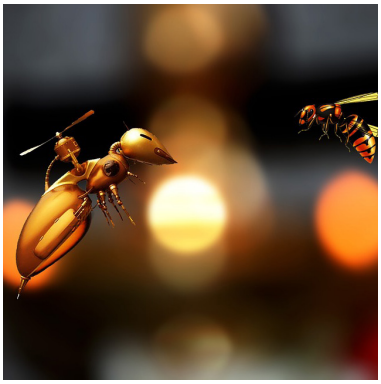
Scientific Tracks & Sessions
October 22, 2018

Robotics & Biomaterials 2018




International Conference on

Robotics and Automation
&
Biomaterials and Nanomaterials

October 22-23, 2018 | Frankfurt, Germany

Research on a conscious robot

Junichi Takeno
Meiji University, Japan

The human brain and its consciousness functions have not yet been clearly explained. There have been many discussions about this issue, with various positions being stated, such as that human consciousness does not exist at all or that there are consciousness functions. However, it is reasonable to think that all mental functions of humans, including consciousness, arise from brain cells, and that connections between these brain cells act as information bridges between the brain and the body. If this is so, then all mental functions can be expressed mathematically as computational algorithms. And programs comprised of such algorithms can also be created. In this lecture, we will first present a computational model of the neural circuits that form the basis of human consciousness, implement artificial neural network circuits using consciousness modules that we call MoNADs, which stands for Module of Nerves for Advanced Dynamics, and then describe the experiment that is performed using the robot. The model features neurons that resemble mirror neurons and has self-referencing functions with double recursive neural networks. Basically, we use some of the MoNADs to imitate the movement behavior of the other image that is captured by the robot's visual sensor, and compare the other's movement with the robot's own movement. We will describe and discuss such topics as emotion and feelings when learning to make determinations about known and unknown information, the capabilities of consciousness in color perception, the principles of pleasant and unpleasant feelings, modeling and simulation experiments on the Rubin's vase phenomenon, the ego as a program, and the modeling of advanced traumatic brain injuries.

Speaker Biography

Junichi Takeno is a Professor at Meiji University and President of Heuristics Science Research Institute. He has also been the Associative editor of the ELSEVIER.

e: Juntakeno@gmail.com

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The impact of intercellular communication in complex pre-vascularized tissue equivalents

Martin Heller
Johannes Gutenberg University Mainz, Germany

A promising approach in reconstructive surgery for the wound coverage after surgical interventions is the use of artificially generated pre-vascularized tissue equivalents. In our group we developed a pre-vascularized buccal mucosa equivalent in a tri-culture of primary buccal epithelial cells, fibroblasts and microvascular endothelial cells successfully, based on the collagen matrix Bio-Gide® from Geistlich. A successful pre-vascularization at superficial areas of the matrix was demonstrated. However, so far the generation of pre-vascularized structures within the tissue equivalent was restricted to only superficial areas of the matrix. Besides the great advances, it is not completely understood yet, why the used endothelial cells did not migrate in depth of the tissue equivalent in order to form vascular structures. To understand the cell biological background for the reduced migration willingness of endothelial cells, we investigated the intercellular communication in monocultures and co-cultures of primary microvascular endothelial cells and buccal fibroblasts based on the collagen matrix Bio-Gide®. To achieve this objective we analyzed the secretion patterns of relevant angiogenic factors such as VEGF, Ang 1, Ang 2, bFGF and eNOS and evaluated their effect on cellular parameters such as viability, proliferation, migration and tube formation. The results showed complex interactions of the investigated growth factors. A distinct influence of the co-cultivation, the spatial separation and the used collagen matrices on the expression patterns of the primary cells could be demonstrated. The co-cultivation of endothelial cells and fibroblasts led to increased levels of VEGF, bFGF, eNOS and Ang-2 compared to the monocultures. Interestingly, a spatial separation of the two cell types as well as the cultivation on the used collagen matrices enhanced this effect additionally. The gained results help us to understand the cellular interaction in complex multi-cultures and may lead to optimized cultivation approaches for tissue engineering of complex tissues.

Speaker Biography

Martin Heller has completed his PhD in Biology at the Max Planck Institute of Polymer Research Mainz in 2013. Afterwards he worked as Postdoc at the University Medical Center of Mainz and started to study Medicine in April 2014. His focus of research is the modification of biomaterials in the context of artificially generated tissue equivalents in complex multi-cultures of primary human cells

e: martin.heller@uni-mainz.de

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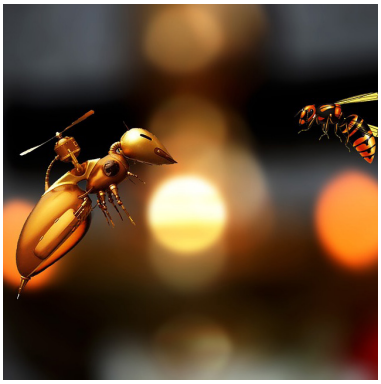


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Functional fe-base biodegradable materials for medical applications

Cimpoesu N
Technical University Gheorghe Asachi of Iasi, Romania

Iron represent the main source of metal applications worldwide based on consumption of steel and cast iron. After the success of stainless steels used in medical field the world is expected to use new materials with special properties in order to treat specific medical problems. With a certain chemical composition Fe-based alloys can fulfill two main functions in the same time: shape memory effect and biodegradability that can be used in medical applications. Shape memory alloys (SMAs) have been analyzed intensively over the last years by different point of view (shape memory effect, superelasticity or damping capacity) by several research teams. Biodegradable metal alloys (Mg, Fe and Zn based) have recently reached an important scientific and medical interest for applications as implant materials in cardiovascular and in orthopedic surgery. Biodegradable materials used in implantology must meet, in addition to the general requirements for an implantable material, two main functions for applications: the first is to provide the mechanical stability of the recovered element during the first part of the healing period and the second of the gradual degradation in a certain period of time. The first function can be provided by coating the biodegradable element with one or more biocompatible thin layers to ensure the integrity of the material for a precise-established period of time. The second function can be accomplished by introducing micro-alloying elements in Fe-based alloy as small quantities in the form of micro- or nano- particles to stimulate and generalize degradation of the material in contact with an electrolyte solution. We choose for thin coatings, materials based on ceramics (HA, HA+ZrO_2 and HA+Ag) and Mg, Ca or Zn as micro-alloying elements. Part of this research was funded by a research grant of TUIASI, project number 1420/2018: Design and characterization of a multifunctional element with memory effect for medical applications, code TUIASI-GI-2018 - PN-III-P1-1.1- TE-2016-1420.

Speaker Biography

Cimpoesu N has completed his PhD at the age of 30 years from Gh. Asachi Technical University of Iasi, Romania, in the field of damping capacity of shape memory alloys. He is the coordinator of Microscopy Laboratory (optical microscopy, scanning electron microscopy and atomic force microscopy), assoc. prof. at Gh. Asachi Technical University, Romania. He has over 85 ISI publications that have been cited over 450 times, and his publication H-index is 12.

e: nicanorcimpoesu@gmail.com

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Comparative assessment of various scaffolds for the construction of artificial tissues

Martin Heller
Johannes Gutenburg-Universiy of Mainz, Germany

In reconstructive surgery artificially generated soft tissue equivalents are a powerful alternative to commonly used autologous tissue transplants in order to cover bigger defects after tumor resection or after trauma. However, the generation of such tissue equivalents is complex and requires adequate cell compatible scaffolds for successful cell cultivation. In order to investigate the influence of various cell compatible matrices on cell viability and differences in cellular morphology in a complex co-culture of fibroblasts and epithelial cells, four naturally derived different collagen matrices were analyzed in a comparative study. From human buccal mucosa specimens, fibroblasts and epithelial cells were cultured separately. In a first step, primary fibroblasts were seeded on the four different collagen matrices BioGuide® (BG), BioGuidePro (BGP) and TissuFoil (TF) and small intestinal mucosa (SIS). The cellular morphology on seeded matrices was analyzed by confocal laser scan microscopy. The viability of the cells was quantified by MTT assay. For co-culture, the primary buccal epithelial cells were seeded on the opposite site of the fibroblasts covered matrices. After 18 days of cultivation microsections were analyzed using Masson-Goldner and immunohistochemical staining (Cytokeratin 13, Tenascin, Collagen IV). In a co-culture of fibroblasts and epithelial cells, BGP turned out to be the most suitable matrix. Fibroblasts growing on BGP revealed the greatest viability. Regarding mechanical characteristics such as shrinkage, degradability and handling, BGP proved to be the superior to the remaining matrices tested. Co-culture with epithelial cells resulted in epidermal stratification, a developing basement membrane. BPG matrix is a promising biomaterial for developing a full-thickness engineered buccal mucosa including cell differentiation and maturation similar to the native tissue when seeking new methods of urethral reconstruction.

Speaker Biography

Martin Heller has completed his PhD in Biology at the Max Planck Institute of Polymer Research Mainz in 2013. Afterwards he worked as Postdoc at the University Medical Center of Mainz and started to study Medicine in April 2014. His focus of research is the modification of biomaterials in the context of artificially generated tissue equivalents in complex multi-cultures of primary human cells.

e: martin.heller@uni-mainz.de

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