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TESTIMONY OF DR. WILLIE SOON
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Distinguished Senators, panelists, and audience: My name is Willie Soon. I am an astrophysicist with the Harvard-Smithsonian Center for Astrophysics in Cambridge Massachusetts. My training is in atmospheric and space physics and my sustained research interests for the past 10 years include changes in the Sun and their possible impact on climate.

This very rich area of scientific research, though still far from having definitive answers, has seen exciting and important progress from our increasing technical ability to measure, quantify, and
interpret the changes in the Sun which could be linked to changes of the Earth's climate.

Today I focus on my latest research conclusions regarding climate change over roughly the last 1000 years, especially the geographical pattern of those changes. My scientific study is only possible because of the careful research produced by nearly one thousand scientists around the world. Their expertise covers a very wide range, including physical, chemical, biological, and geological sciences.

Together with several colleagues whose names are listed in the two scientific papers that I am submitting today for the record of this testimony, we have synthesized the results from several hundred studies of proxy records of climate, including much new work that has appeared in the scientific literature in the last 5 to 10 years.

Climate proxies are indirect climate sensors based on information from tree rings, ice and seafloor sediment cores, corals, glaciers and other natural evidence. They also include important cultural and documentary records.

It is important to recognize that these climate proxies are not temperature readings, but some proxies may be calibrated to give temperature changes. One example is the measurement of the flow of heat in boreholes drilled through rocks or ice, yielding century-scale temperature changes over several millennia. On the other hand, some proxies are sensitive to local rainfall as well as temperature, as in the case of annual tree growth in the southwest United States. Any given proxy may respond to temperature differently from other proxies, depending on, for instance, the type of proxy, location, or season.

For all those reasons, it remains a big challenge to produce an accurate global temperature record over the past 1000 years from the diverse set of climate proxies.

But within the limits and lessons learned from our research papers, we can offer three conclusions:

First, local and regional, rather than "global", changes are the most relevant and practical measure of climate change and impact. This is because truly global averages rarely are available from the distant past, before modern satellite measurements, and because such averages can hide the significant changes that can occur over large parts of the Earth.

Second, on a location by location basis, there was a widespread Medieval Warm Period between approximately 800 and 1300 A.D. This Medieval Warm Period was followed by a widespread colder period, called the Little Ice Age, that lasted from approximately 1300 to 1900 A.D.

Third, there is no convincing evidence from each of the individual climate proxies to suggest that higher temperatures occurred in the 20th century than in the Medieval Warm Period. Nor is there any convincing evidence to suggest that either the rate of increase or the duration of warming during the 20th century were greater than in the Medieval Warm Period.

The fact that local and regional climate has been varying with significant swings in amplitude over many locations provides important challenges for computer simulation of climate. The full models that explore the Earth region by region can test for the natural patterns of change over the last 1,000 years through the use of the climate proxies we just discussed. In that way, the effects of human-caused climate change can be weighed against observed natural variability in the climate system. Having computer simulations reproduce past climate, which has been influenced predominantly by natural factors, is key to making an accurate forecast that includes all potential human-made warming and cooling effects.

Further research could yield a deeper, quantitative improvement to our knowledge of local and regional climate variability during the past 1000 years. As we could be inspired by Mr. Thomas Jefferson who remarked: [I quote]

"It is a common opinion that the climates of the several states of our union have undergone a sensible change since the dates of their first settlements; that the degrees of both cold & heat are moderated. The same opinion prevails as to Europe; if facts gleaned from history give reasons to believe that, since the times of Augustus Caesar, the climate of Italy, for example, has changed regularly at the rate of 1 [degree] of Fahrenheit's thermometer for every century. May we not hope that the methods invented in latter times for measuring with accuracy the degrees of heat and cold, and the observations which have been & will be made and preserved, will at length ascertain this curious fact in physical history?" --- Marginal notes from Thomas Jefferson's Monticello Weather Diary (January 1, 1810 to December 31, 1816).

I strongly believe that the time for research in paleoclimatology to fulfill this important role is now.