

IT'S SCIENCE ...
BUT NOT AS YOU
KNOW IT



QUARK'S ACADEMY



FOR GENIUS
INVENTORS

CATHERINE PELOSI

TEACHERS' NOTES

QUARK'S ACADEMY

BY CATHERINE PELOSI

TEACHERS' NOTES BY ROBYN SHEAHAN-BRIGHT

Introduction	3
Before and After Reading the Novel	4
Themes & Curriculum Topics	4
Studies of Society and History	4
Science	6
English Language and Literature	8
Further Quotes for Discussion	14
Further Activites	15
Conclusion	15
About the Author	16
Bibliography	16
About the Author of the Notes	19
Worksheets	20

INTRODUCTION

'I guess sometimes, no matter how much you plan, you can never really know what's going to happen.' (p 218)

Augustine Cobalt, Celeste Putter, and Oscar Blaxen have been selected to attend an elite science summer camp, Quark's Academy, run by the elusive Inventor Quark. They are each to create an invention to be entered in the televised Best Invention Competition.

Augustine adores the weather and has invented a weather maker. Celeste loves quantum physics and has invented a teleporting machine. Oscar wants to invent a taste replicator.

They are excited upon arrival to find the Academy has an intriguing design based on the human brain, that they are to travel everywhere via moving walkways and tunnels, and that they are to participate in a range of advanced classes. But as they spend more time at the Academy they realise that things aren't quite what they seem. Some seriously strange things are going on, and maybe their youthful inventions aren't the only things which have been invented there?

This is an action-packed adventure for young readers who love science and inventing things. Teachers of STEM will find it an entertaining introduction to some key scientific concepts. The fact that two of the young inventors are female will also appeal to those who wish to encourage young female students to engage with science.

Quark's Academy also engages with the personal issues faced by talented young people – their expectations of themselves, their sometimes strained family dynamics, and their struggles to make friends.

Catherine Pelosi has created a cast of characters who will have wide appeal. This is a lively, humorous, and 'inventive' novel which will leave readers thirsting for more.

BEFORE & AFTER READING THE NOVEL

- Examine the cover of the novel. What does it suggest about the novel's themes?
- After you have read the novel, examine the cover again: what does it suggest to you now?
- After you have read the novel, read about Catherine Pelosi in reviews and articles and use the notes below to examine the text more closely.

Note: Teachers, please ensure that you provide adult supervision needed for the experiments contained in these notes. Neither the author nor the publisher can be held responsible for any loss or claim arising out of the use, or misuse, of the content of these teachers' notes.

THEMES AND CURRICULUM TOPICS

Several themes relevant to curriculum topics (Studies of Society and Environment and English Language and Literacy) might be identified in this novel:

STUDIES OF SOCIETY AND ENVIRONMENT (SOSE)

- **COMING OF AGE & RITE OF PASSAGE**

DISCUSSION POINT: Each of these three inventors grows as a person during the course of the action. How do Augustine, Celeste and Oscar change or mature?

- **FRIENDSHIP**

DISCUSSION POINT: The two girls haven't previously made friends easily but their mutual interests draw them together. Is this what makes a real friendship?

DISCUSSION POINT: 'Augustine and Celeste were not who he thought he would ever want to hang out with, but he did.' (p 223) By the end of the novel Oscar has realised that he likes the girls. Why has his attitude changed?

- **FAMILY**

DISCUSSION POINT: All three children have issues with their parents and families. For example: 'The house had totally transformed since Mr and Mrs Cobalt had left for Europe, and Augustine liked it. Flora moved all the inventions into the basement. She replaced the inventions in the fridge with food. The house always smelt of baked bread and sweet flowers. Augustine had realised that her parents had never really believed in her abilities. Maybe now they finally would. Or maybe they would give her a little more of what she really wanted: their time.' (p 225) Discuss the parenting in this novel and how each family might improve their relationships.

DISCUSSION POINT: Oscar comes to appreciate his brother Toby by the end of the novel and to enjoy his company. How and why has their relationship improved?

- **HUMAN FALLIBILITY**

DISCUSSION POINT: 'There was only so much analysing she could do. Celeste was starting to realise that perhaps Oscar was a variable she could do nothing about.' (p 112) Although this novel is about scientific method it is also about the messy lives of human beings! Each of the three young scientists realises that there are some things we cannot predict or control no matter how much logic we apply to a situation. Discuss how life 'throws curve balls at us' and how we deal with such challenges. Encourage students to recall situations which they have confronted and dealt with successfully or unsuccessfully.

SCIENCE

DISCUSSION POINT: Science, Technology, Engineering, Mathematics (STEM) is an interdisciplinary and applied approach to learning – a curriculum which is taught in schools – and this text is a perfect vehicle for such studies. Discuss the following quote: ‘Science was about pure logic and logic was something she understood. When everything aligned and fell into place she felt a sense of satisfaction she could barely describe. Perhaps the closest feeling would be connecting the last piece of a jigsaw puzzle and then smoothing it over with a flat hand. It was her life-long ambition to be a real scientist.’ (p 10)

DISCUSSION POINT: ‘You will choose two subjects, extract their genes and use those to recreate a new species. I trust everyone here knows how to do that.’ (p 47) How far-fetched is this exercise given to the students at Quark’s Academy by Inventor Spray? Are scientists capable of this?

DISCUSSION POINT: ‘Augustine,’ the girl said. ‘I don’t think the animals would like to be transformed.’ ‘Why ever not? They’re not like regular animals and besides, they don’t feel a thing.’ (p 49) Discuss the ethics of creating new species.

DISCUSSION POINT: ‘The Inventor spread his arms to either side. ‘Right, yes, yes, sorry, let me explain. This is the sixth part of the academy. We call it the Cerebrum and these are clones.’ He spoke as though what he had just said was completely normal.’ (p 145). Discuss the ethics of cloning as replication.

ACTIVITY: The students are given a range of unusual flying contraptions to travel in. Invite students to ‘invent’ a contraption and to draw it for the class. Make a gallery of the images.

ACTIVITY: Make a compass as Celeste does (pp 178–180). For instructions see: ‘How to make a compass’ Wikihow <<http://www.wikihow.com/Make-a-Compass>>

DISCUSSION POINT: 'Time travel appealed to her for several reasons. The ability to visit the past and future would provide life-changing information. If we could see what was ahead, or what life was like in the past, it would impact the decisions we make today. On top of that, no one on the planet had ever achieved it. That in itself was highly motivating.' (p 64) Research the concept of time travel. Watch episodes of Doctor Who as an entertaining introduction to the subject.

ACTIVITY: Research some key inventors and inventions (or scientific discoveries) in the history of society. For example, Leonardo da Vinci (parachute, helicopter, tank, etc); Thomas Edison (phonograph, motion picture camera, electric light bulb, etc); Marie Curie (theory of radioactivity); Johannes Gutenberg (mechanical moveable type printing in Europe); Nikola Tesla (modern alternating current AC electricity supply system); Benjamin Franklin (electricity, bifocal glasses, etc); Alexander Fleming (world's first antibiotic substance benzylpenicillin – Penicillin G – from the mould *Penicillium notatum* in 1928); Grace Hopper (computer); Rosalind Franklin (DNA double helix); Alexander Graham Bell (telephone); Tim Berners-Lee (World Wide Web); and Nancy Johnson (the ice-cream maker).

ACTIVITY: Then invite students to draft an idea for a new invention. Discuss how they'd go about making this invention, and then try to make it!

ACTIVITY: Medical discoveries in recent years have included the cochlear implant (Dr William F. House in 1961); spray-on-skin for burns victims (Professor Fiona Wood); and stem cell isolation (Ann Tsukamoto). Research some key discoveries and the people who pioneered them.

ACTIVITY: Explore aspects of different strands of science with your students, for example:

Chemistry: 'At her bench there was a rack of test tubes, a pair of gloves, goggles and various smaller bottles of liquids, each labelled with a different chemical symbol.' (p 41) Quiz the class on the chemical symbols they know and encourage them to learn about some of them. See: 'The Periodic Table of Elements' It's Elemental <http://education.jlab.org/itselemental/index_sym.html> and 'Chemical Elements Listed by Symbol' LennTech <<http://www.lenntech.com/periodic/symbol/symbol.htm>>

Physics: Discuss key concepts such as Linear and rotational motion and forces; Conservation of energy and momentum; Electricity and magnetism; Heat; Waves; Gravity; Mathematics. See: 'Physics for Kids' Science Kids <<http://www.sciencekids.co.nz/physics.html>>

Biology: The five basic principles are cell theory, gene theory, evolution, homeostasis, and laws of thermodynamics. See: 'Biology Characteristics of Life' ThoughtCo <<https://www.thoughtco.com/biology-meaning-373266>>

ACTIVITY: Have fun with science. Choose the favourite science subjects of the three characters in this novel: Conduct Augustine's Raincloud in a Jar Experiment, Celeste's Expanding Glove Experiment and Oscar's Rainbows in Milk Experiment. [See **Worksheets 1, 2, 3.**]

ACTIVITY: Conduct other science experiments. [See **Worksheet 4.**]

ENGLISH LANGUAGE & LITERACY

Study the writing style employed in this narrative, and examine the following sub-topics:

- **NARRATIVE PERSON, NARRATIVE PERSPECTIVE & TENSE**

Discussion Point: This is a third-person subjective account of the three children's experiences told alternately from the present-tense perspectives of Augustine, Celeste and Oscar. How might it have changed had it been written as a first-person narrative by any one of them?

- **SYMBOLISM**

DISCUSSION POINT: What examples of symbolism did you notice in this novel?

- **LITERARY DEVICES & WORD PLAY**

ACTIVITY: Find examples of the use of literary devices in this novel, using the table below to identify examples.

SIMILIE	
METAPHORS	
PERSONIFICATION	
WORD PLAY	
OTHER	

ACTIVITY: Augustine loves to use synonyms, for example:

'You're camouflaged, hidden, covered, concealed!' (p 3)

'I'm going to impress the Inventors, wow them, amaze them, bedazzle them!' (p 7)

'I'm afraid of heights. Terrified, actually, petrified, horrified.' (p 29)

Write your own synonyms for any of these words.

ACTIVITY: 'There is a Worthington Jet Pack and that is a Hayward Hydroloop.' (p 95) Have fun making up names for new forms of travel technology.



- **HUMOUR**

ACTIVITY: This novel contains a number of humorous quotes and scenes, eg. 'During Augustine's hunt for green foods, she discovered that there weren't a lot of non-vegetable choices. Then one day, she found green jelly. She ate five bowls in a row. However, rather than making her feel stronger, she felt a whole lot wobblier and decided to give up her research.' (p 79) Identify other techniques by which humour is provoked in this novel. Add quotes to the following table:

SARCASM	
IRONY	
EXAGGERATION	
BLACK HUMOUR	
OTHER	

- **STRUCTURE**

The structure of the story can be analysed in terms of key narrative features used to engage the reader's attention and to shape the work:

a) *Strong beginnings and endings to chapters* are one way of structuring a narrative, for example:

Beginning: '**IT MUST BE** a secret entry,' said Augustine.' (Chapter 19, p 138)

Ending: 'Celeste's hands began to shake. What on Earth was she doing?' (Chapter 17, p 130)

Which other opening or closing sentence was particularly gripping, in your opinion?

b) *Suspense* is the key to any narrative's structure.

There are many instances of suspense in this novel. Discuss some of them.

Leaving 'clues' to the action is another strategy used to create suspense. eg 'She suddenly didn't care about being so high up or the growing sharp pain in her upper arm.' (p 32) The reference to a sharp pain refers to the DNA test which the students are unaware of at the time, but which they later discover was administered to them by the scheming Inventor Quark.

What other clues did you notice as you were reading?

c) *Using a 'framing story or idea'* makes a narrative more cohesive. Here inventing is the framing device which brings the three protagonists together.

Discuss the use of a framing narrative in this novel.

- **SETTING**

ACTIVITY: Choose a passage that describes Quark's Academy vividly for you. Discuss the passage with the class.

- **CHARACTERS**

Major Characters: Augustine Cobalt, Celeste Putter, Oscar Blaxen, Inventor Quark.

DISCUSSION POINT: Senior Inventor Flack analyses the three children's characters (p149 and 150). How correct was the analysis?

Minor Characters: The three children's parents Mr and Mrs Cobalt, Mr and Mrs Putter, Mr and Mrs Blaxen; Flora, the Cobalts' housemaid; Senior Inventor Flack, Inventor Spray, Klangton, Inventor Peon, other students.

ACTIVITY: Draw up a character chart and find key quotes which give a clear picture of any of these characters, and isolate events that demonstrate their natures. Then write a brief character study of the person using the quotes and events to illustrate the points made in your summary.

QUESTION: Which character was most intriguing and why? Which character would you like to have heard more about?

- **GENRE**

DISCUSSION POINT: This novel falls into the adventure genre. Make a list of the key features of this genre.

- **WRITING TASKS**

ACTIVITY: Write a diary entry by one of the three protagonists recalling an incident in their childhoods about their three very different families.

ACTIVITY: Write a letter as if it was written by Celeste from Quark's Academy to her family.

• VISUAL LITERACY

ACTIVITY: Create a graphic novel interpretation of an incident in the novel. [See **Bibliography.**]

ACTIVITY: Design a new cover for this book.

ACTIVITY: Create a book trailer for this novel. [See **Bibliography.**]

ACTIVITY: Create a science-themed patterned paper for covering your books. [See **Worksheet 5.**]

FURTHER QUOTES FOR DISCUSSION

1. 'The opportunity to attend Quark's Academy was his chance to show his parents and his brother that he was more than a prankster. It was his turn. His turn to show them exactly what he was made of.' (p 23)
2. 'Travelling in the academy should be used as thinking time. The movement of the walkway and listening to music is proven to encourage creativity and thought. Use every minute you have here wisely.' (pp 34–35)
3. 'All the rooms echoed; it was as if everything that was being said was important and therefore needed to be repeated.' (p 46)
4. 'In one day alone, Celeste blended gold and silver during Chemical Compounds, developed a substance to stop bread from turning mouldy in Preservation and Germs and recreated a giant human ear drum during The Future of Sound Wave Frequencies. Quark's Academy was all she had imagined and more.' (p 63)
5. 'Destiny isn't real,' she said. 'But making things right is!' (p 69)
6. 'But who is going to listen to a bunch of children?' 'So we're the experiment?' said Oscar. 'This is one giant experiment and we are the subjects?' The Inventor grinned. 'Essentially, yes.' (p 147)
7. ' 'Science shouldn't be used to cheat and lie,' said Celeste.' (p 151)

8. 'No,' snapped Celeste. 'We don't want to see what we create in the future. Flack is stealing our ideas. We're not going to let him steal our dreams too!' (p 159)

9. 'Celeste thought back to the first day at the academy, how determined she had been to win the Best Invention Competition. It didn't seem important any more, but now she didn't know what was.' (p 215)

10. 'Maybe his parents would never understand him, but perhaps, over time, his brother would.' (p 220)

FURTHER ACTIVITIES

1. Invite students to create a model of the invention created under **Science**.

2. **Design a poster** to advertise this book.

3. What other **title** might this novel have had?

4. **Debate any of the topics** covered in these notes, or suggested by the novel.

5. Imagine what might possibly happen to these three budding young scientists if there were to be a sequel. **Write a synopsis** for the next novel in a potential series.

CONCLUSION

This is a lively adventure which will appeal to young readers and their tastes for wacky inventions, humour and action!

ABOUT THE AUTHOR

Catherine Pelosi is a Sydney-based children's book author. When she was younger, she loved two things in equal measure: animals and writing stories. For a long time she wanted to be a zoologist. Catherine has had several jobs working with animals, including in wildlife rescue, as a dinosaur tour guide and marketing for an animal shelter in London, but her love of writing never went away. These days, she writes as often as she can. Catherine hasn't lost her love of animals, however, and you will often find one or two roaming through her stories. *Quark's Academy* is Catherine's first book. She also has a picture book due for publication in 2018. Visit her website:

<https://catherinepelosi.com/>

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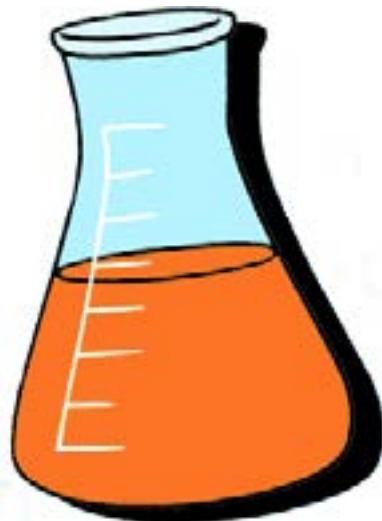
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ABOUT THE AUTHOR OF THE NOTES

Dr Robyn Sheahan-Bright operates justified text writing and publishing consultancy services, and is widely published on children's literature, publishing history and Australian fiction. Her publications include Paper Empires: A History of the Book in Australia 1946–2005 (co-edited with Craig Munro) (UQP, 2006). In 2011 she was recipient of the CBCA (Qld) Dame Annabelle Rankin Award, in 2012, of the CBCA Nan Chauncy Award for Outstanding Services to Children's Literature, and in 2014, the QWC's Johnno Award.



WORKSHEET 1: AUGUSTINE'S RAINCLOUD IN A JAR EXPERIMENT



Equipment: Jar, tap water, shaving foam, blue food colouring, glass dropper

Procedure:

Step 1. Fill a jar three quarters full with water.

Step 2. Squeeze shaving foam onto the top of the water.

Step 3. Allow the foam to settle.

Step 4. Drop food colouring onto the shaving foam cloud.

Step 5. Your 'cloud' will then fill up with the colouring.

Step 6. The colouring will become heavy and then fall into the water below the cloud and look like rain.

What aspect of science does this demonstrate?

Clouds form when water vapour rises into the air. When vapour encounters cold air it turns into droplets of water which stick together to become clouds. When clouds are over-full they release drops of rain.

WORKSHEET 2: CELESTE'S SELF-EXPANDING RUBBER GLOVE EXPERIMENT

Equipment:

- 1 x disposable latex rubber glove
- white vinegar
- bicarbonate of soda
- teaspoon
- measuring cup
- 1 x empty clean wide-mouthed glass jar

Method:

Step 1. Pour about 50ml of vinegar into the glass jar.

Step 2. Hold the latex glove open and carefully spoon the 2 teaspoons of bicarbonate of soda into the glove's fingers.

Step 3. Carefully stretch the glove over the mouth of the glass jar, keeping the bicarbonate in the fingers of the glove.

Step 4. Without pulling it off the jar, gently pull the glove upright. The bicarbonate of soda will fall down into the vinegar in the jar.

Step 5. Stand back and watch the glove inflate itself!

What aspect of science does this demonstrate?

The molecules in the vinegar and the bicarbonate of soda react with each other. Bicarbonate of soda is called a base. Vinegar is mainly an acid (acetic acid). When bases and acids get together, they react, break apart and form new substances: a salt, carbon dioxide and water. Carbon dioxide is a gas and it is what makes the rubber glove expand.

Note: Always conduct your experiments with the help of a responsible adult.



WORKSHEET 3: OSCAR'S RAINBOW PATTERNS IN MILK EXPERIMENT

Equipment:

- food colouring (4 colours: red, blue, yellow and green)
- 1 dinner plate
- small quantity of milk
- small quantity of dishwashing liquid detergent
- cotton buds

Method:

Step 1. Carefully pour the milk onto the plate so it covers the plate's surface.

Step 2. Drop a few drops of each food colour into the milk. Keep the colours separate but the drops close together, towards the centre of the plate.

Step 3. Dip the cotton bud into the dishwashing liquid so that its tip is covered with liquid.

Step 4. Dip the cotton bud into the milk and food colour at the centre of the plate.

Step 5. Stand back and watch the colours swirl!

What aspect of science does this demonstrate?

Milk is made of water, proteins and fats and it has surface tension like water. Dishwashing liquid disturbs the fat molecules in the milk. The soap molecules move around to attach to the fat molecules and break the surface tension and that's what causes the sudden burst of colours as the food colouring can move around quickly when this reaction occurs.

Note: Always conduct your experiments with the help of a responsible adult.



WORKSHEET 4: SIMPLE EGG EXPERIMENTS

1 Equipment: One egg, vinegar, a glass.

Procedure:

Step 1. Fill glass with vinegar.

Step 2. Carefully drop egg into water.

Step 3. Leave for twenty-four hours.

Step 4. Remove egg carefully with tongs and clean it.

Step 5. Observe how the egg is now soft and even bounces.

What aspect of science does this demonstrate? This experiment shows how the acetic acid in vinegar dissolves the shell of an egg by eating away the calcium carbonate, it releases carbon dioxide gas and leaves calcium acetate, which is soluble.

2 Equipment: Two eggs, two containers, water and table salt.

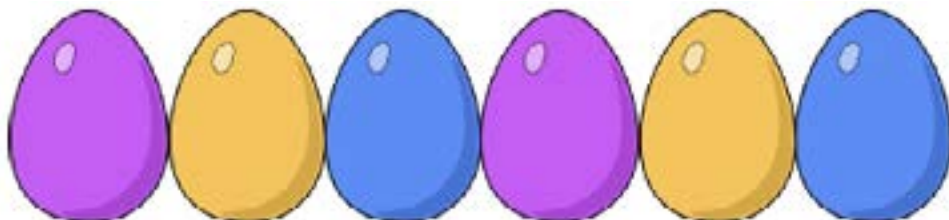
Procedure:

Step 1. Fill the two containers with water.

Step 2. Add six tablespoons of salt to one container and stir.

Step 3. Place one egg in each container and watch which egg floats and which one sinks. (Answer: The one in the salted water floats.)

What aspect of science does this demonstrate? The egg floats in the salt water because the egg is less dense than the salt water. Density affects buoyancy. When salt is added to the water, it increases the density of the water.



WORKSHEET 5: SCIENTIFIC PATTERNS

The devices used at the head of every chapter are symbolic of three strands of science. Colour in the background of these squares below and then enlarge to A3 and colour photocopy them to create a lively covering for your science books.

