A WA View of Nuclear Science – A changing landscape?

Curtin University | Nuclear Science | December 2022

Like SA, WA had an early taste of nuclear science…..

Montebello Islands – UK Nuclear Bomb Testing 1956

Like most Australian Federal and State Governments, there was a fear to mention nuclear, but one decision changed that…..and another potential failure might further accelerate this change!

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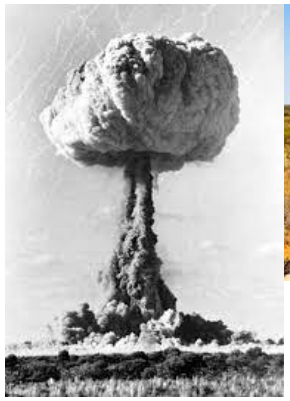
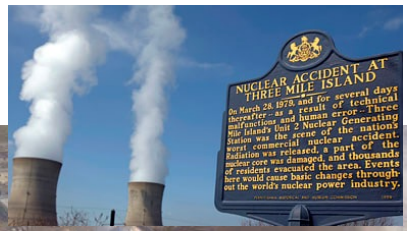
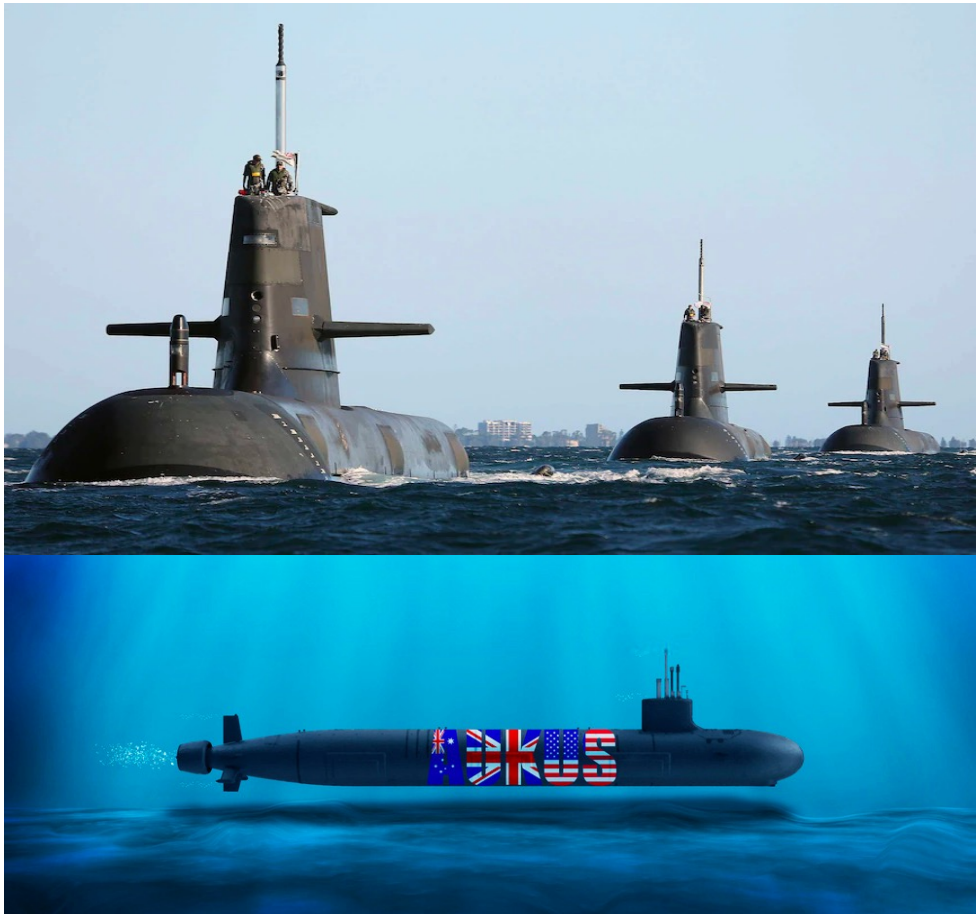




Yesterday

Today

WA Government created a capability analysis and capacity plan for subs



DEFENCE WEST

- Collins Class Submarines are home based in WA at Fleet Base West
- WA developed a capability analysis and capacity building plan as a state response to the task of acquiring a nuclear-powered submarine capability
- It was driven by the assumption that regardless of timeframe, Australia must set about developing an operational and sustainment capability immediately
- The (pathway) plan is set around six pillars of consideration ranging from issues of governance and strategic alignment, to safety and security, through to supply chain and industry

See: Minister Papalia's address to SIA 11th Biennial Conference 2022 Canberra, 7 Nov - 9 Nov, 2022

It has also regenerated the conversation on Nuclear Physics Science Markets in WA…

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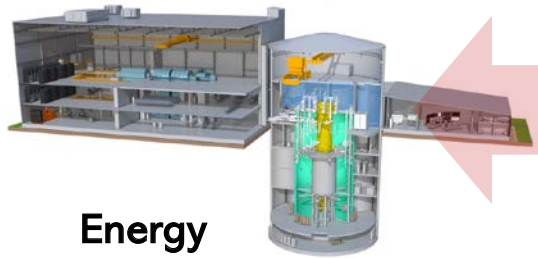
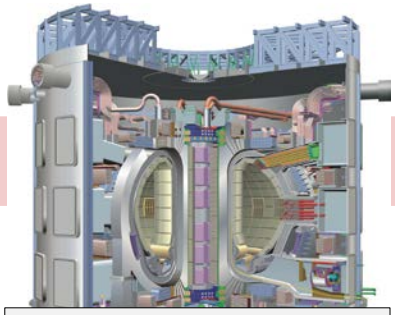
Resources Technology University Trailblazer

Mining



Energy

Defence



Nuclear Science

Uranium Mining

Computational Quantum Physics

Mineralogy Testing & Mapping

Energy Systems

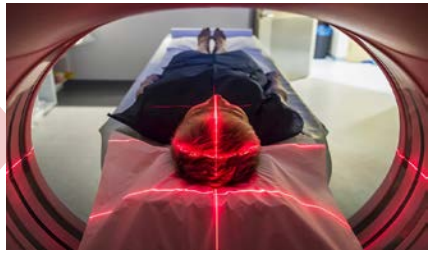
Nuclear Systems Sustainment & Safety

Nuclear Medicine

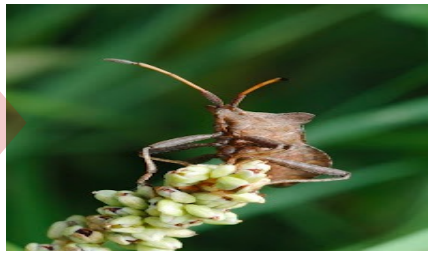
Radioisotopes

Skills & Education

Science & Innovation



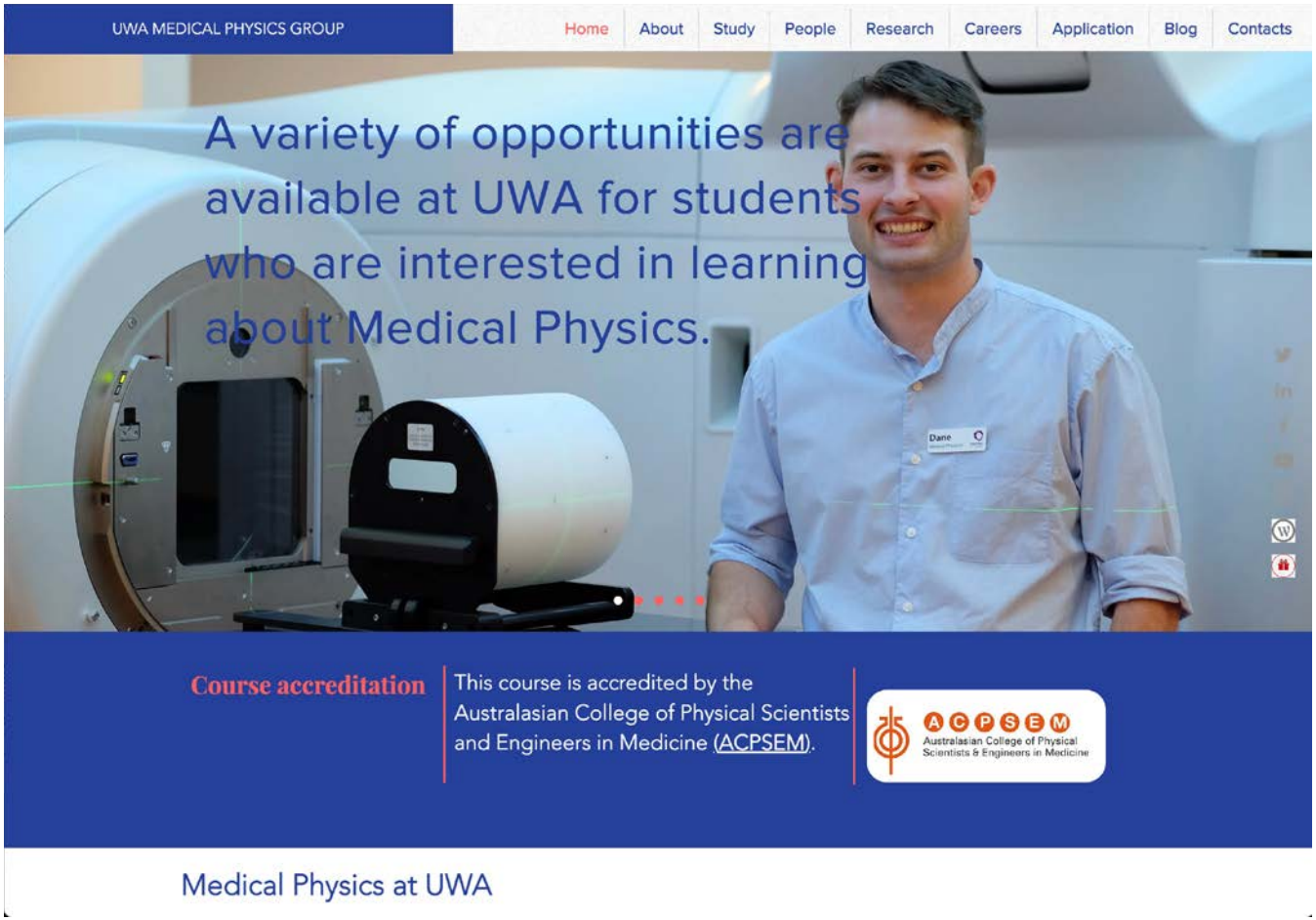
Medical Diagnoses & Treatment (UWA)



Agriculture

Criminal Investigations

UWA Medical Physics Learning, Teaching and Research Programs



THE UNIVERSITY OF WESTERN AUSTRALIA

MEDICAL PHYSICS RESEARCH GROUP

The Medical Physics Research Group at UWA conducts basic and translational research into radiation therapy, radiation biology, tumour modelling, molecular radiotherapy, radiation safety, clinical medicine and health technologies, which will lead to new applications of physics, engineering, biology and medicine for diagnostic and treatment of diseases.

Curtin University Nuclear Physics Research Programs (Examples)

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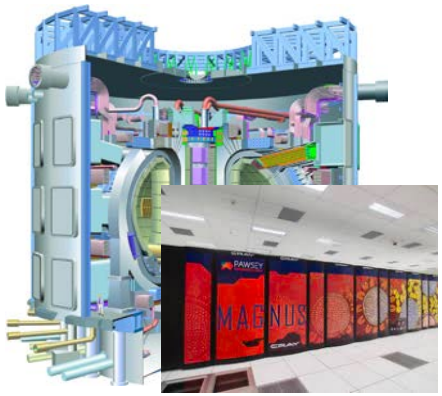
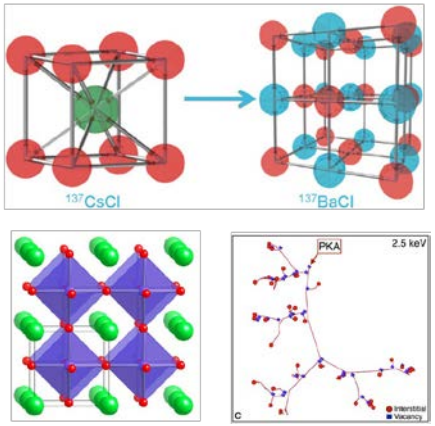
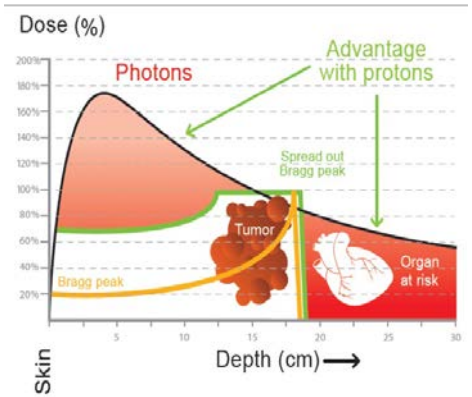


When Atoms Collide



Atomistic Computer Simulations



Proton Therapy

(Minimal radiation exposure of healthy organs)

John de Laeter Centre

Atom Probe Tomography

"We know that certain problems deserve solving, even if we don't know what applications the solutions will have. It's also a feedback mechanism. When people know the solution they then wonder where it can be applied. That's why we work together with everybody."
Prof. Igor Bray, Curtin University, Project Leader.

John de Laeter Centre

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IAEA
International Atomic Energy Agency

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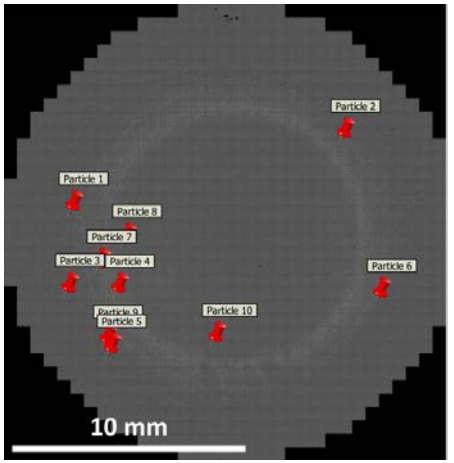
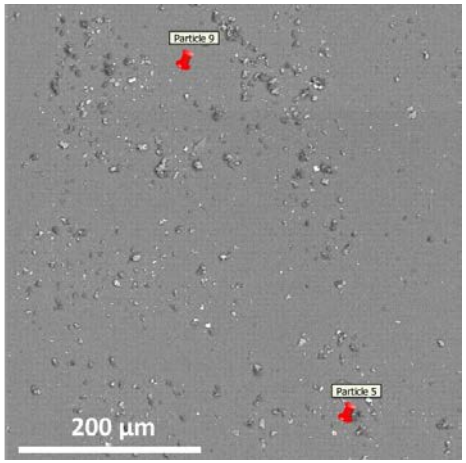
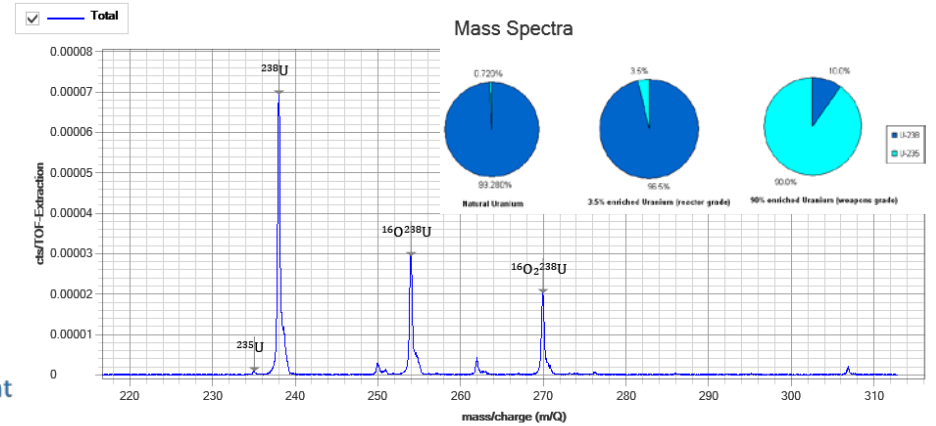
Development of advanced microanalytical methods for IAEA Nuclear safeguards





Nuclear Safeguards are activities by which the IAEA can verify that a State is living up to its international commitments not to use nuclear programmes for nuclear-weapons purposes.

IAEA environmental sampling of nuclear materials



Automated Search

Confirm and Characterise

Precision Isotopic Measurement

Innovative combination of automated mineralogy and imaging mass-spectrometry for the rapid search and characterisation of microscale uranium particles from IAEA environmental samples

Curtin Nuclear Physics Learning & Teaching Programs – Building blocks are already in place

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Nuclear & Particle Physics Course

This unit provides an introduction to contemporary nuclear and particle physics for non-specialists. The unit starts with a historical introduction and some qualitative formalities. Then we consider the size and shape of nuclei, the masses of nuclei, nuclear instability, alpha decay, nuclear collisions and reactions including fission and fusion, and nuclear models. The second half of the unit is devoted to particles and their interactions. We consider the strong interaction of hadrons and the quark model, the electromagnetic interaction, the weak interaction including beta decay, give a summary of the standard model and discuss what is beyond the standard model. The unit concludes by considering nuclear and particle astrophysics.

What you'll learn

- Use the strong link between physics and mathematics in the context of Nuclear and Radiation Physics,GC1
- Apply of Nuclear and Radiation Physics principles to explain the causes of relevant interactions and phenomena, devise strategies to investigate these and test the possible solutions
- Apply a robust problem solving technique suited to multi-stage problems involving nuclear and radiation physics
- Plan experiments and use equipment to perform nuclear and ionizing radiation physics measurements and write detailed reports with due care to uncertainties and OHS issues

We also have school outreach, summer scholarship, as well as Undergrad, Masters and PhD programs.

A strong team led by **John Curtin Distinguished Professor Igor Bray**, Head of Physics and Astronomy, and the Theoretical Physics Group.

The team Includes:

- **Prof Nigel Marks**, a materials scientist, who is a regular commentator on nuclear energy
- **Alisher Kadyrov**, PhD in Nuclear Physics, and teaches Nuclear Physics at 3d year
- **Dmitry Fursa**, PhD in Nuclear Physics, also has experience teaching Nuclear Physics

Drivers for building a future nuclear workforce (for SSNs)

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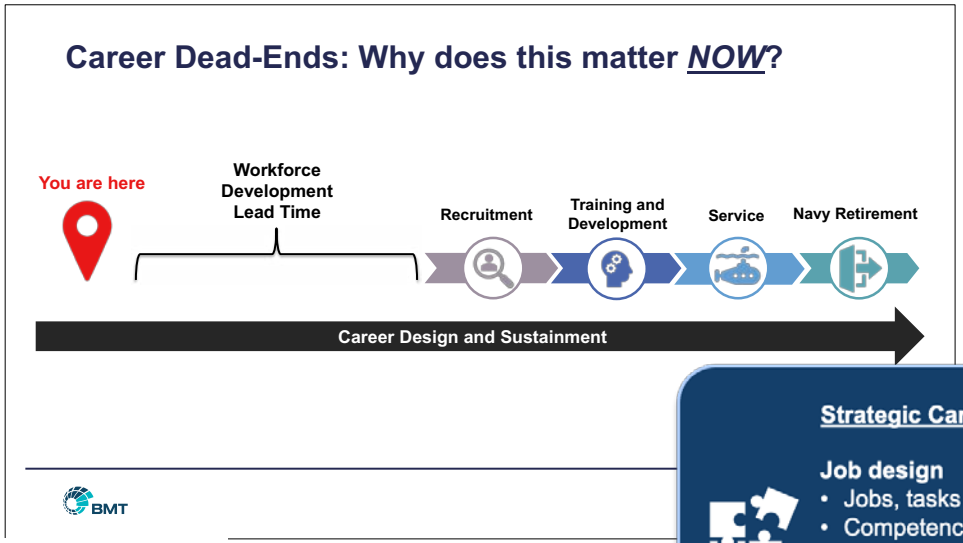
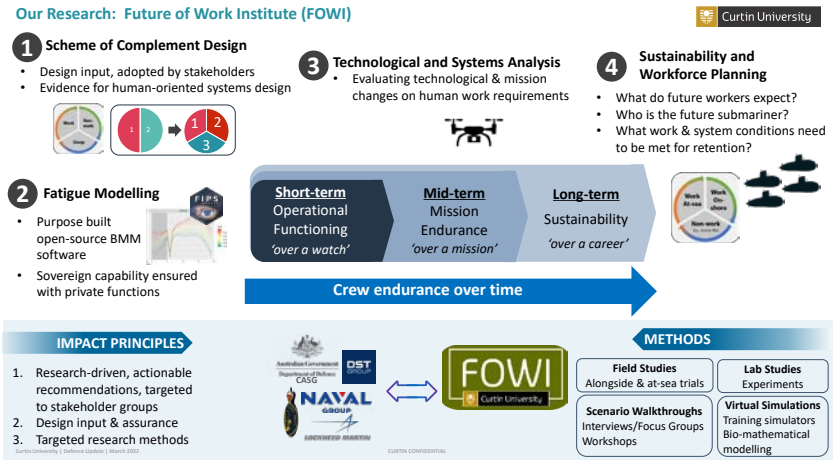
FUTURE OF WORK INSTITUTE

- Strategic career mapping & understanding the required disciplines will be a key driver for growing nuclear capability & capacity in the right areas
- This includes horizontal market movement of like-minded skillsets
- Attracting talent and driving retention for the Nuclear Industry, Applications and Sciences market





The role of nuclear science from mining to nuclear subs – WA can be a strong partner in the evolution of Australia's Nuclear Science ecosystem!

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- WA can and will have a significant role to play in the evolution of Australia's nuclear science ecosystem
- WA has the Universities with the requisite background and foundation in key nuclear science disciplines, both from a learning and teaching, and research/research infrastructure perspective
- WA has significant infrastructure and aligned markets, that are foundational to accelerate the evolution of Australia's nuclear science ecosystem
- WA has a (pathway) plan set around six pillars of consideration ranging from issues of governance and strategic alignment, to safety and security, through to supply chain and industry - this can be expanded to all market disciplines
- Building capability and capacity early will be key, where WA can have a major role in growing our baseline nuclear science ecosystem

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