ABSTRACT: 3D imaging modalities such as Computed Tomography (CT) and x-ray guided minimally invasive interventions have become the preferred procedures for diagnosis and treatment of vascular disease. These imaging modalities use complex software which relies on bench-top validation in vascular phantoms prior to in-vivo or clinical use. The same approach applies to preclinical safety evaluation of devices used in minimally invasive vascular procedures. For all these clinical applications, there is a great need for in-vitro models which mimic human anatomy and replicate physiological conditions. Dr. Ionita’s group has developed a new methodology which combines 3D imaging and 3D printing to create complex but accurate patient-specific neuro-vascular and cardiac models. These models allow simulation of endovascular procedures while providing human relevant blood flow conditions. Their approach aims to match the mechanical and surface properties of the 3D printed vascular models to those of the human arteries. To achieve this, they combined 3D imaging, computer simulations and surface optimization to created geometrically and physiologically accurate vascular models. Dr. Ionita’s group has used their approach for device testing, diagnosis software assessment and patient endovascular treatment planning. More recently they started investigating the feasibility of patient-specific new device development using 3D printing based on 3D imaging information. They believe that the combination of 3D imaging and 3D printing has the potential to create a paradigm shift in the way we create new tools for vascular device safety evaluation and clinical software validation. These tools could enable: more efficient development medical devices, timelier device and software evaluation and a better mechanisms to leverage advances in regulatory science.

Biography: Ciprian N Ionita received his engineering degree in Applied Nuclear Physics from University at Bucharest and a Ph.D. degree in Physics with a focus in Medical Physics from the Department of Physics at University at Buffalo, under the mentorship of Dr. Stephen Rudin. Dr. Ionita’s research focuses on image based physical characterization of vascular disease and endovascular devices development. He combines 3D imaging computed tomography, 3D printing and computer simulations to develop patient specific neuro- and cardio-vascular models which are used for device development, diagnostic software validation, and patient surgical treatment planning. In addition, his research includes development of patient-specific devices for treatment of vascular disease such as aneurysms.