

# The brain

READING

LEVEL  
Advanced

NUMBER  
C1\_3055R\_EN

LANGUAGE  
English

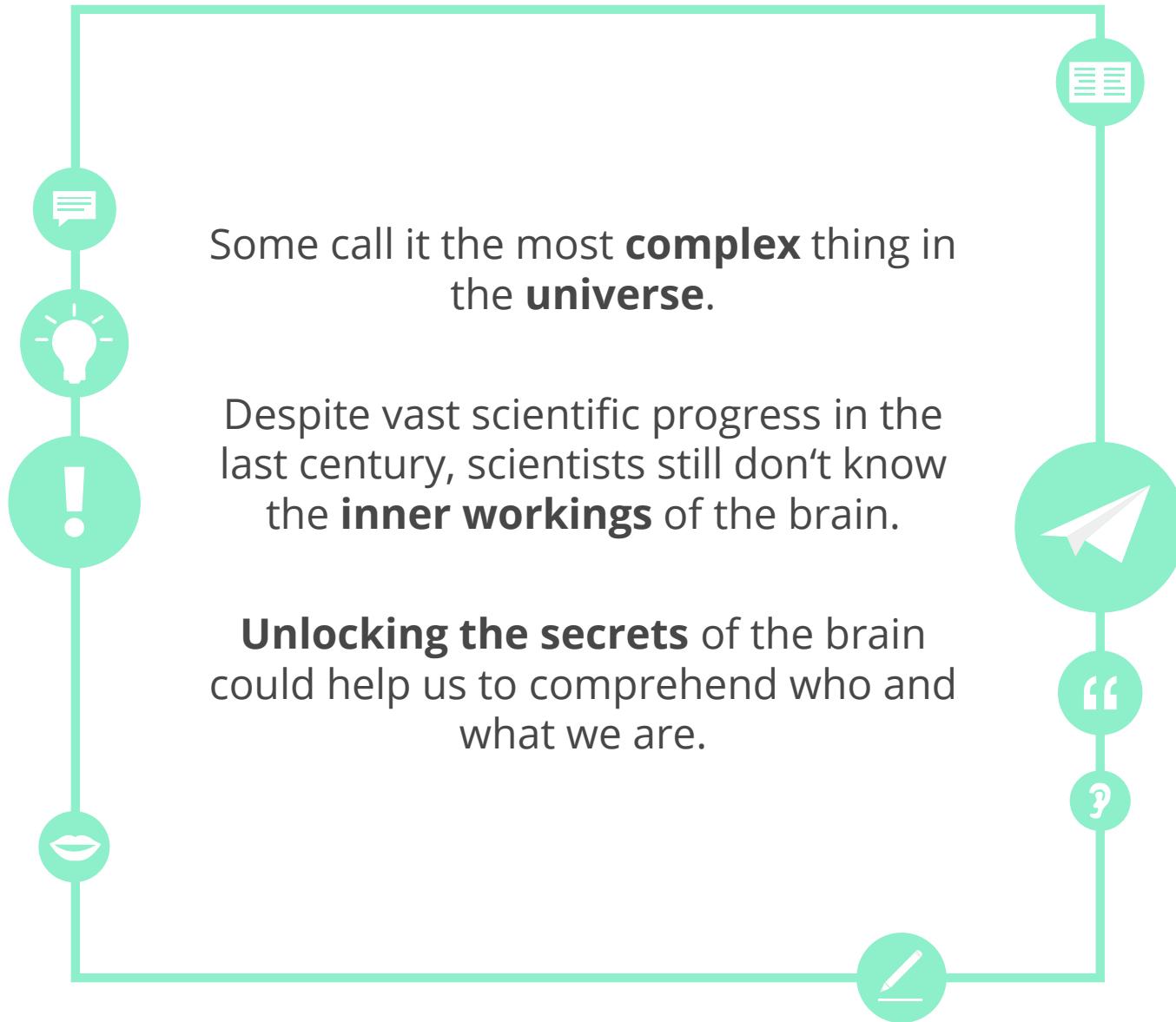




## Goals

- Can read and understand a lengthy, complex text on the human brain.
- Can explain the story of mapping the human brain and express my own views on the brain and humankind's journey to self-comprehension.







## The brain

**The human mind is what differentiates us from other animals on the planet.**

**What is unique about the human brain? Tell your teacher.**



# Adjectives

**Scientists have still not been able to map the human brain. What are some of the difficulties and complications involved in this task?**

## Complexity

# Technology



- 卷之三



## Vocabulary



The outline of the house was **shrouded** in mist.



I have been really enjoying **obscure** Victorian literature lately.



You should see a lot of water birds on the tour, and if you're lucky an **elusive** crocodile.



She is making amazing progress in the field of **neuroscience**.



# Vocabulary

**crisscrossing**

The quilt's pattern was made up of **crisscrossing** blue thread.



**minuscule**

The evidence condemning the suspect is **minuscule**. There isn't enough to make a case against her.



**neuron**

The sheer number of **neurons** in the human brain is beyond comprehension.



**to band together**

The office **banded together** to reach the deadline.



**to foil**

That wily detective **foiled** my escape plan!



**in flux**

Mary's career plans are in a state **of flux** these last few months!





## Mapping the brain of a mouse

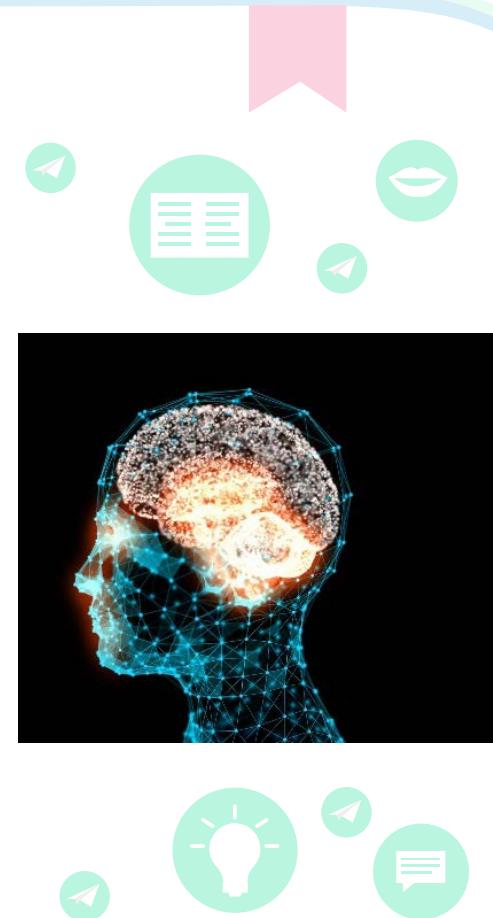


The human brain is one of the greatest unsolved mysteries of modern medicine. While advances in medical technology and knowledge have led us to a highly developed understanding of the human body and the roles of its various organs, understanding of how the brain works remains **shrouded** in darkness. Medical researchers have consistently been **foiled** by the complexity of the organ – we might know what it looks like, and what specific regions do, but real answers about how the brain works and why our minds operate so differently are still hazy and **obscure**.



## Mapping the brain of a mouse

The inner workings of the brain have proven **elusive**, in spite of many gains in the field of **neuroscience**. Conventional **surgical** methods of investigation fail to reveal the **inner workings** of the organ. With 100 billion **neurons** firing, and **minuscule crisscrossing** connections occurring simultaneously, the activity is simply too complex to keep track of. Even more complex than a densely packed grid of connections is that connections are in constant **flux** as new learning results in freshly strengthened connections. Likewise, old memories and fading knowledge can weaken and destroy the ties between neurons.





## Choose the best answer

1. Modern medicine still hasn't solved the \_\_\_\_\_ of the human brain.  
**a. issue                          b. mystery                          c. uncertain                          d. mysterious**
  
2. Despite many efforts, the \_\_\_\_\_ of the brain is still the biggest challenge for neurological research.  
**a. comparative                          b. complexity                          c. complicity                          d. complexity**
  
3. The study of the brain and its workings is referred to as \_\_\_\_\_.  
**a. nanotechnology                          b. nanoscience                          c. neuroscience                          d. pseudoscience**
  
4. There are over \_\_\_\_\_ neurons in the human brain.  
**a. 100 billion                          b. 50 million                          c. 100 million                          d. 1000**



## Choose the best answer

1. Discovering the inner workings of the human brain has proven \_\_\_\_\_ to researchers.

- a. illusive
- b. eluded
- c. elusive
- d. illustrative

2. Conventional \_\_\_\_\_ procedures have failed to answer the big questions about the human brain.

- a. surgical
- b. service
- c. surgery
- d. surrogate

3. The reasons why people have different characters, personalities and mental patterns are still bathed in \_\_\_\_\_.

- a. obesity
- b. obscurity
- c. security
- d. obsolescence

4. The ties between neurons can become frayed and \_\_\_\_\_ through lack of use.

- a. dented
- b. disadvantaged
- c. destroyed
- d. destabilised



## Tell your teacher

You recently met a neuroscientist at a party. You got on very well and had a very interesting conversation.

Describe some of the things you talked about to your teacher.





## Brainstorm

**Mapping the human brain could lead to a range of opportunities for the future.**

**What could be some of the benefits for humanity from this breakthrough?**

Health?

Technology?



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## Mapping the brain of a mouse

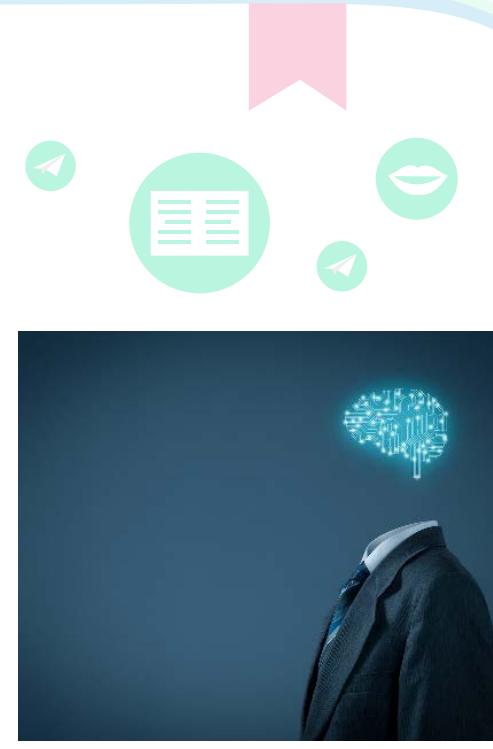


A group of ambitious scientists have **banded together** to attempt to map the brain once and for all. The 'Human Connectome Project', granted \$3 billion dollars from the US government, plans to map and assess the entirety of the human brain in an attempt to reveal the inner workings of the most human of organs. Many researchers think it a more logical step to begin with the mouse brain, with only 75 million neurons seems a more achievable place to start.



## Mapping the brain of a mouse

Using high speed computers and **visualisation** tools to tackle the enormous figures, researchers have succeeded in creating a rough map of how the brains of mice are **wired**. Researchers liken it to a 'road **atlas**', with the major connections (or highways) complete. The smaller connections, or local roads, are to be filled out as research continues. Using precise imaging technology, the team introduced and tracked **microscopic** fluorescent viruses over 1,700 different mouse brains. They measured data from the computer model to reveal that neural connections vary across 5 degrees of scale. The multitude of connections were weak, and supported by few very strong links. The Human Connectome Project openly provides visual representations of its data for the scientific community on its website.





## New vocabulary

**visualisation**

The act of representing information in written terms, or imagining something by seeing it as a mental image.

**how sth is wired**

**How something is wired** is another way of saying the way something works.

**atlas**

A book which contains maps and references where various things can be found and made.

**microscopic**

Something so small it can only be seen using a microscope.



## Tell your teacher

**What is it about the brain as an organ that makes studying it such a challenge?**



Complexity?

Lack of available organs?

Research is costly?

No animals with a brain comparable to ours?



## Compose questions

**If you could spend a day with a leading neuroscientist what questions would you ask them about how the brain works? What are you most curious about? Use the examples below to help you.**

How can you avoid diseases like Alzheimer's and dementia?

What will change as a result of mapping the entirety of the human brain?

How do mental illnesses develop?

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## Advances in technology

What are some of the technological innovations which have allowed the Human Connectome Project to make such significant progress? Do you think we could have attempted a project of this magnitude ten years ago?





## Outline your research findings

You are a researcher who has just taken part in the revolutionary study to map the brain of a mouse. Write to your colleagues discussing your findings.

A large rectangular box with a thin black border. Inside the box are eight horizontal grey lines spaced evenly apart, intended for handwritten text.



## Mapping the brain of a mouse



As work continues, big questions remain. How is information encoded and transferred between neural networks? The brain functions like its own human supercomputer, and the beautiful glowing map produced by the team is the most detailed analysis of brain **circuitry** so far. Before this, the most elaborate study of a brain was for the roundworm *C. elegans*, a microscopic roundworm, which had only 302 neurons. The comparison illustrates the scope and scale of this achievement.

A greater understanding of the human brain would create vast leaps in medical and behavioural science. With this knowledge would come progress in medical treatment for a range of mental conditions.



## Mapping the brain of a mouse

People suffering from incurable mental illnesses such as schizophrenia or Alzheimer's could hope and expect for treatment for their diseases. It could also provide clues as to why some people seem to have increased tendencies towards aggression or violence as well as helping to manage criminal behaviour.

Other potentialities include unlocking secrets of our identities. Understanding our mind, and the evolution of our brains would **illuminate** much about who we are and the nature of our species. With the mapping of the brain, a **plethora** of new discoveries will be unlocked – how human consciousness works, and whether our characters are shaped more by **inherent** genetic traits or our life experience. Big questions about the human experience and the nature of our selves are due to be answered if the project to map the human brain succeeds. It is a brave new world for neuroscience.



## New words

**illuminate**

Would you care to **illuminate** us on your discovery?

**plethora**

New Zealand offers a **plethora** of choices for professional hikers.

**inherent**

Mothers have an **inherent** instinct to protect their children.

**circuitry**

She looked into the **circuitry** to try to fix her television.



## Goals for humanity

Pick one of the topics below and explain how the mapping of the human brain could help us reach these goals. Which of the topics is most interesting to you? Why?

The treatment  
of mental  
illness

Self  
actualisation

Educational  
revolution

The reason for  
existence

Technological  
implants  
(nanotechnology)

Mental  
evolution

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## Self-comprehension



What else could we learn about ourselves if we had a complete map of the human brain?



## Nature vs nurture

**Write a response to one of the statements below.**

A person's nature or temperament is largely due to their genetics and hereditary influence from their parents.

Both nature and nurture contribute to who we are.

People's personalities are a result of their upbringing and socio-cultural environment.

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Talk with your teacher

Character and personality is based more on genetics than life experience.



Agree?



Can you think of another way?



## Reflect on the lesson

Take a moment to review any new **vocabulary, phrases, language structures** or **grammar points** you have come across for the first time in this lesson.

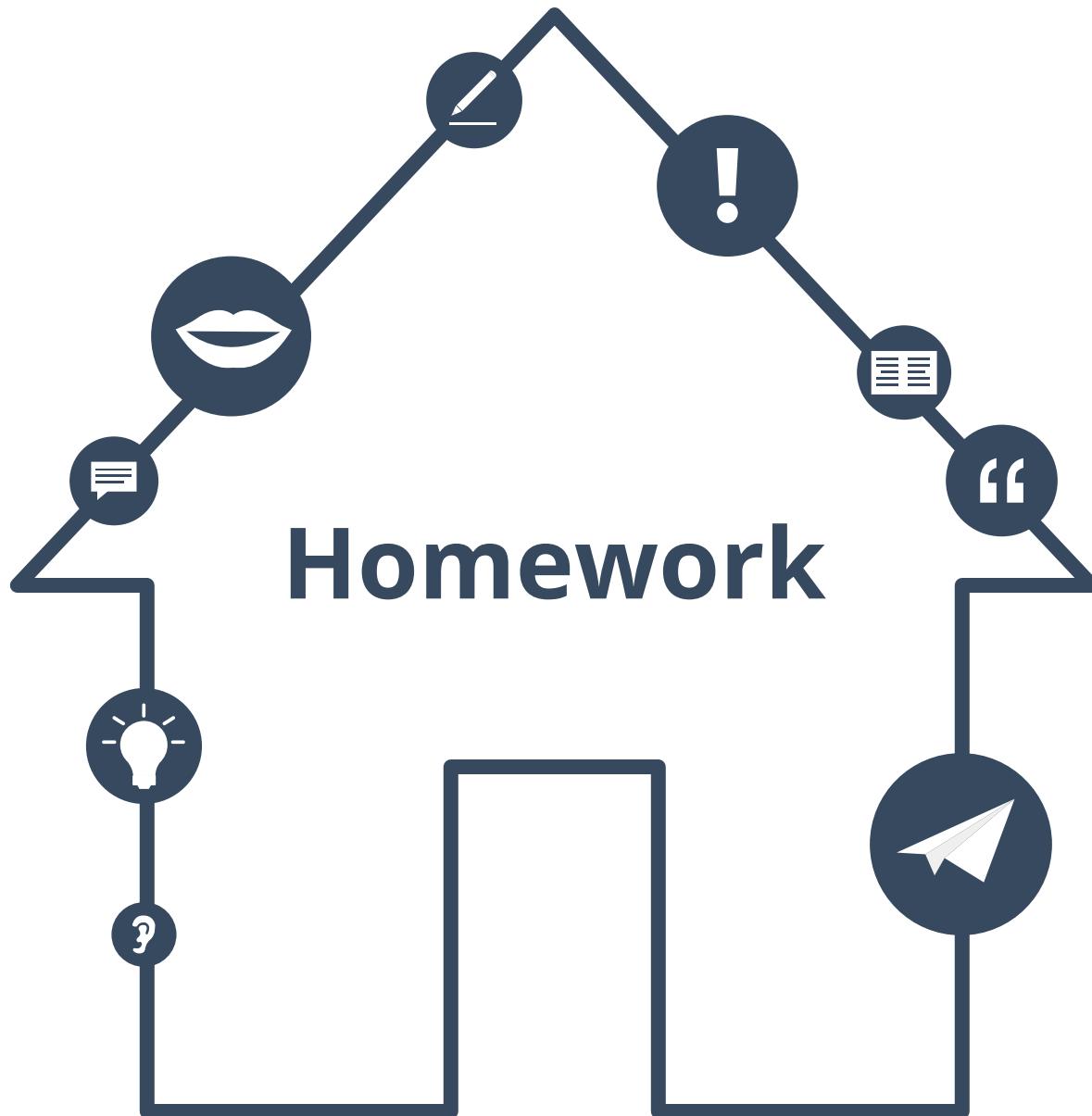
Review them with your teacher one more time to make sure you don't forget!





## Answer key

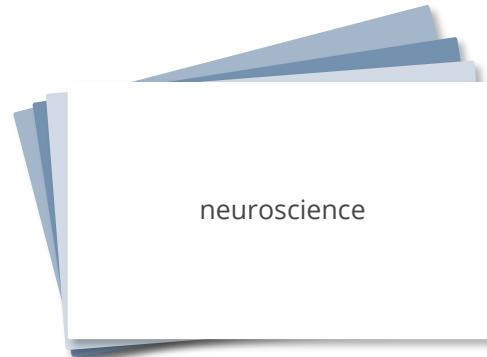
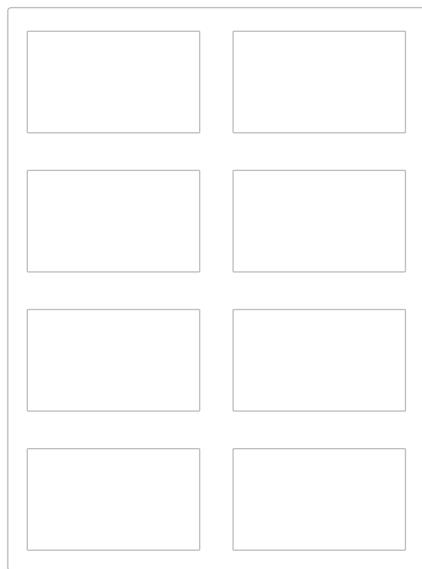
Activity P. 10 1B, 2B, 3C, 4A  
Activity P. 11 1C, 2A, 3B, 4C





## New vocabulary

**Create flashcards for the new vocabulary in today's lesson.  
Ensure you write the definition on the back of the card.**





## Write about technological revolution

Picture the future, 100 years from now.

Write about how progress in the field of neuroscience has revolutionised the fields of medicine, mental health and psychology.





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