NEDDY'S STORIES

UNUSUAL PLANET EARTH

(AS TOLD BY NEDDY)

Just imagine that you are a space explorer from another galaxy. You have traveled to the Milky Way galaxy and find a smallish star. You explore the star's planets and find lights coming out from one of the smaller the planet's surface.

"That's strange," you say. "Where are these lights coming from?"

You go down closer to investigate the source of the light. It does not look like any other planet that you have ever seen. There are structures that look like they have been built, and there is light coming from the structures. Then you see things flying in the sky, and these have blinking lights. Some of them land on areas with lights all around the edges.

You circle the planet, heading for daylight created by the nearby sun, and you find this strange sight: funny little rectangular objects flow like blood cells through what look like arteries.

You've explored other planets of other stars. They are nothing like this. This is surely one of the most unusual things in the universe.

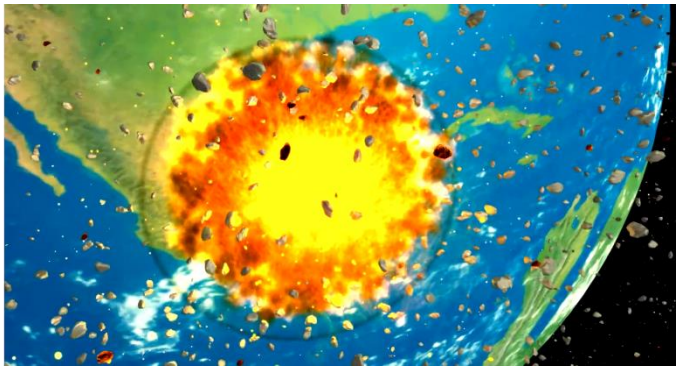
"This, of course, is our Planet Earth," I said. "It started out much like the desolate planet Mars,

but something peculiar happened 3.7 billion years ago. The green slime (cyanobacteria) that Grandpa told us about, or other similar single-celled organisms (living things with a single cell), appeared on Earth. These organisms were capable of using carbon dioxide in the atmosphere to grow and to release oxygen. They used sunlight in a process called Photosynthesis. At first they created elevated levels of oxygen in the ocean. Later in Planet Earth's history, they started to add oxygen to the atmosphere. This time (about 2 billion years ago) marks the start of the *Great Oxygenation Event* in which the atmospheric oxygen concentration steadily grew to reach today's level.

The single-celled organisms had another amazing capability. They could also make exact copies of themselves using a wonderful molecule called DNA. Othere entities called viruses could make copies of themselves unsing a similar molecule called RNA. Sometimes altered copies of the DNA or RNA appeared, called mutations. These altered copies would sometimes become unique organisms first in the oceans and, after the *Great Oxygenation Event*, land based organisms.

Over billions of years, in a process called Evolution, the single-celled organisms became cell colonies, and then multicelled organisms with ever-improving capabilities. Evolution depended on those alterations of the DNA.

Eventually, after the *Great Oxygenation Event* and after the huge volcanic eruptions that took place 200 million years ago, a variety of large and small egg-laying dinosaurs evolved to rule the Earth. Small mammals were there too. They made their homes underground to stay safely away from the fierce dinosaurs."



Scenes from the science video, "The Stardust Mystery Online Introduction."
STARDUST MYSTERY YouTube Channel

But then, something awesome happened 65 million years ago to change the fate of the mammals. A huge asteroid hit Planet Earth. It caused the atmosphere to heat up to pizza-oven temperatures. All the land dinosaurs died, but some mammals, including the small mammals from which humans eventually evolved, survived in the cooler temperature of their underground homes. Yay, mammals!

Mammals became bigger and took over the rule of Planet Earth. Millions of years later, humans appeared. During a very brief 200,000 years, humans figured out how to build structures

filled with lights, like those first seen by our space explorers. They also created those vehicles that flowed like blood cells through arteries, actually cars on roads built to help humanity travel and cover the globe.

Humans have complex thoughts and emotions. They developed art and science and have organized cities, societies, and governments. They built telescopes and satelites that can see events that happened over 13 billion years ago, and they can predict events well into the future. Some of them even visited the moon. Humans sifted through the history laid down in Earth's rocks to find the evidence of the asteroid impact that killed the dinosaurs. They discovered the story of the *Big Bang*, which started the universe 13.8 billion years ago. They developed the science of medicine and unraveled the mysteries of DNA.

They are the first species that we know of that can actually change their own evolution and the evolution of the species around them by modifying their DNA. Humans have the power to repair damage and help create a sustainable future, not just for themselves but for many other species on their planet.

Such a history seems so improbable that Planet Earth must be very unusual. After listening to the radio waves from outer space and looking over research amassed by some of the greatest space programs in the world, it would appear that no planet nearby contains intelligent life.

VC, the rest of the *Cosmic Explorers*, and I nominate Planet Earth, with its humans, as the number-one most unusual thing in the universe.

GRANDPA'S GLOSSARY

Virtual World: Virtual worlds, also known as virtual environments, use computer technology to create a simulated world that a user can explore and interact with, while creating a feeling as if he or she were in that world. The representation of the user in that world is called an avatar. The user can even wear goggles to make it appear that he or she is surrounded by the 3-D virtual world. That is called virtual reality.

Cyanobacteria: Cyanobacteria are small, single-celled bacteria organisms that live in water, manufacture their own food, and grow by photosynthesis. They often grow in colonies large enough to see. Cyanobacteria are the oldest known fossils, 3.5 billion years old, but are still around today. They were essential in shaping the course of evolution on Earth, being responsible for the planet's oxygen gas concentration required by oxygen-breathing life forms. Before the cyanobacteria generated oxygen in the oceans and atmosphere by photosynthesis, the planet was unsuitable for life as we know it today.

Cells: The cell is the basic building block for all living things. The cell was discovered by Robert Hooke in 1665 from studies of living material in which, using a microscope, he observed very small repeating structures. He called the structures cells because they resembled cells of a honeycomb. The first living things on Earth were single-celled organisms. Each cell was able to perform all the functions necessary for life. They could feed themselves and reproduce. Multicell creatures like humans have highly specialized cells that perform specific functions, such as nerve cells, which are long and can transmit signals; muscle cells which contract to move arms and legs; and killer T-cells, which can attack foreign objects to protect the body. Most cells are between 1 micron (1/1,000,000 of a meter) and 100 microns in size. The human body contains about 100 trillion cells, whose size is like the thickness of a hair. An interesting website with interactive diagrams of cells is at http://www.cellsalive.com/cells/cell_model.htm.

Photosynthesis: The most common photosynthesis is the process by which green plants, algae, and cyanobacteria use sunlight to synthesize foods (carbohydrates) from atmospheric carbon dioxide. Photosynthesis in plants generally involves the green pigment chlorophyll and releases oxygen gas as a byproduct. Photosynthesis changes sunlight into chemical energy in the form of carbohydrates.

Great Oxygen Event: Today's bird, insect, and land animal life on Earth is supported by an atmospheric oxygen concentration of 21%, but the early Earth had no atmospheric oxygen at all. Today's atmospheric oxygen concentration is the product of cyanobacteria. These single-celled organisms use carbon dioxide and water to produce carbohydrates and oxygen gas by photosynthesis using sunlight. Early cyanobacteria were largely in the oceans, releasing oxygen that promoted the development of sea life. It was not until two billion years ago that the cyanobacteria started to release oxygen to the atmosphere. This time marks the start of the

Great Oxygenation Event in which the oxygen concentration steadily grew to reach today's level. This event has supported the evolution of life as we know it today.

DNA (Deoxyribonucleic Acid): Let's say you wanted to build a robot. You look online and find a set of instructions. It would have to contain lots of things: a list of parts; specifications and drawings for each part (for size, shape, color, function, etc.); and instructions for how the parts are connected. If your friend is going to build one too, you need to copy the instructions. If you are building a complicated robot, the list could be very long, requiring a whole book full of instructions. The instructions for building you and all living things are contained in the DNA, which is reproduced in every cell. The double-helix structure of DNA was identified by James Watson, Francis Crick, Maurice Wilkins, and Rosalind Franklin in separate papers in the journal *Nature* in 1953. Watson, Crick, and Wilson (but not Franklin, who died in 1958) received the 1962 Nobel Prize in Physiology or Medicine. You can see a picture of the double helix in Epilogue 2. It is two long chains of molecules that are twisted around each other, like a long rope. The molecules are built of mainly five atoms: carbon, hydrogen, oxygen, nitrogen (CHON), and phosphorus. The building instructions are determined by the order or sequence in which the atoms of the elements are arranged, just as the twenty-six letters of the English alphabet can be rearranged to spell out thousands of different words. Each cell in your body contains a complete twisted pair of chains in the form of DNA. When you started life as a single cell, one of your DNA chains came from your mother and the other from your father. As your cells multiplied, the DNA was copied so that each cell had an identical copy of your first DNA molecule. The instructions on whether you are a girl or boy, the color of your eyes and hair, how tall you will be, and every other physical thing about you are coded in your DNA.

Evolution: Charles Darwin's theory of evolution was first presented in his book *On the Origin of Species* in 1859. Darwin described the process by which organisms change over time as a result of changes in inherited or behavioral traits. Changes that allow an organism to better adapt to its environment will help it acquire its needed resources to survive and have more offspring. This is the principal of *survival of the fittest*. What species is fittest may be dictated by changes in the environment, as is seen in numerous species extinction events where some species are better suited to the new environment. We now know that changes in an organism's DNA (mutations) can lead to alterations passed down to subsequent generations. This can sometimes lead to a new species, which will be successful if it is fit for its environment.

RNA: RNA or Ribonucleic acid is a very large molecule that is similar to a single strand of DNA. They are both nucleic acids. RNA has the genetic codes for creating substances needed by living things. All known forms of life and viruses have RNA.

THE STARDUST MYSTERY PROJECT

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