The Department of Radiation Oncology at the University of Pennsylvania is seeking for an enthusiastic physicist to work in the implementation of proton radiation biophysics calculations in Varian’s treatment planning system (TPS), Eclipse.

**Postdoctoral Proton therapy Physicist**

Proton radiotherapy has been built upon the assumption of a constant 10% increase of its relative biological effectiveness (RBE) with respect to conventional radiation sources (x-rays). However, there is growing interest in having access through the TPS to biophysical parameters such as the proton linear energy transfer (LET) and RBE in order to gain more detailed information about these distributions for both, research and clinical purposes. There is also growing interest in optimizing proton plans according to these distributions in order to maximize the difference in LET and RBE seen by the tumor and the organs at risk (OAR). For this purpose, this project intends to implement the necessary algorithms in ECLIPSE to calculate these parameters through the Eclipse Scripting API. In particular the candidate will be involved with (but not only restricted to):

- Implementation of LET calculation algorithm
- Implementation of an LET optimization algorithm
- Implementation of RBE calculation algorithm according to validated models
- Implementation of an RBE optimization algorithm

For this purpose, the candidate will not only be involved with coding but will also be involved in the commissioning of the microdosimetric characteristics of the Roberts Proton Therapy Center proton beam in order to produce the required data to verify LET and RBE calculations. For this purpose, microdosimetric spectra measurements using state of the art silicon based microdosimeters as well as tissue equivalent proportional counters will be used in our pencil beam scanning rooms. These measurements will be verified against our in-house monte carlo software (Geant 4) as well as against our in-house Matlab based treatment planning software (FoCa).

Penn Radiation Oncology is one of the most comprehensive radiation oncology programs in the world. The outstanding faculty and staff, combined with Penn’s extensive collection of advanced technology, gives patients access to nearly every treatment option available for their cancer. The
broad range of radiation treatments available include proton therapy, intensity-modulated radiation therapy (IMRT), high-dose rate (HDR) and low-dose rate brachytherapy, partial breast irradiation, stereotactic radiosurgery (SRS), and Gamma Knife radiation. With the Abramson Cancer Center of the University of Pennsylvania, Penn Radiation Oncology provides patient care at the Ruth and Raymond Perelman Center for Advanced Medicine and seven community-based sites.

Located directly across the street from the Hospital of the University of Pennsylvania, the Perelman Center for Advanced Medicine offers the latest radiation oncology equipment and technology, including five of the most advanced linear accelerators, two CT simulators, a PET CT simulator and an MRI simulator.

With the addition of the Roberts Proton Therapy Center in 2009, Penn further expanded the array of treatments offered thereby providing adult and pediatric patients with options that previously didn’t exist. Penn's Roberts Proton Therapy Center is completely integrated with its conventional radiation therapy services. The Roberts Proton Therapy Center is the largest proton therapy center in the country with five treatment rooms, delivering one of the most advanced and targeted forms of radiation to patients.

Penn Radiation Oncology is particularly proud of its outstanding research program. Penn is committed to developing new biological and physical approaches for improving radiation therapy and bringing these advances to the clinic to benefit patients directly. In particular, Penn's researchers are known for developing novel approaches to biologically target molecular pathways and, thereby, enhance the effect of radiation on tumor cells, while not increasing side effects. Penn's work in tumor hypoxia and the tumor microenvironment is well recognized in the oncology research community, as are its programs in photodynamic therapy, radioprotection and DNA damage.

As pre-requisites for the project, the candidate is expected to be fluent in C#, Matlab and C++ languages. Previous experience in radiotherapy optimization and particle biophysics (RBE) will be considered an important plus. Similarly, experience in clinical radiotherapy and more particularly proton radiotherapy will rank the candidate among the top of the list. The project will last for a minimum of 12 months with a possible extension to 24 months.

Candidates should send their CV, a letter of interests and two reference letters should be submitted to Alejandro Carabe (a.carabe@uphs.upenn.edu).