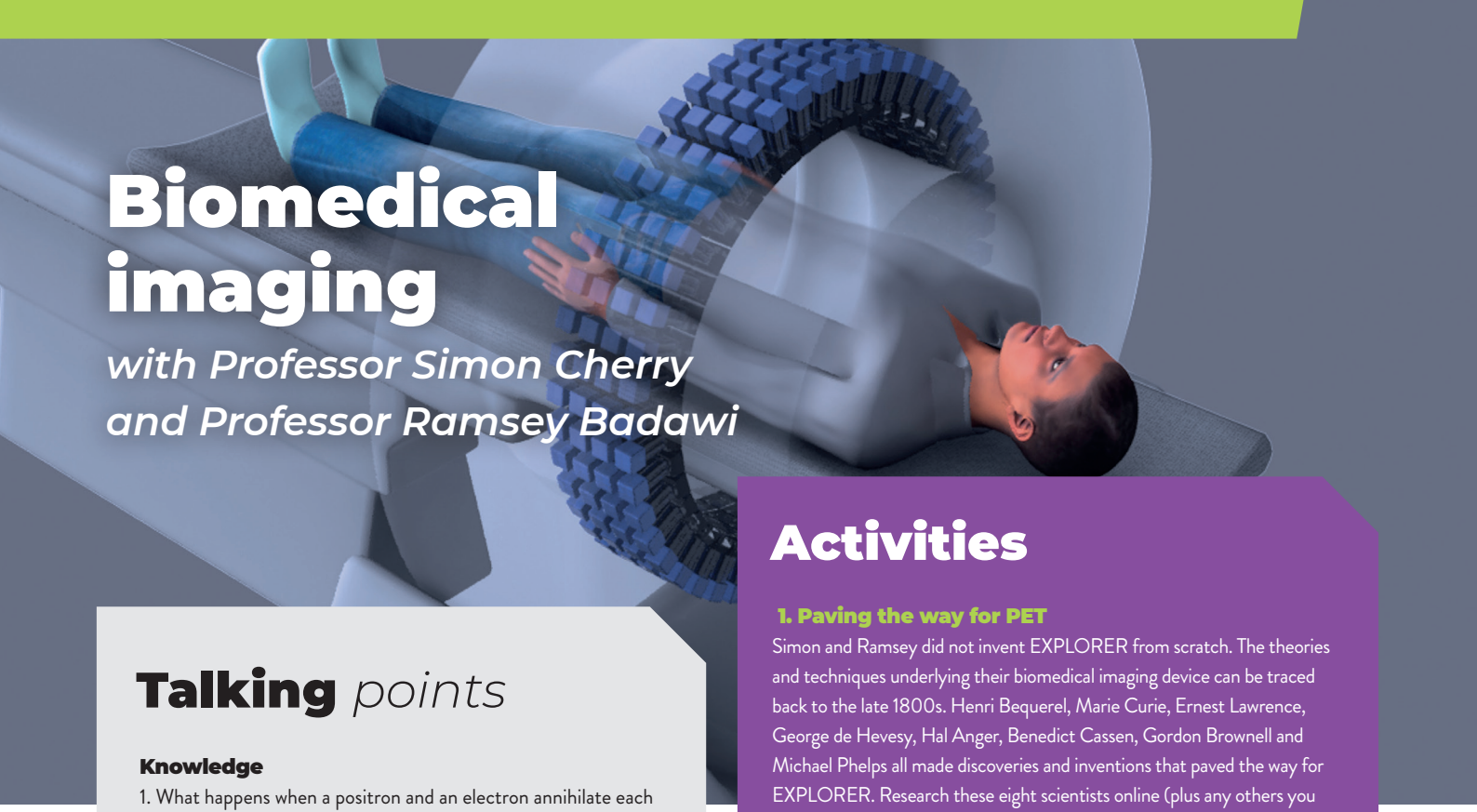

Biomedical imaging

with Professor Simon Cherry and Professor Ramsey Badawi

Talking *points*

Knowledge

1. What happens when a positron and an electron annihilate each other?
2. What are radiotracers, and how are they used in positron emission tomography (PET)?

Comprehension

3. How does the EXPLORER total-body PET scanner differ from conventional PET scanners?
4. What are the advantages of EXPLORER over conventional PET scanners?

Application

5. With PET scans, there is a trade-off between image quality, radiation dosage and scan time. If you were a doctor, which aspect(s) of EXPLORER would you prioritise for the following patients, and why? a) A young cancer patient who is scanned every month to check how they are responding to treatment; b) A older patient who has symptoms suggesting they may have cancer and needs a scan to confirm or reject the diagnosis; and c) An cancer patient who needs a scan to assess how far their cancer has spread but is in a lot of pain and has trouble lying down.
6. What are the applications of EXPLORER in biomedical research?
7. How would you design a study to investigate whether EXPLORER has improved the experience of patients undergoing PET scans?

Analysis

8. Conventional PET scanners can be used to study the whole body (by combining scans of different body parts), so why do you think Simon and Ramsey felt there was a need to develop EXPLORER?

Synthesis

9. Other than biomedical imaging, where else do theories and concepts from physics impact our day-to-day lives?

Evaluation

10. Which of the many different careers in biomedical imaging most interest you, and why?

Activities

1. Paving the way for PET

Simon and Ramsey did not invent EXPLORER from scratch. The theories and techniques underlying their biomedical imaging device can be traced back to the late 1800s. Henri Bequerel, Marie Curie, Ernest Lawrence, George de Hevesy, Hal Anger, Benedict Cassen, Gordon Brownell and Michael Phelps all made discoveries and inventions that paved the way for EXPLORER. Research these eight scientists online (plus any others you find whose work is relevant) and answer the following questions:

- What did they discover/invent?
- When did they make their discovery/invention?
- How did their discovery/invention influence the field of biomedical imaging?
- How else has their discovery/invention affected the lives of ordinary people?

Create a visually engaging and informative poster with a timeline showing how previous physics discoveries have led to the development of the EXPLORER total-body PET scanner.

2. The future of biomedical imaging

"In future, new imaging techniques will be invented," says Simon. "At the moment, we don't know what these will be. But you could be the person who discovers a new way to generate a signal that can be imaged to provide information about the human body."

Simon could be referring to you! Have a go at designing a new biomedical imaging device. Use real-world theories from physics to inspire how your device will work, but get creative and have fun with your invention. What physics concepts will your device use to create and detect signals? What medical conditions will it be used to diagnose? What advantages will it bring for patients, doctors and biomedical researchers?

Sketch and label your biomedical imaging device, and write a brief summary answering the questions above.

More *resources*

- Visit Simon and Ramsey's Futurum webpage to listen to a podcast about their work: www.futurumcareers.com/how-does-physics-allow-us-to-look-inside-the-body
- Learn more about EXPLORER from United Imaging: usa.united-imaging.com/products/molecular-imaging/uexplorer