

Gone Forever *By David Hill*

Introduction

During our planet's history, much of the life on Earth at the time has been wiped out on six different occasions. What caused these mass extinctions? Could it happen again? In *Gone Forever*, the possible reasons for these huge events are explored.

Reason for reading

You could use this book with your students to:

- explore the topics of geology and evolution
- learn about the possible reasons for the six mass extinctions in our planet's past.

Setting the scene

Draw on your students' prior knowledge. If necessary, introduce concepts or vocabulary to help them access the story. Also communicate the reason for reading.

- Brainstorm ideas about climate change, dinosaurs, fossils, and geological eras. Why is it important for scientists to study the geological eras of Earth's past? How might that knowledge affect our lives? What could we learn from their studies?
- Print the KWLH chart (Template A) or create a KWLH chart on the board. Students, before reading, fill in the first two columns of this chart with what they know and want to know about the different geological eras. After reading, they can fill in the last two columns with what they have learned about these eras and how.
- Students explore the cover and determine what they think the book is about.
- Introduce vocabulary that the students may need to access the text. Refer to the vocabulary worksheets (2, 3a and 3b) for words that may be unfamiliar.

Getting stuck in

Choose the prompts that you feel your students need. Remind them to note any unfamiliar words and check for clues to the meanings in the text or images.

- End of page 3 – “What was Gondwanaland? How many million years ago did it exist?”
- End of page 5 – “What are fossils and what can they tell us? What was the most recent mass extinction in our history? What happened then?”
- End of page 7 – “How could a new virus begin?”
- End of page 10 – “In what ways could violent volcanic eruptions have caused a mass extinction? What is an exploding star called?”
- End of page 13 – “What are the possible causes of an ice age? How fast do continents move? What is the mantle, shown in the cross section of Earth's core, made up of?”
- End of page 15 – “In what ways does climate change affect the sea levels on Earth?”
- End of page 19 – “What are asteroids? Why do scientists think a massive asteroid could have wiped out the dinosaurs? In what ways could this have happened?”
- End of page 21 – “What acid do some comets contain?”
- End of page 23 – “What significant happening occurred after the K/T extinction? When was that? Gradually all life on Earth will be destroyed – how?”

Taking a closer look

Choose suggestions that suit your students and reason for reading.

Exploring ideas and opinions

- Ask for your students' opinions of this book. Did they find it held their attention? Why or why not? Why do they think the author wrote it?
- After the students complete the three-level thinking guide (Worksheet 1), they discuss their responses in pairs, in small groups, or as a class.
- Students discuss in pairs or small groups: "How important is it to know about Earth's history? Why? Do we have any chance of preventing another mass extinction? In what ways could we preserve the life of human beings?"

Exploring language

- Cut out the words and definitions from Worksheet 2 and mix them up. Hand them out to students, who then find their correct "partner".
- As an alternative to the above activity, divide the class into two groups: one group fills in the second column of Worksheet 3a and the other fills in the second column of Worksheet 3b. This activity involves the students in creating definitions, which they then use to test the other group.
- Students search for: adjectives such as *violent*, *poisonous*, *molten*; nouns such as *fossil*, *dinosaurs*, *asteroid*; and verbs such as *hurled*, *adapt*, *destroy*. Do these words add to the "picture" of a changing Earth that is generated?
- Students complete Worksheet 4 – the cloze activity.

Moving beyond the text

Choose activities that suit your students and reason for reading.

Reading

- Students read other articles and/or stories about the history of Earth's evolution.

Writing

- Students prepare a chart that compares the different geological eras.
- Students draw up a timeline showing the different geological eras, or a chart comparing the last two geological eras to show how long humans have existed on Earth.

Debating

- Hold a class debate on: "The effect of climate change on life in New Zealand" or "There's plenty of time for humans to find another planet or moon to live on".

Research

Students do research on:

- fossils and how they give us information about Earth's past
- dinosaurs, their evolution and their time on Earth
- the effects of climate change.

Art and design

- Students prepare a static image, poster, or book cover that advertises *Gone Forever*.
- Students create a poster showing the possible effects of climate change on Earth in general, or on New Zealand in particular.
- Students draw a diagram of what a human space colony might look like.

WORKSHEET 1

Gone Forever – Three-level thinking guide

- Level 1 – Reading on the lines (interpreting what the text says on a literal level)
- Level 2 – Reading between the lines (inferring, or interpreting what the text might mean)
- Level 3 – Reading beyond the lines (evaluating ideas and information)

Students write “agree” or “disagree” beside each statement and then discuss their responses in pairs, in groups, or as a class. The value of this activity lies in the discussion it generates as students justify their views. The activity is not intended as a test for comprehension.

LEVEL 1	Agree/disagree
Earth’s landmasses formed Gondwanaland 200 million years ago.	
The Frasnian and Jurassic extinctions are the most famous.	
The mass extinctions all happened very suddenly.	
New viruses reach our planet inside meteorites or comets.	
All deaths from volcanic eruptions occur because of the ash and dust.	
Small animals find it easier to adapt to changes than larger animals.	
An exploding star is called a supernova.	
The ice ages killed off many plants and animals.	
The continents are now stationary as the molten rock solidifies.	
As Earth gets warmer, the sea levels drop.	
Many fish, as well as shore plants and animals, die as sea levels rise and fall.	
Asteroids are made of iridium, which caused the death of the dinosaurs.	
Scientists believe an asteroid hit Earth in Mexico 65 million years ago.	
Our sun will eventually burn out and all life on Earth will die.	

Sheet 1 of 2

LEVEL 2	Agree/disagree
Once people were able to walk over every part of the world.	
We would not understand our world's history if it weren't for fossils.	
Scientists do not know what caused the six mass extinctions.	
Mass extinctions have occurred regularly throughout Earth's history.	
Small animals are more likely to survive disasters than big ones.	
The movement of Earth's surface causes climatic changes.	
An asteroid hitting Earth would completely destroy all life as we know it.	
Comets and asteroids often hit Earth's surface.	
A combination of many things has caused mass extinctions.	
Humans have plenty of time to prepare for another mass extinction.	
LEVEL 3	Agree/disagree
Humans need to act now to prevent another mass extinction.	
Climate change is a totally natural occurrence.	
Humans need to know much more about past geological eras.	

Sheet 2 of 2

Worksheet designed by Barbara Freeman, Wellington, New Zealand, 2007

WORKSHEET 2

Gone Forever – Match the meaning

Cut out the words and their definitions, mix them up, and ask your students to match the pairs.

Word	Definition
adapt	to change in order to cope or survive
alter	to change
ancient	in times long past
asteroid	a huge chunk of rock that orbits the sun
bacteria	a tiny living organism
climate	long-term conditions (eg temperature, wind) that affect the day-to-day weather
colony	a settlement or community
comet	a ball of ice and rock that orbits the sun
continent	a large land mass
core	centre
dinosaur	a reptile that dominated Earth a long time ago and is now extinct

Word	Definition
extinctions	wiping out of much of the life on Earth
fossil	the preserved, ancient remains or imprint of something
gamma rays	rays emitted by a radioactive substance
geological era	a period of millions of years that scientists have defined based on the history of Earth and the life forms on it at the time
glacier	a flow of ice created by compacted snow
global warming	the increase in temperature of Earth's surface
Gondwanaland	Earth's first and biggest continent
gravity	force that attracts things to a planet like Earth
ice age	a long period when the temperature was very cold across all of Earth
iridium	a rare chemical element
lethal	being able to cause death
meteorite	a piece of rock that has come from space and survived its landing on Earth
molten	melted to become a liquid due to great heat

Word	Definition
mutation	a changed or altered state
orbit	the path followed by one object going around another object
primitive	basic, simple
prussic acid	a very corrosive substance found in some comets
radar	a system of using electromagnetic waves to detect and find out more about an object far away
scenario	suggestion for one way something might happen
soot	residue from fire
supernova	an exploding star
tsunami	a gigantic sea wave
virus	a microscopic organism that spreads infection
volcanic eruption	sudden, dramatic event when molten rock is forced through Earth's crust
X-rays	a kind of electromagnetic radiation that can pass through solid objects (it can be dangerous but is also useful in medicine)

Sheet 3 of 3

Note that some words above may have different meanings in other contexts.

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WORKSHEET 3a – GROUP A

Gone Forever – Vocab swap

- Divide the class into two groups, and give one group Worksheet 3a and the other group Worksheet 3b.
- In the second column of its own worksheet, each group writes a definition for each of the words listed in the first column. Where a word has more than one meaning, the group may need to check the page of the book that is listed.
- Each group then folds the first column out of sight and swaps worksheets with the other group.
- Each group guesses the original words, based on the definitions given in the other group's worksheet, and writes them in the third column of that worksheet. A group can go to the page in the book that is listed if it needs help. For an extra challenge, the groups can guess without referring to the page.
- You could make this a fun competition and give points for every correct word.

Word	Definition (Group A)	Word (Group B)
adapt (p 9)	(p 9)	
ancient (p 4)	(p 4)	
bacteria (p 7)	(p 7)	
colony (p 23)	(p 23)	
continent (p 2)	(p 2)	
dinosaur (p 4)	(p 4)	
fossil (p 3)	(p 3)	
geological era (p 4)	(p 4)	
global warming (p 14)	(p 14)	
gravity (p 20)	(p 20)	
iridium (p 16)	(p 16)	
meteorite (p 7)	(p 7)	

Word	Definition (Group A)	Word (Group B)
mutation (p 7)	(p 7)	
primitive (p 22)	(p 22)	
radar (p 18)	(p 18)	
soot (p 16)	(p 16)	
tsunami (p 19)	(p 19)	
volcanic eruption (p 8)	(p 8)	

Sheet 2 of 2

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WORKSHEET 3b – GROUP B

Gone Forever – Vocab swap

- Divide the class into two groups, and give one group Worksheet 3a and the other group Worksheet 3b.
- In the second column of its own worksheet, each group writes a definition for each of the words listed in the first column. Where a word has more than one meaning, the group may need to check the page of the book that is listed.
- Each group then folds the first column out of sight and swaps worksheets with the other group.
- Each group guesses the original words, based on the definitions given in the other group's worksheet, and writes them in the third column of that worksheet. A group can go to the page in the book that is listed if it needs help. For an extra challenge, the groups can guess without referring to the page.
- You could make this a fun competition and give points for every correct word.

Word	Definition (Group B)	Word (Group A)
alter (p 8)	(p 8)	
asteroid (p 16)	(p 16)	
climate (p 11)	(p 11)	
comet (p 7)	(p 7)	
core (p 12)	(p12)	
extinctions (p 4)	(p 4)	
gamma rays (p 10)	(p 10)	
glacier (p 14)	(p 14)	
Gondwanaland (p 2)	(p 2)	
ice age (p 11)	(p 11)	

Word	Definition (Group B)	Word (Group A)
lethal (p 19)	(p 19)	
molten (p 13)	(p13)	
orbit (p 11)	(p 11)	
prussic acid (p 20)	(p 20)	
scenario (p 9)	(p 9)	
supernova (p 10)	(p 10)	
virus (p 7)	(p 7)	
X-rays (p 10)	(p 10)	

Sheet 2 of 2

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WORKSHEET 4

Gone Forever – Fill in the gaps

Add your own words in the spaces to make this passage come alive!

Many scientists that the six mass extinctions have been due several of these causes at once. Creatures weakened by a colder might be easily killed by a virus. Dinosaurs, whose supply was already shrinking as the continents moved, could last through conditions after an asteroid impact.

The mass extinctions were disasters for many But they room for many forms of life to or spread. After the K/T Extinction, the first humans on Earth.

Will be more mass extinctions? Possibly, but it might happen millions of years, and there will probably be of warning.

For example, we know our sun will eventually swell much and gradually destroy life on Earth. But don't worry. It won't for another five billion (that's five thousand million) That's plenty of for humans to find another or moon to live on, and to take other Earth with them.

TEMPLATE A

KWLH chart

<u><i>KNOW</i></u>	<u><i>WANT TO KNOW</i></u>	<u><i>LEARNED</i></u>	<u><i>HOW I LEARNED</i></u>