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Maxine Singer

Maxine Frank Singer, President of the Carnegie Institution of Washington, NIH intramural scientist, and distinguished member of the National Academy of Sciences, is also a tireless and eloquent advocate for biomedical research.

Singer recalls that she has been interested in science since Midwood High School in Brooklyn. "I went to a great big school that had so many students there had to be two sessions each day. There were 700 people in my graduating class." She credits her interest to a few good teachers. Following high school, Singer went to Swarth more College in Pennsylvania, attracted principally by the small class size; the consequent attention she received helped to further shape her commitment to science.

By the time she entered graduate school at Yale in Bio chemistry, Singer had married Dan Singer whom she had met at Swarthmore. Dan attended Yale Law School at the same time that she started graduate school. Singer.s loyalty to Yale prevails to this day: she later became a Trustee of the University. Singer credits a very good mentor in graduate school, Joseph Fruton, who, Singer remembers, wasn.t always easy to get along with, but was very attentive to students. Whereas many of her friends who, were woman felt that they were discouraged in their careers by their advisors, Singer feels that she was lucky to have had an advisor who supported her.

Singer believes that her generation had an advantage over the current generation of young scientists: she was neither expected to solve a major problem as a student researcher nor was she encouraged to allow her studies to extend beyond four years. "Many things have changed," Singer observes. "Students now take seven or eight years to complete their degrees. I think there ought to be serious efforts to change that." Singer believes that many young scientists have an overly pessimistic view of the job market, thus choosing to remain in school longer as well as opting to stay longer in postdoctoral fellowships. When students become experienced and highly valuable to the particular lab they are working in, there is often too little incentive either to the Principal Investigator or to the student to move on in a timely fashion. "It used to be that American science was at an advantage be cause it was driven by young people who had a chance to be independent and creative.

As President of the Carnegie Institution of Washington, Singer is doing her part to promote science in America. The Carnegie Institution, founded in 1902, is located in the heart of Washington DC near Dupont Circle in a large, beautiful old building complete with spectacular pillars and rotundas. She explains that the Carnegie Institution is a free standing private research institution that does fundamental research across scientific disciplines. Andrew Carnegie founded it with a substantial endowment which funds 70% of its operating budget. The Trustees have kept the Institution small and have managed their endowment well. The endowment allows the Institution to maintain its independence and to support creative and sometimes risky activities. "We are now involved in earth science including seismology, geochemistry, geophysics, planetary science, and biogeochemistry, astronomy, plant biology, and molecular developmental biology," Singer says proudly. The Institution is remarkable.

The Carnegie is renowned for its small labs, minimal hierarchy (faculty are known as "members") and highly-respected researchers, including two distinguished former presidents of the ASCB, Joe Gall and Don Brown.

Singer started a Saturday science program in the Washington neighborhood surrounding the Carnegie Institution. This project brings children from various socioeconomic circumstances into the Institution.s headquarters every Saturday to learn about science. Another program has already trained 250 Washington DC elementary school teachers to teach in summer institutes. Carnegie also supports a public lecture series. Singer spends a good portion of her time raising funds to support these and other programs.

Long-time Carnegie colleague and former ASCB President Don Brown calls Singer "an extremely high quality president. She is a listener, very bright and capable. She takes advice and makes tough decisions when she needs to." Brown explains that she manages the Carnegie Institution much the way she runs her lab at the National Cancer Institute at the NIH. He explains that, "she hired individuals and let them do their work on their own. This is how the Carnegie Institution had run in the past, so when she came she realized that her style meshed very well with ours."

Before going to the Carnegie, Singer worked for the NIH in various capacities, initially in 1956 in Leon Heppel.s lab as a Postdoctoral Fellow in the institute that was then known as the National Institute for Arthritis, Metabolism, and Digestive Disease. It was an exciting time to be there, recalls Singer because, "we had just learned that DNA was genetic material." Those who know Singer.s contributions may be surprised that she confesses to having lacked self-confidence as a postdoc. But her reputation grew with

her accomplishments and within two years of arriving at the NIH, she was offered an independent position. Singer notes that, "people don.t like to hear how easy it was, but at that time the NIH was growing and there were jobs. I was given my own small lab with an assistant." She admits that she sometimes tends to minimize the problems in science today because everything came so easily to her. Heppel.s lab at the time was a leader in nucleic acid techniques, Singer credits the leadership of former NIH Director James Shannon for establishing the excellence of the NIH. He argued that the mix between intramural and extramural research was an effective and well-balanced way for government to conduct research, reasoning that such an approach would offer scientists at the NIH more freedom to conduct their work than was found in the European system. Singer notes that much has changed at the NIH since Shannon.s tenure, sometimes resulting in labs that are larger and less flexible and creative than is optimal. Happily, Singer feels that the current leadership is reversing that trend and has "brought the science back into focus."

Singer spent a year in Israel in 1971 with her family as a Visiting Scientist in the Department of Genetics at the Weizmann Institute of Science. Of this experience, Singer says, "we were in Israel between the 1967 war and the Yom Kippur war so this was an extremely euphoric time." She thoroughly enjoyed her friends and colleagues there and felt that she was able to contribute to the expertise of the group. During the recent Gulf War, Singer.s husband returned to Israel to work as a volunteer with Alzheimer.s patients who needed special help with gas masks and other war-related functions.

Singer's scientific focus has progressed from experiments on the synthesis and structure of RNA and the genetic code, to work on animal viruses, to defective SV40 viruses in monkey cells. In the mid-1970s, some work was done in her lab on the binding of H1 histone to superhelical DNA. She explains, "as a result, the postdoc in my lab and I (Dinah Singer, no relation) suggested that H1 might bind at places where two DNA duplexes cross each other, as they appeared (from the work of others) to do where the DNA begins and ends its winding around a nucleosome. To our delight (and amazement) this has turned out to be more-or-less true." Her current research springs from her discovery of a transposable element in human DNA. She hopes to elucidate the mechanism whereby the human transposable element replicates and disperses copies to new genomic locations, a process which can be mutagenic. The work on the transposable element concerns the retrotransposon called LINE-1 in the human genome. LINE-1 sequences make up about five percent of the human genome. "Our recent work has shown that the product of the first open reading frame is a protein, called p40, that is an RNA binding protein and occurs in cell cytoplasms as a very large ribonucleoprotein particle in association with LINE-1 RNA (an intermediate in transposition). The second open reading frame encodes a reverse transcriptase, which is now being studied in the lab," Singer explains.

Singer has won many awards and honorary degrees, not only for her scientific work but for her science advocacy and community service as well. She has written op-ed pieces for major newspapers and was an organizer of the famed 1975 Asilomar Conference on Recombinant DNA. Recently, she gave an address in connection with Presidential Inaugural activities on the future of science in the 21st century. Brown says of her advocacy work that, "she has personal friendships with influential people in Washington some of whom may not know another scientist. She is a wonderful spokesperson for science." The honors that have been most special to Singer have been from her alma maters. Swarthmore awarded her an honorary degree in 1978 as did Yale in 1994, the same year that she received one from Harvard.

Many of her peers and disciples view Singer as an icon in science because she has been so successful in a world that was so totally dominated by men when she entered it. Despite her status, Singer says she hesitates to offer advice to young women today because, "I was in a different place than many of them are in now. Being a woman was both a problem and a blessing for me. I personally did not feel the discrimination within the profession." She notes that she has always been more likely to face criticism for her life.s choices outside the lab than inside. Women of her generation were expected to stay at home. Other women could sometimes be antagonistic because, as she explains, "I didn.t pull my weight at the PTA." One lesson she does offer is that you need to have lots of help, as she did. "I tended to practice benign neglect," she confesses. Her husband, a corporate lawyer, has always been very helpful in their home and with their four children.