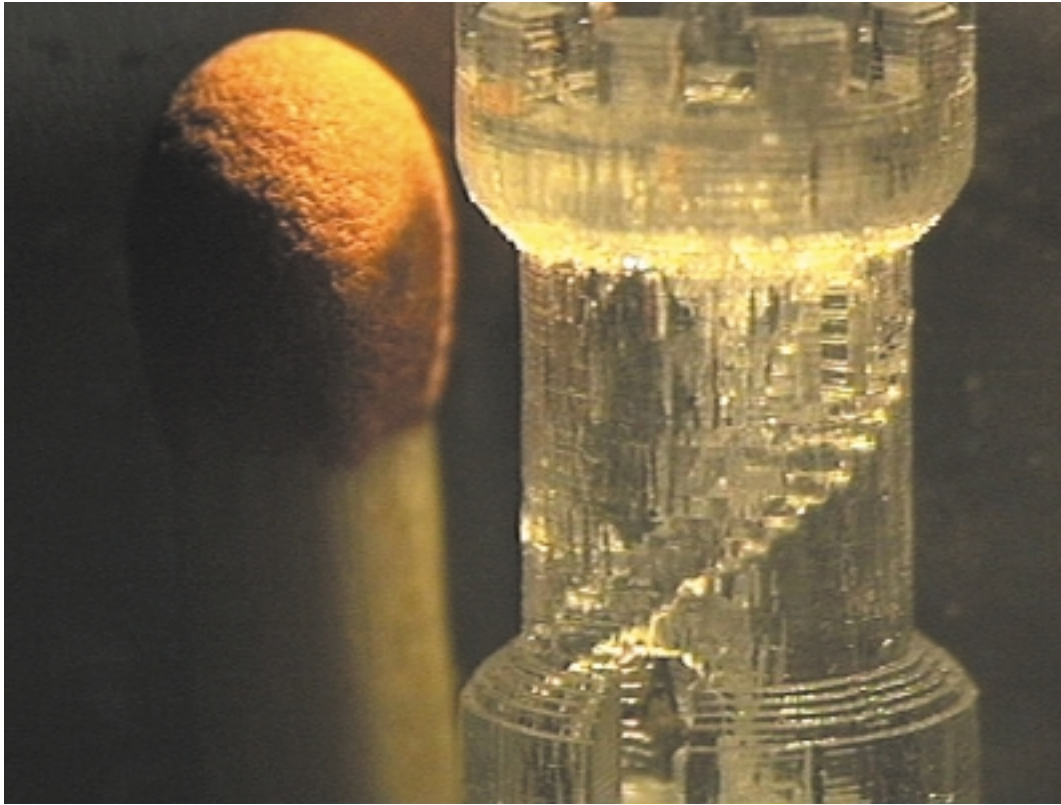
Prof. Dr.med. Dr.med.dent. Hans-Florian Zeilhofer  
Hightech Research Centre – Center of Advanced Studies in Cranio-Maxillo-Facial Surgery of the Technical University of Munich and Department of Maxillo-Facial Surgery/Hospital for Reconstructive Surgery at the University of Basle.

### Administrative office:

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# RESEARCH TOPICS:



Microstereolithography: Ultra-precise construction of individual microstructured mouldings.

## Rapid prototyping

### • 3D structural engineering

Contact:  
PD Dr. med. Dr. med. dent.  
Robert Sader,  
Prof. Dr. med. Dr. med.  
dent. Hans-Florian Zeilhofer  
Technical University of  
Munich, University of Basle

Development of a three-dimensional matrix structure, which serves as an optimised framework for populating with cells.

### • Custom implants by direct rapid prototyping methods

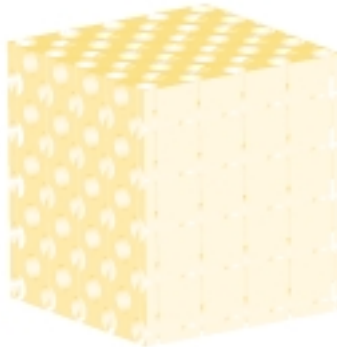
Contact: Prof. Dr.-Ing.  
Günter Ziegler,  
Dipl.-Ing. Carsten Tille  
University of Bayreuth,

caesar Foundation  
Direct fabrication of  
personalised absorbable  
bone replacement materials  
made from ceramics and  
polymers.

### • Custom implants and medical products made by rapid manufacturing (indirect method)

Contact: Prof. Dr.-Ing.  
Joachim Heinzl,  
Dipl.-Ing. Alexander Ott  
Technical University of  
Munich

Manufacture of a prototype for industrial production of a "casting mould", which serves as a custom tool for implant fabrication.



Ceramic samples for testing the growth of human cells into synthetic textiles. Optimised microporosity for the cells and rib constructions for mechanical strength.

## Tissue engineering

### • Cartilage generation

Contact:  
Dr. med. Rainer Staudenmaier,  
Prof. Dr. med. Jürgen Strutz  
University of Regensburg

Manufacture of a customised temporary support framework for populating with cartilage cells.

### • New formation of bone

Contact:  
Dr. med. Matthias Schieker,  
Prof. Dr. med. Wolf Mutschler  
University of Munich

Development of a ceramic-bone cell construction for new formation of bone in human bone defects.

### • Revitalisation of high pressure-treated bones

Contact:  
Priv.-Doz. Dr. med.  
Wolfram Mittelmeier,  
Dr.-Ing. Gerrit Blümelhuber  
Technical University of  
Munich

High pressure treatment of a resected area of tumorous bone and population with endogenous cells for a reimplantation.