Brief introduction

Fraunhofer-Gesellschaft

Fraunhofer-Gesellschaft

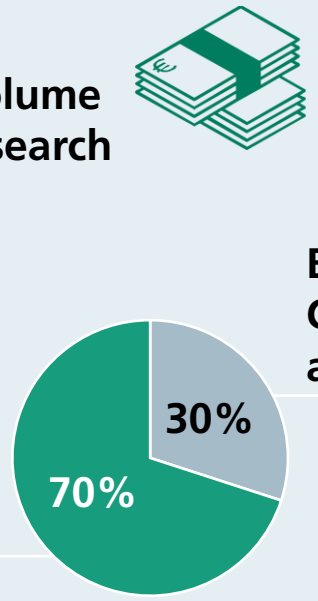
At a glance

Applied research focusing on key future-relevant technologies and the commercialization of findings in business and industry. A trailblazer and trendsetter in innovative developments.

> 30,000 employees

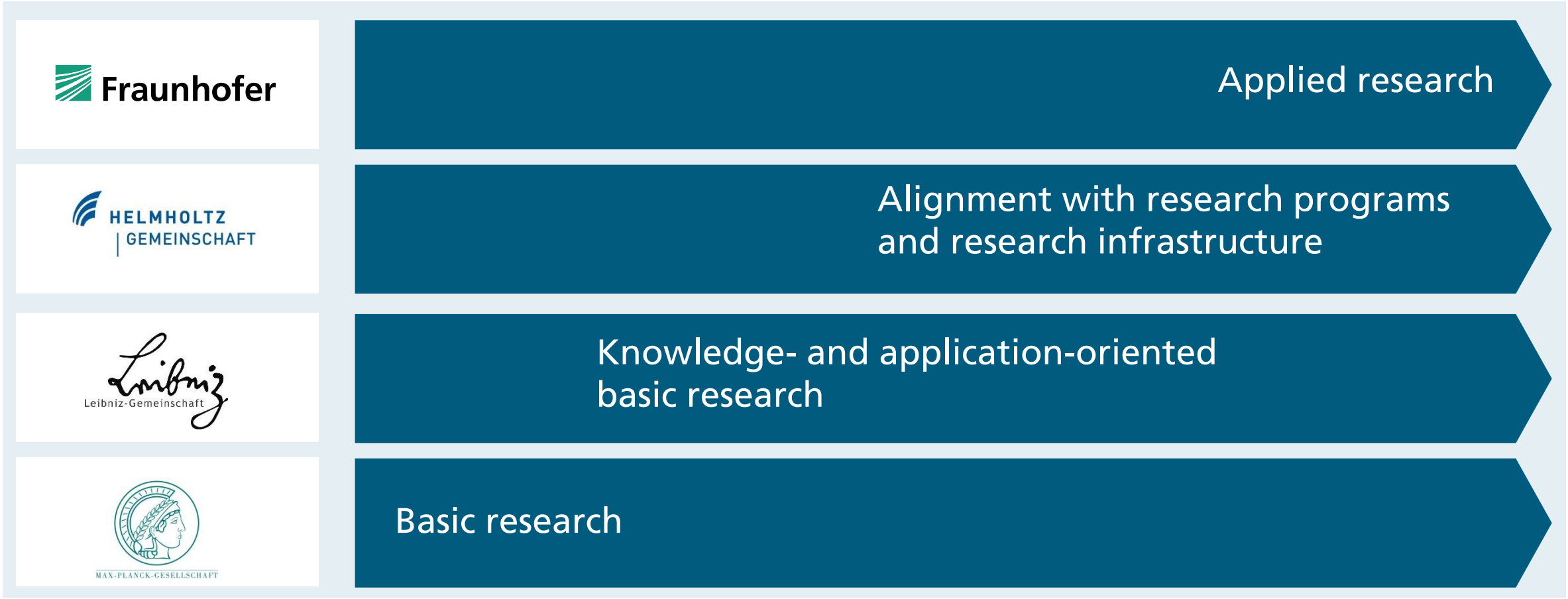
76 institutes and research units

€3.4 billion business volume
€3.0 billion contract research



The four major non-university research institutions in Germany

Broad research coverage



Fraunhofer ISC

Translational Center for Regenerative Therapies

Prof. Dr. Florian Groeber-Becker

Fraunhofer Translational Center Regenerative Therapies TLC-RT

Materials meets Biology meets Engineering

Bioreactors and lab automation

"We believe engineering empowers scientific advancements."

Dipl. Ing. Thomas Schwarz
Prof. Jan Hansmann

3D In vitro testsystems

"We believe in challenging the status quo of what can be tested without the use of animal models."

Dr. Daniela Zdzieblo
Dr. Christian Lotz

Biomaterials

"We believe in realizing complex and challenging biomaterial property profiles."

Dr. Sofia Dembski
Dr. Jörn Probst

Fraunhofer Translational Center Regenerative Therapies TLC-RT

Materials meets Biology meets Engineering

Bioreactors and lab automation

"We believe engineering empowers scientific advancements."

Dipl. Ing. Thomas Schwarz
Prof. Jan Hansmann

In vitro testsystems

"We believe in challenging the status quo of what can be tested without the use of animal models."

Dr. Daniela Zdzieblo
Dr. Christian Lotz

Biomaterials

"We believe in realizing complex and challenging biomaterial property profiles."

Dr. Sofia Dembski
Dr. Jörn Probst

Lab automation and bioreactor technology

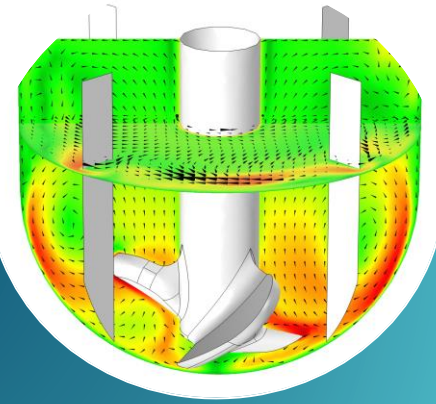
Portfolio

Lab automation

- Tailored system
- Flexible automation
- Tailored actuators

Bioreactor systems

- Automated incubator system
- Integration of sensors
- Control on different culture conditions

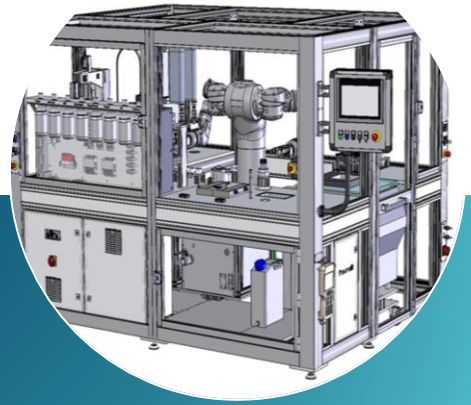


Simulation technology

- Fluiddynamics
- Electrical properies
- AI Algorithems

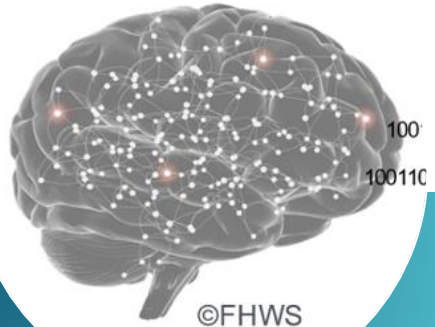
Lab automation and bioreactor technology

Techologies



System development

- Process analysis
- Design and construction
- System integration



AI technology

- Data management
- Model training
- Combination of AI and PLC programming

Synthesis of biomaterials

Development of new batteries

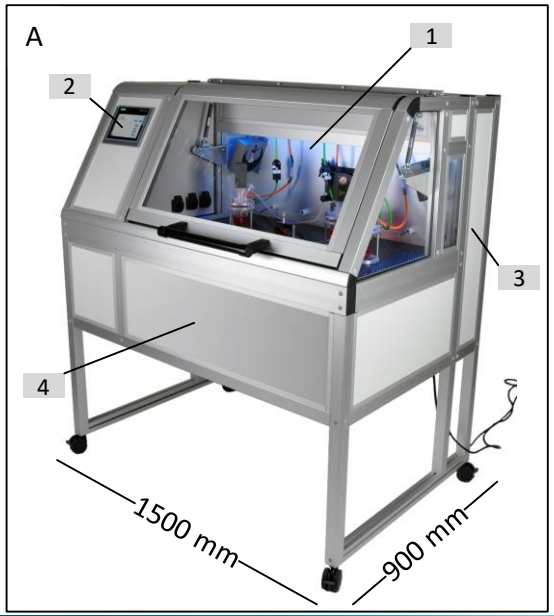
Production of tissue models and testing

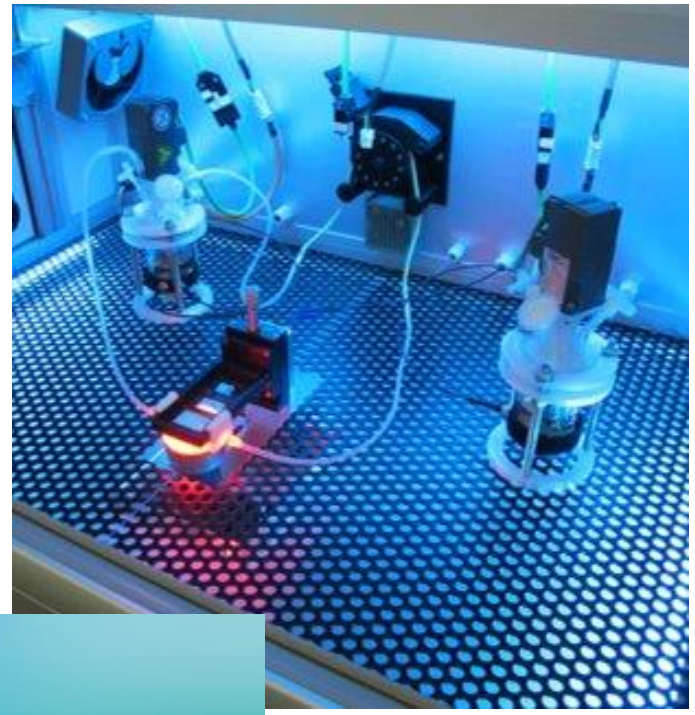
Identification of tailored treatments

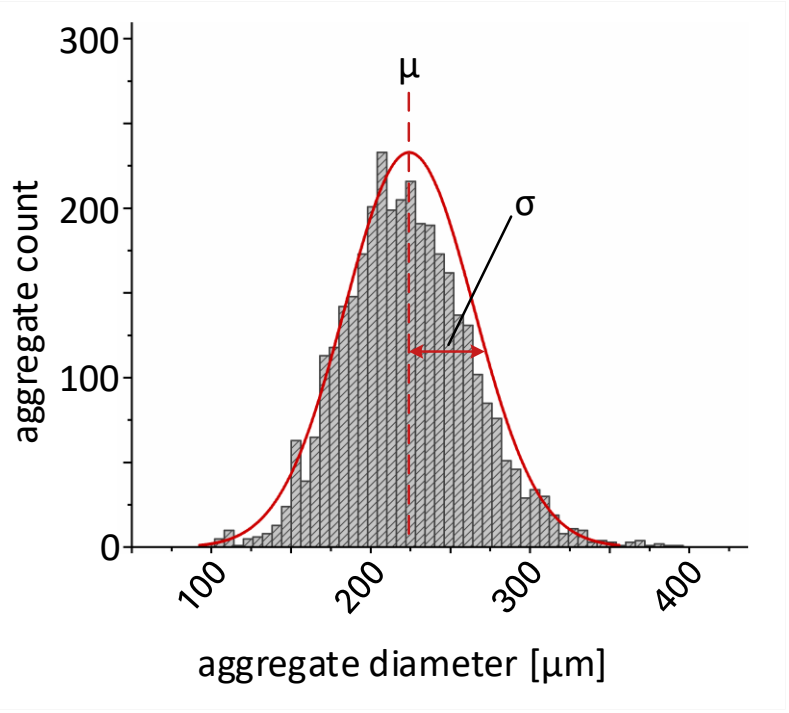
Fraunhofer ISC

Bioreactors

Suspension culture







- Automated incubator system
- Integration of sensors
- Control on different culture conditions

Schwedhelm, I., Zdzieblo, D., Appelt-Menzel, A., Berger, C., Schmitz, T., Schuldt, B., Franke, A., Müller, F.J., Pless, O., Schwarz, T., Wiedemann, P., Walles, H., **Hansmann, J.**; Automated real-time monitoring of human pluripotent stem cell aggregation in stirred tank reactors; Scientific Reports; 10.1038/s41598-019-48814-w; 2019

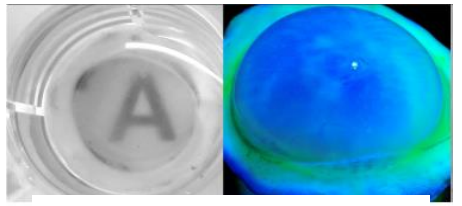
Fraunhofer ISC

Bioreactors

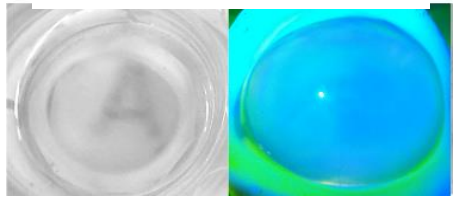
Tissue culture

- Storage of native cornea tissue
- Intraocular pressure, moisturing

Bioreactor, one week



Static culture, one week

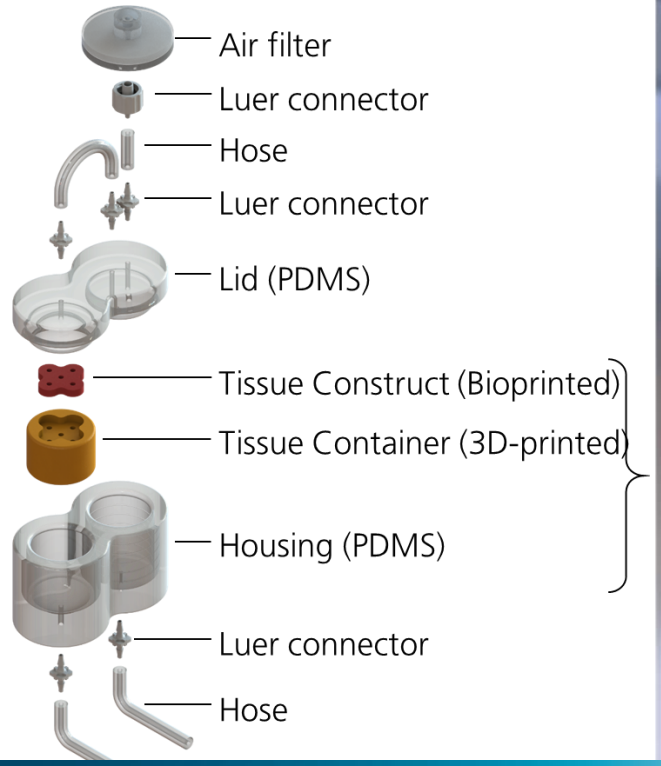


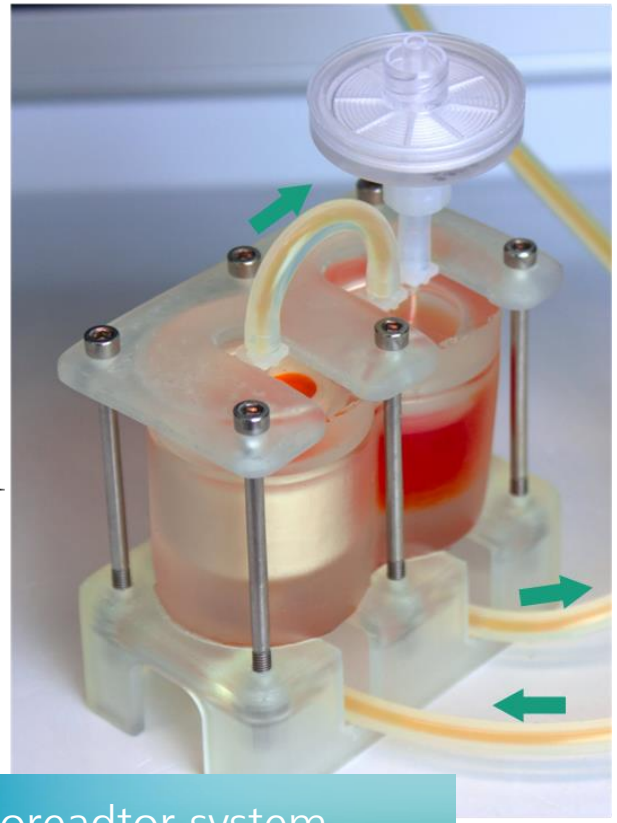
Schwedhelm, I., Zdzieblo, D., Appelt-Menzel, A., Berger, C., Schmitz, T., Schuldt, B., Franke, A., Müller, F.J., Pless, O., Schwarz, T., Wiedemann, P., Walles, H., Hansmann, J.; Automated real-time monitoring of human pluripotent stem cell aggregation in stirred tank reactors; Scientific Reports; 10.1038/s41598-019-48814-w; 2019

Fraunhofer ISC

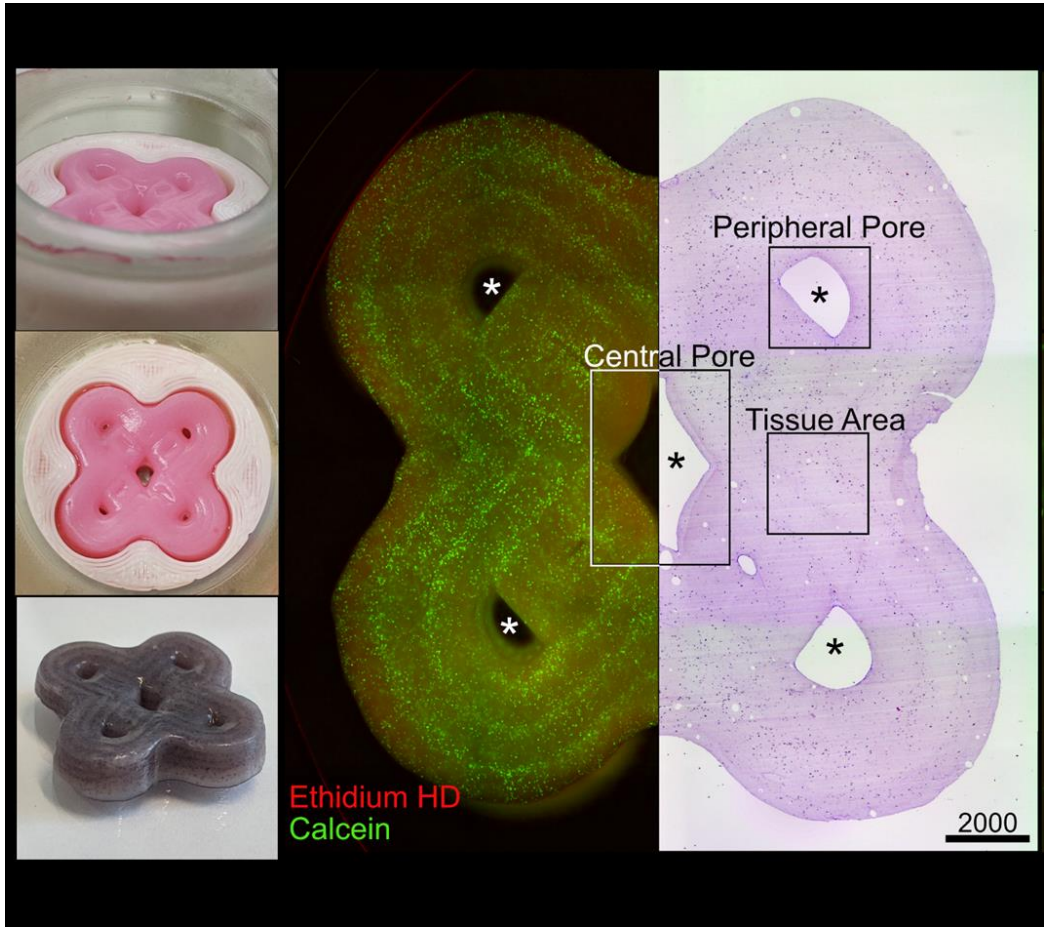
Bioreactors

Additive manufacturing and bioprinting





- Bioprinting in a customized bioreadtor system
- Culture of adipose tissue



Fraunhofer ISC

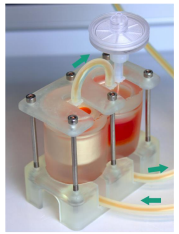
Bioreaktor

Tissue Engineering

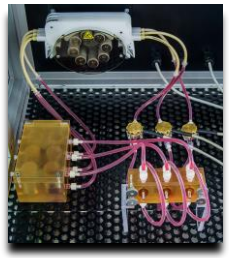
carotis

heart

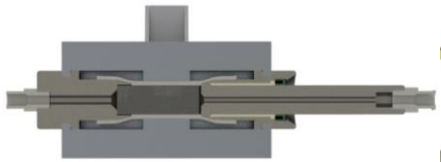
cornea



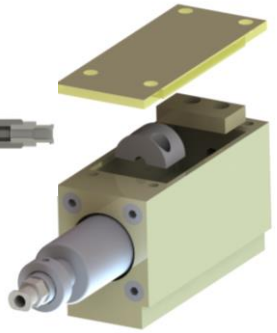
3D bioprinting



perfusion

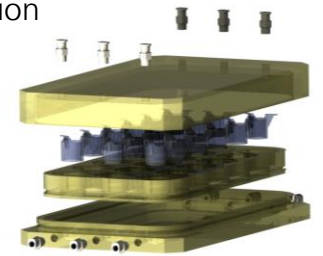


bone



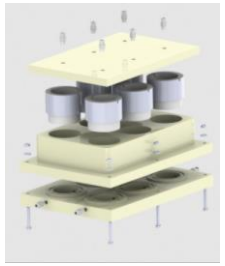
extension

electric stimulation

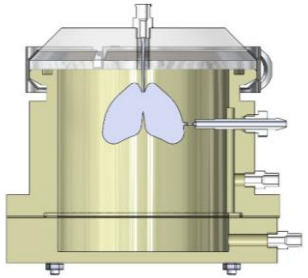


skin

full skin

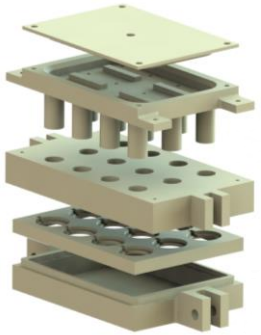


fascia

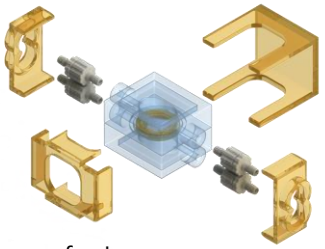


lung

vascularization



collagen-compression

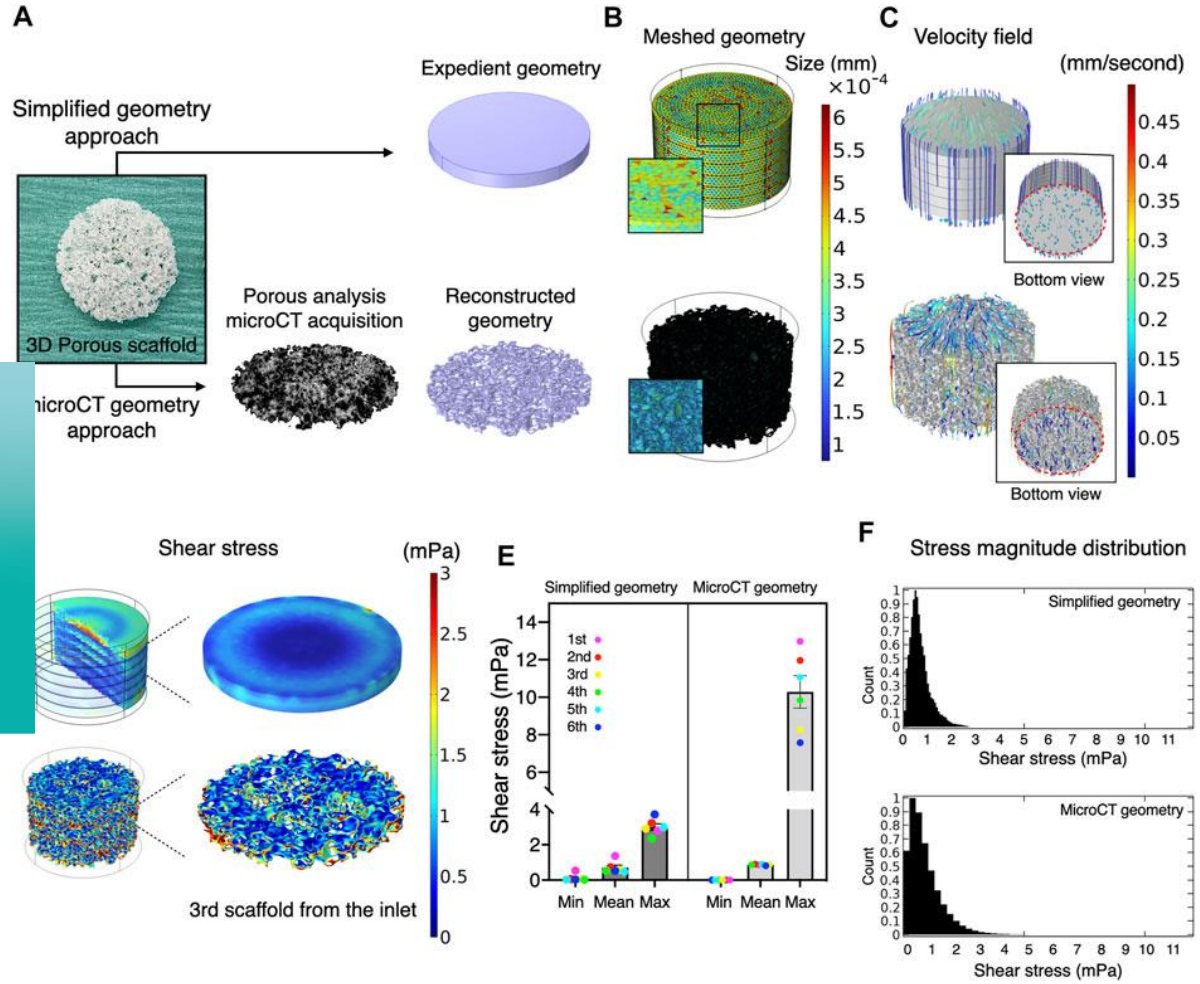


perfusion

Simulation for bioreactor optimization

Scaffold

- How much perfusion is required?
- How does the flow inside the scaffold looks like?
- How should the perfusion system be operated?

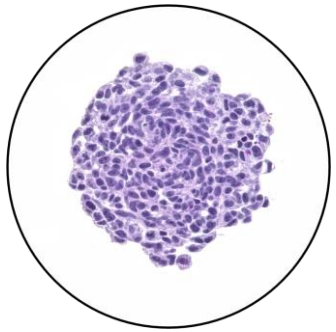


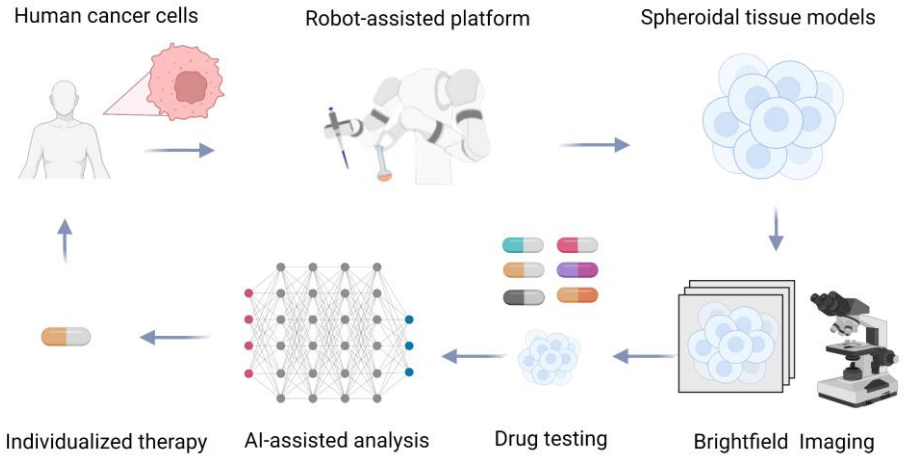
Yamada, S., Mohammed, Y.A., Schwarz, T., Mustafa, K., Hansmann, J.; Optimization and Validation of a Custom-Designed Perfusion Bioreactor for Bone Tissue Engineering: Flow Assessment and Optimal Culture Environmental Conditions; Frontiers in Bioengineering and Biotechnology; 10.3389/fbioe.2022.811942; 2022

Fraunhofer ISC

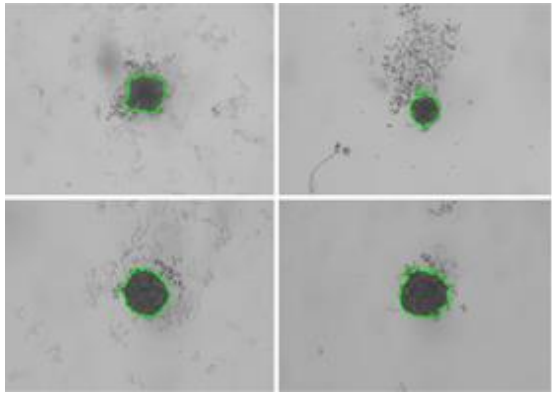
Automation and Artificial Intelligence

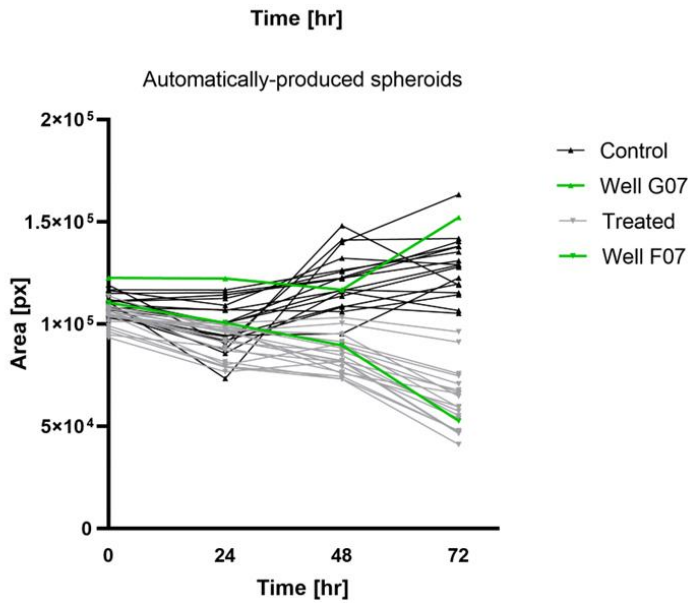
Robot plant





- AI technologies for process control
- Image analysis
- Supervision of the robot

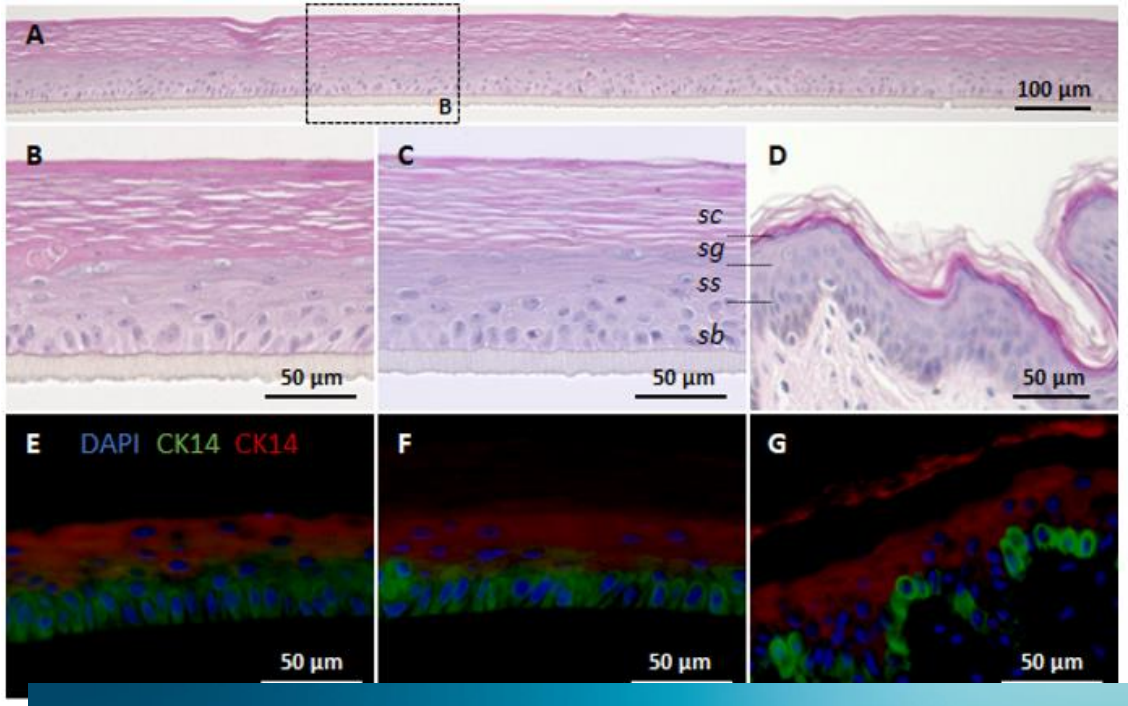


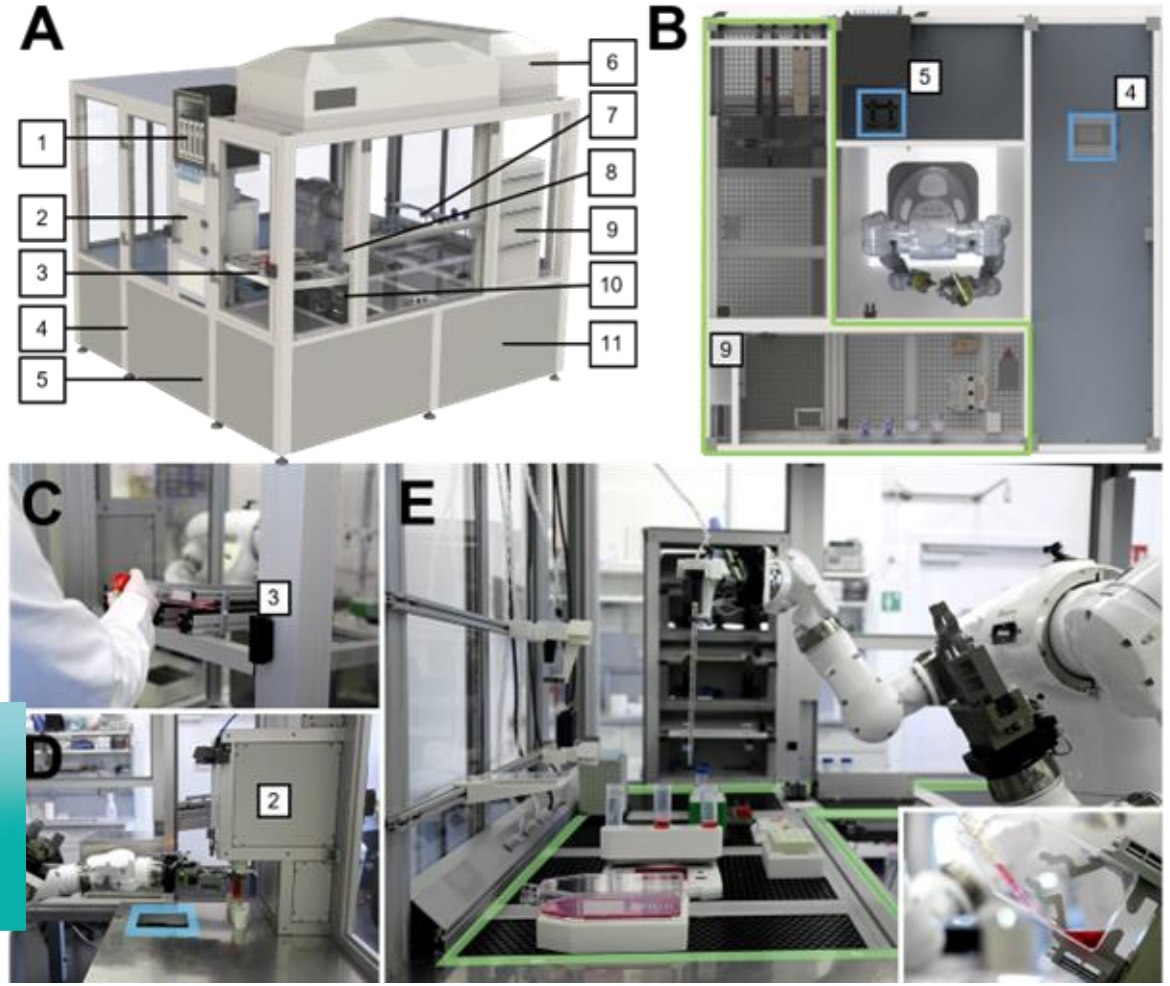


Fraunhofer ISC

Automation and Artificial Intelligence

Robot plant



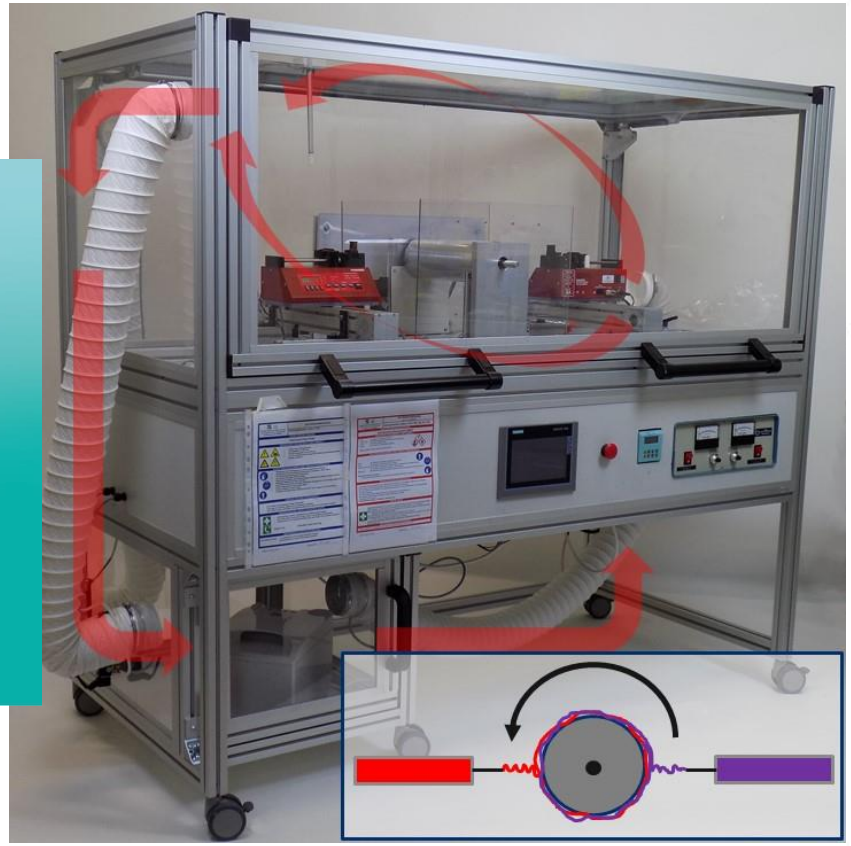


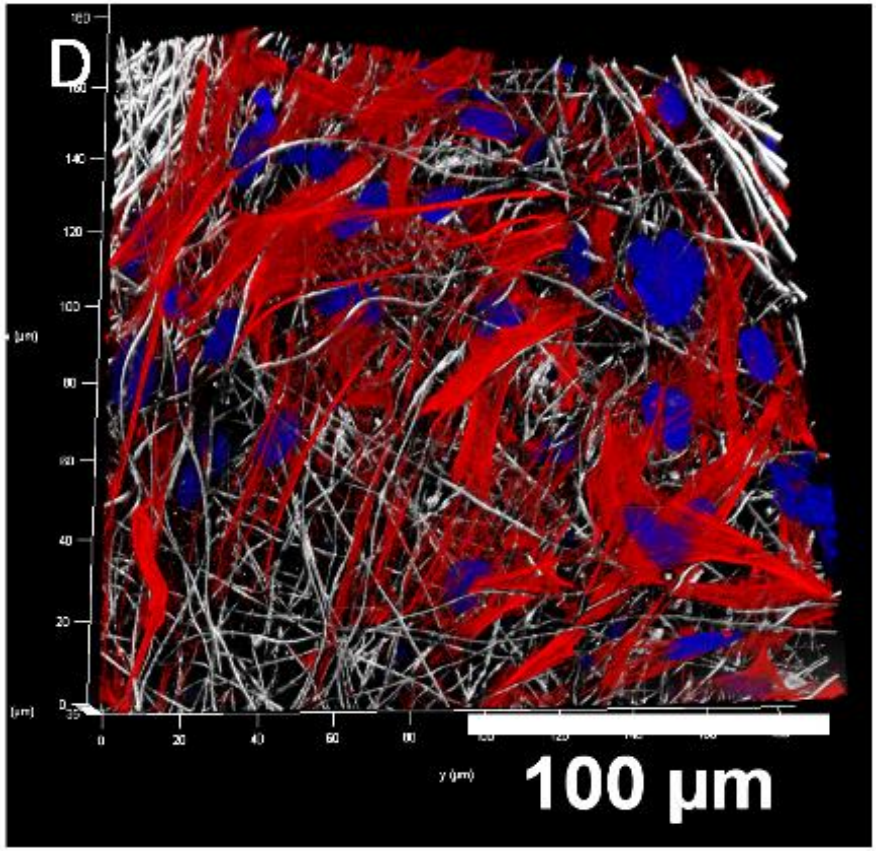
- Automated plant for the manufacturing of tissues
- Applied for skin, airway, and cancer

Fraunhofer ISC

Design and construction
Electro spinning

- Optimized electro spinning system
- Generation of scaffolds for different tissue
- Tailored system according to customer’s requirements





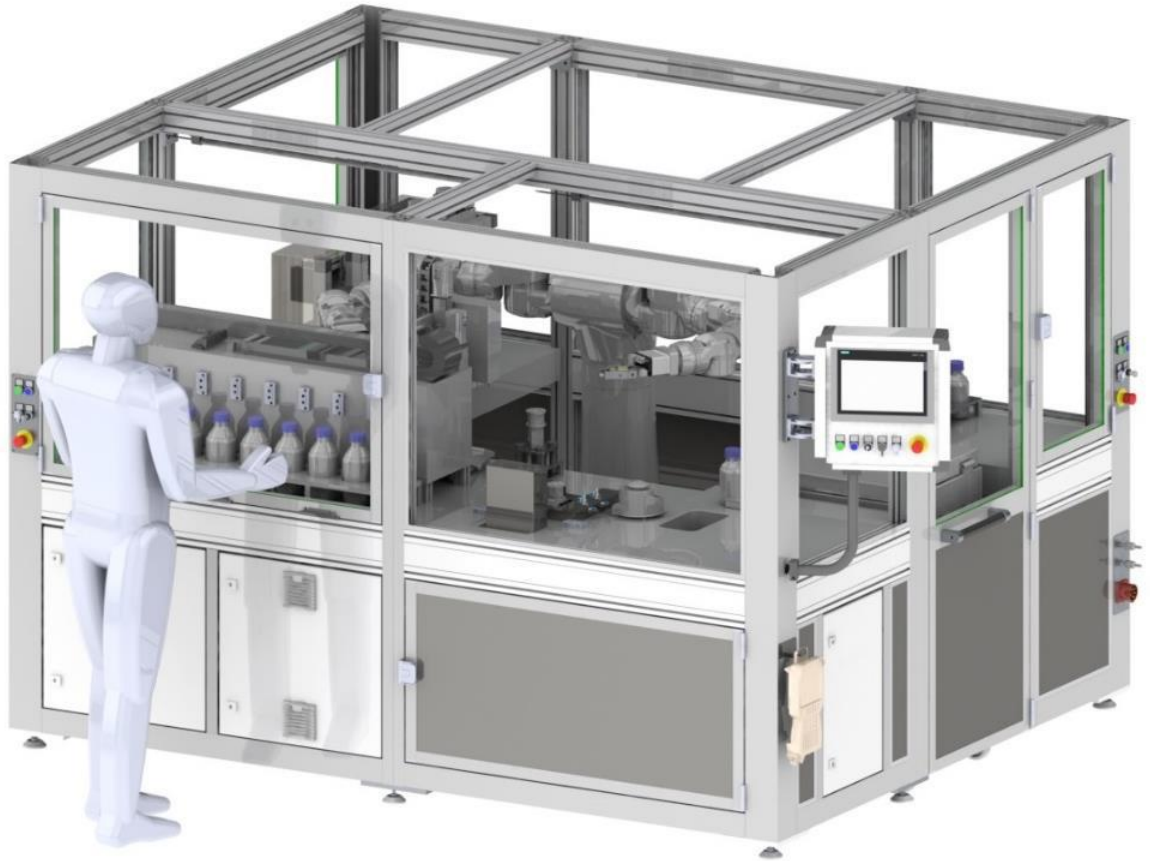
1. Radakovic, D., Reboredo, J., Helm, M., Weigel, T., Schürlein, S., Kupczyk, E., Leyh, R.G., Walles, H., Hansmann, J.; A multilayered electrospun graft as vascular access for hemodialysis; PlosOne, https://doi.org/10.1371/journal.pone.0185916, 2017
2. Weigel, T., Pfister, T., Schmitz, T. , Jannasch, M., Schürlein, S., Al Hijailan, R., Walles, H., Hansmann, J.; Flexible tissue-like electrode as a seamless tissue-electronic interface; BioNanoMaterials, 10.1515/bnm-2017-0002, 20173. Weigel, T., Malkmus, C., Weigel, V., Wußmann, M., Berger, C., Brennecke, J., Groeber-Becker, F., Hansmann, J.; Full synthetic 3D fibrous scaffolds for stromal tissues – replacement of animal-derived scaffold materials demonstrated by multilayered skin; Advanced Materials; 2021

Fraunhofer ISC

Automated Synthesis Lab

Automated (nano)particle production

- Periphery according to the synthesis conditions
- Increasing of the process reproducibility and accuracy regarding nanoparticle properties such as size, morphology, surface properties etc.
- Reduction of the error rate in comparison to manual processes
- Relieving laboratory staff of routine tasks
- Support for regulatory issues



aprona

Fraunhofer ISC

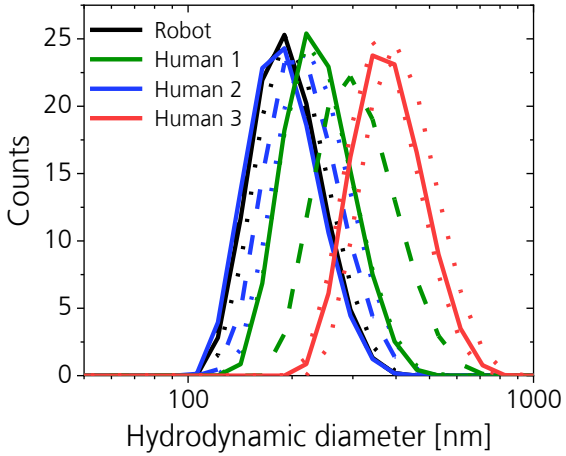
Automated Synthesis Lab

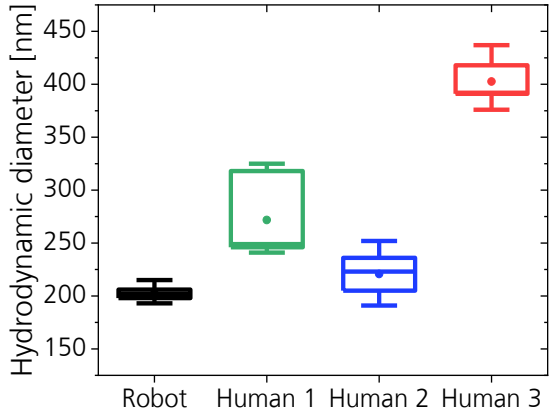
Automated (nano)particle production

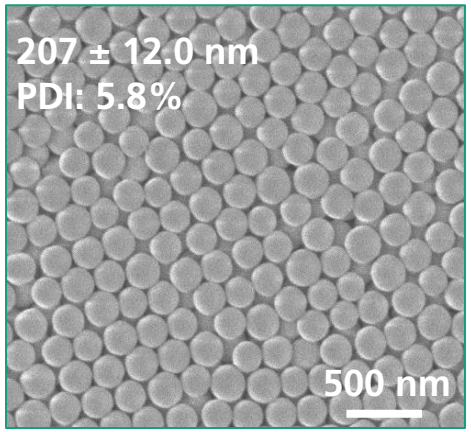
Benefits of the automated synthesis

- enhancement of NP sample batch reproducibility
- relief of the staff from routine tasks and saving of work time up to 75%
- time reduction for the complete synthesis procedure up to 50%
- staff cost reduction up to 75%
- higher work safety when working with chemicals
- reduced risk of sample contamination
- automated documentation (digital laboratory journal)

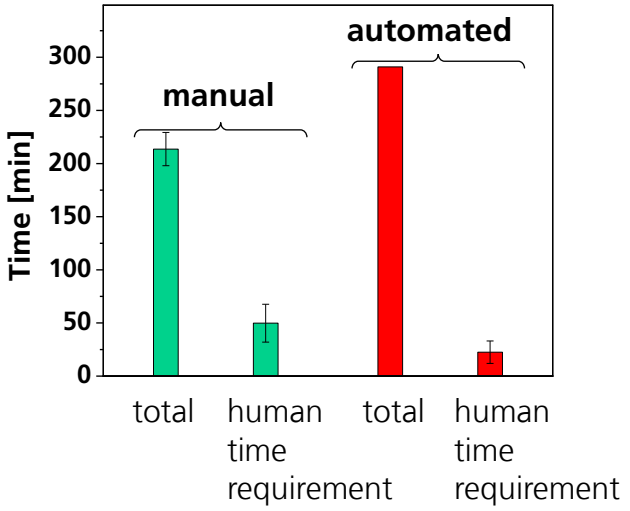
Robot vs. Human







SEM picture of automated prepared SiO_2-NPs



Fraunhofer ISC