The SIMIND Monte Carlo code, a life-long research project, that has its roots in a PhD course

Michael Ljungberg, a professor of Medical Radiation Physics at Lund University, began his research in the Monte Carlo field in 1983 through a project involving the simulation of whole-body counters. However, he later shifted his focus to more general applications in nuclear medicine imaging and Single Photon Emission Computed Tomography (SPECT). As a parallel to his development of the Monte Carlo code SIMIND, he started working in 1985 on quantitative SPECT and problems related to attenuation and scatter. After completing his Ph.D. in 1990, he secured a research assistant position that enabled him to continue developing SIMIND for quantitative SPECT applications. He also established successful collaborations with international research groups. Dr. Ljungberg became an associate professor in 1994 and, after working clinically as a nuclear medicine medical physicist, received a full professorship in the Science Faculty at Lund University in 2005. In 2015, he was promoted to a full professorship in the Medical Faculty. In addition to developing SIMIND to incorporate a new camera system with CZT detectors, Dr. Ljungberg's research encompasses an extensive project in oncological nuclear medicine. Collaborating with his colleagues, he developed dosimetry methods based on quantitative SPECT, Monte-Carlo absorbed dose calculations, and methods for accurate 3D dose planning for internal radionuclide therapy.

His presentation will focus on the development of his program starting from a PhD course 1983 to present date and how evolved from a simple model of whole-body counters to sophisticated iterative reconstruction program. He also will discuss the research for diagnostic imaging and radionuclide therapy that has benefitted from Monte Carlo simulations. He will show examples where Monte Carlo simulations can reveal limitations in clinical image and quantification methods and calculations of activity and absorbed doses. The presentation will provide a background to the current collaboration between Lund and Rijeka, which assesses the efficacy of based reconstructions compared to clinical routine methods.