



## Welcome to **The First International Event Dedicated to Charting the Commercialization Path for Dozens of Research Breakthroughs!**

3D printing/additive technology is exploding beyond the bounds of industrial applications. Building on the realization that a cell is roughly the same size as a drop of ink, dozens of university biomedical researchers and labs are now applying the grid-based, layer-by-layer “additive” method using adapted printer cartridge heads. The technique is already being used to create tissue scaffolds and lattices, replacement tissues, and ultimately complete organs from stem cells. Some applications, like using 3D printed tissues for *in vitro* toxicology testing and surgical training, could be nearer term. The implications for drug-testing, life extension, surgical cosmetics and life-threatening conditions are revolutionary.

However, this field is advancing so rapidly and on so many fronts that only those who are current on today’s development will successfully realize the enormous promise of this technology.

To accelerate commercialization of this highly innovative field, Infocast organized the first dedicated **Bio-Printing Summit**, November 13-14, 2013 in Atlanta, GA. In addition to presentations by leading global researchers, the Summit will showcase advanced applications in combining tissues with complex geometry, biocompatible materials, tissues made up of multiple cell types or cellular ecosystems, ultimately moving towards the goal of complete, individually-tailored organ printing.

On behalf of our staff at Infocast, our Summit Chairmen, our Sponsor, Supporting Organization and Media Partners, we welcome you to **BIO-PRINTING, 3D Printing of Live Cells Summit** and wish you an informative and beneficial event!

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## Summit Agenda

### Day One

Wednesday, November 13, 2013

7:00–8:00 Registration and Networking Breakfast

8:00–8:15 **Welcome and Introduction by Summit Chair**  
**Professor Lawrence J. Bonassar, Ph.D.**, *Department of Biomedical Engineering, SIBLEY SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING, CORNELL UNIVERSITY*

#### *Session I: Bio-Printing Start-Ups*

8:15-8:45 *Presentation A: 3-Dimensional Printing Solutions*  
**Al Siblani**, *President & Chief Executive Officer, ENVISIONTEC, INC.*

8:45-9:15 *Co-Presentation B: Standardizing 3D Printing Innovation: How Uniform Terms, Standards, Languages, and Machines Can Propel Better, Less Costly Science*  
**Jeffrey Lipton**, *Founder/Chief Technology Officer, SERAPH ROBOTICS*  
**Adam Perry Tow**, *Founder/Chief Executive Officer, SERAPH ROBOTICS*

9:15-9:45 Networking Break

#### *Session II: Biological Laser Printing*

*This session will cover breakthroughs in laser-assisted bio-printing, cell assembly via laser printing, laser-assisted bio-printing of skin, laser-based patterning of cells in gelatin, laser based patterning embryonic stem cells, laser-engineered microenvironments for cell culture, laser-based cell micro-patterning.*

9:45-10:15 *Presentation A: Biofabrication Using Laser Direct Write: Patterning Stem Cells, Microbeads, and Cell-loaded Microcapsules*  
**David T. Corr, Ph.D.**, *Associate Professor, Department of Biomedical Engineering, RENSSELAER POLYTECHNIC INSTITUTE*

10:15-10:45 *Presentation B: **In Situ and In Vivo Bioprinting of Cells and Biomaterials***  
**Fabien Guillemot, Ph.D.**, Senior Research Associate, Tissue Engineering & Biofabrication, INSERM, NATIONAL INSTITUTE FOR HEALTH AND MEDICAL RESEARCH, UNIVERSITY OF BORDEAUX

10:45-11:15 *Presentation C: **Skin Tissue Generation by Laser Cell Printing***  
**Dr. Lothar Koch**, Nanotechnology Department, Head of Biofabrication Group, LASER ZENTRUM HANNOVER E.V.

**Session III: Biological Ink Jet Printing**

*This session will include topics such as Microvascular assembly using ink jet printing, biomaterials for inject printing, 3D organ Printing, ink jet based cell assembly, ink jet printing of heterogeneous tissues.*

11:15-11:45 *Presentation A: **Ink Jet Printing of Cells: Principles and Applications***  
**Thomas Boland, Ph.D.**, Professor, Metallurgical & Materials Engineering, UNIVERSITY OF TEXAS AT ELPASO (UTEP)

11:45 -1:00 Group Luncheon

1:00 - 1:30 *Presentation B: **Bioprinting of Tissue and Organ Constructs for Applications***  
**James J. Yoo, M.D., Ph.D.**, Professor, Associate Director and Chief Scientific Officer, WAKE FOREST INSTITUTE FOR REGENERATIVE MEDICINE

1:30 – 2:00 *Presentation C: **Application of Bioprinting Beyond Regenerative Medicine***  
**Gabor Forgacs, Ph.D.**, George H. Vineyard Distinguished Professor of Biological Physics, UNIVERSITY OF MISSOURI, ORGANOVO, MODERN MEADOW

**Session IV: Additive Manufacturing of Tissues**

*Major biomedical advances to be covered in this session include hardware design for bioprinting, bioprinting of heart valves, multi-material printing for complex tissue assembly, freeform fabrication of tissues for bone repair, novel methods for hydrogel printing, 3D printing and fabrication techniques for soft tissue regeneration.*

2:00 - 2:30 *Presentation A: **Bioprinting in Clinical Medicine: The Final Frontier***  
**Jason A. Spector, M.D., F.A.C.S.**, Associate Professor of Plastic Surgery, WEILL CORNELL MEDICAL COLLEGE, Adjunct Associate Professor, Department of Biomedical Engineering, CORNELL UNIVERSITY

2:30-3:00 *Presentation B: **Bio-Additive Manufacturing***  
**Wei Sun, Ph.D.**, Albert Soffa Chair Professor, Department of Mechanical Engineering and Mechanics, DREXEL UNIVERSITY

3:00- 3:30 Networking Break

**Session V: Cell and Tissue Patterning for In Vitro Diagnostics**

*In Vitro Diagnostics is a very large market for both drug discovery and toxicology. Some of the relevant discoveries and inventions to be covered in this session will include: Biophotonic patterning of matrices to study metastasis, printing of microenvironment cellular microarrays for high throughput screening, patterning of extracellular matrix to study endothelial cell – cancer cell co-cultures, cellular microarrays using photolithography and robotic printing.*

3:30 - 4:00 **Presentation A: 3D Biomimetic Models of the Extracellular Matrix Fabricated by Multiphoton Excited Photochemistry**  
**Paul J. Campagnola, Ph.D.,** Associate Professor, Department of Biomedical Engineering, Medical Physics Department, UNIVERSITY OF WISCONSIN, MADISON

4:00 - 4:30 **Presentation B: Micropatterned Surfaces and Scaffolds to Study Liver Cell Interactions**  
**Alexander Revzin, Ph.D.,** Professor, Department of Biomedical Engineering, UNIVERSITY OF CALIFORNIA, DAVIS

4:30 - 5:30 **Taking Bio-Printing Technology to Market**

*This session will assess the time-scale to commercialization, potential hurdles, and investment scenarios for bio-printing platforms and related materials innovation. The session will review the progress of the startups in this area, the scope of the market, and likely funding sources, partnership and/or licensing strategies*

**Carlo Quinonez, Ph.D.,** Principal Research Scientist, AUTODESK, INC.

**Eduardo Napadensky,** Chief Scientist, STRATASYS LTD.

**Jon A. Rowley, Ph.D.,** Chief Executive & Technology Officer, ROOSTERBIO, INC.

## **Day Two**

Thursday, November 14, 2013

7:00-7:45 Networking Breakfast

### **Session VI: Fabrication of Blood Vessels and Vascularized Networks**

*This session will cover advances in printable cellular microfluidic channels, living lithography, fabrication of cellular materials with embedded vascular networks, printable HUVEC networks and direct printing of blood vessels.*

7:45-8:15 **Presentation A: Rapid, Direct Printing of Vasculature-like Structures in Hydrogel**  
**Shaochen Chen, Ph.D.,** Professor, Department of NanoEngineering, Institute of Engineering in Medicine, Clinical and Translational Research Institute, UNIVERSITY OF CALIFORNIA, SAN DIEGO

- 8:15-8:45     *Presentation B: **Biological Laser Printing (BioLP) of Microvascular Cells onto Composite Hydrogel Biopapers***  
**Bradley R. Ringeisen, Ph.D.**, Head of NRL's Bioenergy & Biofabrication Section, U.S. NAVAL RESEARCH LABORATORY
- 8:45-9:15     *Presentation C: **Bio-Printing the Total Bioficial Heart***  
**Stuart K. Williams II, Ph.D.**, Executive & Scientific Director, CARDIOVASCULAR INNOVATION INSTITUTE
- 9:15-9:30     Networking Break
- Session VII: **Scaffolds for Tissue Growth and Bio-Materials Innovation***  
*This session will cover presentations on topics such as image-guided scaffold printing for bone regeneration; material and stem cell deposition for tissue regeneration, printing of soy-based scaffolds for tissue regeneration; and patterning of proteins to guide stem cell differentiation and cardiac regenerative medicine.*
- 9:30-10:00     *Presentation A: **Design and Fabrication of 3D Modular Scaffolds: Pre-clinical and Clinical Experience***  
**Scott Hollister, Ph.D.**, Professor, Biomedical Engineering, UNIVERSITY OF MICHIGAN
- 10:00-10:30     *Presentation B: **Translation of a Biofabrication Technology Platform from Bench to Bedside***  
**Dietmar W. Hutmacher, Ph.D.**, Professor, QUT Chair in Regenerative Medicine, Institute of Health and Biomedical, QUEENSLAND UNIVERSITY OF TECHNOLOGY
- 10:30-10:45     *Presentation C Part I: **Control of 3D Printing for Highly Accurate Polymeric Resorbable Tissue Engineering Bone Scaffolds***  
**Eric J. Mott**, Research Associate, Department of Plastic Surgery, OHIO STATE UNIVERSITY
- 10:45-11:00     *Presentation C Part II: **Bio-Reactor Pre-Culturing of 3D-Printed Bone Tissue Engineering Scaffolds: Tissue-Engineered Grafts***  
**David Dean, Ph.D.**, Associate Professor, Department of Plastic Surgery, OHIO STATE UNIVERSITY
- 11:00-11:30     *Presentation: **Design and Construction of the Palmetto Printer: Advanced Tissue Biofabrication in South Carolina***  
**Michael J. Yost, Ph.D.**, Associate Professor of Surgery and Bioengineering, Associate Chairman for Research, MEDICAL UNIVERSITY OF SOUTH CAROLINA

11:30-12:30 **Panel Discussion: Software for 3D Bio-printing: Integrating BioMedical Imaging to CAD Systems**

*The push of 3D printing techniques into the 'soft' biomed space (i.e., organs and tissue as opposed to rigid prosthetics) necessitates evolution of the CAD design and software tools currently available, pushing them to new methods and perhaps higher resolutions. At the same time, CAD is starting to be integrated with data from medical imaging techniques like MRI, CT scans and ultrasound. This panel will provide a cross-section of views and updates from the design and software side of the emerging bio-printing movement.*

Panelists:

**Danielle Beski**, Biomedical Application Engineer, MATERIALISE USA

**Arif Sirinterlikci, Ph.D.**, Interim Department Head, Engineering, Professor of Engineering, ROBERT MORRIS UNIVERSITY

**Shawn Zhang, Ph.D.**, Product Leader, AMIRA, VSG/VISUALIZATION SCIENCES GROUP

12:30 Summit adjourns