THE PRINCETON PACKET

SOLUTIONS

By Huck Fairman

The Earth was hot before – what's the difference today?

Our planet has been hot before. There were tropical rain forest in the Arctic. But that was 56 million years ago, long before homo sapiens evolved, and civilizations developed.

What are some of the details? Again, after the extinction-causing asteroid collision with the Earth, and starting 56 million years ago, the planet was already comparatively warm, with sea levels much higher than today.

But approximately at that point, global temperatures began to increase, and they continued for about 200,000 years. In a mere 20,000 years the world's temperature increased by 5 – 8 degrees Celsius, or approximately 40 degrees Fahrenheit. The Arctic oceans reached 70 F. This warming is known as the Paleocene-Eocene Thermal Maximum (PETM). It allowed rain forests to expand beyond where they had been. Fossils of tropical plants and reptiles have been found in Arctic regions, in marine sediment samples.

The cause of this warming is not certain. It may have resulted from the release of "biogenic" carbon, freed by wild fires. And/or it may have come from an increase in volcanic activity, which suddenly exposed seams of coal and their carbon. And/or again, the melting tundra, as the planet warmed, released Methane gases, which further warmed temperatures.

Science notes, however, that the rate in which carbon was then released into the atmosphere was only a fraction of today's rate of carbon releasing. Back then, the release rate was 1.7 billions tons of carbon per year and it occurred over thousands of years.

But, it was enough to warm Arctic regions to where they supported tropical forests, their reptile residents and even early primates. It also warmed oceans to the point where creatures – plankton in particular – could not survive, and those oceans became more acidic. This devastated coral reefs, the breeding sites for many ocean species. Generally, then, in one way or another, this warming had very noticeable impacts on life around the planet.

The PETM did end however, approximately 34 million years ago, for reasons also not clearly understood. Dying plants sequestering carbon and sinking down to the ocean floors may have been one cause of the cooling. But that cooling continued and ice caps returned to the poles.

One conclusion drawn from the entire epoch is that carbon releases and temperature changes starkly effect the surface of our planet, from the coming and going of ice sheets, to forests and their residents, and ocean levels and other topographical and vegetation changes.

Today, alarmingly, we are witnessing similar changes: planetary warming, habitat change, ocean acidification, and the potential for large methane releases – all the results from the massive amount of carbon that our civilization is producing and releasing.

In 2014, our planetary release rate was found to have increased to 9.8 billion tons of carbon per year. This is more than 5 times greater than the release rate at the peak of the PETM. And the result is that our world is warming faster than it did back then. The increases we have experienced have occurred in just over the last 100 years, as opposed to the thousands of years it took that earlier warming.

Looking carefully at the changes during the PETM can give us a preview of the changes we are imposing on the planet. The changes to our environments could well be as extreme as those documented back then, and all evidence warns that they are happening much faster.

We know how to halt the release of carbon into our atmosphere. To do so there are a number of changes we need to make. The question is: will we? And most essentially, will we get off carbon? If not, the past can show us what we shall reap.