siteinsel

UNIVERSITÄT BERN

Symposium

18 May 2018, 10:00 a.m.

Maurice Müller Haus Murtenstrasse 35 Room H810, CH-3008 Bern

Talk 1

"Soft and degradable bioelectronics: State of the art, challenges and future perspectives"

Dr Giovanni Salvatore

Scientist ABB Corporate Research Center

A general goal in the development of any electronic device is to achieve high performance operation and mechanical robustness which undergo negligible change over time. Biology and living organisms, instead, are soft, curvilinear and evolves over time. Recent advancements in materials science and nanotechnology have prospected the possibility of new forms of electronic devices which can stretch and bend and exploit materials and layouts that lead to physical properties (thicknesses, moduli, thermal mass, etc.) that approximate those of biological tissues1. Moreover, micro and nanostructures can also be engineered in terms of chemistry so as to physically degrade and disappear via resorption by the body or the environment. Such unique properties enable accurate physiological sensing2, effective tissue stimulation3, 4 and transient functional operation5 which are impossible to achieve with hard electronic systems and which may find application in diagnostics, regenerative medicine, alternative pharmacology and advanced human-machine interface. Despite of such progress, these technologies present limitations and challenges which stands at multiple level. Future efforts will focus on the design of systems/devices with more advanced functionalities and better reliability to address real medical problems and, possibly, move from research labs to clinical testing. Such kind of systems/devices require large-area integration of heterogeneous materials (specially formulated polymers or natural products, inorganic semiconductors, metals) and, often, the assembly of separately fabricated devices into spatially organized, functional systems. Conventional subtractive microfabrication techniques (lithography, etching) do not fully provide the versatility and the capabilities to achieve such goals. Additive manufacturing processes 6, 7 like printing (3D, inkjet, screen), laser cut, "cut and paste" and transfer printing provide new tools to address such needs and complement conventional microfabrication techniques. This talk reviews the most recent advancements in the field with emphasis on materials and designs and list the technological challenges. A description of possible future developments concludes the dissertation.

Dr. Giovanni A. Salvatore is a scientist at the ABB Corporate Research Center. He got his bachelor in Electronics and Master in Micro&Nanotechnology from the Polytechnic of Turin. He received the PhD in 2011 from EPFL for his research on ferroelectric transistors for memory or switch application. In 2011 he moved to ETH Zurich to lead the group of plastic electronics in the Electronics Laboratory. In 2013 he joined the Rogers research group at UIUC to work on "biointegrated electronics. In July 2015 he returned to the Electronics Laboratory at ETH to work on soft and degradable electronic devices with emphasis on bioinspired designs and wireless technologies. At the end of 2017 he joined the ABB Corporate Research Center in Baden (CH) to work on packaging and reliability of electric devices.

Talk 2

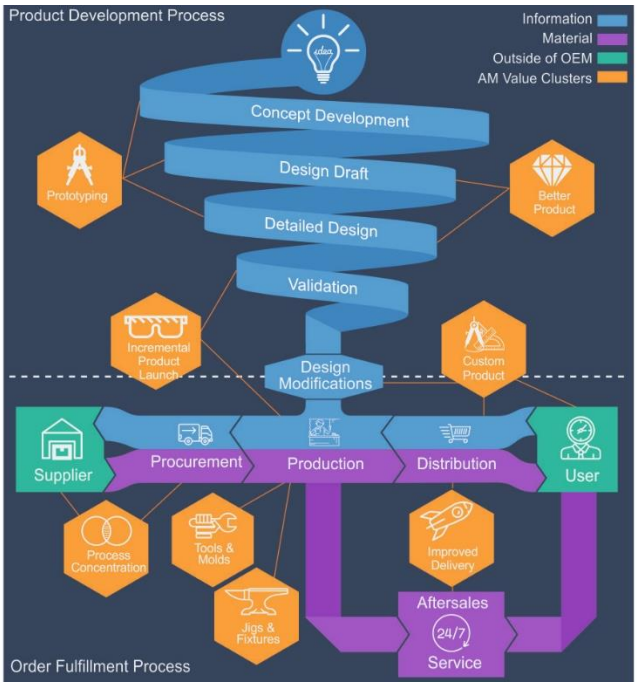
"Mastering the Process Chain from Patient's Data to Patient's Life"

Dr-Ing Christoph Klahn

Head of the Design pd|z at ETH Zürich

Abstract

Additive Manufacturing (AM) is a diverse class of production technologies with proven capabilities in safety relevant applications and a known potential for new designs and business models. Research on successful AM applications in industry shows that it is not sufficient to install an AM machine and to understand materials and processes. It is necessary to develop a valid value proposition and to integrate AM in the digital and physical process chain. For medical applications, an integrated process chain from patient data acquisition to a finished and tested component ready for the patient in the operating theater requires a multidisciplinary approach. In his talk Dr. Klahn will take you along the product development and order fulfillment processes from patient's data to patient's life, highlighting challenges and opportunities of additive manufacturing in medical applications. By understanding this chain, the collaboration of experts from different disciplines can achieve fast and efficiently developed medical products improving the quality of patient's life.



Dr. Christoph Klahn is the head of the Design for New Technologies group at ETH Product Development Group pd|z and at Inspire AG since 2013. He is working on additive manufacturing since finishing his studies on aircraft systems engineering at the Hamburg University of Technology (TUHH) in 2008. For his Master's thesis, he performed a topology optimization on an aircraft bracket to demonstrate the potential of additive manufacturing for Airbus. After his degree, he worked at Airbus on the final assembly lines for A400M and A380, and in A350XWB manufacturing engineering. In his PhD he developed an additive manufactured, gas-permeable structure for pneumatic ejectors in injection molding tools. To Dr. Klahn additive manufacturing is a key to innovative products, bringing benefits to companies and customers alike. Enabling engineers and designers to identify the right application for AM and to design better AM parts efficiently is his mission.