Meet Howard Singer

Howard J. Singer
Chief Scientist
NOAA Space Weather Prediction Center

Why does your work for NOAA matter?

I work at NOAA's Space Weather Prediction Center (SWPC), one of the nine National Centers for Environmental Prediction in the National Weather Service. As part of the NWS, our job is to deliver space weather products and services that meet the evolving needs of the nation. That means that we provide alerts and warnings of space weather conditions on the sun and in near-Earth space that affect astronauts, GPS accuracy, airlines flying over the poles, navigation and communication systems and electric power grids, to name a few. During my years in NOAA, I've contributed to these efforts by working with the NOAA GOES satellites that provide observations of space weather conditions on the sun and in the near-Earth space environment; by leading a research and development group and carrying out research that improves our understanding of space weather and its consequences; and by transitioning space weather data, models and understanding into operations. Each of these activities makes a difference when it comes to protecting society and supporting our economy.

What do you enjoy the most about your work?

I was attracted to NOAA by the opportunity to carry out exciting work that spans scientific disciplines extending from the sun to the upper atmosphere and to use the results of that labor to improve space weather predictions that bring benefits to human activities. I particularly enjoy the interactions between science and operations; the opportunity to work with scientists around the world; to contribute to national committees that help to guide our science future; and to teach, lecture and write about space weather and space science. In my career, I've had exciting opportunities that include being the responsible scientist for magnetometers on satellites, spending more than a year at South Pole Station, Antarctica where I had the opportunity to view the aurora, and visiting facilities and people in places such as Fairbanks, Alaska; Newcastle, Australia; Kiruna, Sweden; and Arecibo, Puerto Rico.

Where do you do most of your work? In a lab? In field studies?

Most of my work is done in my office and our center (Space Weather Prediction Center) with access to people, information, and computers. Equally important, are face-to-face meetings, workshops and conferences with colleagues in the U.S. and around the world with whom we share knowledge and tools to improve services for customers affected by space weather disturbances. Satellite work has often involved traveling to facilities that build and test instruments, as well as the satellites. Serving on national committees and reviews often requires travel to other facilities.

What in your lab could you not live without?

Without a doubt, the most important thing I couldn't live without is the people in our organization. They are a great group with a diversity of knowledge, skills and approaches to carrying out our work. Our work is in great part collaborative and depends not only on the people in our own organization but also on those in other parts of NOAA, other U.S. agencies, universities and international and commercial organizations. None of our work could be carried out without the support and direction from those at higher levels and the U.S. taxpayers.

If you could invent any instrument to advance your research and cost were no object, what would it be? Why?

If I could invent any instrument to advance my research, it would be one that could image dynamic processes in Earth's magnetosphere just as we image cloud cover and atmospheric temperature on Earth from satellites in space.

The magnetosphere is the region around Earth with radiation belts and plasma controlled by Earth's magnetic field, the solar wind and solar disturbances. Most of what we learn in this vast region of space comes from in-situ measurements from a limited number of spacecraft and ground-based facilities. Although some of the plasma has been imaged in recent years, most is invisible, except for local measurements. Finding new ways to image Earth's magnetosphere would settle many important scientific questions and enable us to better predict consequences of disturbances in the space environment on power grids, satellites, navigation, GPS, astronauts and other human and technological systems.

When did you know you wanted to pursue science?

My interest in science came at an early age. My father was a photographer, and we frequently talked about science at home. In addition, while in elementary school, we didn't have a library near us, but every week during the summer, a "bookmobile" would come down our street. One week, I selected a large book called "All about Molecules." I remember being flabbergasted by the large number of molecules in a drop of water - a 1 followed by more zeros and commas than I had ever before seen. For a long time after that, I wanted to be a nuclear physicist, but astronomy was also an interest, perhaps from the time in elementary school that we constructed a scale-sized model of the solar system. One thing led to another, often serendipitous, but with a focus on science. After a B.S. in Physics, and an M.A in Physics and Astronomy, I sort of fell into Geophysics and Space Physics at the University of California, Los Angeles (UCLA), where I received my Ph.D. (That followed a stint in Antarctica, working for UCLA, where I did solid earth geophysics, but that's another story.)

What's at the top of your recommended reading list for someone wanting to explore a career in science?

A single favorite doesn't come to mind, but I recommend reading books that deal with the history of science. Science is exciting and fascinating, but so are the people who do the science. Anyone exploring a career in science will benefit from reading about scientists, how they get their ideas and make their discoveries, their connections to the past and the ways they and their work fit into their society and time in history.

And how about a personal favorite book?

I have many favorites, some touch on science and some don't. Among those that touch on science, I enjoy science fiction, especially the sort of fiction that is plausible or builds on science fact rather than fantasy. One excellent book that fits this category is Timescape, by Gregory Benford. His story deals with the so-called "grandfather paradox" of going back in time and doing something to affect your own future. Another favorite author is Fred Hoyle, a scientist known in part for proposing the steady state universe, and who wrote more than a dozen science fiction books that include good science discussions.

Do you have an outside hobby?

I don't set aside as much time as I would like for hobbies, but hiking in the Colorado mountains or just walking on nearby trails is what I enjoy most. I am moved and inspired by the scenic grandeur and enjoy experiences such as a peaceful lunch alone or with friends and family after reaching a high-mountain lake surrounded by snow-covered peaks. The symphony, folk music, good wine and travel are other "hobbies" important in my life.

What would you be doing if you had not become a scientist?

It's difficult for me to imagine not being a scientist, but at various times I've thought about this question and "forest ranger" has come to mind. I probably have an idealized and romantic view of what it takes to be in that profession, but I love the outdoors, whether in the forests and mountains or spending over a year in Antarctica, as I did early in my career. Caring for the environment and explaining it to others would give me great satisfaction. In some ways, that seems connected to what I do now - exploring the space environment and educating others about how to cope with the conditions created by solar interactions with Earth. I've also thought about working in a bookstore because of my love for books.

Who is your favorite historical scientist and why?

I don't know if this counts as "historical" because it's rather recent, but Richard Feynman has always been one of my scientific idols. I'm in awe of Feynman's ability to explore and explain science and to do it with humor. Feynman had a

remarkable ability to explain basic physical concepts with simplicity and from totally different approaches than I had learned in school. His popular book on quantum electrodynamics, QED, played a role in my views on the importance of exploring alternatives, both in science and life in general. I am glad that I had the opportunity to hear him speak in person, shortly after he won his Nobel Prize, and that in later years, I worked with his sister Joan, an excellent scientist in her own right. For years, I challenged friends to identify the location of a little known country, Tannu Tuva, which I learned about from collecting stamps. Then one day, I learned that Feynman knew about Tuva as well. Sharing that uncommon knowledge made me feel a bit closer to this scientific genius. If only some of that genius could have rubbed off.