

TO THE TEACHER

In this book students will have the opportunity to investigate, learn and create as they work through an enigma unit. They will also explore some of the many areas of science and how each approaches an enigma differently using the scientific process. A list of the branches of science and a description of the scientific method are provided. Students can refer back to these when answering certain questions at the end of their enigma story. This resource contains stories about eight enigmas. Each story is followed by discussion questions creative questions, and learning-centre activities that provide challenges for your gifted students as well as your on-level students. There is also a research unit which includes the steps to a successful research project and how to implement the unit.

Directions:

- Step 1:** Choose one of the enigma stories and read it together. Use the discussion questions at the end of the story to further students' understanding of the story. Introduce or review the information about the branches of science and the scientific method. Then use the set of general questions to ensure that students understand what is meant by the term "enigma" and why the topic in the story just read is an example of an enigma.
- Step 2:** Students are now ready to complete the creative questions. These questions are asked at the upper levels of Bloom's Revised Taxonomy and are designed to encourage students to think at a higher level and not just repeat information learned from the story. Many of the questions involve no right or wrong answers; therefore, marking will be subjective. Look for creative answers which have incorporated knowledge gained from the story.
- Step 3:** When the creative questions have been completed, assign or let students choose one or more learning-centre activities. These activities include creative writing, illustrating and/or the creation of a new product that will support the enigma story. They can be placed in a learning centre for differentiation purposes or as extensions of the unit. A planning sheet and a template for creating additional learning-centre activities are provided.
- Step 4:** When class participation following the reading of the chosen story is completed, students will choose another enigma story and begin their independent research project. The ability to conduct research on an assigned or chosen topic is a very important skill for future success in higher education. Directions are given in that section.

The objectives of this book are to encourage students to learn about enigmas, to use the acquired learning and to develop something new through a research project. In today's society, research is very important. The skills gained by completing this research will be used throughout their lives.

BRANCHES OF SCIENCE

What is science? Science is defined as the study of the world around us. It helps us answer questions about that world—questions such as how? what? where? and when? Science also aids in finding solutions to problems that affect us and the world in which we live. There are many different branches of science. Below are some that might help in relating points of view about the enigmas in these stories.

Physical Science

- Chemistry:** the study of the composition, structure, properties and reactions of matter
- Physics:** the study of matter and energy and their interactions
- Astronomy:** the study of the matter and objects outside Earth's atmosphere

Life Science

- Anatomy:** the study of physical structures of animals, plants and other organisms
- Biology:** the study of living organisms and how they interact with each other
- Botany:** the study of plant life
- Ecology:** the study of the relationships between organisms and their surroundings
- Zoology:** the study of animals

Earth Science

- Geology:** the study of the origin, history and structure of the earth, and the processes that shape it (or the solid matter of another celestial body, such as the moon)
- Meteorology:** the study of the atmosphere and its phenomena with a focus on weather processes and forecasting
- Oceanography:** the study of the ocean and everything in it, including land formations, water and life

OTHERS

- Archaeology:** the study of ancient cultures through the examination of their material remains, such as buildings, graves, tools and other artefacts usually dug up from the ground
- Mathematics:** the study of the relationships among numbers, shapes and quantities

THE SCIENTIFIC METHOD

Scientific Tools

Scientists use many skills in their search for answers. Some of these skills include the use of observation, identification, description and inference.

Observation is a skill used to report what is seen, heard, smelled, touched or tasted.

Description is the communication of what is learned by writing or telling about one's observations.

Identification is the recognition and naming of something.

Inference is a skill that uses previous knowledge and knowledge gained as a result of observation, description and identification to draw conclusions.

Scientific Method

The scientific method includes five steps that scientists use in their search for answers to unanswered questions or solutions to problems.

Step 1: State the problem. (What is the question of concern?)

Step 2: Collect information. (Research and gather information that will help you to understand the problem.)

Step 3: State the hypothesis. (Form a guess based upon the information.)

Step 4: Test the hypothesis. (Set up an experiment to prove or disprove the hypothesis.)

Step 5: Draw a conclusion. (Use the results of the experiment to reach a conclusion.)

THE PYRAMIDS

The sounds of exhausted men labouring tirelessly to build their god/leader, or pharaoh, a home for his afterlife, echoed through the dry desert area of Egypt. The time of building pyramids is long gone, but these great structures still remain today, some dating back almost 5000 years. Eighty pyramids were built on the west bank of the Nile River. The reason the west bank was chosen was that the ancient Egyptians believed that the land of the dead was on the west side of the Nile.

Early pyramids were step pyramids. The step pyramid built for the pharaoh Djoser dates from about 2700 BCE. It is thought to be the oldest building left standing on Earth. The structure is very elaborate with six great, flat-roofed buildings built one upon the other. There were many rooms in the buildings, but no doors. The Egyptians believed their pharaoh's spirit could pass through walls and, therefore, did not need doors. The room that held the pharaoh's body and treasures lay 24 metres underground beneath the structure.

The tomb was opened in 1925 to reveal ... emptiness. Nothing remained of the pharaoh's mummy but his foot. All the artefacts were missing. What happened to the mummy and the artefacts buried with it? Perhaps it will never be known. Were the pharaoh's mummy and other objects ever placed in the burial room of the tomb? Were they hidden in another room somewhere else within the pyramid? Is it possible that the mummy was hidden in a secret place outside his pyramid, in a place known only by a few, so the body would be protected and the pharaoh could safely pass into the land of the dead?

Today known as the Great Pyramid of Giza, the pyramid built for Pharaoh Khufu was as tall as a 40-storey building with each side being as long as seven city blocks. Beginning at about 2600 BCE, it took many thousands of farmers and slaves about thirty years to build. About two million stones, some of them weighing as much as 45,000 kilograms, were used to build this wondrous pyramid. The outside of the pyramid was then covered with white limestone so it glistened in the sun. The Great Pyramid of Giza was on the original list of the Seven Wonders of the Ancient World.



THEORIES

The following are some theories regarding the building of the Egyptian pyramids.

- Engineers and architects have studied the pyramids in search of an answer as to how these great architectural feats were accomplished. Some think a ramp was built alongside the pyramid to move the heavy blocks of stone up to each level. Once the construction was completed, the ramp could have been disabled.
- It was once speculated that it took several hundred men to drag each stone into place. Later, the a Polish architect thought that 25 men could have dragged a block weighing 1360 kilograms up to the pyramid; however, more modern tests have shown that if the surface was lubricated, then perhaps as few as 8 to 12 men could have pulled a block of stone up the ramp. Some physicists and mathematicians think that rather than needing hundreds of thousands of workers to build the pyramids, the jobs could have been done with as few as 10,000 men for the medium-sized pyramids and 36,000 for the largest.
- Archaeologists think the stone used for the structure may have been cut near the pyramid and rolled on great logs to their final destination. The limestone used for the outside of the pyramid was thought to be moved down the Nile River and over to the pyramid by way of human-built canals. The closest granite quarry was some 64 kilomtres away, so these great slabs of stone are thought to have been brought to the sites by boat.
- Some believe that—in addition to slaves—farmers worked during those periods of time when the Nile flooded the region, thereby preventing them from cultivating their lands.

The pyramids have been and possibly will always be an enigma of science. As yet, no evidence has been uncovered to explain how these great structures were built.