I'm hoping that by now you've either read or viewed *An Inconvenient Truth*. So today we're going to look at some of the reactions to Gore's work. There have been a bunch of them, and I've included some of the more prominent ones in the reading links.

I'll mention nine negative reactions, and these come from Tom Moriarty's blog called Climate Sanity. These sorts of objections to Gore's conclusions fall under several categories: (1) The data isn't correct or it was interpreted incorrectly, and it's really contrary to what you would expect if human caused global warming were the primary driving force. (2) The conclusions desired, by politicians or businesses, are driving the way the data is collected or analyzed.

It's sort of like if someone you secretly like makes eye contact with you. What does that mean? Was it an accident? Do they like you? Or do they fear you or think you are weird? Well, any of these conclusions might be correct. You need more data before you let your desires and fears superimpose conclusions that may not be warranted. I'm sure you know that people NEVER jump to conclusions in these sorts of situations!

The geneticist Gregor Mendel provides a good example of how data can be unconsciously or even consciously manipulated to support conclusions. Mendel theorized that the results of certain pea breeding experiments would give him predictable results…say a ratio of 3 tall pea plants to 1 short pea plant. But his results are too good to be true; that is too close to the expected 3:1 ratio. It's just like if you flip coins you wouldn't expect to always get a 50:50 ratio of heads to tails. A standard bell-shaped curve would predict how often a certain ratio of heads to tails would be achieved. So if your results are consistently better than that curve we would conclude that you have somehow altered the data…the official term is "cooked" the data to support your desired result.

That's what Mendel did, but we aren't sure how or why since he never said, and most of his data was destroyed in a fire. Some say he had God on his side since he was a monk, and that's why he got better than expected results. Well, maybe! More likely he had helpers—monkettes or monkletts—who knew what he believed he would find. They probably put intermediate plants, that were neither

tall nor short—for various reasons having nothing to do with genetics--into the category that needed strengthening to achieve the "correct" ratio.

In the case of climate change, politicians or business men in the energy sector may have very good reasons for wanting the results to turn out a particular way.

Another factor may influence how results turn out or are interpreted. This is the fact that we are dealing with a complex subject that has lots of variables. Let's take a simple example of this complexity: If we measure an increasing temperature at a particular location what kind of thermometer did we use, how accurate was it, was it sitting in the sun or the shade? What time of day or night were the readings taken? Was the result recorded accurately? If we are comparing temperatures over time at the same location did earlier investigators use an accurate thermometer? Do we have a way of comparing their thermometer with ours? Where did they locate it? And so on.

If we are using satellite data to measure ice thickness of a glacier the variables are even greater in number and making sure that things work or worked properly becomes an even greater concern.

One of my areas of expertise is the effect of light in promoting the germination of certain kinds of seeds. For this area, I can tell you with certainty that over half of the research papers published have problems with the way solutions were made, data was collected, or data was statistically interpreted. And these problems are usually serious enough to invalidate one or more of the result claims made by the authors. That's a sad fact of science, and if you have ever tried to carry out scientific experiments as a student in lab class you know exactly what I mean. Repeating Mendel's experiments accurately using either peas or fruit flies can be particularly maddening!

In the case of climate change we have to measure lots of variables correctly and over long spans of time. And, just like any other area of science, we have to NOT let our preconceived ideas interfere with how our data are interpreted.

Soon after *An Inconvenient Truth* was released, two groups of viewers developed: *Climate change supporters* who believed Gore and *climate change*

deniers who didn't believe him. People willing to be agnostic and analyze the data as it developed seemed to be in short supply. We'll spend considerable time in this course taking a look at these two points of view and trying to figure out who is right.

I'll tell you right now that there are very few undeniable facts in the debate. These undeniable facts include:

1. The amounts of CO2 and other greenhouse gasses are increasing in the atmosphere because of human activity. Both supporters and deniers admit this.
2. These gasses are able to radiate heat back into the atmosphere that would otherwise escape.
3. Number 3—and this is an important one. A number of short and long term variables affect Earth's temperature and the cycles it goes through. These include
    a. Ocean currents, which affect both ocean and land temperatures.
    b. Photosynthesis , which removes CO2 from the air and incorporates it into the bodies of plants, algae, and, ultimately, animals.
    c. Decay of organic material, which adds CO2 back to the air.
    d. Milankovitch cycles, which are wobbles and changes in Earth's orbit and position with respect to the sun, which have repeating periodicities of 20,000 to 100,000 years and very definitely influence the amount and distribution of heat reaching the earth.
    e. Recurring ice ages, with a variety of suggested causes
    f. Unknown variables.
    g. Interaction of known variables.
4. This state of affairs, with complex, numerous, and not always understood variables, is common nowadays in our society whenever scientific analysis of a problem or solution is involved.
5. Next time we'll look at heart disease, cholesterol, influenza, and smoking as other examples of how confusing things can get in science before correct answers become clear.