Definitions

Greenhouse effect - The process by which radiation warms the planet’s surface above what it would be without the atmosphere.

Climate Change - Long-term change in the earth’s climate.

Global Warming - Gradual increase in the earth’s temperature primarily due to the Greenhouse Effect.

Skeptic - Basically folks who require evidence which supports conclusions. Describes scientific thinking.

Denier - A person who refuses to accept scientific evidence which supports conclusions.

Models - Tools used by scientists to make scientific conclusions easier to understand. They could be visual, mathematical or computer models. Models are continually updated when new data is discovered.

Scientific Proof - An exercise in logic. Generally something that is backed up with evidence. It may support or reject an hypothesis.

Feedback Loop - Where an activity causes changes which affects the activity itself. eg. Higher temperatures melt permafrost which releases trapped methane that causes the temperature to rise even more.

Carbon Cycle - Carbon naturally cycles from CO2 to organic compounds and back again. This balance fluctuates over long periods of time as climate changes. Millions of years ago over a period of millions of years some of the carbon was preserved as fossil fuels (and carbonated rocks). Burning of fossil fuels rapidly releases CO2 which took millions of years to accumulate, upsetting the natural balance.

The formula for the natural cycle includes Photosynthesis. This process unites carbon dioxide and water with the addition of energy (light) to produce glucose and oxygen. The reverse process of respiration combines oxygen with glucose (organic compound) to release carbon dioxide, water and energy. (This energy provides our body heat.)
History

CO₂ was known by its properties in the 1700’s, first studied by van Helmont, Black and Priestly. Priestly used it to make sulfuric acid and “Soda” water. (1)(2)(3)(4)

The original concept of the greenhouse effect dates back to 1807 with Joseph Fourier. “On the Propagation of Heat in Solid Bodies” to the Paris Institute

In 1859 John Tyndall established that CO₂ was a greenhouse gas. (5)

In 1895 Svante Arrhenius recognized that burning fossil fuels could alter the earth’s climate. (6)(7)

In 1938 Guy Callendar had compiled empirical evidence from the previous 50 years that the effect was already discernible. (8)

Callendar’s Hand drawn chart superimposed of actual records.

In the 1950’s, work by Gilbert Plass, Hans Suess and Roger Revelle led to studies by Charles Keeling who published in the early 1960’s that atmospheric CO₂ was steadily rising. (9)(10)

CO₂ levels are now permanently over 400 ppm, highest in history.
In 1965, President Lyndon Johnson in a ‘Special Message to Congress’, recognized that CO₂ from burning fossil fuels altered the atmosphere. (11)

In 1968, the National Climate Act passed. It was an interagency program that conducted climate research, provided climate information, and supported policy decisions in the United States. (12)

In 1979, the JASON committee predicted that CO₂ would double and a temperature rise of 2-3 degrees C. would be achieved by 2035. Polar warming would be as high as 10-12 degrees C. (13)

As a result, a second NAS panel re-examined the data and the 1979 Charney report confirmed the data that burning fossil fuels was leading to increased CO₂ in the atmosphere and was causing the rise in the earth’s temperature. (14)

In 1980, the Energy Security Act was passed. It provided for developing renewable energy sources. (15)

In 1983, the Carbon Dioxide Assessment Committee published a 496 page report summarizing CO₂ research that had been completed. (16)

In 1988, the U.N. Intergovernmental Panel on Climate Change (IPCC) was formed. To date, all reports of this panel have confirmed that human activity is the leading cause of the climate changes we are seeing. (17)

In 1992, the U.N. Framework Convention on Climate Change met in Rio de Janeiro and called for immediate action to reverse mounting greenhouse gas emissions. George H.W. Bush signed on and the U.S. Senate unanimously ratified it. (18)

In 1997, the U.N. meeting in Kyoto, Japan passed the “Kyoto Protocol” a treaty which set targets on CO₂ emissions in all industrialized countries of the world. The United State signed but did not ratify the agreement and has still not ratified it. (19)
Politics

The science seemed to be settled and politically accepted. So what happened?? Let’s go back a little.

The George C. Marshall Institute was organized in 1984 to defend and promote President Reagan’s SDI program. Scientists at the time were saying the program would not work. Founders Fred Singer & Fred Seitz were physicists who had worked with rockets and bombs.

Over the next few years the George C. Marshall Institute promoted ideas contrary to science findings on acid rain, CFC’s effect on the ozone layer, and health effects of smoking.

After the IPCC was formed in 1988, the Marshall Institute added climate change to their agenda. They began to politicize the issue in the press and with elected individuals, planting the idea that there was no scientific consensus.

Also in 1984, the Heartland Institute was formed to “…discover, develop, and promote free-market solutions to social and economic problems.” They are now the most dominant anti-climate change organization in the USA. Fred Singer is now working for the HI.

In 1994, the Heartland Institute took on climate change even though they say they are an “…organization that focuses on economics, not science.

So this is their view: “If AGW is true, then stopping or preventing it requires higher taxes, more income redistribution, more wilderness preservation, more regulations on corporations, “smart growth,” subsidies for renewable energy, and on and on. In other words, many of the policies already on the liberal political agenda.”

The HI is extremely influential in congress and with the press. They host fake Climate Symposia, fabricate lies about legitimate scientists, publish copious false information and create billboards like the one below. Their face to the public comes through the conservative press, primarily FOX News and Rush Limbaugh (20)
So What’s the Fuss?

Following are some of the arguments deniers are using.

Argument #1 ‘Climate is always changing.’ Yes, But?

We see a downward trend since about 8,000 years ago till 1900.

Michael Mann’s ‘Hockey Stick’ Graph

We have been above average since 1980.
Skeptic’s View

Not on this chart is that the past few years have been the hottest on record.

Temperature Vs CO2 - Past records show CO2 was not the forcing issue as it is now.
Excuse # 2 ‘It’s the Sun’ —– No it isn’t.

Temperature, CO₂, and Sunspots

Excuse # 3 ‘Models are Unreliable’ Are they?

Sea level rise is at the high end of models.
Excuse # 4 ‘It’s not that bad.” - Some of the problems caused.

Melting Glaciers
Sea Level Rise
Migration Patterns Disrupted
Diseases

Food Production
Wildfires
Weather Extremes
Acidification of the ocean

Excuse # 5 ‘No Consensus’

Oreskes, 2004
1993-2003 100% of 928 papers
www.sciencemag.org/content/306/5702/1686.full

Cook, 2013
1991-2011 97% of 12,000+
http://iopscience.iop.org/1748-9326/8/2/024024/article

Excuse # 6 ‘Temperatures are not reliable’

Heat island effect? After Anthony Watts brought this up as a possible problem. Scientists double checked their work to find that rerunning the figures taking Watt’s complaint into account gave the same results.
Excuse # 7 ‘Plants and animals can adapt’

**Extinction Risk From Climate Change**

“...we predict, on the basis of mid-range climate-warming scenarios for 2050, that 15–37% of species in our sample of regions and taxa will be ‘committed to extinction’.”

[http://www.nature.com/nature/journal/v427/n6970/full/nature02121.html](http://www.nature.com/nature/journal/v427/n6970/full/nature02121.html)

**Has the Earth’s sixth mass extinction already arrived?**

“Our results confirm that current extinction rates are higher than would be expected from the fossil record, highlighting the need for effective conservation measures.”

[http://www.nature.com/nature/journal/v471/n7336/full/nature09678.html](http://www.nature.com/nature/journal/v471/n7336/full/nature09678.html)

Excuse # 8 ‘Antarctica Ice is Expanding’

True, maybe, but this does not negate global warming. Wind patterns keep ice close to shore. Fresh water from ice melt freezes dilutes ocean water and freezes faster.
Excuse # 9 ‘Climategate’

Nine studies from around the world found no improprieties in the research found in the stolen papers. [http://www.skepticalscience.com/Climategate-CRU-emails-hacked.htm](http://www.skepticalscience.com/Climategate-CRU-emails-hacked.htm)


Excuse # 10 ‘Money’

The claim is made that only the scientists who reach the conclusion that Climate Change is real will receive grant money. There is no basis for this claim, only unfounded insulting accusations.

Excuse # 11 ‘Scientists won’t debate us’

Scientists have debated deniers in the past and some may still do it occasionally; however, there is no benefit in doing so. These debates are rigged in favor of the deniers. First: Scientists have answered and debunked all of their questions. The deniers just refuse to accept them. Second: In these ‘debates’ deniers will throw out a laundry list of questions making it impossible for the scientist to respond in the time alloted. Then the denier declares ‘victory’.

‘Ask a Scientist Program’
[http://www.nasa.gov/content/goddard/this-september-ask-a-nasa-climate-scientist/index.html#.UiiitWWTrc4x](http://www.nasa.gov/content/goddard/this-september-ask-a-nasa-climate-scientist/index.html#.UiiitWWTrc4x)