Title: Personalized Stents and Robotic Balloon Endoscopes for Airway Management

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Abstract: In medical interventions, there are advantages to using soft materials for both implanted devices and therapeutic robots. This talk explores their use in treating blockages of the airways for which two fundamental procedures are stenting and balloon dilation. An in vivo molding technique will be presented which enables patients to receive a stent tailored to the size and shape of their airway. In this approach, a soft stent with a liquid UV-curable core is balloon expanded so that it conforms to the airway walls and is then quickly cured to this shape. A soft robot will also be presented that can navigate through the airways serving as both an endoscope and balloon dilator. Combining these functions which are normally performed using two instruments avoids the visual occlusion problems encountered during balloon dilations. Fabricated using inexpensive materials and processes and powered by pressurized air and vacuum sources that are found in standard medical operating rooms, the design lends itself to use as a disposable.

Bio: Pierre E. Dupont is Chief of Pediatric Cardiac Bioengineering and holder of the Edward P. Marram Chair at Boston Children's Hospital. He is also a Professor of Surgery at Harvard Medical School. His research group develops robotic instrumentation and imaging technology for medical applications. He received the BS, MS and PhD degrees in Mechanical Engineering from Rensselaer Polytechnic Institute, Troy, NY, USA. After graduation, he was a Postdoctoral Fellow in the School of Engineering and Applied Sciences at Harvard University, Cambridge, MA, USA. He subsequently moved to Boston University, Boston, MA, USA where he was a Professor of Mechanical Engineering and Biomedical Engineering. He is an IEEE Fellow, a Senior Editor for the IEEE Transactions on Robotics and a member of the Advisory Board for Science Robotics.