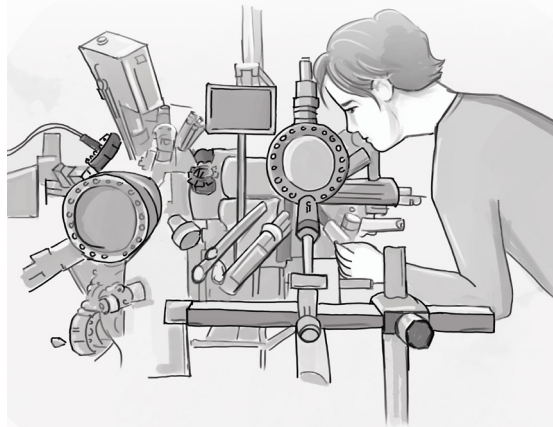


Aussie
STEM Stars

MICHELLE SIMMONS

Quantum computing Scientist

Story told by NOVA WEETMAN



Teacher Notes

written by

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WILD
DINGO
PRESS 

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ABOUT THIS SERIES

Aussie STEM Stars is a fresh and unique series for children and young teens aged 9–13 years that focuses on our Australian STEM heroes. Each book is written by an award-winning children’s author and follows the real-life stories of Australia’s top scientists and inventors, chosen on the basis of their pioneering work. Themes explored in the series include childhood, school, family and formative experiences, what inspired them to pursue their chosen path, how they persevered in the face of challenges and what they have contributed to science in Australia.

Reason for studying this book

Wild Dingo Press publisher Catherine Lewis is excited about their publication. “These disciplines are more important than ever as we look to our inventors and innovators to solve contemporary problems facing humanity and the planet. Our Aussie STEM Stars series uses narrative non-fiction as a tool for educating children – making it as fun and interesting as fiction books. Our writers are passionate about doing justice to their chosen subjects – and their lives – providing teachers, parents and librarians a wonderful series aimed at encouraging children to develop an interest in STEM at a young age.”

About the author

Nova Weetman lives in Melbourne with her family. She has written for TV and is the author of many middle-grade and young adult novels. *The Secrets We Keep* was shortlisted for the Readings Children’s Book Prize, the Speech Pathology Book of the Year Awards and the ABIA Awards. The sequel, *The Secrets We Share*, was a 2018 CBCA Notable Book and won the KROC Kids Reading Oz Choice Awards, NT – Best Fiction for Years 7 to 9. It was also shortlisted for the Speech Pathology Australia Book of the Year Awards. Nova’s middle grade novel *Sick Bay* was a CBCA Notable Book and shortlisted for the ABIA Awards.

Read about her at **About — Nova Weetman**

About our STEM Star: Michelle Simmons

Growing up in London, Michelle’s interests frequently bumped up against expectations of girls which she pushed through, including her love of playing soccer and chess, and later, her passion for science and technology.

Professor Michelle Simmons is a pioneer in atomic electronics and a global leader in quantum computing and information technology. She is the Director of the highly successful Centre of Excellence for Quantum Computation and Communication

Technology in Sydney, which make tiny atomic-scale devices in silicon and germanium and is recognised internationally for creating the field of atomic electronics. Her research group at the University of New South Wales is the only group worldwide that can create atomically precise devices in silicon. It was also the first team in the world to develop a working 'perfect' single-atom transistor and the narrowest conducting doped wires in silicon. Michelle established Australia's first quantum computing company.

In 2018 Michelle became Australian of the Year and is an Australian Research Council Laureate Fellow. She is passionate about encouraging girls to pursue a career in science and technology: 'Seeing women in leadership roles and competing internationally ... gives them the sense that anything is possible'. In 2023, she won the prestigious Prime Minister's Prize for Science.

There are many online sources with information on Michelle and her team's work to explore, and videos explaining quantum computing.

OUTCOMES

Australian Curriculum

KEY FOCUS AREAS

Literacy Stages 3–4

Science Stages 3–4

OUTCOMES

NSW Curriculum

KEY FOCUS AREAS

Literacy Stages 3–4

Science Stages 3–4

BEFORE YOU BEGIN READING THIS BOOK

Front cover

- What do you know about Michelle Simmons?
- What do you know about Quantum physicists?
- What do you know about different types of scientists?

Back cover

- Read the blurb. What can you gather about this book from the blurb?
- Discuss the image on the back cover. What do you think Michelle is doing?

Before you start reading

- Highlight the quote at beginning of the book:

Although my mother died soon after I reached adulthood, and although she is not prominent in this story, my mother had a very important influence. Hardworking, kind and beautiful, Gloria Jean Simmons always taught me to do my best and listen to my inner voice.

— Michelle Simmons

Write this quote on a poster as a class or small group. Ask students to write ideas around the quote as to what it might mean to them. Add to this poster as the book is studied.

- Outline the glossary at the back and how to use it.
- Who is the author of this book? Explore other books and pieces of writing Nova Weetman has written and discuss why she may have been asked to write this book.
- What is the difference between a biography and an autobiography? Explore what this book is and why it is a biography and not an autobiography. Discuss the importance of the STEM Stars series.
- Why do you think the publisher, Wild Dingo Press, has asked Nova to write this story rather than the scientist herself?
- What is narrative non-fiction? Could this book fit into that genre as well?

KEY PROJECTS

Key project 1: Chess

Research the history of chess

- Where it started.
- Why it has continued to be played.
- How it has evolved over time.
- Research the Grandmasters of chess, and how they have played a role in influencing the game.
- Discuss how chess is like life. Create analogies between chess pieces, moves and life events.

Key project 2: Quantum physics

- Explore how quantum physics plays a role in our everyday lives and what changes would have to take place if we had not made the breakthroughs.
- Imagine our world when computers can process information two thousand times faster than our current computers. What positive and what negative outcomes might happen in that world?

Key project 3: Women in science

- What are the ongoing factors that influence how girls and women see, or don't see themselves as being a part of the science and mathematical industries?
- Outline, with examples the changes that have occurred over time for women to play a bigger role in these industries.
- Find out about two or more influential women in the field of science or maths, and discuss how they have influenced girls and women to take part in these industries.

Key project 4: Loving science

- Michelle loved Science at school because she loved a challenge but she also had a great teacher.
- What do you like or dislike about science at school?
- Create a new curriculum for your stage (e.g. Stage 3 is Years 5 & 6) so that more students love science, learn interesting topics and make links to the real world so they can make a difference just like the Aussie STEM stars! Present this new curriculum to your teachers and school principal to see if you can influence some change.

Key project 5: Reflection on literature

Students can fill in this table as they read to record their ideas and feelings:

Chapter	
In one sentence, explain what this chapter was about?	
What did Michelle Simmons or another key person do and say in this chapter? How did he/they feel?	
What real life events occurred? Link some dates and extra details to this event.	
List new vocabulary you have learnt in this chapter	
How has the author made you feel? Think of the language used to create tension, happiness, wonder, anxiety.	

Reflect on this table after the book has been read

- How did your knowledge change throughout the book?
- How did your feelings change? Why?
- Did the characters seem to change as you learnt more about them? Which events caused change in their characteristics?
- What new vocabulary have you learned?

TEACHING AND LEARNING ACTIVITIES

These questions have been written so that students can explore the book. Not all questions need to be answered, and not all questions are suitable for all students. Choose questions that are aimed at your level of students, so that they can be completed as a book study, a group discussion or whole class activities.

Chapter 1

1. What does 'Odd one out' mean in this biography? Have you ever felt like this, or noticed someone else feeling like this?
2. What sport does Gary love? How do you know this?
3. Consider why this chapter has been written as you move through the rest of the book, and link back to this question when you think you understand why the author chose to write about this.

Chapter 2

1. What do you think about the game of chess? Compare your feelings to Michelle's.
2. Consider the time when Michelle was growing up: why was Gary often saying to Michelle that girls can't do things like football and chess?
3. Use a map to find where London is and work out how long it would take you to get there.
4. What does Michelle's father do for work?
5. What does 'Michelle's head spun from concentrating' mean?

Chapter 3

1. Where is Nottingham in relation to London?
2. Why would Michelle's opponents 'smile excitedly' when they saw her?
3. What does the word 'gruesome' mean?
4. What is 'Beano'? Why do you think Gary would enjoy reading it?
5. If someone has a distant look in their eyes, what might be happening?
6. Find out what Behcet's syndrome is, and discuss how life might be like for Gary now that he and his family know that he has it.
7. What is a comprehensive school, and why would Gary and Michelle prefer to go to the grammar school?

8. What emotions do you think the different members of Michelle's family are going through as Gary returns home? How might they be similar and different?

Chapter 4

1. What causes 'butterflies' in your stomach, and how might it be making Michelle feel?
2. Why does Michelle not want to let her Dad down?
3. Find out what a box room looks like, and consider how you would like to have a bedroom in one of these.
4. Sketch what you think the chess competition looks like using the information from the story.
5. How can Michelle play aggressively yet also calm her emotions? Write down what she could be thinking as she moves through the game.
6. Why was the certificate printed with the word 'his' on it?
7. Who are some famous chess players around the world, and the country you live in?

Chapter 5

1. Why do you think Michelle does not want to be a Grandmaster? Consider all of the information in this chapter to come up with your conclusion.
2. What does it mean to 'bubble over with pride'?
3. If you could decorate your bedroom in something that you loved, what would it be? Or would you prefer to be like Michelle? Explain why.
4. Who is 'Alice in the looking glass', and what is the drink-me potion?
5. Why do you think the author has mentioned Michelle's favourite chess piece at the end of this chapter?

Chapter 6

1. Write a diary entry imagining you attend Eltham Green Comprehensive, linking in ideas from what Gary tells Michelle.
2. What does the word 'horde' mean?
3. Why would the way Michelle fought Stacey cause her to never be in a fight again?
4. If someone is 'wickedly witty', what might they be like as a friend?
5. What happened at the Iranian Embassy in London? Using information from the book and your own research, outline the events and the impact on society at the time.
6. What is a 'Bobby'?
7. How is the paragraph about Elizabeth I important to Michelle's story?

Chapter 7

1. What is a 'chippie'? Do we use the same word to describe a person who works in that trade in Australia?
2. oWhat did a Sinclair ZX81 look like? How does it compare to the personal computers we have today?
3. oDo you think Gary really ate 19 sandwiches? What form of figure of speech could this be?
4. oWhat is a soldering iron?
5. oWhat skills do you need to be good at building a computer?

Chapter 8

1. Would you enjoy 'independent learning'? How might it affect the way you master subject areas?
2. Why would the government think it was a good idea to have textbooks instead of teachers?
3. How is the advertisement about British astronauts important to Michelle as she is choosing her A Level subjects?
4. Why does her father suggest choosing the most challenging subjects?
5. Look up the words - titrations, soluble, insoluble. How could you use these in an experiment at school? Can we say that people are insoluble? Why/why not?
6. Explain how did her physics teacher played an important role in Michelle's life?
7. It is mentioned that Gary is going blind. Why is this occurring to him?

Chapter 9

1. How would Michelle have felt to be one of the two people who passed her A Levels? How might the other students & school felt? Do you think there would have been consequences because of this outcome?
2. Find Durham and Cambridge on a map and work out how Michelle could travel there without a car.
3. How does Michelle feel after meeting with her tutor?
4. What is a double degree?
5. What is an honours supervisor?
6. Where is the North Sea, and why is it cold and treacherous?
7. What is a PhD, and who can do one?
8. How did the death of Dr Russell impact on Michelle?
9. Draw an image of a transistor and a computer chip. Label it and note how the different components work.

10. How can 'being overlooked' be a positive thing?
11. Who is Helen Sharman?
12. What does 'fabricate' mean?
13. Why might atoms be Michelle's future?

Chapter 10

1. What is the difference between basketball and netball that led to Michelle preferring playing basketball when she went to university?
2. How did the death of Michelle's mum impact her outlook on life?
3. What is silicon used for in our daily lives? Where does it come from?
4. What were the reasons that led to Michelle applying for a fellowship in Australia? What is a fellowship?
5. How is chess like Michelle's love of science?
6. What was the essential item Michelle needed to buy when she arrived in Australia?
7. How does Michelle feel about living in Australia in her first few weeks?

Chapter 11

1. How are the tools mentioned in this chapter helpful to Michelle's research? What are the atomic fabricator pod, scanning tunnelling microscope and the molecular beam epitaxy system?
2. How can energy in a room shift as it did during Michelle's meeting?
3. What was Tom's tip for Michelle about public speaking? Do you have a strategy that works for you when dealing with an uncomfortable situation like public speaking?
4. Why did Tom and Michelle marry secretly in New Zealand?
5. How would you feel if you had worked on a project for two years before you could test if it could work? How does this compare to how Michelle feels?

Chapter 12

1. How can a cup of tea be compared to being strong enough to hold up a spoon?
2. Why did Michelle decide to use silicon in her transistors?
3. Do you think girls are now more interested in maths and science than they were when Michelle was young? Why do you think this?
4. If Michelle had not moved to Australia, do you think the inventions she and her team have achieved so far would have been invented?
5. Have Michelle's explanations in this chapter helped you to understand quantum physics?

6. What is the purpose of building a quantum computer?
7. How is being doubtful a strength?
8. When does Michelle hold her school open days?

Chapter 13

1. How was winning the L'Oreal award different for Michelle?
2. What is the film 'Clockwise' about?
3. How did the students at Michelle's old high school feel about her visit? How did Michelle feel about it?
4. Would you be inspired to study science subjects if a famous scientist who was also a former student came back to your school for a talk?
5. Why did the author finish the chapter with reference to playing chess against her father, and remembering Gary's old computer?

Chapter 14

1. Why would Michelle think JT would win Australian of the year rather than her?
2. How does Prime Minister Malcolm Turnbull begin his speech? Who are the Ngunnawal people?
3. What was Michelle's initial reaction to hearing her name being called as Australian of the Year?
4. List some key points you liked about Michelle's speech and how it paints a picture of Australian science.

EXTENSION QUESTIONS FOR FURTHER THINKING

List the attributes of a successful scientist.

Read another Aussie STEM stars book, and **find some patterns** in successful scientific life.

Consider what factors converge to make someone successful in their chosen field.

List some questions you would ask Michelle Simmons if she were to come to your school for a science lesson. Consider what she could teach your class for the day.

How do various points of view influence how people solve problems? Consider the influences that played a role in how Michelle continued to persist with her way of thinking.

What if we were to replace teachers with textbooks and computers? How do you think this would impact in both negative and positive ways for all students? It might help to reflect on your experiences during COVID lockdowns that meant you had to work online from home instead of attending school.

ELABORATION OF OUTCOMES TO THE AUSTRALIAN CURRICULUM

Literacy

STAGE 3

Make connections between students' own experiences and those of characters and events represented in texts drawn from different historical, social and cultural contexts (ACELT1613).

Analyse and evaluate similarities and differences in texts on similar topics, themes or plots (ACELT1614).

Identify, describe, and discuss similarities and differences between texts, including those by the same author or illustrator, and evaluate characteristics that define an author's individual style (ACELT1616).

Clarify understanding of content as it unfolds in formal and informal situations, connecting ideas to students' own experiences and present and justify a point of view (ACELY1699).

Plan, rehearse and deliver presentations for defined audiences and purposes incorporating accurate and sequenced content and multimodal elements (ACELY1700).

Navigate and read texts for specific purposes applying appropriate text processing strategies, for example predicting and confirming, monitoring meaning, skimming and scanning (ACELY1702).

Plan, rehearse and deliver presentations, selecting and sequencing appropriate content and multimodal elements for defined audiences and purposes, making appropriate choices for modality and emphasis (ACELY1710).

Analyse how text structures and language features work together to meet the purpose of a text (ACELY1711).

Use comprehension strategies to interpret and analyse information and ideas, comparing content from a variety of textual sources including media and digital texts (ACELY1713).

STAGE 4

Identify and explore ideas and viewpoints about events, issues and characters represented in texts drawn from different historical, social and cultural contexts (ACELT1619).

Reflect on ideas and opinions about characters, settings and events in literary texts, identifying areas of agreement and difference with others and justifying a point of view (ACELT1620).

Compare the ways that language and images are used to create character, and to influence emotions and opinions in different types of texts (ACELT1621).

Recognise and analyse the ways that characterisation, events and settings are combined in narratives, and discuss the purposes and appeal of different approaches (ACELT1622).

Recognise, explain and analyse the ways literary texts draw on readers' knowledge of other texts and enable new understanding and appreciation of aesthetic qualities (ACELT1629).

Science

STAGE 3

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083, ACSHE100).

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS086, ACSIS103).

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE098).

STAGE 4

Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available (ACSHE119, ACSHE134).

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE121, ACSHE136).

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124, ACSIS139).

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125, ACSIS140).

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures (ACSHE223, ACSHE226).