**RESEARCH EXPERIENCE**

1. **Development and applications of Green Energy systems**
* Supervision of students laboratory of Green Energy at UR
* Collaboration with research centers and industry in Poland and other countries
* Supervision of Diploma, Master and PhD projects related to Green Energy
1. **Development of radiation detectors with special characteristics for Science and Industry**
* High speed and efficiency detector for ions using Boron-doped diamond. Developed at GSI, Darmstadt, Germany. International Patent: PCT/EP 03/02323; P179 (GSI 12283) **2003. *Licence for the patent purchased by SIEMENS, Germany in 2008.***
* High speed and efficiency detector for X-rays and ions using modern nanomaterials. Developed in Singapore. At NTU: ITTO Ref: PAT/019/04/05/US
* Development of pixelated detector for medical imaging with X-rays. Developed at Monash Centre for Synchrotron Science (MCSS) at Monash University
* Development of high resolution detector for imaging with X-rays. Developed as a joint project between MCSS & ARC Centre of Excellence for Coherent X-ray Science.
1. **Monte Carlo simulations of interaction of radiation with matter**
* Work on the radiation interaction with matter (1977-1982) in the Institute of Nuclear Physics, Krakow, Poland. This project was associated with a development of a new cyclotron for medical therapy
* Application and further development of the GEANT code. This project was related to the funded project (2003-2007) by European Union (EU) on single cell irradiation with high resolution microbeams – CELLION.
1. **Development and applications of high resolution microbeams:**
	* **Ions: nuclear microprobe with MeV ions**: Brookhaven National Laboratory (1982-85), The University of Melbourne (1987-98), MC Scientific Consulting (1998-2004), GSI (1999-2003).
	* **X-rays:** National Synchrotron Light Source (1982-85), Singapore Synchrotron Light Source (2003-now).
	* **Electrons:** with high resolution imaging using secondary electron microscopy (SEM), transmission electron microscopy (TEM) and PEEM.
	* **Photons:** with phase contrast imaging including phase contrast microscopy (PCM), Differential Interference Microscopy (DIC – Nomarski), Hoffman modulation contrast microscopy (HMCM), fluorescence microscopy (FM) and quantitative phase microscopy (QPM).
2. **Development and applications modern analytical techniques using:**
	* **Ions:**

**(a) nuclear microprobe with MeV ions** and associated systems and techniques including proton induced X-ray emission (PIXE), Rutherford Back-Scattering (RBS), scanning transmission ion microscopy (STIM), STIM tomography (STIMT) and single cell irradiation facility (SCIF).

**(b) microprobe with keV ions** including systems such as scanning ion mass spectroscopy (SIMS), MALDI-TOF, time-of-flight heavy ion backscattering spectrometry (TOF-HIBS)

* + **X-rays:**

with associated systems and techniques with both laboratory and synchrotron sources including synchrotron radiation x-ray emission (SRIXE), x-ray absorption near edge spectroscopy (XANES), total X-ray fluorescence (TXRF), small angle x-ray scattering (SAXS) and glass capillary optics.

* + **Electrons:**

with associated analytical techniques including EDAX, scattering and transmission techniques.

1. **Rheology**

 Since April 2011 I I have been involved in development and applications of rheological techniques for nanomaterials and nanoliquids at Rzeszow University of Technology. Rheophysics is the study of the deformation and flow of matter in all its states (gaseous, liquid, solid and even glassy or mesomorphic). In this definition, the topic is extremely vast, comprising the hydrodynamics of simple liquids, the elasticity and plasticity of solids and rheology of complex fluids exhibiting a behaviour intermidiate between those of liquids and of solids.

1. **Development of new nanomaterials and its applications**

 Since 1995 I have been involved in development and applications of high efficiency detectors for ions, X-rays and electrons. I have been able to organize necessary funds and groups working and have been granted 2 international patents in this area.

1. **Development and applications of imaging techniques in Biology and Medicine**

I have been involved in development of high resolution imaging techniques in biology and material science for more than 30 years. And for the last 10 years I got involved in newly development imaging modalities in Medicine. These techniques involved:

* Development and applications of high resolution imaging techniques with ions, electrons and X-rays.
* Involvement with development of imaging modalities with applications in Medicine
* Development and applications of Magnetic Resonance Elasography (MRE)