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Nuclear Physics: The Unsung Hero of Medical Diagnostics

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X-rays and nuclear radiations have been the tools of medical diagnostics and therapy in addition to diverse applications in agriculture, industry and security. Starting from the early 20th century, the development of particle accelerators of diverse species of higher and higher energies along with nuclear reactors have enriched the nuclear tool chest.
Not only have we been able to take advantage of the photoelectric effect, positron annihilation and various kinds of scattering principles to calculate attenuation coefficients but we have been able to use these principles to improve radiation safety, leverage them to optimize radiation dose, and - above all –obtain better quality images for our patients. Our challenge is to keep up with the demand while maintaining our standard of imaging and minimizing dose to patients.

What initially started as X-ray photography of human bodies for diagnosing broken bones has expanded to image interiors of the bodies both for anatomical and functional imaging. Computed Tomography with X-rays produce detailed images which would have otherwise required several X-ray imaging exposures. Added to that are the Single Photon Computed Tomography (SPECT) and Positron Emission Tomography (PET) with ever more increasing number of medical isotopes.
Additionally, theranostics is a growing field of activity which facilitates real time imaging along with therapy to monitor the patient's improvement.
All these developments also raise concern of the excessive radiation exposure to the patients and also radiology professionals. A good understanding of the diverse species of radiations and unique health risks of each species of radiation in conjunction with the affected human physiology are warranted.

Ongoing research, usually by medical physicists, will allow medical imaging to become more precise, efficient, and effective in patient care. A good understanding of nuclear radiation physics and technologies will contribute to help the medical professionals perform their duties with enhanced confidence. I will give a brief overview of the current state of the art of medical imaging and stress the need for better knowledge of nuclear physics by diagnostic radiologists.

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Keyword-1

diagnostic radiology

Keyword-2

radiation dose

Keyword-3

MRI, CT, xrays, mammography

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