

Professor Jon Martin – Testimony on the Adoption of Science Standards 7/17/17

There is hardly any other physical science topic on which the general public feels more qualified to comment than weather and climate. The day-to-day variations in the weather impact us viscerally and inspire universal response ranging from casual commentary to lifelong fascination. The nature of long term trends in the day-to-day weather, one of the intriguing questions in climate science, foster a natural extension of the general interest the public has always had in these science issues. For the past 23 years I have had the privilege of working at one of the world's greatest universities creating and articulating knowledge about the marvelous atmosphere that surrounds our precious Earth. During that time I have had the wonderful opportunity to make frequent intellectual contact with my fellow Wisconsinites through both a weekly column in the Wisconsin State Journal (for the past 10 years) and a monthly call-in radio show on WPR for the last 19 years. These activities have led me to the gratifying, though not surprising, conclusion that the general public is not only interested in weather and climate but is also motivated to understand the meteorological phenomena better.

We live in a state that experiences nearly every conceivable type of weather. The exception may be hurricanes and yet one of the greatest hurricane research institutions in the world exists on the campus of our great University of Wisconsin. Therefore, we can be assured that there will always be a ready supply of young Wisconsinites interested in weather and climate.

Progress in understanding weather and climate science has been recent, modern meteorology is arguably less than a century old and modern climate science even younger. What progress has been made is a direct result of the systematic observation, hypothesis testing and revision that characterize the scientific method. Nearly everyone 50 or older today was born into a world in which a forecast of the next day's weather was nearly as likely to be wrong as to be right and there was no reason to even discuss a 3-day forecast! Today, forecasts in the 1-5 day range are not only routine, but they are routinely accurate, at least in correctly painting the complexion of the 4th and 5th days. The product of this revolution, one of the most underrated scientific advances of the second half of the 20th century, is now accessible on our phones without a thought as to its origins. This did not happen by accident, the necessary answers were not delivered by aimless stumbling in the darkness of ignorance. Instead, this progress was won by hard work, creative genius and an immunity to discouragement fostered by the proven power of the scientific method to forge the way forward in understanding physical systems.

While we nurture their many dreams, we must strive to prepare our children to face the world as it is – observe it carefully, postulate what makes it so, and challenge established theory when the weight of the evidence compels the change. I contend that these actions define the American character. No other system of thought is better able to navigate this process than the scientific method. It has led us to understand the nature of the day-to-day weather to the point where 1- 5 day

forecasts are routinely, though not unerringly, accurate. It has also led us to the conclusion that the planet is warmer now than it was 150 years ago and that the warming is largely a function of human activity that has changed the chemical composition of the atmosphere. One does not believe in this conclusion any more than one believes that $2 + 2$ equals 4. This is a conclusion to which one arrives based upon analysis of empirical evidence carefully categorized through agreed upon definitions that systematize observation. Because it is allergic to logical inconsistency, hyperbole and misdirection, the scientific method provides an intellectual superstructure upon which we can confidently build understanding of how nature works. Science education, with this method at its core, is therefore vital to the broad education of our children.