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**To:** [xgxu@ustc.edu.cn](mailto:xgxu@ustc.edu.cn)  
**Subject:** IOMP webinar: New Tools of Phantoms, Monte Carlo Calculations, and AI for Medical Physics Applications  
**Date:** Monday, September 13, 2021 8:14:48 PM

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## **IOMP webinar: New Tools of Phantoms, Monte Carlo Calculations, and AI for Medical Physics Applications**

**Wednesday, 6th October 2021 at 12 pm GMT**

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**Organizer: Madan Rehani**

**Moderator: Madan Rehani**

**Speaker: Prof. Xie George Xu, University of Science and  
Technology of China (Hefei, China)**



**Speaker biosketch:**

Prof. Xie George Xu is professor and director of the Institute of Nuclear Medical Physics, University of Science and Technology of China (Hefei, China). Before relocating to China recently, he was the Edward E. Hood Endowed Chair Professor of Engineering at Rensselaer Polytechnic Institute (Troy, New York, USA). He received a Ph. D. in Nuclear Engineering (health/medical physics focus) from Texas A&M University (College Station, Texas, USA) in 1994. Since 1995, Prof. Xu has mentored nearly 100 Ph.D and M.S. students in the U.S. and China. His research has focused on “radiation dosimetry” for radiation protection, medical imaging, and radiotherapy applications, with continuous funding by governmental agencies and private sector industry. His publication list includes 2 books, 200 peer-reviewed papers/chapters, 400 abstracts, and 140 invited talks. Widely known for his work on “computational phantoms” and “advanced Monte Carlo simulations”, Prof. Xu is a fellow of American Nuclear Society (ANS), Health Physics Society (HPS), American Association of Physicists in Medicine (AAPM), and American Institute for Medical and Biological Engineering (AIMBE), as well as a council member of the National Council on Radiation Protection and Measurement (NCRP) and a past president of the Council on Ionizing Radiation Measurements and Standards (CIRMS). He has been on the editorial board of Medical Physics and Physics in Medicine & Biology for 20 years. Prof. Xu and his team have developed a number of commercial software tools including VirtualDose (a CT and IR patient dose reporting software), ARCHER (a GPU-based Monte Carlo dose computing software for treatment planning and dose QA verification), and DeepViewer (an image segmentation and registration software tool). Prof. Xu has received numerous professional recognitions including, recently, CIRMS Randal S. Caswell Award for Distinguished Achievements (2015), HPS Distinguished Scientific Achievement Award (2018), ANS Arthur Holly Compton Award in Education (2020), ANS Rockwell Lifetime Achievement Award in Radiation Protection and Shielding (2020), and AAPM Edith H. Quimby Award for Lifetime Achievement in Medical Physics (2020).

## **Abstract:**

Estimation of organ doses in medical physics depends on computational phantoms and Monte Carlo calculations - two tools that have seen major advancement recently. Phantoms have evolved from the 1st-generation stylized phantoms to 2nd-generation voxel phantoms, and to 3rd-generation boundary representative (BREP) phantoms. Aided with the latest deep-learning image segmentation tools, patient-specific phantoms can be created consisting of organ outlines ready for Monte Carlo calculations. And GPU-based Monte Carlo codes can reduce dose computing time from hours to less than one minute. This presentation will cover: (1) Historical review of computational phantoms and Monte Carlo codes, (2) Development of patient-specific phantoms using an automatic multi-organ segmentation tool, DeepViewer, that is based on neural convolutional network (called U-Net) , (3) Development of rapid Monte Carlo dose calculation code, Archer, that is based on nVidia GPU co-processors and virtual-source-modeling of medical accelerators. Examples in medical imaging dose (CT, PET/CT) and radiation treatment will be discussed.

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Technical support, promotion, recording: Prof. M. Stoeva

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