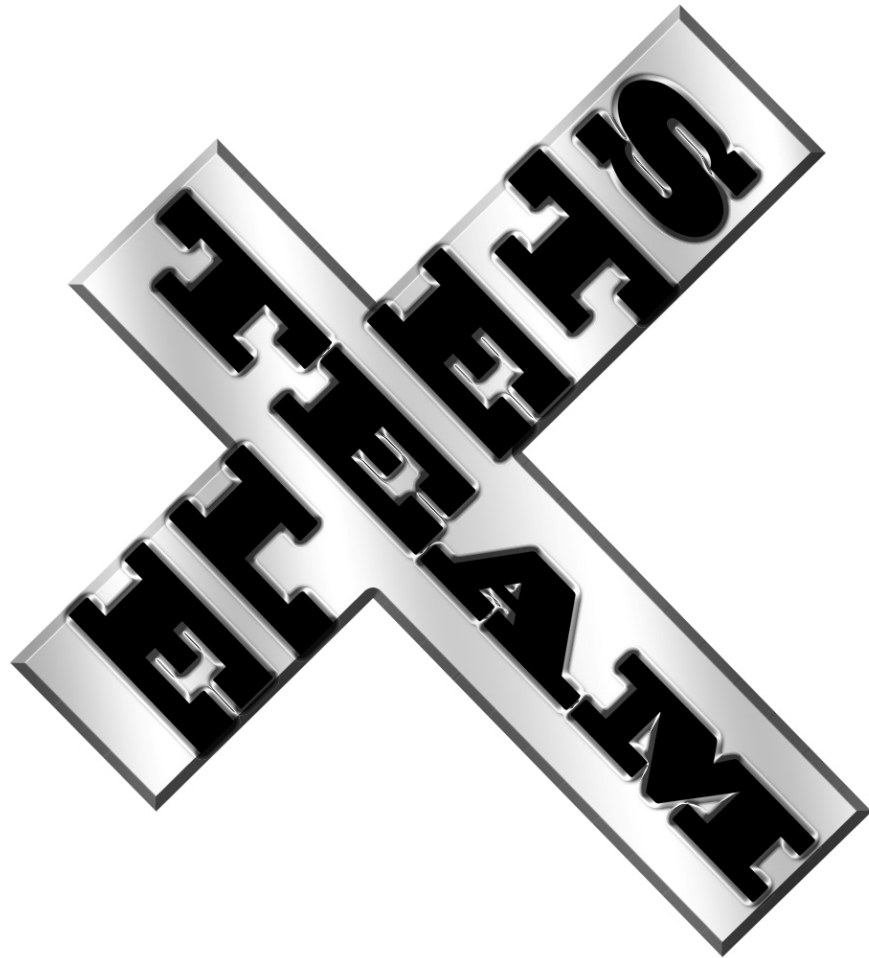


FIRST LEGO® League



Team STEELE Project Report

www.i-leadonline.com/TeamSTEELE

Introduction

This report is delivered by the team members impersonating important contributors to nanotechnology.

- Alexander Meyer plays the part of Nobel prize winning scientist Dr. Robert F. Curl.
- Zachary Kaufman plays the part of Nobel prize winning scientist Dr. Harold Kroto
- Ryan Cushman plays the part of Buckminsterfullerene, a form of carbon that plays an important role in our report.
- Barrett Kaufman plays the part of the narrator.

The scientist comments made below are not actual quotes from them but represent our creative attempt to communicate our report.

Narrator

Hello, my name is Barrett Kaufman. Thank you for allowing us to present our project to you today. I am joined by Nobel Prize winners Dr. Harold Kroto and Dr. Robert Curl. Also we are joined by buckminsterfullerene, also known as C₆₀, or Bucky.

Now of course these aren't the real Nobel Prize winners but our team did talk to the real ones. This presentation is based on what we have learned through our research and discussion with the scientists.

Our question: "How can nanotechnology be used to help treat cancer?"

Our team is proposing to decorate buckyballs with chemically enhanced antibodies to deliver lifesaving medicine directly to the cancer.

What does this mean? Let's hear from Dr. Curl.

Dr. Robert Curl

Thanks, Barrett. My fellow scientist and I discovered buckyballs along with another scientist, Richard Smalley. Mr. Smalley died a few years ago, unfortunately, so we could not email him. Now, about those buckyballs...

Buckminsterfullerene

Hi, I am Buckminsterfullerene, but my friends call me Bucky. I'm made out of the strongest organic material: graphite. My molecular arrangement is typically 60 carbon atoms shaped like a soccer ball, although I can come in many shapes and sizes. Richard Smalley, Harry Kroto, and Bob Curl discovered me by vaporizing carbon with a laser, and out of the fumes, a buckyball was formed.

However, that isn't the most efficient way of producing buckyballs so another way was forged. This new method is performed by putting two carbon electrodes close together in a reaction chamber filled with helium or neon. The self-assembly of carbon atoms

happened within the reaction chamber and in the vapor was a significant supply of buckyballs. That's me!

So, what are the advantages and disadvantages of current cancer treatment? Find out more from Dr. Kroto.

Dr. Harold Kroto

Thanks Bucky! Cancer has killed humankind for centuries! Only in recent years have doctors found better ways to treat and detect it earlier. Even so, it is estimated that over 564,000 will die of cancer in just the U.S.! Three of the most common used treatments are:

- Surgery—trying to cut it out
- Radiation therapy—trying to kill cancer with radiation
- Chemotherapy—trying to kill it with drugs

Each of these can be helpful but have very bad side effects.

One of the biggest problems with current treatments is they kill both the cancer cells and normal cells. This can cause side-effects such as:

- Losing your hair
- Vomiting
- Even death

Now that you have heard about the horrible side effects of current cancer treatments, let's hear from Dr. Curl about our approach!

Dr. Robert Curl

Our proposed method of attacking cancer is to attach antibodies to the outside of the buckyball and to place something that destroys cancer on the inside. Antibodies are cells that the body's immune system produces. Every antibody is not created equal. There are many different types of antibodies, and they each attack a different type of disease. Scientists can produce antibodies in the lab. The antibodies attached to the outside of the buckyball would be coded to attach only to cancer. Once that has been done, we have a fleet of buckyballs coded to attack cancer, currently doing, well... nothing. Nothing, that is, until we inject them into the body. So after that, they are attached to the tumor, ready to do some damage! But how?! That's where the fun starts. What I haven't told you is what goes inside this army of C₆₀ molecules. The name is long: liposomal doxorubicin. This drug interferes with the growth of cancer cells. The cells eventually are destroyed, which means the tumor is shrinking. The smaller the tumor gets, the easier and less risky it is to take it out with surgery. Now let's hear from Dr. Kroto on the benefits of our proposed method.

Dr. Harold Kroto

The benefits of our approach are:

- the medicine goes directly to the cancer cells, and
- there should be reduced impact on normal cells.

This should reduce side-effects and do a better job of killing the cancer wherever it is in the body. This should save more lives.

Narrator

We learned from our discussion with the scientists that there are challenges to our proposed solution. Yet there is hope. They encouraged us to pursue our proposed solution, as well as learning more about science.

Let me read part of an e-mail from Dr. Eigler, IBM Fellow who specializes in nanotechnology: "Learn to ask questions about nature. This is the key. Let your curiosity and imagination carry your thoughts to places where no other mind has gone. Learn to love science as a method for getting answers to your curiosity driven questions. Let science, and the scientific method, incite your curiosity even further."

This project has given us a greater curiosity about how nanotechnology can save lives. Thank you.