

## **The Facts About Science Fiction**

Investigating How Much Science Fiction is Really Fiction

An Interdisciplinary Unit

By

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### INTRODUCTION AND RATIONALE

Today you can find science fiction almost everywhere. One place is in movies. Science fiction movies have been around almost as long as the major motion picture industry itself. For instance, the highly successful movie Star Wars was about the battle between good and evil set in space. In addition, television has seen its share of science fiction. There are numerous television shows based solely on science fiction. One example, the X-files, first had to do with "secret government files" of the supernatural, but today is mainly focused on "finding the truth". The 'truth' is whether or not extraterrestrial life forms are out there and if they visit planet Earth. Other popular science fiction television shows include Star Trek, and its two spin-offs: Star Trek: Deep Space Nine and Star Trek Next Generation. Star Wars, Star Trek, and X-files are so popular that they have developed a following of fanatics. I use the term fanatics rather than just fans because these people belong to very large fan clubs and they attend conventions, as well as just collecting any and all paraphernalia. Such collectibles include trading cards, action figures, and life-sized cut out figures of their favorite characters. Star Wars even has its own Lego set! There is no mistake that people LOVE science fiction. This is the main reason why I thought science fiction would be an excellent resource that could be used to introduce and teach numerous scientific topics. I cannot count how many times class has been delayed or sidetracked discussing the facts and fiction of the latest science fiction films. Through these discussions, I have found out just how susceptible secondary students are to science fiction films, no matter what the topic is. One such example is that they do not believe that when there is an explosion in space, you do not hear anything! Television also has an entire channel dedicated to science fiction with shows ranging from space travel to time travel to people with "supernatural" abilities! Literature is yet another example of where science fiction can be found. If I were to start naming all the book titles whose themes centered on science fiction phenomenon I would be here for days! With even just these few examples, it is clear that science fiction has captured our imaginations, regardless of the scientific merits of the stories. If "the truth is out there", it is this: there are some vulnerable people that can recognize science fiction; but, most do not know why certain themes cannot be possible or are presented in an impossible manner. The purpose of this unit is to educate students about what is acceptable science fiction, develop knowledge of scientific theories, and identify some of the basic scientific laws that are found in numerous science fiction stories.

This unit is designed to introduce students of all secondary levels to several basic scientific laws, theories, formulas, and observations through science fiction. Some people interested in science fiction cannot differentiate, or do not know when to differentiate, between the science and science fiction. These people automatically assume that since it is science fiction, there is no validity to the story. For example, a story about Venus described its atmosphere as harsh, being made of suspended sulfuric acid that remains a thick mist, and having an atmospheric pressure that is a mere 100 times greater than that of the earth (PRINCIPLES OF SCIENCE, 1979). With those conditions, the United States Special Forces sent a special unit there to condition themselves for chemical warfare. Well, the fact of the matter is, Venus DOES have clouds of concentrated sulfuric acid and the atmospheric pressure IS almost 100 times that of Earth. An educated reader/viewer would

be able to identify that anyone exposed to such atmospheric pressure (ignoring all other factors) would be crushed. Also, they would probably dissolve instantly (if not VERY rapidly) in an atmosphere of sulfuric acid. This purely hypothetical story line is being used to illustrate that good science fiction is based on science facts. In this unit I am going to go over several science fiction stories to analyze and research what is factual and what is fiction. The class will also construct and investigate "what if?" questions based on the stories. I chose several stories, each based on a different scientific topic, for two reasons. First, the stories will be used to introduce different units throughout the year (i.e. - Ecology, Astronomy, Biology). Second, these stories will illustrate to the students that science fiction can be based on any scientific topic, law, or fact. We will follow up each science fiction piece by writing our own short stories based on the scientific law, theory, or formula (i.e. - black holes, space travel, etc.) of each story. Along with writing a story, we will list the fiction and the facts in each of our individual stories. Research or an activity will reinforce the facts presented in each story. This will demonstrate how good science fiction stories are also intertwined with facts.

To successfully complete the objective of discovering scientific fact from science fiction, I am going to introduce three science fiction stories. These stories will cover biodiversity, evolution, wormholes/time travel, space travel and rates of erosion. The students will incorporate any of all of the following standards in three units. Each unit will last one half to three weeks, depending on how many topics will be covered with each story. One story will be administered each nine-week period to reinforce the current topic for that quarter. I have designed these three separate individual units or stories so each one can last as long as the individual teacher would like them to. Teachers can "pick and choose" what they feel is pertinent or what goes along with their curriculum. Also, they can easily add activities or topics that I did not include.

### **I. The Homesick Chicken**

I chose The Homesick Chicken to introduce ecology, and then branch into several different topics from there. This story will be read in class as a group. After the story, several topics will be discussed, with biodiversity being the most prominent. We will also talk about evolution, imprinting, Darwinism, and genetic mutations. We will ask questions such as, "Why have organisms evolved the way they have?" i.e.- why do camels have a large hump on its back? Why is a parakeet's beak different than a ducks bill? Why do catfish have barbels on either side of their mouths? One of the activities for this unit is creating an organism from other organisms. They will also create a biological profile on the created organism.

The story is about a man named Barnabus Rex whose specialty is the solution of scientific riddles. The problem is that one of the research chickens pecked its way through the security fence and crossed an eight-lane belt of highway to the other side. There at the research center, mutated turkeys were being bred for life in the domes of the colonies of the moon; some fowl were destined for Mars. The chickens had extra strong beaks to crack the extra-tough seed hulls used for feed, and those in turn, were developed to withstand the native fauna. The chicken's motive comes into question. Why would a chicken hatched and raised at the research center try to escape? It could not have been homesick or have had any type of honing device because the security fence would have detected that. B. Rex traced the chicken's tracks down through the fence and across the belt highway to the empty lot where the chicken was picked up at, just pecking at the ground as if it were back home. The empty lot across the street that the chicken ran to was barren of grass or weeds and seemed nothing more than a patch of dusty earth. Nothing there seemed to have anything of interest for a human, let alone a chicken. The only thing found in the lot was a few tire tracks from an automobile, indicating that the lot was sometimes used for parking. When B. Rex got back, he was notified that they had a competitor named Beaverbrook Farms that they just beat out of a contract with the government. Barnabus Rex talked to the security guard who noticed a stripped car in the parking lot the day the animal escaped. Once he talked the security guard, the mystery had been solved. Since the fence is capable of detecting electronic bugging devices, the chicken had come from Beaverbrook Farms with a microminiaturized tape recorder implanted in it. They had dropped the chicken over the fence late one night and removed another bird so that the count would be correct. The chicken they placed had a tape recorder so Beaverbrook Farms could play back the contents of the tape. An X-ray later showed that this hypothesis was correct: it was a case of industrial espionage. The last question to be answered was how the chicken knew when to escape? The answer is

imprinting. Beaverbrook Farms had trained the chicken since hatching to associate the pattern on the car with home and food. When the chicken saw the car, it just went home!

## **A. Biodiversity**

Biodiversity is just the first concept that will be introduced from this story. It refers to the vast differences in organisms that have evolved since the beginning of evolution.

### Activity 1

Students will be broken down into groups and required to think of at least 3 different organisms in each of the following categories: insects/spiders, fishes, amphibians, reptiles, birds, and mammals. Each group will then put their list on the chalkboard. The classroom will then discuss and compare the differences between all the organisms in the same group, as well as the other organisms listed. For example, "How are black widow spiders different and similar to tarantulas?" "How do fish differ from reptiles?" This will serve as a small-scale example biodiversity.

### Activity 2

We will then watch *Crawling Kingdom* (Discovery Channel), a 60-minute film on the numerous differences found in nature for organisms in the same family. During the film, students will list and describe each of the organism's niches in their environment.

These activities will incorporate the following standards:

### Communication

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

#4 All students write for a variety of purposes, include to narrate, inform and persuade, in all subject areas.

### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

## **B. Evolution/Darwinism**

Evolution, in biology, is the theory that living things and the populations of which they form a part change gradually over the course of their history and that all living things are to some extent related to one another. The name most commonly associated with theories of evolution is Charles Darwin, the father of almost all-modern evolutionary thinking. Students will be given the Charles Darwin discovery of the Finches that he made when he was traveling as a naturalist on the ship called the *Beagle*. The *Beagle* stopped on the Galapagos

Islands and Darwin observed a number of species of a bird called the finch. These birds were apparently related for they were highly similar in anatomy and coloration except that each bird was specialized for a particular life-style. Darwin observed the Cactus finch, which has not evolved much, while the Ground finch has an extremely heavy nut cracker-type beak adapted for eating heavy walled seeds.

### Activity 1

Students will learn to use Punnett Square's to show how dominant traits are passed from one generation to the next. For instance, students will investigate the likelihood of blue-eyed children if one parent has brown eyes and one parent has blue eyes.

### Activity 2

They will also be able to study the structures of organisms in order to discover their likenesses and compare their differences. They will observe, discuss, and compare the human arm and label similar parts of forelimbs of the following animals: cat, lizard, bat, bird, frog, and whale. This will show the similarities in the anatomy of most organisms, specifically vertebrates. Each organism has grown to occupy its own niche in the environment, and the differences in most organisms are too incredibly numerous to list. Structurally, however, they are all incredibly similar!

### Activity 3

We will also watch *The World of the Weird & Wacky* (Discovery Channel) in order to compare special adaptations of various organisms.

These activities will incorporate the following standards:

### Communication

#2 All students read and use a variety of methods to make sense of various kinds of complex materials.

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

### Mathematics

#1 All students use numbers, number systems, and equivalent forms (including numbers, words, objects and graphics) to represent theoretical and practical situations.

### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

#4 All students explain the relationships among science, technology and society.

## **C. Imprinting**

Imprinting is a learned mechanism operating very early in the life of an animal. Immediately imprinting a particular stimulus establishes an irreversible behavior pattern with reference to the same stimulus in the future.

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### Activity 1

There will be a class discussion on imprinting using an example of how quickly ducklings learn from the mother duck. Illustrating this will be the cartoon Tom and Jerry: the episode when the baby duckling hatches and immediately follows Jerry around. Students will then watch the film *Eternal Enemies* (National Geographic) that shows the inherent and learned behaviors of a lion pride and a family of hyenas. Discussions will occur throughout the film on the behavior of the pride and family.

This activity will incorporate the following standards:

### Communication

#2 All students read and use a variety of methods to make sense of various kinds of complex materials.

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

## **D. Genetic Engineering/ Hybridization**

Genetic engineering is the manipulation of DNA outside an organism so that new genetic strains of organisms with new characteristics can be constructed. This will allow scientists an unprecedented control of heredity.

### Activity 1

After the introduction/discussion, students will be separated into groups, and each group will be given a genetic disease or agricultural problem to solve. Acceptable answers for the problems will be very general. For example, one problem will be "How can a scientist help farmers create a tomato that will be more resistant to damage while being shipped?" Answers here could range from square tomatoes for better packing to tougher skins on the tomatoes so they don't become damaged. The students will justify their answers with a few sentences.

The next topic is hybridization, which is when you produce an offspring by crossing two individuals of unlike genetic makeups.

### Activity 2

The students will stay in their groups and will be giving similar problems as in the genetic engineering activity, but will have to solve problems using another organism. Once again, the acceptable answers can be very vague and general as long as they can justify how they came to that conclusion.

These activities will incorporate the following standards:

### Communication

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions and solve problems.

### **E. Final Activity**

Each student will have to create his or her own unique organism. They will have to:

- draw the organism,
- color it in order to show whether it will be camouflaged or brightly colored to warn other organisms,
- describe its eating habits (carnivore, omnivore, or herbivore) range
- what part of the world it occupies,
- niche- the role it plays in its environment,
- any imprinted information - students can create any appropriate answer,
- state whether it evolved from another organism, was genetically engineered, or is a hybrid.

Next the students will be required to write a short, fictional story using their organism and the information that they just fabricated.

These activities will incorporate the following standards:

### Communication

#2 All students read and use a variety of methods to make sense of various kinds of complex materials.

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

#4 All students write for a variety of purposes, include to narrate, inform and persuade, in all subject areas.

### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

#4 All students explain the relationships among science, technology and society.

#7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

## **II. Why I Left Harry's All-Night Hamburgers**

This story will be read in class to introduce several theories and vocabulary words, including parallel universes, black holes, white holes, wormholes, escape velocity, tachyons, and singularity. There are two reasons why I chose this story. First and foremost is its scientific content. The other reason is the point of the story. It is about a young man that really wants to leave his hometown because he believes that there is so much more out there. Personally, I have noticed a lot of people who feel they "need" to move, and there is nothing their hometown has to offer them (wherever their hometown may be). The point of the story is that most of what the young man is looking for isn't too far from home, and before he moves, he should look around and see if it's already there.

The story is about a young man who got a job at a small hamburger stand that was close enough to his house that he could walk to it. That particular hamburger stand somehow seemed to stay in business even after a several fast food businesses moved in closer to the interstate. The young man started working the midnight shifts when he was a junior in high school. Harry was the owner of the hamburger stand, which was appropriately named "Harry's All-Night Hamburgers". He told him over and over again that he was worried that the young man was going to cause trouble. "Don't bother the customers, just take their orders bring them their food, and don't bother them. You got that?" "Sure," the young man said, "I got it." Harry informed the young man that he would wait on some funny guys while working in there at night. Most of the people were good customers. If a customer complained, stiffed the young man on the check, then he is fired. He figured that they were just all truckers who didn't like fast food. Then, the first one of 'those' customers came in. The thing that shocked him the most about the customer was that he didn't hear anyone drive up; he just came walking in the door. Who would just be out walking to Harry's place in the West Virginia Mountains, miles from anywhere? He must be one of 'those' customers that Harry kept talking about. He noticed that Harry was looking at HIM, not at the customer at all, but at HIM, his own employee. When the young man looked up, he saw a short little guy wearing winter clothes, even a pair of goggles. The only weird thing about that was it was April, there had not been snow for weeks and it was fifty or sixty degrees out. The young man went over to take his order and the little man insisted that he paid before he ate. Not all the people that came in during the night were strange, and after a while he didn't even notice. It was just the first one that he would always remember.

Eventually Harry appreciated the young man's help, and the young man enjoyed working. No matter how many weird things the young man saw, he never was as cool about it as Harry. Harry wouldn't even blink when a flying saucer would be in the parking lot! The young man blinked, every time that they got them. They didn't get them often, but they got them. Most customers had more sense; if they came in something strange they would hide it in the woods. Harry eventually explained what was really going on. He reassured the young man that his customers were not Martians or monsters from outer space or anything like that. Some of them were from West Virginia, just not *their* West Virginia. Different West Virginias, from what the science fiction writers call "parallel worlds." That means that in a lot of those parallel worlds, people figured out how to travel from one to another. Apparently it is not that hard to do and there are lots of different ways to do it, which is why Harry's get everything from guys in street clothes to people in space suits and flying saucers. The problem is, once the explorers go out, they can't go back. With an infinite number of universes, they cannot find the one they left, and they have no way of controlling where they go. They either go on hopping from one world to the next, or try to find one that is similar to the one they left and settle down. The reason why they all end up at Harry's is that West Virginia is one of the best places to travel between worlds because it's a pretty central location for eastern North America.

One night, a couple months after the young man had graduated from high school, he overheard someone mention that they had room on their vessel. This was his chance to see everything, he thought, since he didn't really get far out of the immediate area. The man eagerly agreed to take him when a third fellow named Joe pulled the young man aside. Joe had been traveling different universes for years until he decided to settle down in this one. Joe described 1000-ft skyscrapers, vast ocean, and beautiful mountains, and that is just what the young man wanted to see. Joe informed the young man that is exactly what he would find right here on his current world, except that on this world, he could eventually go home. He encouraged the young man to explore his world before leaving, and if he did still want to leave, he could always go back to Harry's.

## **A. Parallel Universes**

Parallel universes have many different names, such as other dimensions, alternate realities, parallel worlds, etc. Everything that ever could possibly have happened in the entire history of the universe, right from the Big Bang up until now, *DID* happen – somewhere. So, every possible difference means a different universe. That means on every possible level of the world that we know of, even every single atom or particle or what ever, whenever it had a chance to do something--break up or stay, move one direction instead of another, whatever—it did *ALL* of them, but all in different universes. They didn't branch off either; all the universes were always there, and there just wasn't any difference between then until this particular event came along. And that means that there are millions and millions of identical universes, too, where the differences haven't happened yet. There's an infinite number of universes, more than that, an infinity of infinities.

### Activity 1

There will be an activity given so the students have an idea of the number of different possible outcomes for just one event. Students will be matched in pairs and giving several case scenarios to try to label as many parallel universes that could have occurred from each possible event that might have happened in that case scenario. One such example will be "Eric throws a pencil at Tonya. Label as many parallel universes that you can think of that would result from that one incident (remember, it did not say that the pencil hit Tonya)."

This activity will incorporate the following standards:

#### Communication

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

#4 All students write for a variety of purposes, include to narrate, inform and persuade, in all subject areas.

#### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

#7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

## **B. Black holes, White holes, and Wormholes.**

Loosely speaking, a black hole is a region of space that has so much mass concentrated in it that there is no way for a nearby object to escape its gravitational pull. Our best theory of gravity at the moment is Einstein's general theory of relativity. Suppose you are standing on the surface of a planet. You throw a rock straight up into the air. Assuming you didn't throw it too hard, it will rise for a while, but eventually the acceleration due to the planet's gravity will make it start to fall down again. If you threw the rock hard enough though, you could make it escape the planet's gravity entirely. It would keep on rising forever. The speed with which you need to throw the rock so that it just barely escapes the planet's gravity is called the "escape velocity."

Now imagine an object with such an enormous concentration of mass in such a small radius that its escape velocity was greater than the velocity of light. Then, since nothing can go faster than light, nothing can escape

the object's gravitational field. Even a beam of light would be pulled back by gravity and would be unable to escape. Now you have all seen diagrams of what black holes theoretically look like, the question now is, "Where do black holes go?" This is where white holes come in. Since black holes suck everything in and have an escape velocity greater than the speed of light, what is found on the other side of black holes is called a white hole. White holes spit everything out that gets sucked into black holes, theoretically speaking. In fact, they almost certainly do not exist, since there's no way to produce one. (Producing a white hole is just as impossible as destroying a black hole). So far, we have only considered ordinary black holes. Next, we need to consider black holes that rotate and/or have charge. This is where things get more complicated. In theory, the interior of a charged or rotating black hole can "join up" with a corresponding white hole in such a way that you can fall into the black hole and pop out of the white hole. This combination of black and white holes is called a wormhole. The white hole may be somewhere very far away from the black hole; it may even be in a "different universe". A conveniently located wormhole would therefore provide a convenient and rapid way to travel very large distances, or even to travel to another universe. Maybe the exit to the wormhole would lie in the past, so that you could travel back in time by going through. There are some things to consider about wormholes. First of all, wormholes almost certainly do not exist. As we said above in the section on white holes, just because something is valid mathematically, the equations do not mean that it actually exists in nature. In particular, black holes that form from the collapse of ordinary matter (which includes all of the black holes that we think exist) do not form wormholes. If you fall into one of those, you're not going to pop out anywhere. You're going to hit a singularity (a singularity is a place of infinite curvature of space-time in a black hole), and that's all there is to it. Furthermore, even if a wormhole were formed, it is thought that it would not be stable. Even the slightest disturbance (including the disturbance caused by your attempt to travel through it) would cause it to collapse. Finally, even if wormholes exist and are stable, they would be quite unpleasant to travel through. Radiation that pours into the wormhole (from nearby stars, the cosmic microwave background, etc.) gets blueshifted to very high frequencies. As you tried to pass through the wormhole, you would be fried by these X-rays and gamma rays.

### Activity 1

After introducing and discussing black holes, white holes, and wormholes, students will illustrate, label, and differentiate the three by using a variety of diagrams.

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### Activity 2

The students will then watch the "*Ultimate Abyss*" (Discovery Channel). The film will take them on a search of a black hole. The film also talks about the "event horizon" along with discussing the question, "What if we could survive inside?"

These activities will incorporate the following standards:

### Mathematics

#1 All students use numbers, number systems, and equivalent forms (including numbers, words, objects and graphics) to represent theoretical and practical situations.

### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

#4 All students explain the relationships among science, technology and society.

#7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

### **C. Final Activity**

For the final activity, the student will have to create a short story dealing with any or all of the following topics-

-Time travel with this they will need reminded that WHATEVER and WHO EVER they talk to, touch, see and interact with will have affect on future generation (including the date in which they left). For this, clips of Austin Powers and Back to the Future will be shown. The clips of the films will enforce the affects of present day life when the original chains of events are disrupted.

-Space travel –. If the students chose space travel, tachyons will be an acceptable form of propulsion if the student can justify its form (an example would be if in the story a character buys a block of frozen tachyons that thrusts the spacecraft forward as it melts).

The unit will in corporate the following standards:

#### Communication

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

#4 All students write for a variety of purposes, include to narrate, inform and persuade, in all subject areas.

#### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

#4 All students explain the relationships among science, technology and society.

#7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

### **III. Before Eden**

Before Eden is a story about space travel. The book was published in 1969 before much was known about the underneath surface of Venus's thick cloud cover. Unfortunately, if they were aware of the extreme pressure and atmospheric conditions, the story could never have scientifically taken place. It is however a good story

with an excellent ending. This story covers the origin of life, waste disposal and pollution, single celled and colonial heterotrophic eukaryotes, and extinction.

Before Eden starts out with the crew having trouble with their spacecraft with the weather being exceptionally clear, visibility nearly thousand yards. As the three crewmembers were trying to decide whether or not to turn back, Hutchins found something through his binoculars in the cliffs. What he discovered was a dried up waterfall, which meant that there are rivers on Venus. With the presence of water, that proposed the idea that, if there was water there might be life. And as shown on Earth, if life has the slightest chance of survival, it will find it, and this is the only chance it's ever had on Venus. They soon decided who was going to explore the steep cliffs where the waterfalls were discovered. The weight of the oxygen gear, refrigerated thermosuit, and scientific equipment came to more than a hundred pounds per man, which made it a little difficult to traverse the cliffs. They had lost all radio contact since reaching the top of the cliff. While walking up the dried riverbed, Hutchins continually checked temperature and oxygen levels. Hutchins then noticed that the oxygen level was way up, fifteen parts per million, when back at the car they could barely detect any. Jerry quickly protested that nothing could breath only fifteen parts per *million*. Hutchins then explained that nothing was breathing it; something was *making* it. Just like on earth, before there was oxygen, the atmosphere was a mess of carbon dioxide, ammonia and methane, until vegetation evolved and slowly produced oxygen. To Hutchins, this meant that there where some type of plants, and in a few million years there would be animals. On the way back to their ship, Hutchins stopped so suddenly that Jerry nearly collided into him. They stood there looking at a dark patch of rock over in a distance; it appeared to grow bigger since they got there. Soon they realized that it was moving. They were watching a dark tide, a crawling carpet, sweeping slowly towards them over top of the ridge. Their unreasoning panic lasted briefly after realizing that it was moving to slow to be a real threat, unless it cut off their line of retreat. After viewing it for a while, Jerry asked what it was, and Hutchins believed that it was probably a plant. Jerry argued that it couldn't be because it was moving. Hutchins replied that terrestrial plants moved, such as ivy, not to mention that plankton can actually swim. Then, when it was only ten feet away, the velvet tide checked itself. On the right and the left, it still flowed forward; but dead ahead it slowed to a half. The two explorers began to retreat, and after a brief hesitation, the creature resumed its slow advance and the dent in its front line straightened out. When Hutchins stepped forward again, the thing slowly withdrew. Half a dozen times the biologist advanced, only to retreat again, and each time the living tided ebbed and flowed in synchronism with his movements. "Thermophobia," said Hutchins. "Purely automatic reaction. It doesn't like our heat." The refrigeration units on their back were pumping a blast of heat into the surrounding air. There was no reaction-apart from the automatic avoidance of their exhaust heat, even when Hutchins snipped samples or took probes. The creature just kept flowing steadily onwards over the hills and valleys, guided by some strange vegetable instinct. When they got back, they realized that the world around them was no longer the same; Venus was no longer dead, it joined the ranks of Earth, a planet with life. In a few months they would be back with a team of assistants equipped and with the eyes of the world upon them. It flowed over the little cairn of stones that Hutchins and Jerry had buried their wastes. Then it stopped. The chemical urge that it had was to find phosphorous (the element it needed to survive) was relentless; it would nuzzle rocks, ooze into cracks and crannies, scratch and scabble with probing tendrils. Nothing that it did was past the capabilities of plants here on earth, it was just a thousand times faster, and requiring only minutes to pierce through the plastic film. Then it feasted, on food more concentrated than any it had ever known. It absorbed the carbohydrates and the proteins and phosphates, even the cellulose from the paper cups. All these it broke down and absorbed into its strange body, without difficulty and without harm. It also absorbed whole microcosms of living creatures-the bacteria and viruses, which, upon an older planet had evolved into a thousand deadly strains. As the creature crawled back to the lake, it carried impurities to its entire world. As the crew headed back home, Venus was dying. The photograph's and specimens that Hutchins was carrying were more precious then he knew. They were the only records that would ever exist of life's second attempt to gain a foothold in the Solar System. Beneath the clouds of Venus, the story of Creation had ended.

## **A. Origin of life**

According to evolutionary theory, life was generated from nonliving molecules, that is, by what is called abiogenesis. This apparent paradox is usually explained by the assertion that conditions on earth were far different billions of years ago, when life first began to evolve. Then once they came into being, living organisms changed the conditions of their environment, so abiogenesis is no longer probable on most parts of the earth.

### Activity 1

The students will construct a geologic time scale of the major events of the birth of life on Earth. Using sheets of white paper, tell students that each sheet of paper represents 100 million years. Have students record the major events that took place in Earth's history.

- 4.6 billion years ago - Earth was created.
- 4.5 billion years ago - Earth's moon formed.
- 3.8 billion years ago - Bacteria arose.
- 3.6 billion years ago - A cooling process began on Earth.
- 3.0 billion years ago - Clouds formed.
- 2.0 billion years ago - Eukaryotic cells evolved.
- 0.5 billion years ago - Oxygen began to saturate the atmosphere.

The time scale will be taped together and displayed on a wall in my room. The students will use references to find more milestones in the Earth's development that will be needed to answer the following questions: How long did it take for oxygen to form in the Earth's atmosphere? How much space does the average human life span cover on the time line? Discuss other surprising developments revealed by the time scale.

The students will be given the following background information. Protozoans are unicellular organisms that have a true nucleus. They live in fresh water and salt water. Some live independently while others live in colonies. Most protozoans are *heterotrophs* while others are *autotrophs*.

### Activity 2

Students will research the difference between autotrophs and heterotrophs, and then list and draw protozoans that fall in each category. Students will be required to give their rationale for placing a particular protozoan in a category.

### Activity 3

Finally, students will collect water samples to analyze under microscopes and using reference books to help them identify the protozoans. Students will draw and label, as well as compare and contrast what they observe.

These activities will incorporate the following standards:

### Communication

#2 All students read and use a variety of methods to make sense of various kinds of complex materials.

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

#4 All students write for a variety of purposes, include to narrate, inform and persuade, in all subject areas.

## Mathematics

#1 All students use numbers, number systems, and equivalent forms (including numbers, words, objects and graphics) to represent theoretical and practical situations.

## Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

#4 All students explain the relationships among science, technology and society.

#7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

## **B. Final Activity**

Students will be required to write a 5-page science fiction story incorporating the previous three stories followed by a 2-3 minute presentation. They will be required to include at least 4 of the topics that have been discussed:

- Biodiversity
- Evolution
- Imprinting
- Genetic mutations
- Parallel universes
- Black holes
- White holes
- Extinction
- Single cell organisms
- Pollution
- Origin of life
- Wormholes
- Tachyons

This activity will incorporate the following standards:

## Communication

#2 All students read and use a variety of methods to make sense of various kinds of complex materials.

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

#4 All students write for a variety of purposes, include to narrate, inform and persuade, in all subject areas.

## Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

#4 All students explain the relationships among science, technology and society.

#7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

## **BIBLIOGRAPHY**

Before Eden, Tomorrows Worlds, New York, NY, Hawthorn Books, 1969. This book is a science fiction collection of short stories about space travel to different planets. The story Tomorrows Worlds is about space travel to Venus and its environment.

Borderlands of Science, Riverdale, NY, Baen Publishing, 1999. This book contains scientific theories, famous scientists, science fiction themes, and how each could contribute to good science fiction writing.

<http://www.discovery.com/online.html> This website contains links to read current science articles and to purchase merchandise.

<http://www.nationalgeographic.com/media/ngm/index.html> This website contains links to read current National Geographic articles and to purchase merchandise.

The Homesick Chicken, Why I Left Harry's All-Night Hamburgers New York, NY,

Bantam Doubleday Dell Publishing Group 1990. This book is a collection of science fiction stories on numerous topics including biodiversity, time travel, and cloning.

The World Of Biology, Philadelphia, PA, CBS College Publishing, 1986. A science text book.

Why I Left Harry's All-Night Hamburgers, Why I Left Harry's All-Night Hamburgers, New York, NY, Batham Doubleday Dell Publishing Group 1990. This book is a collection of science fiction stories on numerous topics including biodiversity, time travel, and cloning.

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## **STANDARDS**

The Homesick Chicken, Why I Left Harry's All-Night Hamburgers New York, NY,  
Bantam Doubleday Dell Publishing Group 1990

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## Communication

#2 All students read and use a variety of methods to make sense of various kinds of complex materials

This is met in several ways, first by reading the story itself. Another way that this will be met is by researching how organisms are structurally similar, yet have developed special adaptations for their individual environments.

#4 All students write for a variety of purposes include to narrate, inform and persuade, in all subject areas

At the end of the unit, they will meet #4 by writing about their own individual organism as well as informing the reader of its color, diet, range, niche, origin, and behavior.

## Mathematics

#1 All students use numbers, number systems, and equivalent forms (including numbers, words, objects and graphics) to represent theoretical and practical situations.

This will be met by using Punnett Square's, graphing, and calculating the percentage of the results.

## Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

The scientific principles cover here are: biodiversity, evolution/biodiversity, imprinting, and genetic engineering/hybridization.

#4 All students explain the relationships among science, technology and society

- This will be met with discussing genetic engineering/hybridization and completing an activity on the impact the practices have on society.

#7 All students evaluate advantages, disadvantages, and ethical implications associated with the impact of science and technology on current and future life forms.

Evolutions, imprinting, and genetic engineering will all be used to meet #7; activities will be performed on each of these.

## STANDARDS

Why I Left Harry's All-Night Hamburgers, Why I Left Harry's All-Night Hamburgers,

New York, NY, Batham Doubleday Dell Publishing Group 1990

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### Communication

#2 All students read and use a variety of methods to make sense of various kinds of complex materials.

This will be met by reading and discussing the story.

#4 All students write for a variety of purposes include to narrate, inform and persuade, in all subject areas.

This will be met from several of the activities. One will be from the list of all the parallel universes that could occur from one small event. Another will be when they create their individual stories dealing with either time travel or space travel.

### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations.

This will be met by watching and discussing the "Ultimate Abyss."

#4 All students explain the relationships among science, technology and society.

This standard will also be met with watching and discussing the "Ultimate Abyss."

#7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

This will be met with two of the activities. The first will be the parallel universe activity and the second will be discussed from the question in the film "Ultimate Abyss" which is, "what if we could survive inside a black hole?"

## STANDARDS

Before Eden, Tomorrows Worlds, New York, NY, Hawthorn Books, 1969

### Communication

#2 All students read and use a variety of methods to make sense of various kinds of complex materials.

This will be met by reading the story, researching to find milestones in the earth's development along with having to research the difference between autotrophs and heterotrophs.

#3 All students respond orally and in writing to information and ideas gained by reading narrative texts and use the information and ideas to make decisions solve problems.

This will be met with classroom discussions on the story.

#4 All students write for a variety of purposes, include to narrate, inform and persuade, in all subject areas.

This will be met by writing about the significant landmark's in the earth's development, by comparing different protozoans, and writing their final story dealing with all three stories that they have read.

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### Science

#1 All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real-world situations

This will be met by discussing and explaining abiogenesis.

#7 All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.

This will be met by discussing the impact that man has on him environment (the positives and the negatives) while reading the story. It will also be discussed while students are writing their final story.