

Biology 1

Defining Life (A Story: Is Sammy Alive?)

This is a modification of "Substituted Sammy: An exercise in defining life". It raises some interesting questions about defining life.

Sammy was a normal, healthy boy. There was nothing in his life to indicate that he was anything different from anyone else. When he completed high school, he obtained a job in a factory, operating a machine press. On this job he had an accident and lost his hand. It was replaced with an artificial hand that looked and operated almost like a real one.

Is Sammy Alive?

Soon afterward, Sammy developed a severe intestinal difficulty, and a large portion of his lower intestine had to be removed. It was replaced with an elastic silicon tube.

Is Sammy Alive?

Everything looked good for Sammy until he was involved in a serious car accident. Both of his legs and his good arm were crushed and had to be amputated. He also lost an ear. Artificial legs enabled Sammy to walk again, and an artificial arm replaced the real arm. Plastic surgery enabled doctors to rebuild the ear and with a cochlear implant, his hearing was restored. Is Sammy Alive?

Over the next several years, Sammy was plagued with internal disorders. First, he had to have an operation to remove his weakening aorta and replace it with a synthetic vessel. Next, he developed a kidney malfunction, and the only way he could survive was to use a kidney dialysis machine (no donor was found for a kidney transplant). Later, part of his digestive system (his stomach and small intestines) became cancerous and was removed. He received nourishment intravenously. Finally, his heart failed. Luckily for Sammy, a donor heart was available, and he had a heart transplant.

Is Sammy Alive?

It was now obvious that Sammy had become a medical phenomenon. He had artificial limbs, nourishment was supplied to him through his veins; therefore he had no solid wastes. All waste material was removed by the kidney dialysis machine. The heart that pumped his blood to carry oxygen and food to his cells was a human but the DNA in the heart cells differed from the DNA in the rest of Sammy's cells. Eventually, Sammy's transplanted heart began to fail. He was immediately placed on a heart-lung machine. This supplied oxygen and removed carbon dioxide from his blood, and it circulated blood through his body.

Is Sammy Alive?

The doctors consulted bioengineers about Sammy. Because almost all of his life-sustaining functions were being carried on by machine, it might be possible to compress all of these machines into one mobile unit, which would be controlled by electrical impulses from Sammy's brain. This unit would be equipped with mechanical arms to enable him to perform manipulative tasks. A mechanism to create a flow of air over his vocal cords might enable him to speak. To do all this, they would have to amputate at the neck and attach his head to the machine, which would then supply all nutrients to his brain. An artificial blood would have to be developed since Sammy would no longer have any blood cell producing bone marrow. Sammy consented, and the operation was successfully performed.

Is Sammy Alive?

Sammy functioned well for a few years. However, a slow deterioration of his brain cells was observed and was diagnosed as terminal. The medical team that had developed around Sammy began to develop small computer processors that could be inserted into the weakening areas of his brain and could control the functions of Sammy's mechanical body. As time wore on more and more computer processors were installed until Sammy's brain cells completely deteriorated and all regulatory functions were controlled by the computers. With advancements in technology, the team was then able to replace Sammy's head with a case for his "brain." It was a machine that was humanlike in appearance, movement, and mannerisms. Sammy was once again able to leave the hospital with complete assurance that he would not return with biological illness.

Is Sammy Alive?

The End





Biology 1 *Defining Life*

Name:

Date:

Hour:

1. Read the story on the back side of this page. Using the characteristics that you have outlined above, consider the answer the question "Is Sammy alive?" each time it is posed. After you have read the entire story, discuss the point at which you decided (if any) that Sammy is no longer a LIVING ORGANISM. Do this in the space below. Be sure to explain why you believe this.

2. What is LIFE? Can you define what it means to be ALIVE? What characteristics do you think that all LIVING ORGANISMS exhibit? Define/explain those characteristics of LIVING ORGANISMS in the space below:

