Questions for Dr. Harold Geller

Questions from Ms. Bullock

Would you be able to give a brief introduction about yourself, and what has led you to your career and research.

I am Dr. Harold A. Geller. I was born and raised in Brooklyn, New York. My father was an automobile mechanic who was born on my grandparents' farm in Brooklyn, New York. My mother was a housewife who raised three sons. I developed an interest in astronomy when my parents first took me to the Hayden Planetarium in New York City. I was five years old at the time. I grew up with a keen interest in math and science. I looked up to my oldest brother who became a math teacher and professor. I would read his books on math and science after he finished reading the books. One of my early favorite books was titled "One, Two, Three, Infinity" by George Gamow. George Gamow was a physicist who helped develop the big bang model of the formation of the universe. While I was attending Midwood High School in Brooklyn, New York, I started working as a research assistant at the State University of New York at Downstate Medical Center. It was part of a summer school program. I have worked at many places including the Einstein Planetarium in the Smithsonian Air and Space Museum in Washington, DC. I have been associated with George Mason University in Fairfax, Virginia for over 30 years when I started as a graduate student. I earned my master's degree and doctorate at George Mason University, where I have been teaching for over 25 years.

1. To become an astronomer, what courses did you take in college?
   I did not start out as an astronomy major in college. My path was long and winding. I actually started out as a biochemistry major in college. Then I switched to physics. However, I ended up in mathematics. This was largely because that is what I was able to schedule given my work schedule. I had to work and go to school. Along the way, aside from the general education courses, I took many courses in mathematics, physics, astronomy, biology, and even oceanography. For my master's degree, I started in physics and switched to astronomy and information technology. In graduate school you focus

more on your specific discipline. For my doctorate I focused on astronomy and education.

2. What qualities does an astronomer need to have to be successful?
   To be successful, an astronomer needs to have the same qualities as any other technical profession. As Thomas Edison said, it is 99 percent perspiration and 1 percent inspiration. I had to have lots of mathematics and I had to be willing to spend lots of time in the laboratory or observatory; collect data; analyze the data; then write about the results that I had obtained. My results were always open for criticism and repeated experiments and observations.

3. What is the most rewarding part of your research/career?
   I believe any good scientist is like a good detective. The greatest reward is when you solve the case; or, solve the problem you are addressing.

4. What is the most challenging part of your research/career?
   As a professor you have many responsibilities beyond your research and your teaching. You have to participate in the university's governance. This can be very time consuming; however, just like voting, it is your duty to participate in the conduct of business at the university. It is not easy juggling all of these hats that we professors wear. It is very time consuming.

<u>Questions for Dr. Harold Geller, 3rd Period Ms. Bullock's classroom</u>

1. What will be a leading factor to find a form of life in space?
   Astrobiologists say that the three things you need to develop life on a world is the right chemicals; a source of energy; and, protection from damaging rays from outer space and the star you revolve around.

2. What qualities might we have in common with aliens, are they plants, animals, or both?

Whatever life we may encounter in space; it will have to have a source of fuel (the right chemicals); it will have to convert that source of fuel (food) into useable energy to conduct life actions; and, it must have a way to protect itself from the physical dangers around it.

3. Do you think that alien life forms are more technologically advanced than us and could find us first?
   We have no evidence of any intelligent extraterrestrial life forms. If we do encounter extraterrestrial life forms today; they would have to be more technologically advanced than us. We do not now have the technology to go to the stars in a human lifetime.

4. What type of technology do you use in this job?
   I use all types of technology in my job. From the simplest writing implement, like the pencil and pen, to the most advanced computers available. From a telescope the size and weight of a small car; to a microscope to examine images.

5. What type of extraterrestrial life do you think exists?
   I believe that the most common type of extraterrestrial life that exists is microbial in nature. I don't believe that intelligent life is common within our galaxy.

6. Does space have sound?
   Sound waves require a medium, some substance within which to travel. Space is very near to be like a vacuum. As sound does not travel in a vacuum chamber; sound waves cannot travel through space. I'm afraid all those noisy explosions in space in movies are just not real.

7. If there is advance life on other planets how long do you think that they have existed on that planet?
   We have no data to come to any conclusions about the lifetime of an intelligent civilization. We can only guess times based upon civilizations as those that have existed on Earth. Civilizations, such as

the Aztec, Mayan, and Mesopotamian, only existed for a few hundred years. That would be my best guess.

8. What do you think life on other planets would look like? Like humans? Like aliens we see in movies?
   There are reasons why we have certain bodily features. We have 2 eyes to allow us to estimate distances. We have 2 ears for similar reasons. We have arms, legs and feet for the purposes they are designed; and, in that sense, extraterrestrials might be similar. However, they don't have to have the organs in exactly the same way that our organs are featured.

9. What do you think aliens would be like?
   I believe that extraterrestrials would be similar to us in the way we respond to the environment around us; they would similarly be responsive to the environment within which they find themselves to live.

10. If water is on different planets, might there be some type of bacteria or unicellular organisms living in it?
    Water is a combination of hydrogen and oxygen; which are two of the five most abundant chemical elements in the universe. We know of many worlds in our Solar System which contain water. Unfortunately, just because you have water present, that is not the only requirement for life of any kind.

11. What evidence, if any, has there been of other life in the universe?
    As of today, there is no evidence at all that there is life elsewhere in the galaxy. This beautiful planet of ours is the ONLY world we know that has life.

12. How many planets are there that have the capability to sustain life?

We don't know for sure how many planets out there may be able to sustain life. As of today, there are 3,955 known planets orbiting stars other than our own Sun. Of those, 47 are considered to be habitable. That is just a little over 1%. Fifteen of those are Earth sized planets within their star's habitable zone.

13. Have you done any tests to determine life on other planets?
While I was conducting my research for my master's degree, I worked with the data from the Viking mission to Mars, which landed on Mars in the summer of 1976. I found no evidence of life.

14. Have you studied outside of our solar system?
Most of my astronomical research has been with the planets in our Solar System. Many years ago, while a graduate student at the National Radio Astronomical Observatory at Green Bank, West Virginia, I studied radio signals from an object known as SS433. It is located about 18,000 light years from our own Solar System.