



wosmip

Evolution of WOSMIP: A Journey Through Time

Dr. Paul R.J. Saey | 4 December 2023 | Santiago de Chile



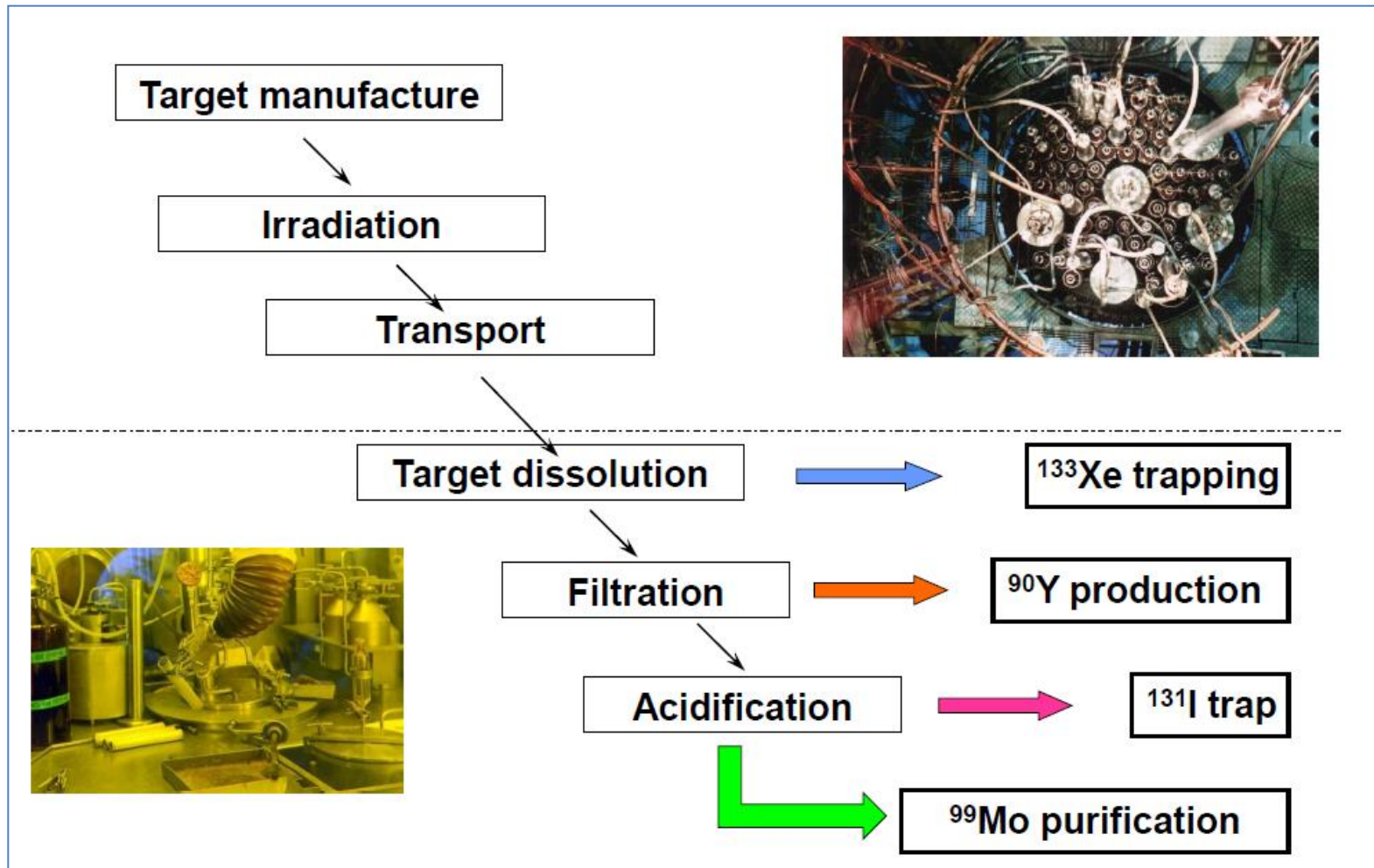
AGENDA

- Introduction
- Founding Vision
- Milestones and Achievements
- Global Impact
- Evolution of Topics
- Participant Engagement
- Future Directions

Introduction

- Medical and industrial isotopes are fundamental tools used in science, medicine and industry. Principal use in diagnosis (~30 million procedures per year) and therapy (~3 million treatments per year)
- ^{99m}Tc , daughter of ^{99}Mo , is by far the most heavily utilized
- Broad applications:
 - Function of heart, liver, thyroid, blood flow
 - Prostate, breast and bone tumour detection
- Main production of ^{99}Mo is reactor based, i.e. fission of ^{235}U
- In industry, the fission products ^{137}Cs , ^{90}Sr are some of the most commonly used radioisotopes worldwide
- In the fission process, gases like xenon and krypton are created and released into the atmosphere

A common technique for ^{99}Mo production



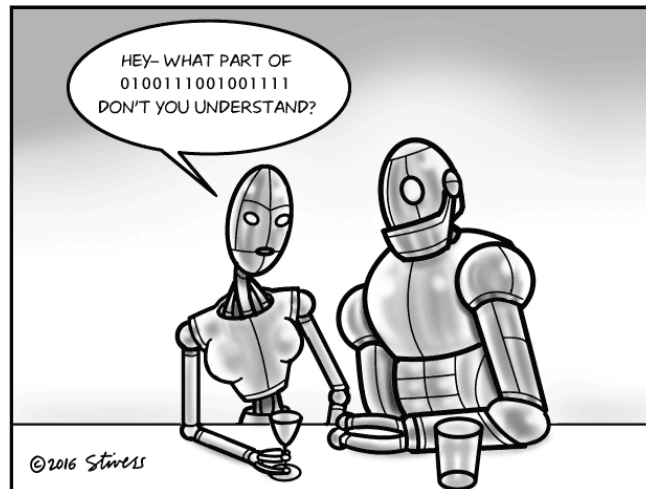
Some physics... the root of “The Xe-Puzzle”

- During fission of ^{235}U in a nuclear reactor, thermal (slow) neutrons are used, whereas during a nuclear explosion the fission is induced by fast neutrons
 - There is little time for complex activation build-up in a nuclear explosion (< **microseconds**) - there is sufficient time for production of many activation products during fission based isotope production (**days**) or in a nuclear power reactor (> **several months**)
 - These differences produce different radionuclide abundances
- ⇒ Therefore that isotopic ratios of these fission products, like **radioxenon**, can be used for source identification, but **a good and detailed understanding of the processes is needed...**

Founding Vision in 2009: Bringing two communities together



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We think in solutions, not in problems 😊

- Bring two communities (isotope production and the monitoring communities) together to better understand each other concerns;
- Find solutions to try to solve the concerns by:
 - Discussing the scientific issues
 - Confidence building measures
 - Developing solutions
- Discuss ways to mitigate the effects of isotope production on the monitoring community without disrupting the supply of isotopes
- to better understand the isotopic and chemical signatures created through isotope production mechanisms.

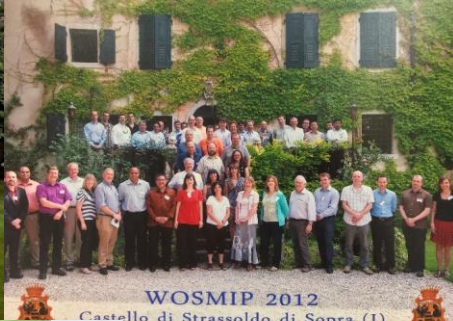


WOSMIP

Workshop on Signatures of Man-Made Isotope Production (WOSMIP)

WOSMIP is an open, international forum where innovative ideas and concepts are discussed with input from a wide range of scientists, technicians, and others interested in emissions from man-made processes and how we might lessen the impact.

WOSMIP has enjoyed attendance from hundreds of scientists from nearly 50 countries from every continent.

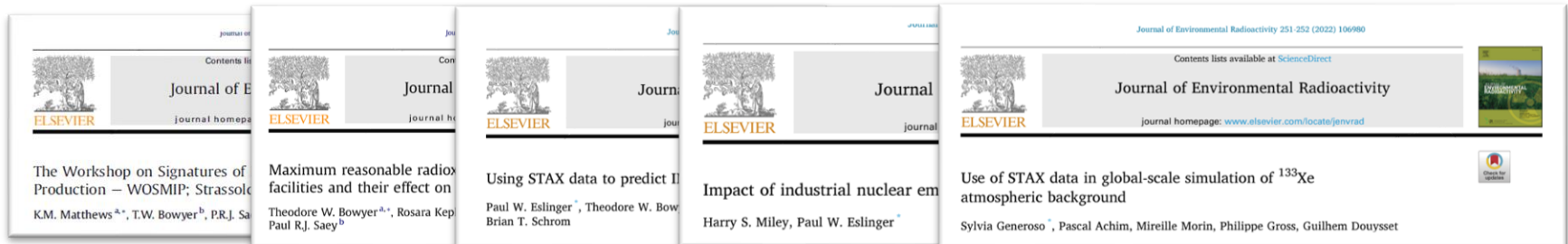


Global Impact

- It was recognized that large amounts of isotopes are produced every year at locations across the globe using a variety of means. They release detectable amounts of radioisotopes into the atmosphere
- The workshops resulted in a better understanding of the isotopic and chemical signatures created through isotope production mechanisms and the trace quantities that are detected in the environment
- E.g. concrete experiments are being conducted by the Belgian Nuclear Research Centre SCK-CEN at IRE to mitigate emissions

Global Impact

- Information exchange of emissions of some producers with the monitoring community
- It was shown that a 5×10^9 Bq/day release limit released from MIP did not significantly interfere with monitoring, when investigated using ATM
- An IAEA CRP was initiated: *“Sharing and Developing Protocols to Further Minimize Radioactive Gaseous Releases to the Environment in the Manufacture of Medical Radioisotopes, as Good Manufacturing Practice”*



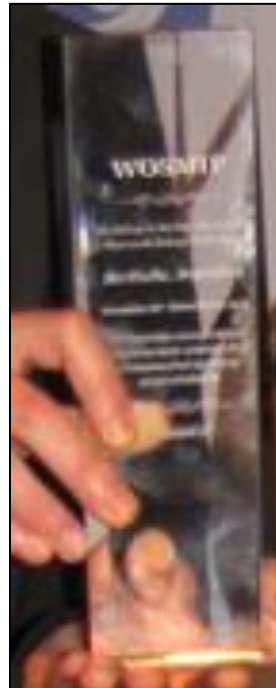
Evolution of Topics

- The unfortunate Fukushima nuclear accident in 2011 introduced another set of source-term variables.
- The community started expanding their working field to alternative xenon sources:
 - nuclear power plants
 - research reactors
 - production, handling and use of medical isotopes
 - industrial isotopes, etc.



Participant Engagement: the **Wozzie**

The **Wozzie** Award: for leadership and commitment towards the better understanding of emissions from man-made isotope production





Participant Engagement: the **Wozzie**

- Benoît **Deconninck**, IRE, Belgium
- A.A. **Sammy**, Expert, Germany
- Richard **Decaire**, Nordion, Canada
- Emmy **Hoffman**, ANSTO, Australia
- C. **Gueibe** & J. **Camps**, SCK, Belgium
- Anders **Ringbom**, FOI, Sweden
- Sylvia **Generoso**, CEA, France



Future Directions

- Keep up-to-date on current and planned ^{99}Mo and other industrial fission based production activities
- R&D efforts toward radioxenon emission reduction
- Global radioxenon stack measurements: the Source Term Analysis of Xenon (STAX) project
- **More visions in Dr. Bowyer's presentation** 😊

Thank you for your attention!



Welcome to the Workshop on
Signatures of
Man-Made Isotope Production **IX**
in **Santiago de Chile** !