



# SENIOR SCIENCE SOCIETY

## NEWSLETTER Vol. 1, No. 3, April 2013

### NEXT GENERAL MEETING

May 13, 2013; The speakers will be Dave Webb and Deidre DeRoia on "Whips in the Night".

### CLIMATE CHANGE

Dr. Lee Magness presented the results of his personal study on climate change (actually a hobby) at the November meeting. Although he was originally among the doubters, Lee has come to believe that change is in the wind (no pun intended), although there are still large error bars for the estimates of the speed and extent of the changes.

That CO<sub>2</sub> levels have been increasing in the Earth's atmosphere over the past 2.5 centuries is well established in ice core air samples and other direct/proxy measures. That this is largely due to human activities is clear from records of fossil fuel consumption, as well as from isotopic analyses. The world climate has clearly been warming over the past century as well, but changes in the Earth's overall climate have also occurred many times prior to human activity. However, examinations of many of these earlier changes in climate reveal that the composition of the atmosphere often played a direct forcing role (e.g. high methane and CO<sub>2</sub> levels enabled a weak young Sun to warm the early Earth sufficiently for the presence of liquid water, high CO<sub>2</sub> levels and temperatures occurred during periods of extensive volcanism, and low CO<sub>2</sub> levels and low temperatures occurred during periods of extensive mountain weathering or photosynthesis). In other cases, greenhouse gases (GHG) may have merely reinforced responses to external drivers, such as natural solar cycles or periodic changes to the shape of Earth's orbit (the Ice Ages).

The science behind GHG effects, with the interplay of positive and negative feedback effects, are complicated. Furthermore, the response times of some of the eco-systems are sluggish: for example, it takes the ocean about forty years to fully react to an external temperature increase. The oversimplified view that the science is presented by politicians and the media likely contribute to the skepticism of some scientists, engineers, and the general public. Probably the most egregious of these oversimplifications is to view the atmosphere as a homogeneous envelope around the Earth, rather than one where density, pressure and temperature change with altitude. Without this more detailed model, the major feedback mechanism by which GHGs cause warming, by increasing the water vapor contents higher in the atmosphere, is not even addressed. Other mechanisms can be non-obvious, such as the albedo effects of deserts vs. forested areas, and CO<sub>2</sub> and methane feedbacks of soil and the oceans. Calculations of the net change in the heat budget of the Earth depend upon the balance between competing large effects, some with large error bars, so estimations of future climate conditions are difficult to make with complete confidence. (continued above, right)

### ARTICLES SOLICITED

If you have a contribution for a future issue of this newsletter, please contact ([bonniesbru@comcast.net](mailto:bonniesbru@comcast.net)).

There were several important teachings: currently, global temperature is slowly rising; the United States is no longer the prime contributor of greenhouse gases, China and India are; the oceans are slowly rising, with current models indicating a minimum rise of around four feet in the next hundred years; and there is not a lot that can be done in the short term to make a significant difference in these trends



### OUTREACH RESULTS

The SSS has participated in four school-related STEM Events this year, reaching about 240 children, plus parents teachers and other interested parties. Three of the events were associated with the Harford County Public School system with the other event being sponsored by the Harford Community College. Seeing children engaged in science and engineering is very rewarding to our SSS participants!

### SCHOOL OUTREACH

The SSS continues to bring new outreach programs to the schools of Harford County. To date, the following events are scheduled or are under development: Our POCs are listed.

- Riverside Elementary School – April 16, agenda finalized. (Bruce Burns) .
- Mountain Christian - April 29 (night. new date due to the late March snow) . (Clarence Fry).
- Southampton Middle School's Environmental (STEM) Day - May 13 (day). (Dick Schwanke).
- Forest Hill Elementary School STEM Program – May 15 (day). (Ed Schmidt).
- TNT Day @ the Harford Community College – May 22 (day). (Susan Luckan).
- Red Pump Elementary School STEM Day – May 22 (day). (Bruce Burns)
- North Harford Elementary School - June 3 (night). (Bruce Burns).
- STEM Teaching Academy at HCC – 29 to 31 July (day). (Bruce Burns).

If you wish to participate in these events or develop a new module, please feel free to contact one of the SSS contacts.