



A Little Story About Dr. Robert Jastrow

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Dr. Robert Jastrow founded the Goddard Institute for Space Studies in 1961 and was GISS Director for 20 years. For his 80th birthday, 7 September 2005, I wrote the following story about him and we dedicated the 2005 GISS Research Publications document to him.

Dr. Jastrow persuasively advocated the value to NASA of what became known as the "GISS formula" for a research organization. Key ingredients: a small permanent research staff, an academic environment, post-docs and students, ability of staff to teach courses for student recruitment and work with university faculty and researchers, and public outreach to make results of NASA research understandable and available to the public.

The GISS formula is designed to yield high research productivity and a flexibility that allows research directions to shift as NASA objectives develop. Thus an initial emphasis on astrophysics and lunar and planetary science has evolved into a focus on understanding the causes and consequences of global climate change on Earth, of direct relevance to the first objective in NASA's mission "...to understand and protect our home planet."

GISS research productivity, measured by peer-reviewed publications, must rank among the best in the nation, with a rate of at least three papers per scientist maintained for several years. In 2005, 73 publications by 17 civil service staff members are supplemented by 29 papers by other GISS researchers, including two emeritus staff members.

Robert Jastrow, with A.B. and A.M. from Columbia College in 1945 and Ph.D. in 1948 in nuclear physics, was a postdoctoral fellow at Leiden University, Netherlands in 1948-49, and a member of the Institute for Advanced Study at Princeton in 1949-50 and 1953. His work at Princeton led to discovery of the "Jastrow Potential" for interactions between protons and neutrons. Dr. Jastrow has described his time at the Institute for Advanced Study thus:

"I went to the Institute at the invitation of Robert Oppenheimer. The emphasis then was on neutrons and protons, nuclear physics and particle physics, and nuclear forces. One day a visitor gave a seminar describing an experiment in which protons and neutrons were bounced off one another, so-called neutron/proton scattering. What he reported was this: neutrons and protons are known to attract one another, so when you fire a proton at a neutron, or vice versa, it goes through and comes out the other side, with only a moderate deflection. But he found that sometimes the neutrons and protons bounced right back as if they had hit a brick wall.

So in the question period I got up and said, ‘Maybe the reason is that inside the nuclear force of attraction, which holds nuclei together, there’s a very strong short-range repulsive force, like a little hard sphere inside this attractive Jell-O, and when the neutrons and protons hit this strong force, they bounce back as if they’ve hit a billiard ball.’ Well that violated basic ideas of the theory of relativity, or at least so it seemed, because it selected the space dimension in a way that didn’t fit into the four-dimensional continuum of Einstein’s ideas.

I’ll never forget, Oppenheimer got up, he liked to needle the young fellows, and said very dryly, ‘Thank you so much, we are grateful for every tiny scrap of help we can get.’ But I ignored his needle and pursued my idea, and calculated the scattering of neutrons by protons. I showed that it fit the data very well. Oppenheimer read my paper for the *Physical Review* and took back his criticisms. This work became a permanent element in the literature of physics.”

Dr. Jastrow had stints as Research Associate at the University of California and Assistant Professor of Physics at Yale, after which he was a consultant at the Naval Research Laboratory in Washington D.C., where he became fascinated with the budding American space program. At the inception of NASA in 1958 Dr. Jastrow was invited to head the Theoretical Division of Goddard Space Flight Center. A better description comes from words of Dr. Jastrow:

“I was working on the Vanguard Project at Naval Research Lab trying to figure out a quick and easy way to determine where satellites would come down when they re-enter the atmosphere. In the meantime Khrushchev, as part of the Cold War, claimed that the rocket casing of Sputnik had come down in Alaska and we had it and he wanted it. I went to a meeting in Moscow and presented results that showed, from the last radar sightings of its height, that it had actually come down somewhere in an arc between Siberia and China. This drew the attention of people who, unbeknownst to me, were at that moment planning to set up a U.S. space agency. They asked me to join NASA, which I did the month it was formed. That was October, 1958.”

Dr. Jastrow was Chairman of NASA’s Lunar Exploration Working Group from 1959 to 1961, an exciting period in NASA history described in his book *Journey to the Stars*. The first location of his theoretical division was over a furniture store in Silver Springs, Maryland, as Goddard was just being built. In 1961 he convinced NASA management on the merits of locating his division in New York City, in the vicinity of Columbia University, where he founded the Goddard Institute for Space Studies.

Dr. Jastrow has been a frequent commentator on science news, having appeared on more than 100 CBS-TV network programs on space science, as well as having many appearances on the Today and Tonight shows. His articles have appeared in *New York Times*, *Reader’s Digest*, *Foreign Affairs*, *Commentary*, *Cosmopolitan*, *Atlantic Monthly*, *Natural History*, *Scientific American*, and *Psychology Today*.

Of Dr. Jastrow’s several best-selling books, perhaps the favorite is one mentioned by our own Michael Allison: “I first heard of the Goddard Institute as a college sophomore in, of all places, a course on science and religion, where I read *Red Giants and White Dwarfs*. What an epiphany it was to learn that we and our world are made of the nucleosynthetic remnants of exploded stars!” Dr. Jastrow, with Malcolm Thompson, also wrote a pioneering textbook *Astronomy: Fundamentals and Frontiers*, and he has just completed, with Michael Rampino, an astrobiology text *Stars, Planets and Life: The Evolution of the Universe*.

Dr. Jastrow taught at Dartmouth and was at the Marshall Institute in Washington, D.C., after leaving GISS. He was Director and Chairman of the Board of Trustees of Mount Wilson Observatory from 1992 to 2003, where he oversaw the refitting of the 100-inch telescope with state-of-the art adaptive optics that allowed unprecedented observing from a ground-based

telescope. Today, Dr. Jastrow continues to write and lecture on science and public policy as Chairman Emeritus of the Board of Directors of the Marshall Institute.

It has been 25 years since I succeeded Dr. Jastrow as GISS Director, yet we still see his influence through more than the "GISS formula". Recently, after I twice declined to speak at a conference on renewable energy, the organizer shamelessly came back a third time with the story: "In 1967 shortly after the publication of Dr. Robert Jastrow's book, *Red Giants and White Dwarfs*, a skinny high school student from Long Island with an abiding interest in astronomy was moved to seek out the author's career advice. He took a bus and subway to upper Manhattan, made his way to the Goddard Institute for Space Studies over Tom's Restaurant, and found Dr. Jastrow's office location on the lobby directory. Upon reaching a secretary in an outer office, he announced that he was there to see Dr. Jastrow to speak with him about a career in astronomy. "Do you have an appointment?" she asked. 'No,' the student replied, 'but I read Dr. Jastrow's book and I'm interested in astronomy, and...!' At that point a voice boomed from an adjacent office, 'Send the young man in!' Dr. Jastrow spent a half-hour speaking to the student, and then called in other scientists to give him a tour of the Institute. Needless to say, this left a lifelong impression on the young man. Thirty-eight years later, I find myself once again approaching the Director of the Goddard Institute with a request..."

...and so I am packing my bags to speak at a conference on renewable energy. —*Jim Hansen*

An improved draft of Chapters 19 & 20 of *Sophie's Planet* is available at [Sophie's Planet #13](#), but additional improvements are likely before the book is finished.