The "Climate Debate" Bruce Parker May 18, 2014

" There is nothing more anti-scientific than the very idea that science is settled, static, impervious to challenge." – Charles Krauthammer in an op-ed in the Washington Post (February 20, 2014).

Many climate deniers/skeptics use this argument to downplay the necessity of taking immediate (and aggressive) actions to reduce the expected global warming and the resulting climate change. What they overlook (or ignore) is that some *tenets* of science have been so well established that, for all practical purposes, they *are* "impervious to challenge". Such tenets include

- Greenhouse gases in our atmosphere are responsible for making our planet habitable
- Without greenhouse gases in our atmosphere the Earth would be about 60 degrees F cooler
- Increasing greenhouse gas concentrations in the atmosphere will increase the Earth's equilibrium temperature
- CO2 and methane are some of the "non-condensing" greenhouse gases
- Water vapor is a "condensing" greenhouse gas and its atmospheric concentration is primarily correlated to temperature

In addition, scientists both make direct measurements of the Earth's climatic variables and use scientific techniques to deduce values for the same variables for the climates of the past. These observations and deductions include the following (which are generally accepted as "fact"):

- In the last 5 million years
 - In the Pliocene (about 3-5 million years ago) CO2 levels were around 400 ppm (which is where they are now) and global sea level was anywhere between 30 and 90 feet higher than it is today.
 - The sea levels rose about 30 feet/°F as the Earth warmed after the last glacial maximum
- In the last 8,000 years (Holocene):
 - Atmospheric concentrations of CO2 varied between 260PPM and 280PPM
 - Sea levels varied risen about 7 meters in the last 7000 years and about a meter in the last 4000 years
 - The Earth' average global temperature varied within a range of less that 1°F
- Since about 1870:
 - The Earth's average atmospheric temperature has increased about 1.8 degrees F
 - The atmospheric concentration of CO2 has increased from about 270ppm to about 400ppm
 - Cumulative emissions of CO2 since 1870 are set to reach 2015 billion tons in 2013, with 70 percent caused by burning fossil fuels and 30 percent from deforestation and other land-use changes,
- Recent Observations
 - o Atmospheric concentrations of CO2 are increasing about 2ppm/year
 - The Earth currently receives more energy from the sun than it emits
 - The oceans absorb about 80% of the "excess" energy
 - The Earth (oceans and atmosphere) has been warming at a relatively steady rate for about 40 years (since 1970) – about .016 degrees C/year

- During the last 15 years more of the "excess" energy has gone into the oceans (and less into the atmosphere), resulting in smaller increase in the Earth's atmospheric temperature
- The volume of Arctic ice has been declining steadily since 1990

Although such values can never be "exact", scientists have enough confidence in them to reach many conclusions about the Earth's climate which should be treated as facts, as no valid scientific theories have been proposed which show otherwise.

- Conclusions
 - Much (if not all) of the increased atmospheric CO2 resulted from human activities (burning of fossil fuels, agriculture, land clearing, etc.)
 - Humans are primarily responsible for the increase in atmospheric CO2
 - Humans are primarily for the increase in the Earth's average temperature
 - Arctic sea ice will likely disappear in the summer sometime in the next 20-30 years (and may disappear in next 5 years)
 - There is a reasonable chance that the "equilibrium sea level" for an atmosphere with 400ppm CO2 is at least 30-50 higher than today
 - 0

Not only do these conclusions make sense, but there is also no reason to debate them until another plausible theory can be advanced.

The only reasonable items to debate are

- A reasonable value for "climate sensitivity" (in order to project future temperature increases)
- Costs (and policies) associated with taking aggressive action on reducing CO2 emissions
- Costs associated with increased global temperatures (due to sea level rise, ocean acidification, storms, droughts, health impacts, etc)
- Our moral responsibly to future generations
- How much money we are willing to spend on reducing CO2 emissions
- A reasonable target for atmospheric CO2