



## GREENHOUSE EFFECT

## Not a creation of demented minds

QUAMRUL HAIDER, Ph.D.

THE Earth's atmosphere is a window for radiation streaming in from the Sun and for infrared radiation flowing out from the Earth. About 60 percent of solar radiation, mostly in the visible part of the electromagnetic spectrum, gets through to the surface and heats the Earth. The Earth emits, in turn, infrared radiation. But the opacity of the atmosphere to infrared radiation reduces the heat loss and makes the surface warmer than it would be if the radiation could escape freely. This kind of trapping of infrared radiation by transparent glasses warms an actual greenhouse, and hence it earned the moniker "greenhouse effect."

Water vapor plays the major role in the greenhouse effect, with carbon dioxide playing a minor role. Other lesser players are methane, nitrous oxide, and fluorinated gases. These gases are known as greenhouse gases. They have a lifespan ranging from a few years to thousands of years, long enough to become well-mixed in the atmosphere. Once mixed, their concentration is roughly the same all over the world, regardless of the source of the emissions. With the right concentration of these gases in the atmosphere, greenhouse effect will be comparatively gentle and the Earth will be comfortably warm.

What will happen if the atmosphere has no greenhouse gases? There will be no atmospheric blanket insulating the ground from space. Thus, all the infrared radiation will escape into space. Thermodynamic calculations show that a consequence of this will be a lowering of the ground temperature to -18 degrees Centigrade. The Earth would be an inhospitable planet, too cold to sustain life. This is called "no-greenhouse effect."

The amount of energy a planet receives from the Sun must be precisely balanced with the amount of energy it



returns to space. The greenhouse effect cannot change the amount of incoming solar radiation and thus cannot change the amount of energy the planet returns to space. So how can the greenhouse effect make a planet warmer while the overall energy balance remains unchanged?

The greenhouse effect does not generate heat; it makes the planet warmer by limiting the loss of heat to space. We cannot regulate the amount of water vapor in the atmosphere needed for a mild greenhouse effect as its source is the oceans. We can, however, control the concentration of carbon dioxide which plays the major role amongst the minor players in determining the temperature of the Earth. If it is high, Earth will return less energy than it received from the Sun. Consequently, the surface will rapidly heat up from its comfortable level leading to what is known as Global Warming. If the concentration is low, Earth will return more energy, and the planet will cool down.

It is obvious that neither too little nor too much carbon dioxide is beneficial for the Earth. The greenhouse effect is the only reason why our planet is not frozen over. While it makes the Earth livable, greenhouse effect is also responsible for increasing the surface tempera-

ture of Earth.

The oceans are a major reservoir for carbon dioxide, storing 60 percent more than the atmosphere. As the Earth's temperature rises, the ocean's ability to dissolve and hold carbon dioxide will decline. They will then release into the atmosphere much of the absorbed carbon dioxide, thereby boosting the greenhouse effect.

Greenhouse effect is on the ascendancy, brazenly staring us in the face. Science does not lie and the facts are in front of us. So are the global dangers posed by greenhouse effect. Sea levels are rising at an alarming rate; bizarre and violent weather patterns have grown in numbers in recent years.

According to former U.S. Vice-President Al Gore, "We are facing a global climate crisis. It is deepening." Anti-environmentalists, in contrast, believe greenhouse effect is "phony science" and "only God can change the climate, and the idea that manmade pollution could affect the seasons is arrogance." These scientifically challenged people perhaps think that some demented scientists with ulterior motives created an illusion of greenhouse effect by manipulating scientific data.

We are probably within a few decades of time beyond which the continued degradation of the environment will become an irreversible process. There is still time for the fabled late-starting hare to catch up with the tortoise. We have to make everyone aware that continued inaction on our part in dealing with the problem is unconscionable for our generation, and suicidal for the next. American environmentalist Wendell Berry points out: "To cherish what remains of the Earth and to foster its renewal is our only legitimate hope of survival."

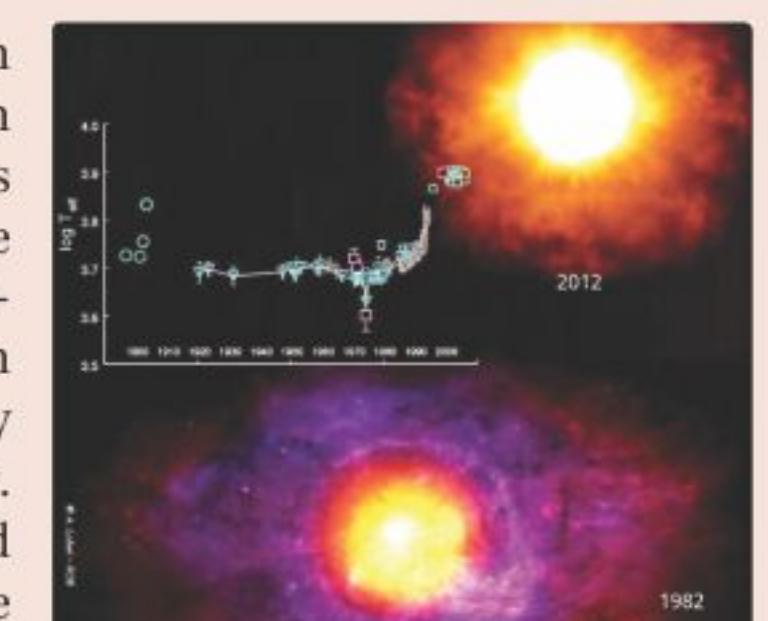
The writer is a Professor in the Department of Physics & Engineering Physics, Fordham University, New York



GALACTIC POWERHOUSE

## Hypergiant enigma solved?

A European research team has published the results of a 30-year study of an extraordinary hypergiant star. They have found that the surface temperature of the super-luminous star HR 8752 increased by about 3000 degrees in less than three decades, while it went through an extremely rare stage called the 'Yellow Evolutionary Void'. The discovery marks an important step closer to unravelling the evolution of the most massive stars.



With this discovery a crucial 'missing link' in the evolution of hypergiants has been found.

A team of astronomers from six European countries, including the Royal Observatory of Belgium (ROB), has investigated the hypergiant star HR 8752 for 30 years while it traversed the 'Yellow Evolutionary Void'. The 'Void' is a short stage in the lives of the most massive stars when they become very unstable. The team finds that the surface temperature of HR 8752 rose surprisingly fast from 5000 to 8000 degrees in less than 30 years. The research results were very recently published in the journal *Astronomy and Astrophysics*. The discovery is an important step forward to resolve the enigma of the hypergiants, the most luminous and massive stars of the Galaxy.

Hypergiants can shine millions of times brighter than the Sun, and they often have a diameter several hundred times greater. HR 8752 is a quarter million times more luminous than the Sun. The powerhouse is therefore visible with normal binoculars at large distance from Earth in the Northern constellation of Cassiopeia. There are currently only 12 hypergiants known in our Galaxy.

The 'Yellow Evolutionary Void' is a unique stage in the short life of a hypergiant when its temperature and luminosity can quickly change.

Source: *Science Daily*



NYASASAUROUS

## Oldest dinosaur?

WHAT may be the most ancient dinosaur ever found or at least a very close relative to the oldest currently known examples could push the appearance of the awesome beasts back to 243 million years ago.

Paleontologist Rex Parrington of the University of Cambridge in England discovered the fossil in the early 1930s, preserved in a rock formation known as the Manda Beds in Tanzania's Ruhuhu Valley. Now, a team of scientists has taken a fresh look at Nyasasaurus parringtoni. It lived during the Anisian age of the Middle Triassic period, about 10 million to 15 million years earlier than the oldest confirmed dinosaurs. The finding suggests dinosaurs evolved and diversified over a longer time frame than scientists thought, the team reports online December 4 in *Biology Letters*.

So far only fragments of the creature's backbone and upper arm bone have been found, but these bear telltale features of dinosaurs, such as rapid bone growth. More fragments are needed to determine whether the fossil is in fact the oldest dinosaur or a member of the nearest sister group.

At 2 to 3 meters long and no more than 1 meter tall, Nyasasaurus was hardly a king of the beasts. It would have been slightly larger than a golden retriever but with a very long tail, says Sterling Nesbitt, a paleontologist at the University of Washington in Seattle. Nesbitt and colleagues estimate that the creature weighed about 20 to 60 kilograms.

The team examined the fossil's structure and microscopic anatomy and then compared it with members of known animal family trees. Computer analyses showed that Nyasasaurus was either part of the dinosaur lineage or an as-yet-unknown group that's even closer than dinosaurs' nearest currently known relatives, silesaurids.

Source: *Science News*



The creature is either the oldest known dinosaur yet discovered or a close relative to the oldest currently known specimen.