未来先端研究機構セミナー
第7回　重粒子線医工連携セミナー　共催

2019年2月19日(火) 17:00～19:00
群馬大学重粒子線医学センター　カンファレンス室

1. Jan Schuemann, PhD　– Assistant Professor

Head of the Multi-Scale Monte Carlo Modeling Lab・Department of Radiation Oncology
Massachusetts General Hospital/ Harvard Medical School

2. Aimee McNamara, PhD – Instructor

Department of Radiation Oncology Massachusetts General Hospital/ Harvard Medical School

The TOPAS Tool for Particle Simulation – Monte Carlo Simulation and its application in the clinic

Jan Schuemann, PhD

Monte Carlo (MC) simulations are the gold standard when it comes to determining dose distributions delivered to radiation therapy patients. We have developed TOPAS, a TOol for PArticle Simulations, to facilitate the use of the MC method for medical physicists and radiation biologists. TOPAS wraps and extends the general purpose Geant4 MC Simulation Toolkit and has recently become part of the US NCI's initiative "Institute for Technology in Cancer Research (ITCR)". TOPAS is free and well supported for all non-profit users in medical physics and radiation biology worldwide. TOPAS currently has over 500 users at 227 institutions in 35 countries.In this presentation we will show how, ten years into the TOPAS project, we have achieved our goal to provide a tool that can be of tremendous help for clinical as well as research physicists. Further, we will demonstrate how TOPAS is being used

- **for modeling treatment delivery systems**
- **for detector design studies**
- **for quality assurance in a clinical environment**
- **for four-dimensional beam scanning applications**
- **for calculating dose distribution in patients**
- **for investigations correlating outcome and properties beyond dose (e.g. LET)**
- **for microdosimetry applications**

The Monte Carlo toolkit for cellular and sub-cellular radiobiology: TOPAS-nBio

Aimee McNamara, PhD

Computational simulations offer a unique tool for quantitatively investigating radiation interactions within the cell and within sub-cellular structures. The TOPAS collaboration has developed a new extension, TOPAS-nBio, which is dedicated to advance the understanding of radiobiological effects on the sub-cellular level. The aim of TOPAS-nBio is to provide a comprehensive Monte Carlo toolkit, making advanced simulations and a comprehensive library of biological geometries available to non-computing experts working in the field of radiobiology. TOPAS-nBio, which uses the libraries of the Geant4-DNA Monte Carlo toolkit. TOPAS-nBio offers full track-structure Monte Carlo simulations, explicitly simulating every particle interaction event-by-event,integration of chemical reactions of radiolysis products within the first millisecond, an extensive catalogue of specialized cell geometries as well as sub-cellular structures such as DNA, and interfaces to mechanistic models of DNA repair kinetics. Here we will present an introduction to TOPAS-nBio as well as example applications to radiobiology, including modeling damage to a full cell genome as well as models of damage to specific structures in a neuron (e.g. spines, mitochondria).

お問い合わせ　群馬大学 重粒子線医学研究センター レニー、猪爪
〒 371-8511　前橋市昭和町3-39-22　TEL：027−220−8378