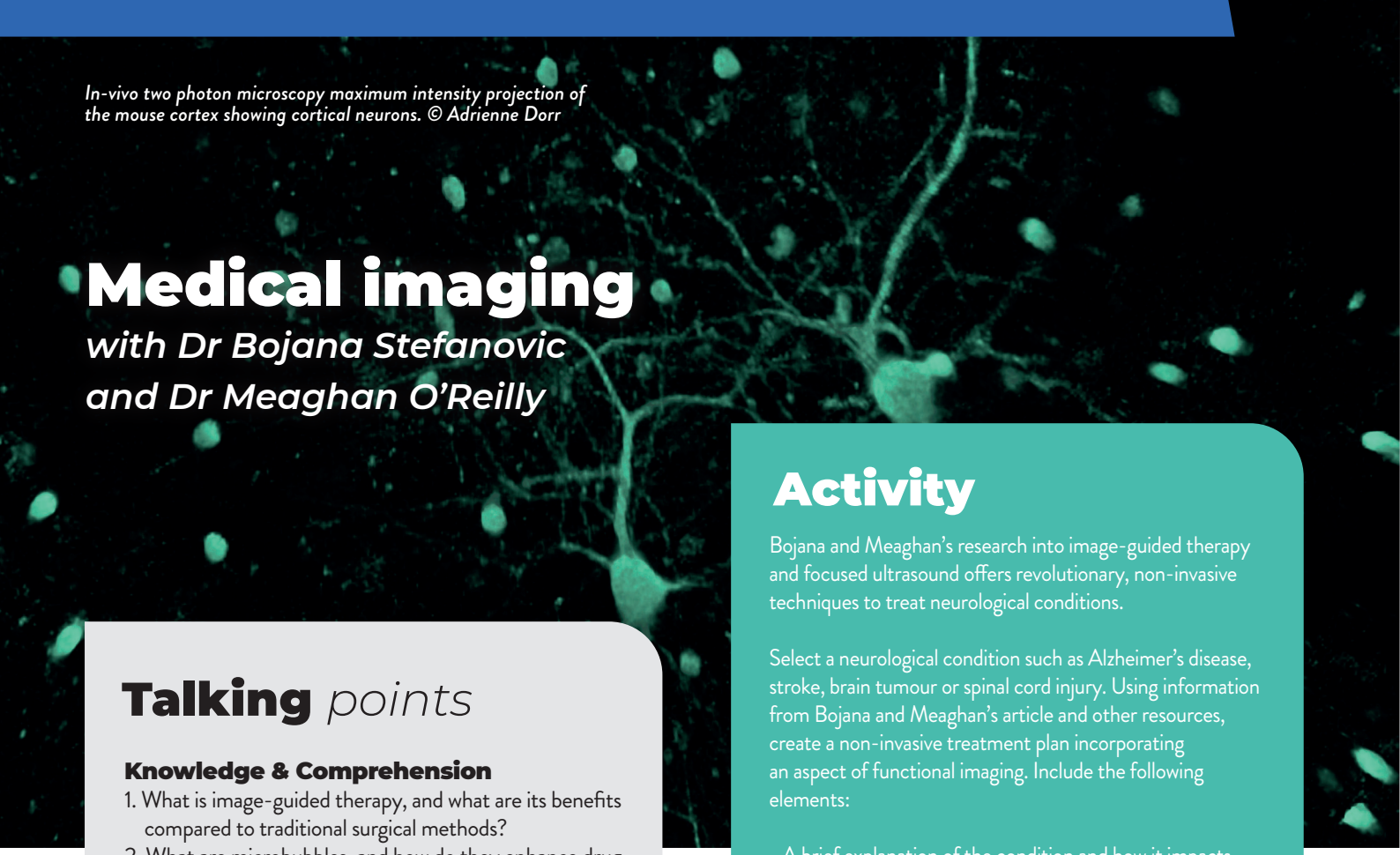

In-vivo two photon microscopy maximum intensity projection of the mouse cortex showing cortical neurons. © Adrienne Dorr

Medical imaging

with Dr Bojana Stefanovic and Dr Meaghan O'Reilly

Talking *points*

Knowledge & Comprehension

1. What is image-guided therapy, and what are its benefits compared to traditional surgical methods?
2. What are microbubbles, and how do they enhance drug delivery in the brain and spinal cord?
3. How does two-photon fluorescence microscopy help researchers study brain function?

Application

4. Imagine you are a medical researcher using focused ultrasound. How would you explain its advantages to someone who is not familiar with the method?
5. How could image-guided therapy be applied to other medical conditions not mentioned in the article?

Analysis

6. Compare and contrast traditional brain surgery with focused ultrasound treatments. What are the advantages and disadvantages of each?
7. "We are excited to see the new insights that arise from training artificial intelligence (AI) models on large amounts of neuroimaging and microscopic data," says Bojana. How might AI help to advance the field of functional brain imaging?

Evaluation

8. To what extent do you think non-invasive treatments like focused ultrasound will replace traditional surgery in the future?
9. What are the potential risks of relying too heavily on imaging for guiding brain therapy? Could imaging be misleading? How so?
10. Consider the accessibility of focused ultrasound treatment. How might economic and geographic factors affect patients' access to this advanced therapy? What strategies could be used to make it more widely available?

Activity

Bojana and Meaghan's research into image-guided therapy and focused ultrasound offers revolutionary, non-invasive techniques to treat neurological conditions.

Select a neurological condition such as Alzheimer's disease, stroke, brain tumour or spinal cord injury. Using information from Bojana and Meaghan's article and other resources, create a non-invasive treatment plan incorporating an aspect of functional imaging. Include the following elements:

- A brief explanation of the condition and how it impacts
- the brain or spinal cord
- A description of how functional imaging techniques
- could be applied to define treatment targets at the beginning and over the course of treatment
- A comparison of your proposed method to traditional
- treatments, highlighting potential improvements in safety, accuracy and effectiveness
- A discussion of any potential obstacles, such as
- technological limitations, patient suitability or accessibility concerns.

Prepare a short presentation or infographic summarising your treatment plan.

Reflection questions

- What are the biggest challenges when implementing functional imaging techniques for your chosen condition?
- How might advancements in functional imaging technology improve treatment options in the future?
- How might a patient's quality of life change if they received your proposed treatment instead of traditional methods?

More *resources*

- Watch this video to see the incredible effects of focused ultrasound on a patient with essential tremor disorder: **www.youtube.com/watch?v=9VcwihYwURw**
- Learn more about the brain and how it works by reading this free textbook: **www.brainfacts.org/the-brain-facts-book**