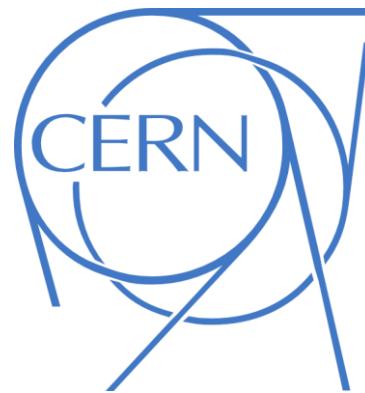


# Medical Applications of Particle Physics

Aysha Alkhailfa  
Carmelita Cipollone  
Jeroen Rosier  
Nurul Islam  
Tomislav Cerinski

ITW 2019



# Agenda

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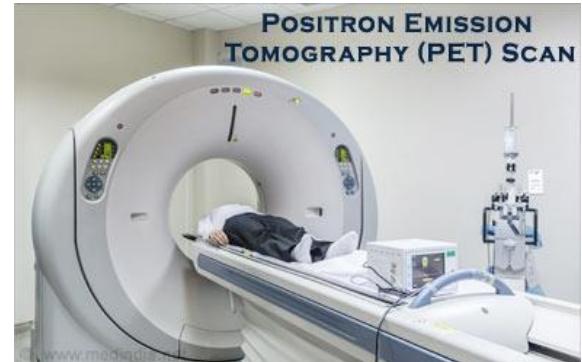
- ★ Curriculum Connection
- ★ Key concepts and Expectations
- ★ Experiences – classroom connections
- ★ Difficulties and challenges
- ★ Best practice examples
- ★ Helpful material and resources



# Curriculum Connection

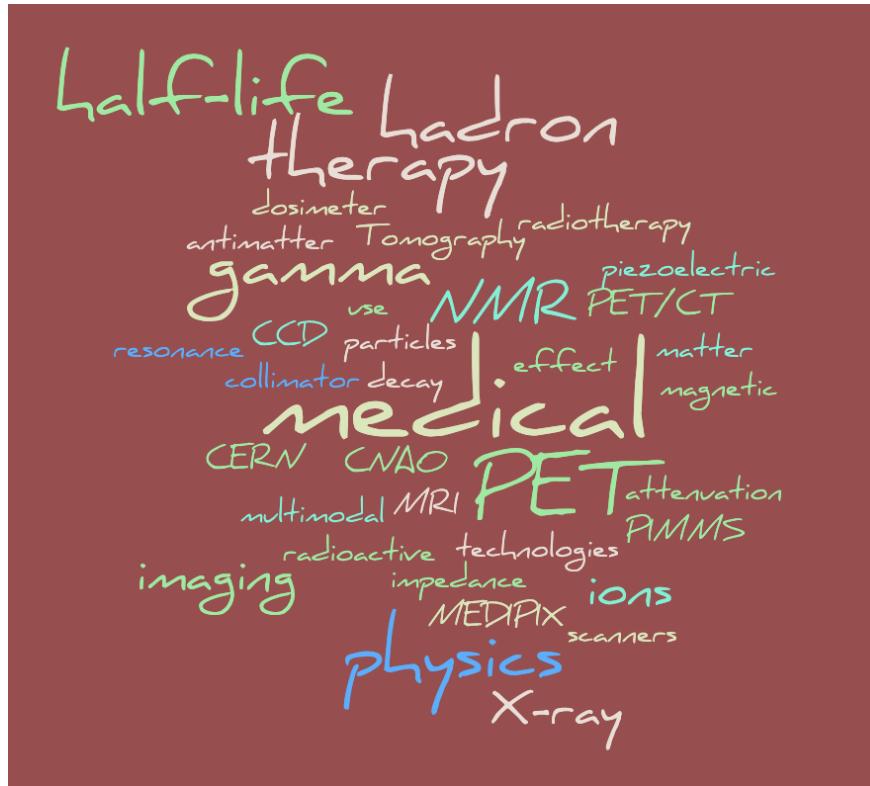
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- Medical applications
- Nuclear Medicine (X-ray and CT scanning, PET and gamma scanning, MRI)
- Rely on
  - Strong uniform magnetic fields through use of superconductors.
- Imaging has enabled medical practitioners to improve diagnosis with fewer invasive procedures.



# Key Concepts to be covered in the curriculum

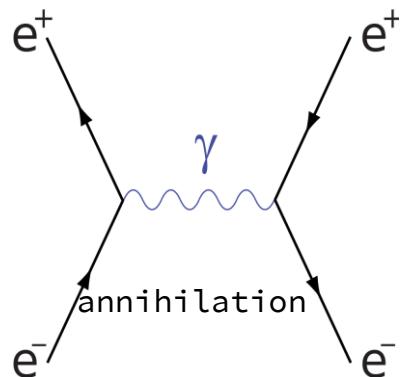
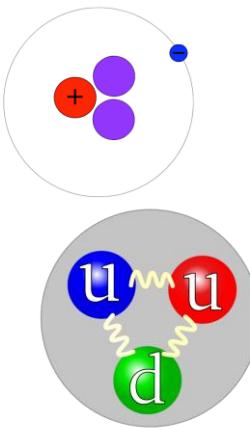
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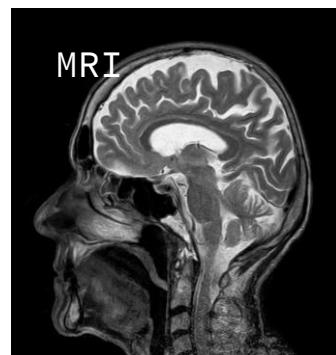
# What is expected to be known

## Particle Physics

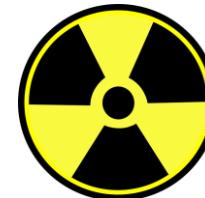
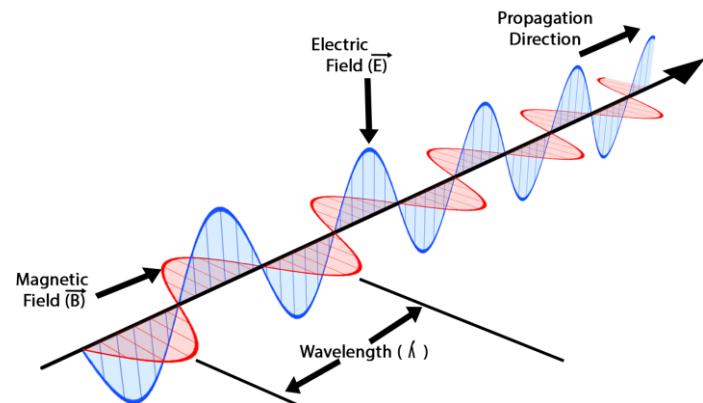
### atomic structure



### superconductivity



### Electromagnetic Wave



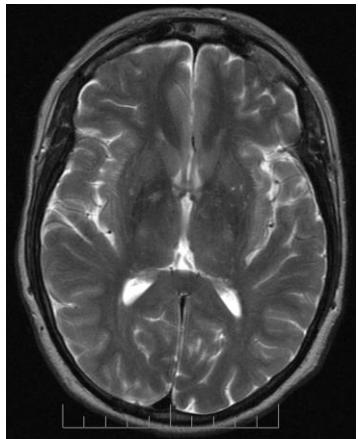
### Decay

# Our experiences

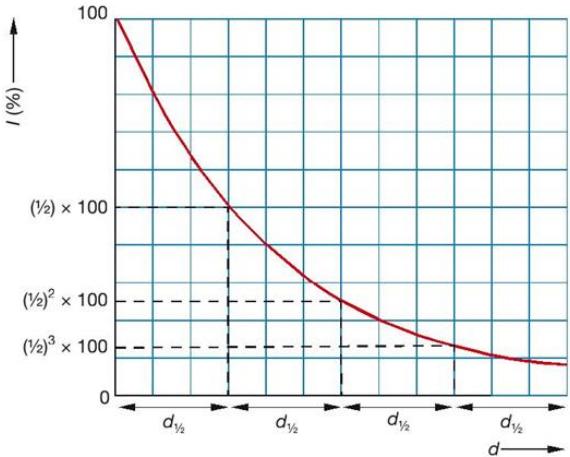
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CT Scan

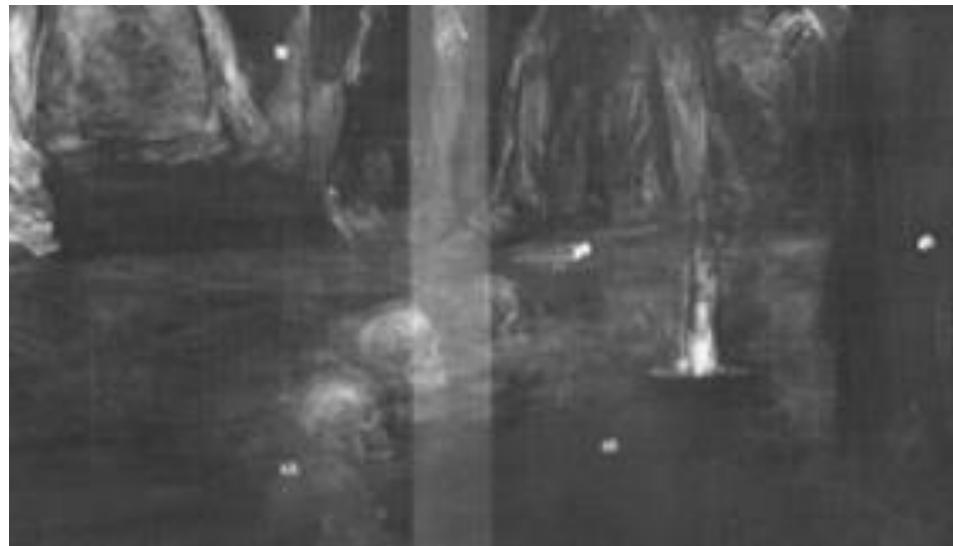


MRI Scan



# Our experiences - classroom connections

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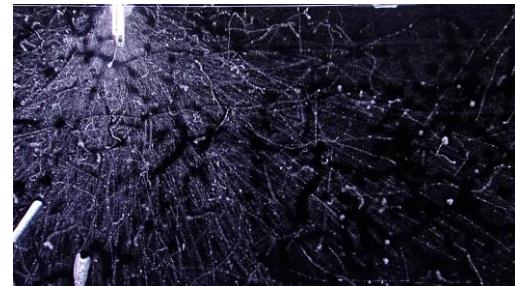


# Difficulties



annihilation

collimator



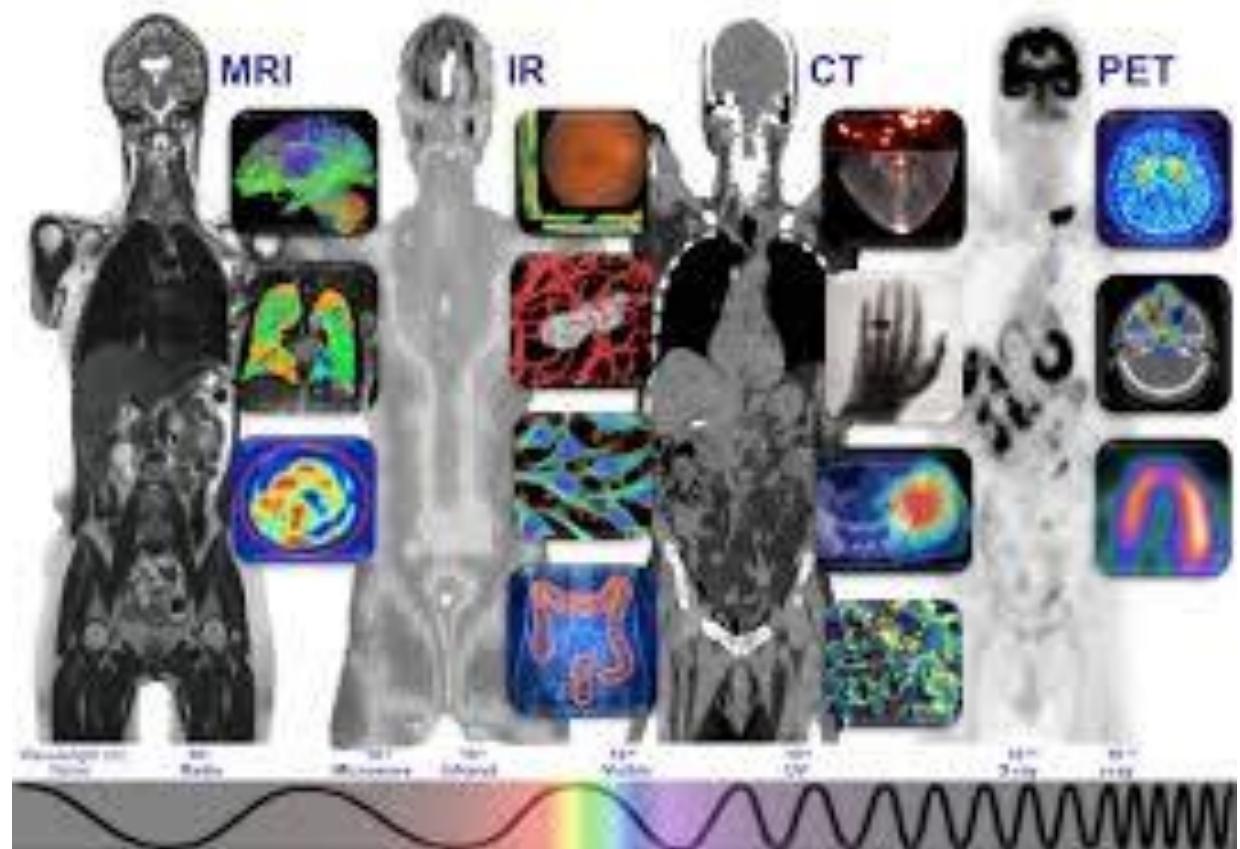
$$I = I_0 \cdot \left(\frac{1}{2}\right)^{\frac{d}{d_{0,5}}}$$

$$A = A_0 \cdot \left(\frac{1}{2}\right)^{\frac{t}{t_{0,5}}}$$

$$N = N_0 \cdot \left(\frac{1}{2}\right)^{\frac{t}{t_{0,5}}}$$

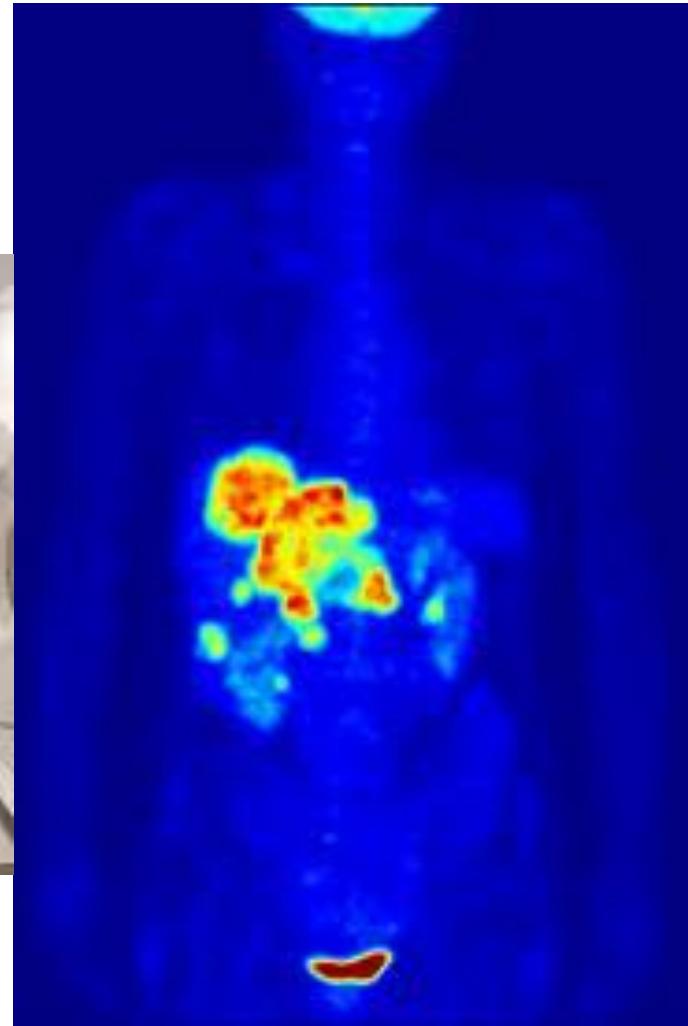
# Challenges

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# Best practice example

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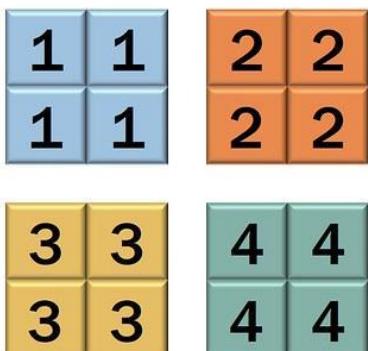
# Best practice example

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## JIGSAW

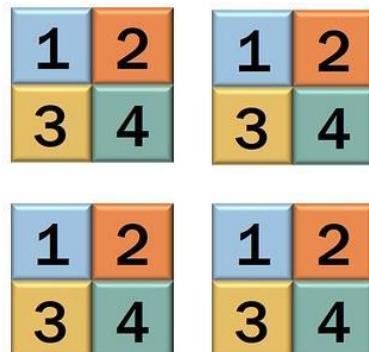
### Round 1 – Focus Groups

Divide students into groups and give each group a different text to read and discuss.



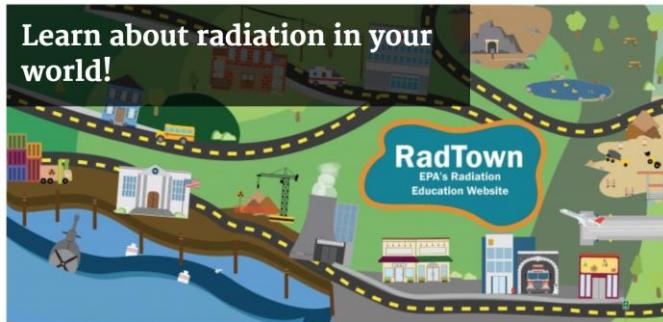
### Round 2 – Task Groups

Mix the groups so that students can bring their specific focus to a common task or problem.



# Helpful material and Resources

RadTown



CONTACT US:

United States Environmental  
Protection Agency

**IOP** Institute of Physics

Teaching Medical Physics



Simulations on quantum  
phenomenon



Teacher resources on  
Medical Physics

# Helpful material and Resources

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1. "from particle physics to medical applications - CERN Indico."  
[https://indico.cern.ch/event/261667/contributions/581171/attachments/462124/640469/med\\_app\\_english\\_2\\_lowres.pdf](https://indico.cern.ch/event/261667/contributions/581171/attachments/462124/640469/med_app_english_2_lowres.pdf). Accessed 15 Aug. 2019.
2. "The ENLIGHT Network · CDS Videos · CERN." 13 Sep. 2012, <https://videos.cern.ch/record/1477954>. Accessed 15 Aug. 2019.
3. "From Particle Physics to Medical Applications - Book chapter ...." <https://iopscience.iop.org/book/978-0-7503-1444-2/chapter/bk978-0-7503-1444-2ch1>. Accessed 15 Aug. 2019.
4. "Using CERN magnet technology in innovative cancer treatment | CERN." 27 Nov. 2018, <https://home.cern/news/news/knowledge-sharing/using-cern-magnet-technology-innovative-cancer-treatment>. Accessed 15 Aug. 2019.
5. "On Particle Physics - Parametric Press." 1 May. 2019, <https://parametric.press/issue-01/on-particle-physics/>. Accessed 15 Aug. 2019.
6. "Medical Applications at CERN and the ENLIGHT Network ... - Frontiers." <https://www.frontiersin.org/articles/170798>. Accessed 15 Aug. 2019.
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9. "Medische beeldvorming - Natuurkunde.nl." <http://www.natuurkunde.nl/artikelen/1594/medische-beeldvorming>. Accessed 15 Aug. 2019.
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11. "Intrapartum - Apps on Google Play." <https://play.google.com/store/apps/details?id=be.appsonly.intrapartum&hl=en>. Accessed 15 Aug. 2019.
12. "Teachers Professional Development in IBSE - The InterAcademy ...." <https://www.interacademies.org/File.aspx?id=9348>. Accessed 15 Aug. 2019.

Thank you!

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S.O.S.

Save Our Souls -  
-with particle  
physics--

