MIRION Connect AMERICAS 26

Annual Users' Conference

ADVANCING RADIATION SAFETY. EMPOWERING PROGRESS.

M Resort, Henderson, NV | June 15 – June 18

MIRION TECHNOLOGIES

Advancing Radiation Safety.
Empowering Progress.

Educating for Safety and Efficiency

Purdue University's Educational Initiative for Radioisotope Manufacturing

Kara Weatherman, PharmD, BCNP, FAPhA

Clinical Professor, Director of Radiopharmaceutical Programs

Purdue University

Mirion Connect | Annual Users' Conference 2026

Henderson, NV

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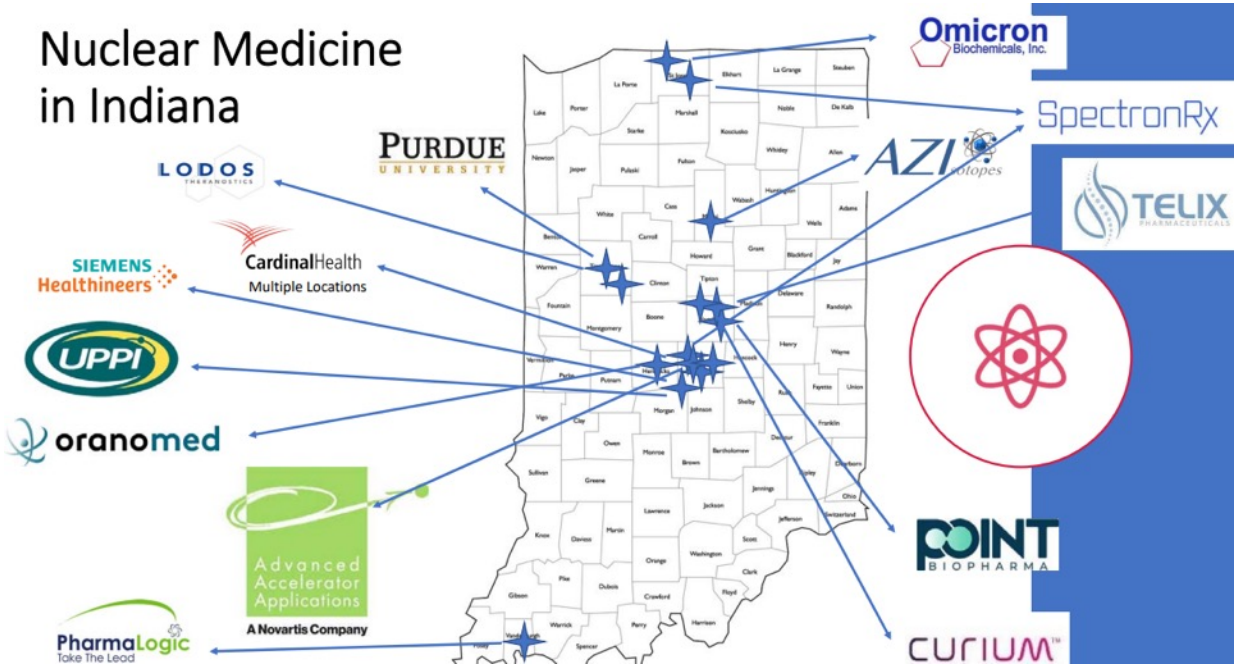
Indiana Radiopharma

Indiana Radiopharma (selected events)

- 2018: Novartis acquired Endocyte/Dr. Phil Low ($2.1B)
- 2023: Lilly acquired Point Biopharma ($1.4B),
- 2024: BMS acquired RayzeBio ($4.1B)
- 2024 June: OranoMed invested $20 M to IN ATLab
- 2024: Novartis opens production facility
- 2024 Sep: Novartis Indianapolis site expansion >200M
- 2025 July: RayzeBio manufacturing facility opens
- 2026 July: RayzeBio expansion announced (2028)



- **Indiana is a radiopharmaceutical hub:**
  - IN is home to 12+ radiopharmaceutical companies and growing
  - Public-Private collaboration includes BioCrossroads
    - Radiopharma is one of BioCrossroad's "areas of excellence" for the state

Advancing Radiation Safety.
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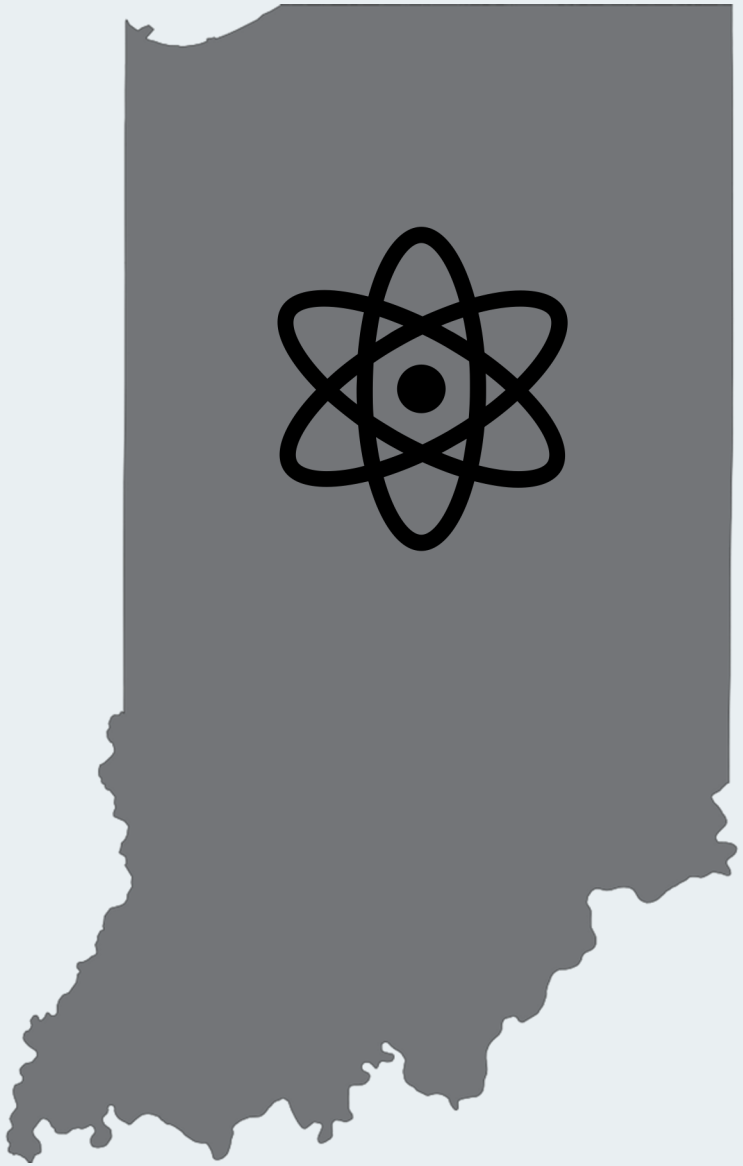

What Could Indiana Do to Build on its Strengths and Grow its Leadership?

- Distribution capacity and capabilities
- Workforce training and education
- Supply chain infrastructure
- Nuclear Medicine Centers (Research and Clinical Trials)
- Regulatory Processes
- Public Education

Radiopharmaceutical Workforce Training

How Do We Train Today?

General Academic Pathway

- *Pharmacy*
- *Physics*
- *Chemistry*
- *Biology*
- *Engineering*

Specialized Academic Training

- *Advanced degrees: Masters, PhD*
- *Training opportunities: internships, fellowships, clerkships*

Pros and Cons: General

PROS

- *General training – strong theoretical baseline*
- *Shorter time to train*
- *Multiple sources of potential employees*

CONS

- *Limited opportunities for specific applications*
- *May not have strong understanding of job potential with basic degrees*
- *How to partner?*

Pros and Cons: Specialized

PROS

- *Specific, focused training in designated area*
- *Generally involves hands-on opportunities*
- *Focus on bigger picture, not just theory*

CONS

- *Limited training sites*
- *Funding*
- *Research vs practical knowledge*
- *TIME*

How Do We Train Today?

On The Job Training

- *On the job training focuses on* **SPECIFIC JOB TASKS**

Pros and Cons: On The Job

PROS

- *Larger employee base*
- *Can train for specific duty*
- *On-the-job = working*

CONS

- *Employ first then train*
- *Steep learning curve*
- *Potential for workforce disruption*
- *Hands on: How?*

Workforce Development Defined:

a comprehensive, human-centered strategy that aligns education, training and employment services with the needs of the labor market

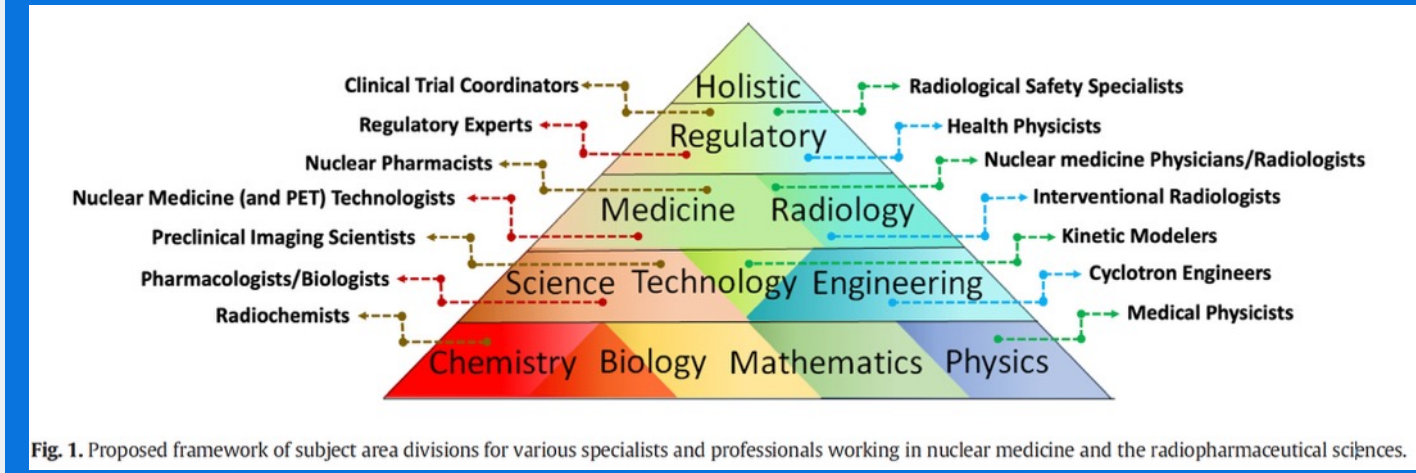

Fig. 1. Proposed framework of subject area divisions for various specialists and professionals working in nuclear medicine and the radiopharmaceutical sciences.

Advancing Radiation Safety. Empowering Progress.

TRAINING


Knowledge
Teaching
Coaching
Experience
Learn
Skills
Development
Target

Radiopharmaceutical Workforce Issues

Workforce Needs

Lancet Oncol. 2024 June ; 25(6): e250–e259. doi:10.1016/S1470-2045(24)00037-8.

Trends in Nuclear Medicine and the Radiopharmaceutical Sciences in Oncology: Workforce Challenges and Training in the Age of Theranostics

The talent pipeline is the industry's next design challenge.

Workforce development was one of the summit's clearest themes: a growing gap between graduates entering the field and the specialized talent companies need. Demand for radiopharma-trained professionals is exceeding the output of current academic programs.

This is a problem SMRT is uniquely positioned to help address. Our work spans both life sciences facility design and higher education, and we understand how those two worlds connect. Research infrastructure, specialized lab environments, and purpose-built academic facilities directly shape an institution's ability to attract faculty, develop rigorous curriculum, and produce graduates ready for industry roles. The facility investment and the workforce outcome are part of the same equation.

BioSpace

NEWS PODCASTS EVENTS JOBS COMPANIES HOTBEDS MORE ADVERTISE

Radiopharma Field Casts a Wide Net

February 10, 2026 | 4 min read | Nick Paul Taylor

iStock, Andrii Yalanskyi

LATEST

VACCINES

FDA, Moderna appear aligned on mRNA flu shot heading into adcomm

Annalee Armstrong

STAT+ | BIOTECH

'Significant talent shortage' threatens the rise of radiopharmaceuticals

Interest in the new cancer treatments has surged, but expertise in development and delivery is lacking

Scott et al. Lancet Oncology. June 2024.

Basic Science	
Responsibilities	**Specialists**
Targetry; accelerator and reactor development	Cyclotron and reactor engineers
Production and isolation of radionuclides	Nuclear chemists
Development of radiosynthetic methods and cGMP processes	Radiochemists and radiopharmacists
Quality control testing and method validation	Radioanalytical chemists
In vitro and *in vivo* evaluation	Pharmacologists, radiopharmaceutical chemists, radiation biologists, and cancer biologists

Clinical Translation	
Responsibilities	**Specialists**
Preclinical proof-of-concept studies	Pharmacologists, radiopharmaceutical chemists, radiation biologists, and cancer biologists
Preclinical dosimetry	Medical physicists
Preclinical pharmacology and toxicology studies	Pharmacologists and toxicologists
Generation of clinical protocols and preparation of regulatory filings.	Nuclear medicine physicians, health physicists, medical physicists, radiochemists, radiopharmacists, and regulatory scientists.
cGMP manufacturing	Radiochemists, QC chemists, and radiopharmacists
Clinical trials	Nuclear medicine physicians, biostatisticians, clinical trial coordinators, and study coordinators

Scott et al. Lancet Oncology. June 2024.

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Routine Clinical Use	
Responsibilities	**Specialists**
Patient referral for imaging and treatment with radiopharmaceuticals	Affiliated physicians (*e.g.*, urologists, medical oncologists, radiation oncologists, and interventional radiologists, often via multidisciplinary tumour boards)
Administration of radiopharmaceutical tracers and supervision of clinical protocols	Nuclear medicine physicians, radiation oncologists, nurses, and technologists
Interpretation of imaging data	Nuclear medicine physicians and radiologists
Human dosimetry	Medical physicists
Helping patients (and their loved ones) navigate the healthcare system	Patient advocates

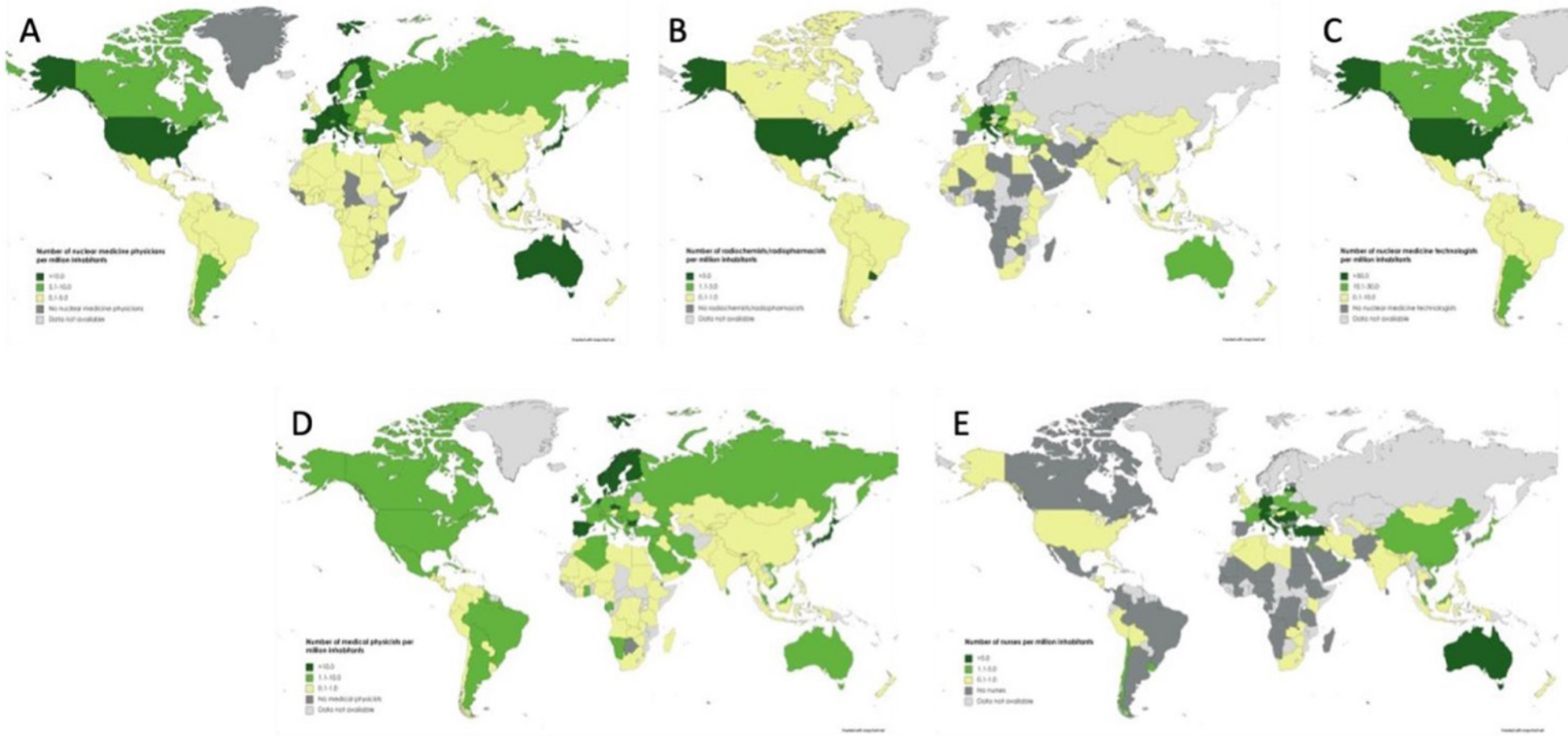


Figure 1:
(A) Nuclear medicine physicians per million people; **(B)** Radiochemists and Radiopharmacists per million people; **(C)** Nuclear medicine technologists per million people; **(D)** Medical physicists per million people; **(E)** Nurses in nuclear medicine per million inhabitants

Scott et al. Lancet Oncology. June 2024.

Scott et al. Lancet Oncology. June 2024.

Nuclear medicine workforce per million people by country income group

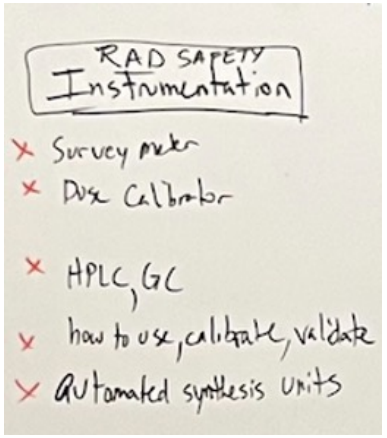
Index/ Worker	Nuclear Medicine Physicians	Medical Physicists	Nuclear Medicine Technologists	Radiochemists and Radiopharmacists	Nurses	Other staff
High-income						
Range	0.0-54.5	0.0-40.9	0.0-86.3	0.0-18.8	0.0-18.8	0.0-129.0
Mean (SD)	10.5 (10.9)	4.9 (9.9)	30.4 (18.8)	1.8 (3.5)	2.1 (4.5)	35.8 (30.0)
Median (IQR)	7.0 (1.6-11.6)	1.9 (0.0-5.2)	6.7 (0.0-15.5)	1.0 (0.4-2.6)	2.1 (0.0-5.5)	15.1 (7.2-27.0)
Upper-middle-income						
Range	0.0-14.9	0.0-12.2	0.0-17.2	0.0-3.9	0.0-16.5	0.0-28.1
Mean (SD)	4.1 (3.6)	1.0 (2.1)	2.9 (3.5)	0.3 (0.9)	1.4 (3.6)	4.0 (7.1)
Median (IQR)	1.2 (0.0-3.4)	0.7 (0.0-2.1)	0.9 (0.0-2.5)	0.4 (0.2-1.2)	0.5 (0.0-1.9)	2.9 (1.6-9.0)
Lower-middle-income						
Range	0.0-5.7	0.0-3.5	0.0-10.2	0.0-0.9	0.0-4.6	0.0-12.9
Mean (SD)	0.6 (1.0)	0.4 (0.8)	0.8 (1.7)	0.1 (0.2)	0.3 (0.9)	1.2 (2.8)
Median (IQR)	0.2 (0.0-0.9)	0.1 (0.0-0.5)	0.1 (0.0-0.7)	0.1 (0.0-0.2)	0.1 (0.0-0.5)	0.8 (0.2-2.1)
Low-income						
Range	0.0-0.5	0.0-1.2	0.0-0.5	0.0-0.2	0.0-0.1	0.0-0.4
Mean (SD)	0.1 (0.1)	0.1 (0.2)	0.1 (0.1)	0.0 (0.1)	0.0 (0.0)	0.1 (0.2)
Median (IQR)	0.0 (0.0-0.1)	0.0 (0.0-0.0)	0.0 (0.0-0.1)	0.0 (0.0-0.0)	0.0 (0.0-0.0)	0.1 (0.0-0.1)

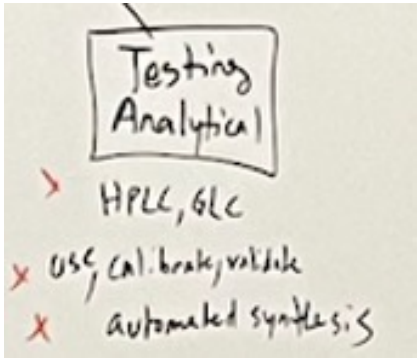
Radiopharmaceutical Workforce – Our Approach

The Beginning

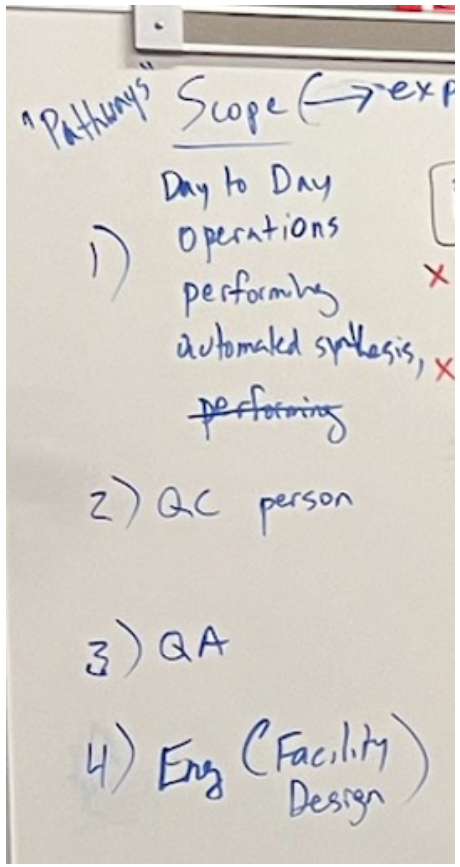
Workshop Participants

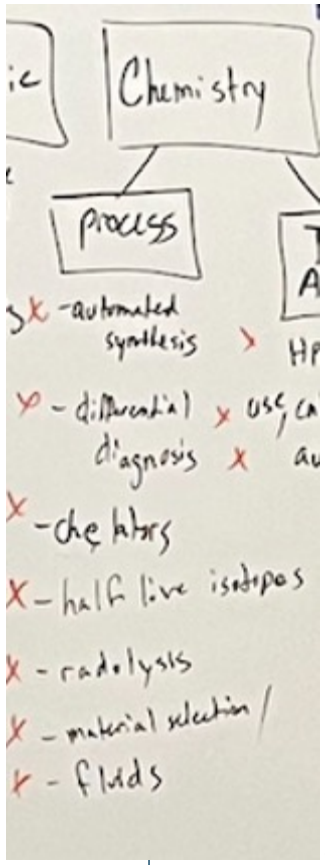
- Point Biopharma
- RayzeBio
- Perspective Therapeutics
- PharmaLogic
- Nucleus Radiopharma
- SOFIE
- Dana Farber Cancer Institute (Harvard)
- Isotopia USA
- Evergreen Theranostics
- Cardinal
- Telix
- Curium
- PETNet
- OranoMed
- SpectronRX

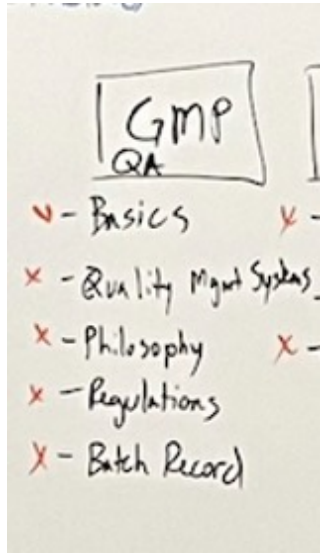




- *October 2023: Kick-off workshop*







Outcomes

Dream employee is a ninja: strong foundation in aseptic and radiation handling, is agile, flexible, competent, and capable in a variety of working scenarios

Outcomes

Dream employee is to some extent a unicorn: where do we find these people and how many do we need?

RADIATE

Radiopharmaceutical Alliance for Discovery, Innovation and Training Excellence

RADIATE was created to help raise the voice of INDUSTRY

Designing the Future: Industry Consortium

Industry-led, academically supported initiatives that bring value to the community

Established: 2023 with formal consortium enrollment 2025/2026

- RP manufacturers
- PET manufacturers
- Nuclear pharmacy (distribution)
- Isotope production
- Contract development/manufacturing

Bi-annual workshops: develop and drive programs of value

Initial Major Focus – Employee Pipeline and Development: develop a pipeline of trained and prepared employees across multiple disciplines ready to enter radiopharmaceutical manufacturing job opportunities

Foundational Support: Radiopharmaceutical Manufacturing

How do we continue to advance radiopharma?

Support and Promotion

Regulatory issues
Supply chain issues
Transportation issues
Enhancing clinical use
Supporting clinical trials

Student Recruitment

How do we get students across all levels interested in radiopharma?

Workforce Development

How do we prepare current and future members of the workforce?

Research and Innovation

How do we support partnerships between corporate and academic partners to further the growth of this area?

Radiopharmaceutical Workforce – Our Approach

Purdue University Master's in Radiopharmaceutical Manufacturing

- *32 credits*
- *Online*
  - *Local students have option for hands-on laboratory work courses if desired*
  - *All students complete a 6-week capstone project with radiopharmaceutical partner*
- *Requirements: BS degree in sciences or related fields*
- *Concentrations*
  - *9 credit hours focused toward a particular subject area*

Master's in RP Manufacturing Concentration List
Radiochemistry
Regulatory oversight
Clinical trials
Facility design and operation
Sterility assurance
Project management
TBD

WHY A MASTER'S DEGREE?

Master's Degree Content

Undergraduates (Junior /Senior) can take Master's Level courses as part of an undergraduate degree

Content can be restructured to create certificates / short courses / microcredentials for given areas of practice

WHY A MASTER'S DEGREE?

Master's Degree Educators

Current practitioners in the field (and Purdue faculty oversight)

Master's offers a mixture of lecture / knowledge courses along with seminar-based courses which place with a heavy emphasis on real world scenarios and problem solving

What's Missing?

Advancing Radiation Safety.
Empowering Progress.

Purdue Radiopharmaceutical Manufacturing Training Center

Indianapolis

- 1800 square feet
- Entry vestibule and office space
- Quality control lab
- Quarantine area
- Mock clean room
  - Isotope prep
  - Sterility prep & evaluation
  - Hot cell with manipulator arms
  - Isolator

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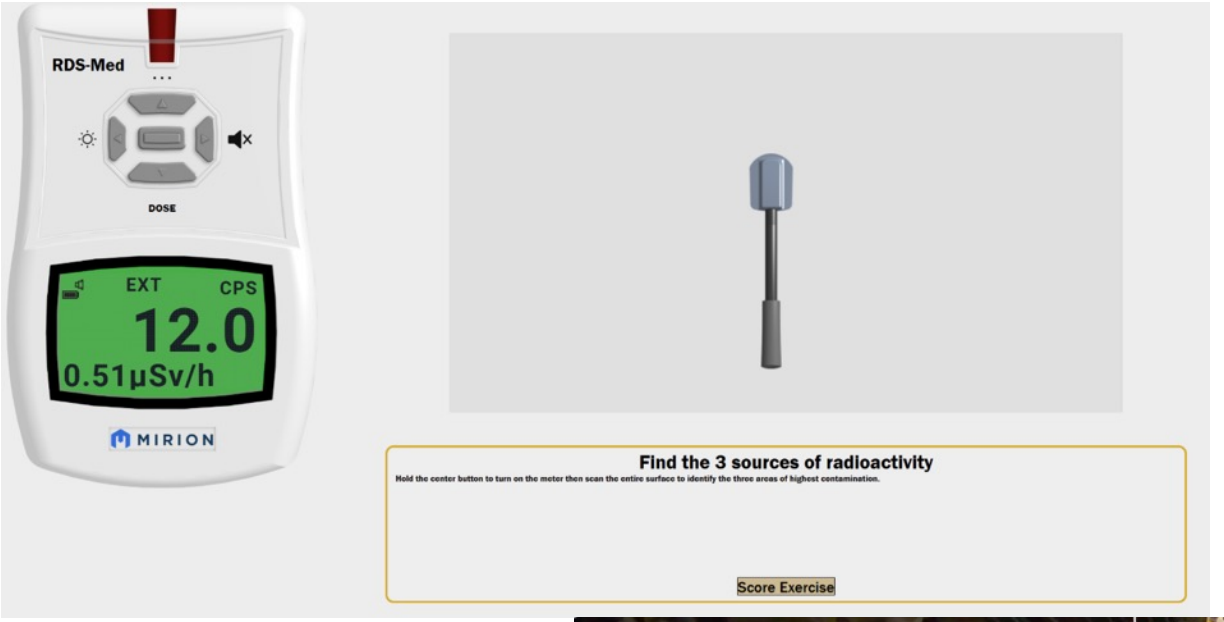
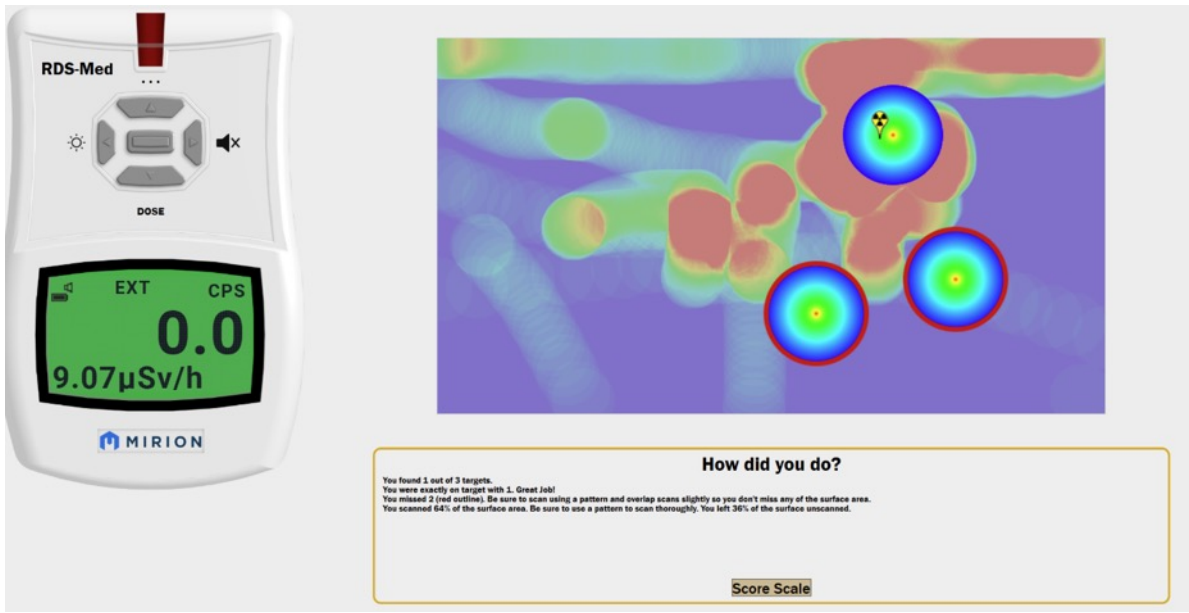
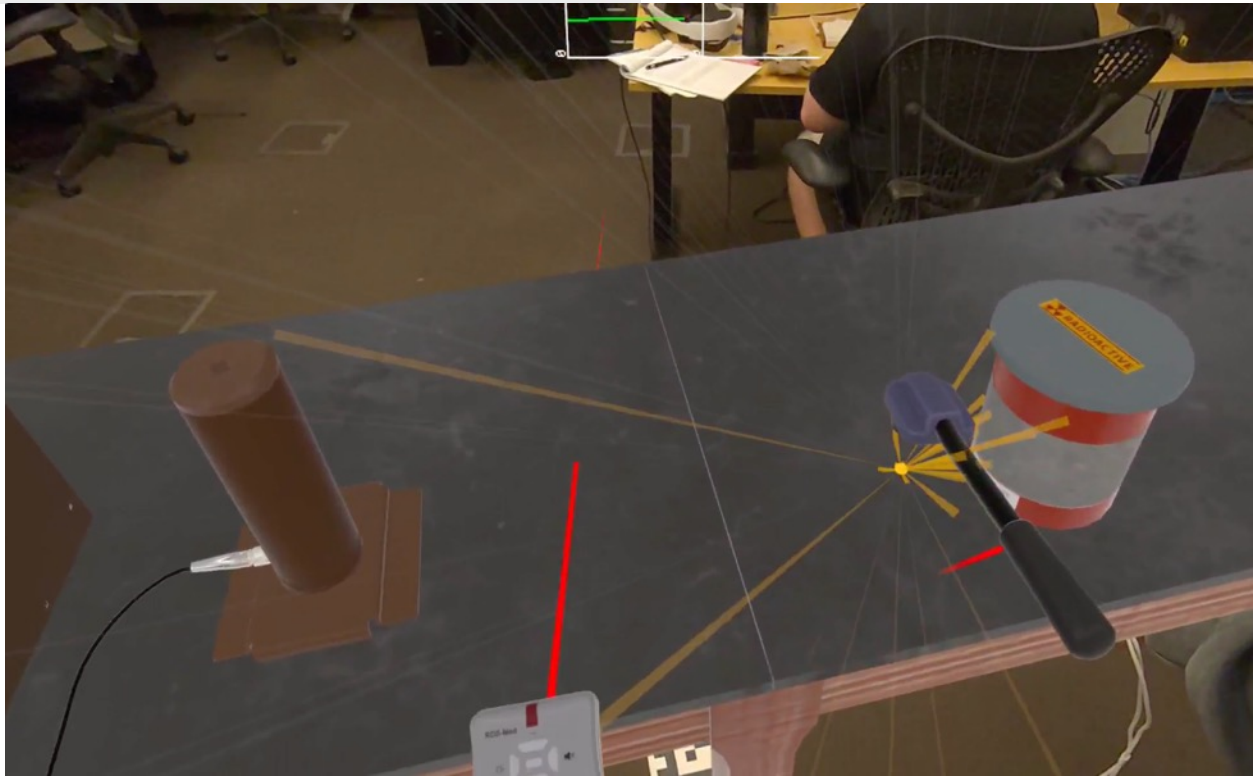
A Very Special Thank You.

MIRION

Purdue Simulation Training







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Empowering Progress.

What's Missing?

Workplace Experience


Work experience


Internship


Apprenticeship


networking


prospect


professional


Career management

Passing on to the next generation…….

Questions?
Comments?
Want to teach??

kdwman@purdue.edu