

BIOMEDICAL SCIENCE

WITH BIOMEDICAL SCIENTISTS AT THE
UNIVERSITY OF TECHNOLOGY SYDNEY (UTS)

Talking points

KNOWLEDGE

1. How did photonics contribute to detecting COVID-19 in patients?
2. What are biomarkers?

COMPREHENSION

3. Why has biomedicine seen so many significant advances in the last couple of decades, especially in the last few years?
4. Why are nanoparticles useful for developing new probes?

APPLICATION

5. Many diseases show different symptoms and characteristics dependent on the traits of the patient in question. How do you think researchers such as Lana and Yuen Yee can account for this within their work?
6. Antibiotic-resistant bacteria are an increasing threat. Though similar to diseases we are familiar with, they are not treatable with conventional antibiotics. How do you think society can prepare for such a threat?

ANALYSIS

7. How do you think the increased elasticity of cancer cells helps them spread to other parts of the body?
8. Though cancers are not typically inherited, it is possible to have 'genetic predisposition' to certain cancers. What do you think this means in terms of DNA, RNA and epigenetics?

EVALUATION

9. If a COVID-19-scale pandemic had arisen twenty years ago, how do you think it might have played out differently? If the pandemic had never happened and, instead, struck ten years from now, what do you think the response would be like?
10. Irina says that societal issues such as climate change and energy crises lead to biomedical challenges. What challenges do you think these might be, and how might they be addressed?

Activities

Connect the dots

Draw a 'map' of the five researchers from the article – Jin, Jiajia, Lana, Irina and Yuen Yee – and their disciplines.

Use labelled arrows to show how one contributes to the work of another, and vice versa. Begin with those connections mentioned in the article.

Then, using a different colour, add further arrows describing likely contributions that are not specifically mentioned.

- What does this exercise demonstrate to you about the work of researchers and what is required for research success?



Design a device

Think of an idea for a new biomedical device that incorporates aspects from all five researchers' areas of expertise:

- Photonics
- Probes and sensors
- Biomarkers
- Brillouin microscopy
- Epigenetics

Construct a timeline for the creation of such a device, drawing in all the disciplines explored in the article. Feel free to use the internet to learn more about any of the material in the article or to find out about other relevant techniques or discoveries. Make sure to answer the following questions:

- What research needs to be done to understand the fundamental science your device will rely upon?
- What experimental techniques will be used to perform such research?
- What research needs to be done to develop the methodologies that the tool will use?
- What technology does your tool use, and how can this be developed?
- How will you test the efficacy of your tool for its intended purpose?
- What real-world issues will your tool address?
- How can you make sure your tool can be practically applied in the real world?

Show your idea and timeline to a classmate:

- What questions do they have for you about your device? To what extent can they imagine your device being developed in reality?
- What about their design – what approach did they take? What has impressed you about their design?
- What could you achieve if you collaborated and designed a medical device together?

More resources

- This video from UTS shows Jin talking about how light can be used to diagnose and treat disease:
www.youtube.com/watch?v=wz2QyAtMuQg
- This video shows Jin and colleagues from the Institute of Biomedical Materials and Devices (IBMD) talking about their research:
www.youtube.com/watch?v=kf-wNv0-eGU
- Here, Jin talks about transforming photonics into live cell imaging technology:
www.youtube.com/watch?v=TWPQDrvJSR4
- This video from CrashCourse gives an overview of the history of biomedicine, highlighting major breakthroughs and how they have been used for good and bad:
www.youtube.com/watch?v=gQGwqA22s5s
- This article from *The Biomedical Scientist* gives an insight into starting a biomedical science career at the peak of the COVID-19 pandemic: thebiomedicalscientist.net/resources/covid-19-perfect-time-new-job