

## PEOPLE IN ASTRONOMY

### JEFF HOFFMAN



Jeffrey Hoffman is a NASA Scientist-Astronaut. He grew up near New York City, and went into the city every month or so to visit the American Museum of Natural History's Hayden Planetarium. After graduating from Amherst College (Amherst, Massachusetts) in 1966, he attended graduate school in astronomy at Harvard University, receiving his Ph.D. in 1971.

He then worked in England with the x-ray astronomy group at the University of Leicester for 3 years. While in England, he married, and his wife and he had their first child. Then he returned to the United States, working at the MIT Center for Space Research for 2 years. In 1978, he was selected by NASA as a scientist- astronaut, and moved to Houston. He flew on the space shuttle for the

first time in 1985, making NASA's first unplanned space walk in an attempt to repair a malfunctioning satellite. In 1990 he was on the mission that carried aloft the "Astro" set of ultraviolet telescopes. During missions in 1992 and 1996, he conducted tests of a new type of space technology: the use of long tethers in space to generate electricity and to change the orbits of satellites. In 1993, he was one of the astronauts who repaired the Hubble Space Telescope. Hoffman is currently Professor of the Practice of Aeronautical Engineering at MIT. He is also director of the Massachusetts Space Grant Consortium.

### HOW DID YOU ENJOY BEING IN SPACE?

Answering as an astronomer first, astronomers are used to working on mountaintops, and space is the ultimate mountaintop. Actually, for me, working on the Astro mission [a set of ultraviolet telescopes carried on a space shuttle] was unique, because my professional work had been x-ray astronomy using satellites, so I had never actually done anything with traditional telescopes. The first time I guided an actual optical-type telescope in my life was in space, but my three astronomer-astronaut colleagues let me do it anyway. Since I had spent most of my professional career building x-ray telescopes to fly in rockets and satellites, it was gratifying to fly with some

telescopes on board. Of course, the fun of being in space goes beyond what your actual mission is. No matter what you are doing up there, it is an incredible view, an incredible feeling. But working as an astronomer on one of my space flights gave me a lot of professional satisfaction.

## WHAT DID IT FEEL LIKE TO REPAIR THE HUBBLE SPACE TELESCOPE?

Fixing the Hubble Space Telescope was the most important and challenging task of my entire astronaut career. It is easy in retrospect to forget the incredible shock produced by the discovery of Hubble's initial optical flaw, but in many ways the whole future of NASA's human spaceflight program rested on our ability to show that astronauts working in space suits could fix the problem. Had we not succeeded, it is quite possible that Congress would not have given NASA the go-ahead to build the new International Space Station. We worked extremely hard training for the mission, spending over 400 hours underwater and countless weeks in simulators. When we finally took off, I can honestly say that we had done everything we could think of to ensure the success of the mission. Of course, we knew that there were many unexpected things that could go wrong no matter how hard we trained. In fact, as things turned out, the most surprising thing

about the mission was how few unpleasant surprises we had.

At the end of the fifth and final space walk, we were elated at having been able to accomplish every one of the tasks that we had set out to do. Of course, we would not know for several weeks whether the new optics we installed had actually corrected Hubble's vision. It was New Year's Eve when I finally got the news from some astronomer friends working at the Space Telescope Science Institute that Hubble was finally working flawlessly. What a great way to celebrate the new year!

## HOW DID YOU GET TO BE AN ASTRONAUT?

How did I originally decide I wanted to be an astronaut? That's been going on for a long time, ever since I was a little kid. I first got interested in astronomy back in the Hayden Planetarium in New York City. But I got interested not only in astronomy but also in anything having to do with space, including rockets. Of course, there was no such thing as a real space program back then, and I wanted to be a scientist. The first astronauts were all jet pilots, and that didn't appeal to me, though I was excited by the rocket part of it.

But when they announced that they needed scientists to be astronauts on the shuttle program, I always knew that this was

something I wanted to do, so I applied.

## WHAT DO YOU DO IN AEROSPACE NOW?

After I left flight status as an astronaut, I spent four years representing NASA in Europe. This was a bit like being an ambassador. Spaceflight is increasingly an international activity, and it is useful to have someone “on the scene” to work with our partner space agencies. My office was in the American Embassy in Paris, since the headquarters of the European Space Agency is located in Paris. My technical background and experience with international projects during my various space missions gave me the qualifications for this job. In addition, I speak several European languages, which helps a lot.

Now, I have entered my fourth career, following being an astronomer, astronaut, and diplomat, as a faculty member of the Department of Aeronautics and Astronautics at the Massachusetts Institute of Technology. I am now working more as an engineer than an astrophysicist, a result of my extensive experience in space operations and design during my many years at NASA. We try to expose our students to all the phases involved in space projects: conceiving, designing, constructing, testing, and operating. I bring to the department special personal experience

in operating space systems, which I try to share with students. In addition, I am involved in research projects using the International Space Station as a test bed for new satellite control technology and trying to develop more maneuverable space suits.

## WHAT WOULD YOU MOST LIKE TO SEE NASA DO NEXT?

Exploration in all its aspects is NASA's primary mission. We need to develop space telescopes even more powerful than Hubble to continue our exploration of the astronomical universe. I think the search for extra-solar planetary systems and the search for life in the Universe is one of the most exciting scientific goals of the new millennium. Closer to home, we have a lot of exploring to do in our own Solar System. I am particularly excited about searching for signs of life on Mars and Europa. And of course I am interested in expanding human capability to travel and work in space. The International Space Station is a step in this development. Making all this happen requires more reliable and cheaper space transportation, which is also one of NASA's main goals.

## WHAT MESSAGE DO YOU HAVE FOR STUDENTS?

First of all, I like to try to spread an ecological message that we have to take care of the Earth, our planetary home in space. We get a lot of responses to pictures that we take of the Earth from space, particularly where we can show the environmental changes taking place on the planet. Kids really seem to respond to that. We get disturbing sequences of pictures taken over the last 15 years showing the deforestation of the Amazon, the encroaching desert in sub-Saharan Africa, and land erosion in Madagascar, one environmental disaster after the other, which you can see better from space than from anywhere else.

I also like to talk to young people about the fact that you can study physics and astronomy and apply it in numerous different ways other than just becoming a professional astronomer. For instance, I can show my younger son, who is thinking about what he wants to do after university, two examples of friends of mine from graduate school. One of them started in physics and moved to biology and one was in applied mathematics and also moved to biology, and both do a lot of work in environmental science. Both developed the skills of mathematical analysis and facility with computers, which we use all the time to model complex systems in astronomy. I often

find that my training as a physicist allows me to cut to the heart of problems in a way that some people who were trained as engineers sometimes don't do. The other thing that I often stress is the fact that my inspiration to become an astronomer and to become an astronaut spring from the same fascination at looking beyond where we are now, looking out from the Earth. I hope that we can keep the dream alive for the next generation so that they will be able to live out some of their dreams as well, whether they are studying through telescopes or travelling outside the Earth.

## WHAT COMMENTS DO YOU HAVE ABOUT THE CREWED SPACE PROGRAM?

I never felt that space flight was without risk. Space is a hazardous environment, unforgiving of human errors or mechanical failures. People have died exploring the oceans, the mountains, and the polar regions of the Earth, but it is part of the human spirit to push onward and outward. The exploration of space is one of the most exciting aspects of the past half-century. I wish we had a way to get into and back from space more safely, but I think it is important to continue. We owe it to the next generation.