

## UNIT 2: Informative Essay



© Houghton Mifflin Harcourt Publishing Company • Image Credits: ©AlexanderFotola

# Things Change

## UNIT 2

# Informational Essay

STEP

1

### ANALYZE THE MODEL

*Evaluate two informative essays about the universe and planets.*

STEP

2

### PRACTICE THE TASK

*Write an informative essay about the presence of pythons in the everglades.*

STEP

3

### PERFORM THE TASK

*Write an informative essay about scientific knowledge, its change over time, and its effect on society.*

An informative essay, or expository essay, is a short nonfiction work that tells a reader facts about a topic. The purpose of a nonfiction piece is to convey information. Examples of nonfiction writing are newspaper articles, online articles, magazine articles, encyclopedia articles, and speeches.

The nonfiction topics that you will read about in this unit discuss factual changes in scientific knowledge. The information in these selections is factual.

**IN THIS UNIT,** you will analyze information from a variety of nonfiction articles from magazines and newspapers. You will find, organize, and present facts that will add to your readers' knowledge of a topic. Your success will depend on how well you select evidence to support your topic.

# ANALYZE THE MODEL

*Why does our knowledge of the universe change over time?*



## You will read:

- ▶ AN INSTRUCTIONAL ESSAY  
*Starting Strong*

## You will analyze:

- ▶ TWO STUDENT MODELS  
*A Universe of Knowledge*  
*Planet X or Dwarf Planet?*

# Source Materials for Step 1

Ms. Rogers' students read the following text to help them learn strategies for writing informative essays. As you read, underline information that you find useful.

## NOTES

## Starting Strong

Researching a fact or two usually isn't challenging. Researching a topic and planning and writing an informative essay, however, is a complex process. A successful informative essay conveys factual information from several sources and presents that information in a logical way that leads to an overall conclusion.

When you write an essay, the parts should *relate* to each other in a clear way to support your message. Graphic organizers like the basic framework for an informative report below, can help you plan your organizational structure.

### Framework for an Informational Essay

#### Introduction

Hook your reader's interest and clearly identify your subject. Make your topic and main point clear.

#### Body

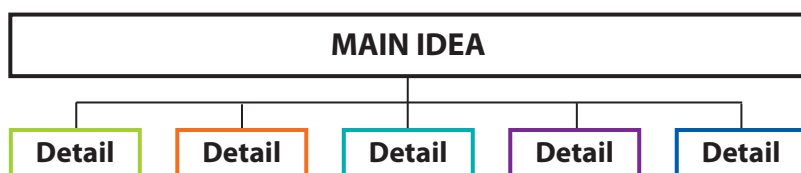
Discuss each main idea in one or more paragraphs and support each main idea with facts, examples, and quotations.

#### Conclusion

Bring your report to a close by tying your ideas together. Summarize or restate your main idea(s) or draw conclusions.

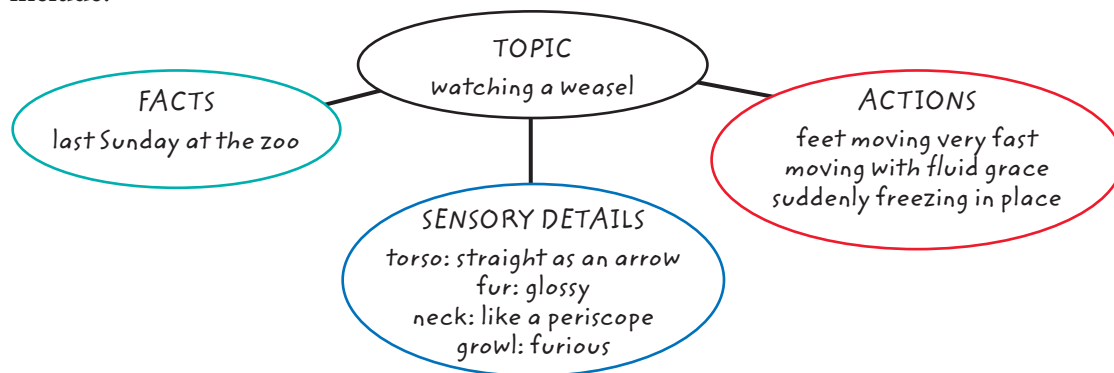
## Main Idea and Supporting Details

The main ideas that you develop in the body of your informative essay will be supported by two or more details, descriptions, or explanations. The graphic organizer below will help you organize your ideas and the details you will use to explain them. Jot down a main idea or central point. Then identify the details you will use to support your main idea. To keep on track, refer regularly to your graphic organizer as you write.



## Narrative Description: Painting with Specifics

Informative essays often require descriptive language to help the reader understand the topic being discussed, especially if you want to describe specific people, events, or procedures. Narrative description is used to explain an event is usually organized chronologically, with details presented in time order. A graphic organizer such as the one below can help you incorporate narrative description into your informative essay. Facts, sensory details, and actions are three types of specifics you can include.

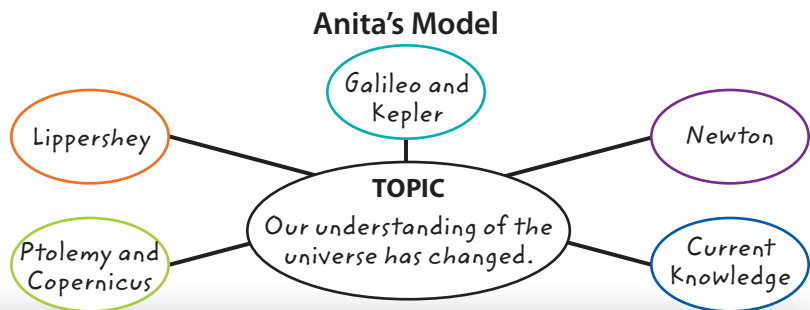


## Discuss and Decide

Explain how you might use narrative description in an informative essay on Civil War drummer boys. What events would you describe? Think about duties, uniforms, and the boys themselves.

# Analyze Two Student Models for Step 1

Anita developed her topic by supporting it with five main ideas that were each covered in a paragraph in the body of her essay. Read her essay closely. The red side notes are comments made by her teacher, Ms. Rogers.



Anita Brown  
Ms. Rogers, English  
January 30

## A Universe of Knowledge

*Mentioning the future is a good way to hook your readers!*

*Why didn't anyone believe him? Were people too connected to Ptolemy's theory?*

*Specific examples support your main idea. Each discovery had to build on one before.*

What we understand about the universe has changed over history, and it will probably continue to change.

The first person to suggest that Earth revolved around the sun was the Greek astronomer Aristarchus of Samos, in the third century BC. Most people rejected his ideas later in favor of Ptolemy, who stated that Earth was the center of the universe, and that the sun, moon, and stars all revolved around it. Ptolemy's theories were taken as fact for about 1,400 years, until Copernicus, a Polish astronomer, claimed that the sun was the center of the universe, and that all the planets revolved around it.

It took the accidental invention of the telescope in 1608 to start what we think of as modern astronomy. An optician, Hans Lippershey, found that if he looked through two glass lenses together, objects appeared magnified. The Dutch military used Lippershey's invention on the sea to check for approaching enemy ships, but the Italian astronomer Galileo Galilei decided to use the telescope to look at the stars.

Galileo discovered that Jupiter had moons orbiting it, he saw that the Milky Way was actually made up of billions of individual stars, and he agreed with Copernicus's idea that the sun was the center of our solar system. But Galileo was found guilty of heresy and was put under house arrest for the rest of his life. In Germany, however, the work of Johannes Kepler supported Galileo's ideas. People began to accept that the planets move around the sun, but it would take over 40 years to understand why they move around the sun.

In England, Sir Isaac Newton had developed his own theory about why the planets move around the sun. He determined that the force of gravity that made an apple fall from a tree to the ground was the same force that held the planets in their orbits in space.

Inventions such as photography and the discoveries of various forms of light have pushed our knowledge of the universe further. In the twentieth century, astronomers learned that there are 100 billion stars in our galaxy, and there are hundreds of billions of galaxies. In this century, we have found out that there are probably 17 billion Earth-sized planets in our galaxy.

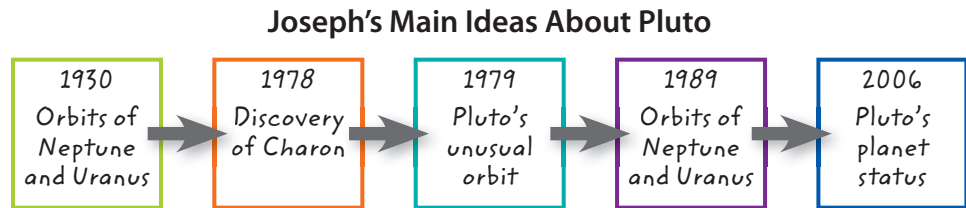
How will our knowledge of the universe change? We cannot tell, but the one thing we do know is that our ideas will change.

*Technology has definitely advanced our understanding of the universe!*

## Discuss and Decide

How did Anita's main ideas relate to her topic? Cite textual evidence in your discussion.

Joseph used chronological order to develop the main ideas that support his topic. Ms. Rogers made her notes in red.



Joseph Keegan  
Ms. Rogers, English  
January 30

## Planet X or Dwarf Planet?

### A Century in the Study of Pluto

*Nice setup of your topic.*

Over 100 years ago, the astronomer Percival Lowell started looking for Planet X, a planet he thought should exist beyond Neptune. His theory was that there had to be a planet whose gravitational pull affected the orbits of Neptune and Uranus.

It wasn't until 1930 that the mystery planet was found, very close to the point it was expected to be. Planet X was renamed Pluto, a name proposed by an 11-year-old girl from Oxford, England. The name pleased astronomers, as it began with Percival Lowell's initials.

*Detail is supported with fact-based evidence.*

In 1978, astronomers discovered Charon, one of Pluto's moons. This allowed them to calculate the mass of Pluto, and they discovered that Lowell's theory had been wrong—Pluto's gravitational pull on Neptune and Uranus was insignificant.



Although Pluto is the farthest planet, the next year an event occurred that takes place every 248 years. Because of Pluto's particular orbit, Neptune became the farthest planet from the sun. This lasted until 1999.

In 1989, *Voyager 2* allowed astronomers to calculate Neptune's mass more accurately, and they found that there really was no discrepancy in the orbits of Neptune and Uranus.

In 2005, two more of Pluto's moons were discovered. The International Astronomical Union (IAU) named them Nix and Hydra. But later in 2006, the IAU made another announcement: Pluto is no longer considered a planet in our solar system. It is now classified as a "dwarf planet." The decision means that Neptune will now be considered the eighth and last planet in our solar system.

So, students will no longer remember the order of the planets by saying "My very eager mother just served us nine pizzas" (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto). We will have to think of another mnemonic.

*Good way to show how advancements in science have allowed us to get more accurate information.*

*Very true! Any suggestions?*

## Close Read

Why did it make sense for Anita and Joseph to present their essays in chronological order? Cite text evidence in your response.

---

---

---

# Terminology of Informative Essays

Read each term and explanation. Then look back and analyze each student model. Find an example to complete the chart. Finally, make a claim about which model was more successful in illustrating each term.

Term	Explanation	Example from Student Essays
<b>topic</b>	The <b>topic</b> is a word or phrase that tells what the essay is about.	
<b>text structure</b>	The <b>text structure</b> is the organizational pattern of an essay.	
<b>focus</b>	The <b>focus</b> is the controlling, or overarching, idea that states the main point the writer chooses to make.	
<b>supporting evidence</b>	The <b>supporting evidence</b> is relevant quotations and concrete details that support the focus.	
<b>domain-specific vocabulary</b>	<b>Domain-specific vocabulary</b> is content-specific words that are not generally used in conversation.	
<b>text features</b>	<b>Text features</b> are features that help organize the text, such as: headings, boldface type, italic type, bulleted or numbered lists, sidebars, and graphic aids, including charts, tables, timelines, illustrations, and photographs.	

**Claim:** \_\_\_\_\_

Support your claim by citing text evidence.

\_\_\_\_\_

\_\_\_\_\_

## PRACTICE THE TASK

*How is the presence of  
Burmese pythons changing  
the Everglades?*



## You will read:

- ▶ **AN INFORMATIONAL ARTICLE**  
*Burmese Python: Not the Ideal Pet*
- ▶ **A NEWSPAPER ARTICLE**  
*Florida's Python Hunt*
- ▶ **AN ADVERTISEMENT**  
*Python Challenge*
- ▶ **A BLOG**  
*Burmese Python: The Ecosystem Challenge*

## You will write:

- ▶ **AN INFORMATIVE ESSAY**  
*How is the presence of Burmese pythons changing the Everglades?*

## Source Materials for Step 2

**AS YOU READ** You will be writing an informative essay on the topic of Burmese pythons in Florida’s Everglades. Carefully study the sources in Step 2. Annotate the texts by underlining and circling information and evidence that may be useful when you write your essay.

### Source 1: Informational Article

# Burmese Python: Not the Ideal Pet

by Matt Piven

The Burmese python is a magnificent and powerful animal. Native to the grassy marshes of Southeast Asia, it is among the largest snakes in the world, capable of growing to an astounding length of 23 feet and a weight of up to 200 pounds. Think of a telephone pole, and then imagine a snake as big around the middle as that pole. That’s the Burmese python.

Burmese pythons are carnivores and survive primarily on small birds and mammals. Although they have no venom, they have other, quite effective means of killing their prey. Chemical receptors in their tongues and heat sensors along the jaws compensate for their poor eyesight and allow them to hunt in the dark. To kill their prey, they first grasp it with their back-curving teeth. When the animal tries to pull away, it only sinks further into the python’s grip. Then, the python coils its long and powerful body around the animal, squeezes until the animal dies, and swallows the animal whole. The python’s unique hinged jaws allow it to swallow an object five times as wide as its own head.

Many people have chosen these unusual reptiles as pets, most likely because of the snakes’ beautifully patterned skin, their rapid growth rate, and their generally docile disposition. Unfortunately, many of these owners, upon discovering that they had more snake than they could handle, have resorted to the worst possible solution and released the snakes back into the wild.



## Source 2: Newspaper Article

January 5, 2013

# FLORIDA'S PYTHON HUNT

by Andrew Ng

**A** growing population of Burmese pythons—many pets turned loose by their owners when they became too big—is threatening the ecosystem of Florida's

Everglades. With no natural predators, these eating machines appear to be wiping out huge numbers of opossums, raccoons, and bobcats, as well as many bird species.


Tens of thousands of Burmese pythons are estimated to be living in the Everglades, where they thrive in the warm, humid climate. In a dramatic demonstration intended to underscore the threat posed by these snakes, Florida Senator Bill Nelson actually took the skin from a 16-foot Burmese python to a Senate committee hearing on the subject.

To address the problem, the state's Fish and Wildlife Commission is sponsoring



its first-ever Python Challenge. Open to the public from Jan. 12 until Feb. 10, the challenge is to hunt and kill Burmese pythons, with a grand prize of \$1,500 awarded to the

hunter who kills the most pythons, and another \$1,000 to the hunter who bags the longest one. Prizes will be awarded in two divisions: one for novices and the other for those who already have python hunting permits.

This means that for 30 days, hundreds of people armed with shotguns, rifles, machetes, handguns, and hooked spears—many who have never even seen a Burmese python—will roam the Florida Everglades in search of the coveted snakes. Our advice: If you happen to be in the area, be sure to wear a bulletproof vest. 

### Discuss and Decide

Which seems the greater risk to Florida: the problem of too many Burmese pythons, or the solution in which untrained hunters are competing for cash prizes to hunt them? Cite text evidence to support your answer.

## Source 3: Advertisement

# Python Challenge

- Tired of the cold weather blues?
- Aching for warmth and adventure both at the same time?
- Eager to earn some cash?

Get all of this and more by joining the 2013 Python Challenge.

Sign up for the competition to harvest the most Burmese pythons or the longest one and win up to \$1,500! Once you sign up and pay a \$25 registration fee, you will learn from experts how to identify, handle, and harvest these giant snakes. You'll also gain valuable information on the effect of this invasive species on the Florida everglades and its native wildlife.

**Join the fun at [PythonChallenge.org](http://PythonChallenge.org)**



The Florida Fish and Wildlife Conservation Commission, host of the Challenge, welcomes people from all parts of the country to participate.

## Source 4: Blog



# Burmese Python

## The Ecosystem Challenge

by EcoEchoes

Enter your email address:

[Subscribe by Email](#)

**SEARCH**

- [www.blogspot.com](#)
- [EcoEchoes](#)
- [About / FAQ](#)
- [Surprise me!](#)

I'm not in love with the idea of the Python Challenge. Yes, the alarming growth of Burmese pythons in the Everglades is a big problem. And, yes, if we want to preserve the ecosystem of the Everglades, we have to address it. But is challenging people from all over the country to come down and kill some pythons really going to solve the problem?

I don't think so. It's not by accident that the Burmese python, a native of Southeast Asia, ended up in the Everglades. Their appearance in Florida is totally a man-made event, largely the result of the lucrative exotic pet market.

Some of the "proud" owners of Burmese pythons are—well, there's just no polite way to put this—just downright stupid. Can you imagine buying a wild animal without researching anything about it? And, when their pythons got too big, the owners got rid of them in the most irresponsible fashion: They just let them go into the Everglades or some other wild area. Hurricane Andrew didn't help matters. An exotic pet dealer's warehouse that housed nearly 900 Burmese pythons was destroyed, and many of its pythons escaped.

It's not enough to say, "Let's go out and shoot some pythons." These animals are in Florida because we brought them here. We must do a better job of educating people about the effect their careless actions have on ecosystems here in Florida and around the world.

### Discuss and Decide

Explain the solution EcoEchoes advocates. Cite text evidence in your response.

## Respond to Questions on Step 2 Sources

The following questions will help you think about the sources you've read. Use your notes and refer to the sources as you answer the questions. Your answers to will help you write your essay.

- 1 Why is Florida's Python Hunt important to the Everglades?
  - a. The tourists will help the economy.
  - b. Florida has outlawed alligator challenges.
  - c. Burmese pythons are destroying local animal populations.
  - d. Burmese pythons are injuring people in the area.
  
- 2 Which words best support your answer to Question 1?
  - a. "... it is among the largest snakes in the world, capable of growing to an astounding length of 23 feet and a weight of up to 200 pounds." (Source 1)
  - b. "With no natural predators, these eating machines appear to be wiping out huge numbers of opossums, raccoons, and bobcats as well as many bird species." (Source 2)
  - c. "... gain valuable information on the effect of this invasive species on the Florida Everglades and its native wildlife." (Source 3)
  - d. "Their appearance in Florida is totally a man-made event, largely the result of the lucrative exotic pet market." (Source 4)
  
- 3 Which of these is a reason why the python should be hunted?
  - a. Pythons are negatively affecting the local ecosystem.
  - b. Thousands of pythons are living in the Everglades.
  - c. Large rewards are being offered to capture and kill pythons.
  - d. People who brought them here as pets created the problem.



- 4 What is a disadvantage to Florida’s Python Hunt?
  - a. It will eliminate all of the Burmese pythons in the area.
  - b. People might get hurt.
  - c. It’s too late to fix the damage caused by the pythons.
  - d. Too many tourists will hurt the local community.
  
- 5 Which words best support your answer to Question 4?
  - a. “The python’s unique hinged jaws allow it to swallow an object five times as wide as its own head.” (Source 1)
  - b. “. . . many who have never even seen a Burmese python . . .” (Source 2)
  - c. “Dying to get some cash into your pitifully small bank account?” (Source 3)
  - d. “These animals are in the Florida because we brought them here.” (Source 4)

6 **Prose Constructed-Response** What is one claim you can make about humans’ involvement in the python problem? Cite text evidence from at least two of the sources.

---

---

---

---

7 **Prose Constructed-Response** How does the Python Challenge affect people outside of Florida? Cite text evidence in your response.

---

---

---

---

## ASSIGNMENT

Write an informative essay that explains how the presence of Burmese pythons is changing the Everglades.

# Planning and Prewriting

Review your notes and sources before you start writing. Then decide what key idea you want to express and collect text evidence to support it.



You may prefer to do your planning on a computer.

## Introduce Your Topic

State your topic clearly: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Develop Your Topic with Relevant Facts and Evidence

Main idea and details about Burmese pythons: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Main idea and details about the changes in local animals: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Main idea and details about the changes in people: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Main idea and details about the changes in ecosystems: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Find Evidence

For each type of detail, cite text evidence that supports your topic.

Detail	Evidence

## Finalize Your Plan

Use your responses and notes from previous pages to create a detailed plan for your essay and fill in the chart below.

- ▶ “Hook” your audience with an interesting detail, question, or quotation.
- ▶ Clearly introduce your topic.
- ▶ State each main idea.
- ▶ Include relevant facts, concrete details, and other evidence that support your main ideas.

- ▶ End your essay by tying your ideas together in a concluding statement. You may want to include your own thoughts or opinions about your topic.

<b>Introduction</b>
<b>Main idea and details about Burmese pythons</b>
<b>Main idea and details about changes in local animals</b>
<b>Main idea and details about changes in people</b>
<b>Main idea and details about changes in ecosystem</b>
<b>Conclusion</b>

# Draft Your Essay

As you write, think about:

- ▶ **Audience:** Your teacher
- ▶ **Purpose:** Demonstrate your understanding of the specific requirements of an informational essay
- ▶ **Style:** Use a formal and objective tone.
- ▶ **Transitions:** Use words and phrases such as *for example* or *because* to create cohesion, or flow.

# Revise

## Revision Checklist: Self Evaluation

Use the checklist below to guide your analysis.



If you drafted your essay on the computer, you may wish to print it out so that you can more easily evaluate it.

Ask Yourself	Tips	Revision Strategies
1. Does the introduction present your topic clearly and grab the audience's attention?	Underline sentences in the introduction that engage the readers.	Add an interesting question, fact, or observation to get the reader's attention.
2. Are your details relevant, do you present evidence for them, and do they support your main idea?	Circle evidence.	Add textual evidence and descriptive details, if necessary.
3. Are appropriate and varied transitions used to clarify ideas?	Place a checkmark next to each transitional word or phrase.	Add transitional words or phrases where needed to clarify the relationships between ideas.
4. Does the concluding section follow and sum up the details, showing how they support the main ideas? Does it give the audience something to think about?	Double underline the summary of key points in the concluding section. Underline the insight offered to readers.	Add an overarching view of key points or a final observation about the significance of the main idea.

## Revision Checklist: Peer Review

Exchange your essay with a classmate's, or read it aloud to your partner. As you read and comment on your classmate's essay, focus on how clearly the main idea is supported by details. Help each other identify parts of the drafts that need strengthening, reworking, or even a complete new approach.

What To Look For	Notes for My Partner
1. Does the introduction present your topic and grab the audience's attention?	
2. Are your details relevant, do you present evidence for them, and do they support your main ideas?	
3. Are appropriate and varied transitions used to clarify ideas?	
4. Does the concluding section follow and sum up the details, showing how they support the main ideas? Does it give the audience something to think about?	

## Edit



Edit your essay to correct spelling, grammar, and punctuation errors.

## PERFORM THE TASK

# *Why does scientific knowledge change over time?*



## You will read:

- ▶ **A MAGAZINE ARTICLE**  
*The Half-Life of Facts*
- ▶ **A NEWSPAPER ARTICLE**  
*The Food Pyramid and Why It Changed*
- ▶ **AN INFORMATIONAL TEXT**  
*The Explosion in What We Know About Life Forms*

## You will write:

- ▶ **AN INFORMATIVE ESSAY**  
*Why does scientific knowledge change over time?*

## Part 1: Read Sources

### Source 1: Magazine Article



# The Half-Life of Facts

by Samuel Arbesman

**AS YOU READ** Identify key ideas and textual evidence to use in your essay. For example, "change" is likely to be a topic in all three selections.

#### NOTES

*An interviewer asked mathematician and author Samuel Arbesman why he wrote the book *The Half-Life of Facts*, in which he explains why facts are always changing. Here is Arbesman's response.*



I want to show people how knowledge changes. You have to be on guard, so you are not shocked when your children come home to tell you that dinosaurs have feathers. You have to look things up more often and recognize that most of the stuff you learned when you were younger is not at the cutting edge. We are coming a lot closer to a true understanding of the world; we know a lot more about the universe than we did even just a few decades ago. It is not the case that just because knowledge is constantly being overturned we do not know anything. But too often, we fail to acknowledge change.

Some fields are starting to recognize this. Medicine, for example, has got really good at encouraging its practitioners to stay current. A lot of medical students are taught that everything they learn is going to be obsolete soon after they graduate. There is even a website called "up to date" that constantly updates medical textbooks. In that sense we could all stand to learn from medicine; we constantly have to make an effort to explore the world anew—even if that means



just looking at Wikipedia more often. And I am not just  
20 talking about dinosaurs and outer space. You see this same  
phenomenon with knowledge about nutrition or childcare—the  
stuff that has to do with how we live our lives.



Scientists now believe that young *Tyrannosaurus rex* dinosaurs first evolved with a thin coat of feathers to stay warm.



This *Dilong paradoxus* dinosaur is a small-sized, evolutionary predecessor of *Tyrannosaurus rex*. Even though he never had wings or flew, his fossils prove that the Tyrannosaurs evolved with primitive feathers.

## NOTES

### Discuss and Decide

1. How could the solution for medical textbooks be applied to other sources of knowledge?
2. What specific changes does Arbesman propose? Cite examples from the text.

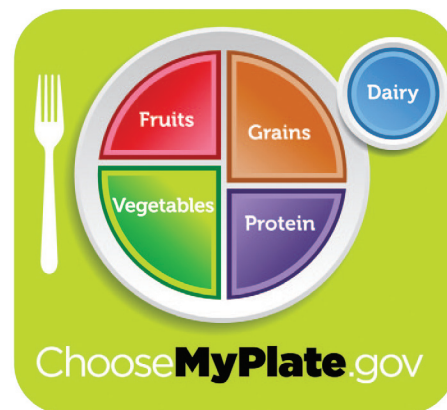
# The Food Pyramid and Why It Changed

by William Neuman, *The New York Times*, May 27, 2011

## NOTES

**T**he Obama administration is about to ditch the food pyramid, that symbol of healthy eating for the last two decades. In its place officials are dishing up a simple, plate-shaped symbol, sliced into wedges for the basic food groups and half-filled with fruits and vegetables.

The circular plate, which will be unveiled Thursday, is meant to give consumers a fast, easily grasped reminder of the basics of a healthy diet. It consists of four colored sections, for fruits, vegetables, grains, and protein, according to several people who have been briefed on the change. Beside the plate is a smaller circle for dairy, suggesting a glass of low-fat milk or perhaps a yogurt cup.



The new nutritional graphic to replace the food pyramid

Few nutritionists will mourn the passing of the pyramid, which, while instantly recognized by millions of American school kids, parents and consumers, was derided by nutritionists as too confusing and deeply flawed because it did not distinguish clearly between healthy foods like whole grains

and fish and less healthy choices like white bread and bacon. A version of the pyramid currently appearing on cereal boxes, frozen dinners and other foods has been so streamlined and

30 stripped of information that many people have no idea what it represents.

“It’s going to be hard not to do better than the current pyramid, which basically conveys no useful information,” said Walter C. Willett, chairman of the nutrition department at the Harvard School of Public Health.

## NOTES

### Close Read

What was wrong with the food pyramid? Cite evidence from the text in your response.

---

---

---

---

---

---

---

---

---

---

## Source 3: Informational Essay

# The Explosion in What We Know About Life Forms

by Alan Cochev

### NOTES

For hundreds of years, people have wondered if we have encountered most of the living things on Earth or not. During the last three centuries, scientists have attempted to answer this question by classifying organisms to measure the number of species that are known. But recently, changes in the system of classification—called *taxonomy*—are making scientists believe that there are far more species on Earth than we ever suspected, most of them undiscovered.

- Systems of taxonomy go back at least two thousand years.
- 10 The ancient Greek philosopher Aristotle classified all living things as either plants or animals and further described animals as being of three types: those that live on land, those that live in water, and those that live in the air. Plants and animals were called by their common names. One of the confusions that arose from this way of naming organisms is that scientists could not be sure whether two similar creatures that lived in different places were actually the same organism called by two different names. For example, the third largest rodent in North America, sometimes called a woodchuck, is
- 20 called by many other names—groundhog, marmot, grass rat, earth pig, and even whistle pig.

In the 18th century, the Swedish botanist Carl Linnaeus created a new, complex system of taxonomy based largely on the similar structures that organisms have. This system grouped organisms into large kingdoms (e.g., plants and animals) and smaller and smaller groupings called phyla,

classes, orders, families, genera, and species. The genus and species of each type of organism were used to name the organism, which at last gave each organism a unique name—in the case of the woodchuck, *Marmota monax*.

Since the Linnaean taxonomy was first conceived, there have been some changes in the system as scientists learned more about organisms. For example, various life forms have been moved into three new kingdoms: Fungi (including mushrooms), Monera (bacteria), and Protists (protozoans and most algae). Also, scientists have added ranks below species: *subspecies* for animals and *varieties* for plants. But for the most part, the system devised by Linnaeus is still in use.

However, the information used by scientists to classify organisms changed greatly in the 20th century. Molecular biology has given scientists additional information as to how organisms are related. Organisms that have similarities in their DNA and RNA are understood by scientists to be more closely related than organisms that lack similarities. Also, scientists now believe that when a characteristic (such as feathers) shows up in only one group of organisms, those organisms must be related.

The 20th century also provided an explosion in the number of new species that were discovered. Many of these species live in places that were previously unexplored, such as the floors of the world's oceans or the eyelids of humans. Many other species have been found in places where life was unexpected, such as in hot springs or the stomachs of humans. New information from all these discoveries has caused scientists to reevaluate modern taxonomy. Two groups of organisms—bacteria and archaeans—are now considered to be so different from other organisms that a new level of organization, called *domains*, has been created above kingdoms. The three domains are Archaea (including organisms that live near ocean vents and in hot springs), Bacteria, and Eucaryota (all other organisms).

### Discuss and Decide

Why has the taxonomy system of Linnaeus remained popular despite new discoveries about species?

## NOTES

One of the important outcomes of scientists' greater understanding of the diversity of life is the impact it may have on estimates for the number of species of living things. For example, scientists now understand that among smaller species, there tends to be greater diversity in the number of species. For example, the number of species of mammals on Earth is about 5,500, while the number of insect species is known to be at least one million. Some scientists believe that a spoonful of soil may contain as many as ten thousand different species of bacteria.

- 70 In addition, the discovery of thousands of new species every year provides scientists with better information to predict the number of species in a group based on the diversity in a higher level of taxonomy (genus, family, order, etc.). The method is like estimating the size of the base of a pyramid by measuring how much it widens at the top. One recent study reported by scientist Camilo Mora used this technique to estimate the number of species of living things—discovered and undiscovered—at 7.8 million. This number excludes bacteria and archaeans, about which too little is known to
- 80 make meaningful estimates. Since scientists have currently catalogued about 1.2 million species, this would mean that about 85% of species on Earth are still undiscovered! This estimate may need to be revised as more information becomes available, but so far the predictions made by this study have proven reliable.

With new and improving technologies shining additional light on the nature of life, we find that the more we learn, the more we continue to be surprised.

### Close Read

1. To which domain would we assign extremophiles that can survive in steam, in acid, and in high radiation?

---

2. To which kingdom would we assign bread mold and mushrooms?

---

## Respond to Questions on Step 3 Sources

The following questions will help you think about the sources you've read. Use your notes and refer to the sources as you answer the questions. Your answers will help you write your essay.

- 1 What could Carl Linnaeus *not* have used as a method of classification in his taxonomy system?
  - a. DNA
  - b. the habitats of organisms
  - c. structure of organisms
  - d. appearance of organisms
  
- 2 Which words best support your answer to Question 1?
  - a. "Molecular biology has given scientists additional information as to how organisms are related."
  - b. "In the 18th century, the Swedish botanist Carl Linnaeus created a new, complex system of taxonomy based largely on the similar structures that organisms have."
  - c. "The ancient Greek philosopher Aristotle classified all living things as either plants or animals and further described animals as being of three types . . ."
  - d. "Some scientists believe that a spoonful of soil may contain as many as ten thousand different species of bacteria."
  
- 3 Why might a parent be shocked to learn that a dinosaur has feathers?
  - a. because their child knows more than the parent
  - b. because the parent didn't think dinosaurs were covered at length in schools
  - c. because when the parent was in school, this knowledge wasn't available
  - d. because the child was never interested in dinosaurs before

**4 Prose Constructed-Response** Why is it helpful that the new nutritional graphic is shaped like a table setting? Cite textual evidence to support your answer.

---

---

---

---

---

---

---

**5 Prose Constructed-Response** How has Linnaeus's taxonomy system changed over the centuries? Explain. Cite evidence from the text in your response.

---

---

---

---

---

---

---



## Part 2: Write

### ASSIGNMENT

You have read several sources about advancements in scientific knowledge. Write an informative essay that discusses why scientific knowledge changes over time, and what impact these changes have on society. Include text evidence to support your ideas.

### Plan

Use the graphic organizer to help you outline the structure of your informative essay.

**Introduction**

**Main Idea and Text Evidence**

**Main Idea and Text Evidence**

**Main Idea and Text Evidence**

**Conclusion**

## Draft



Use your notes and completed graphic organizer to write a first draft of your essay.

## Revise and Edit



Look back over your essay and compare it to the Evaluation Criteria. Revise your essay and edit it to correct spelling, grammar, and punctuation errors.

## Evaluation Criteria

Your teacher will be looking for:

### 1. *Statement of purpose*

- ▶ Is it clear what the topic is?
- ▶ Did you support the topic with relevant main ideas and supporting details?

### 2. *Organization*

- ▶ Are the sections of your essay organized in a logical way?
- ▶ Is there a smooth flow from beginning to end?
- ▶ Is there a clear conclusion that supports the comparisons?
- ▶ Did you stay on topic?

### 3. *Elaboration of evidence*

- ▶ Is the evidence relevant to the topic?
- ▶ Is there enough evidence?

### 4. *Language and vocabulary*

- ▶ Did you use a formal tone?
- ▶ Did you use vocabulary familiar to your audience?

### 5. *Conventions*

- ▶ Did you follow the rules of grammar usage as well as punctuation, capitalization, and spelling?