

## Capital Science 2014 Featured Speakers



**Professor of Biological Sciences Eugene Williams (Salisbury University)**

### **The Fish of Iceland and Climate Change (Saturday Morning)**

We used Icelandic Arctic charr to test the hypothesis that within a species a population of individuals living for a very long time in a thermally stable environment will be less able to respond to changing temperature than closely related individuals living in a thermally complex environment. As Iceland emerged from the last ice age 10,000 years ago populations of anadromous Arctic charr became landlocked. Over that time these confined populations have experienced very different thermal conditions. Some have inhabited water with extremely variable temperature while others have lived with very stable temperature. Yet these populations remain members of the same species. We collected charr from Myllulækur, a site with highly variable temperature, and Kaldárbotn, where fish have lived at a constant temperature of 5°C for thousands of years. In the laboratory Charr were held at their habitat temperature for 14 days before the temperature of their tanks was raised by 10°C over several hours. White muscle was then assessed for the activity of lactate dehydrogenase (LDH), an enzyme of energy metabolism known to be altered by some fish in response to a temperature change. Forty-eight hours after the temperature shift, Charr from the thermally variable environment, and closely related charr from a local aquaculture facility (Hólar, Iceland), exhibited a significant change in LDH activity. Charr from the thermally stable environment failed to show any change. These data support the hypothesis and suggest that some populations of Icelandic Arctic charr may be among those animals most susceptible to the detrimental effects of climate change.



**Author and Astronomer Sethanne Howard (USNO Retired)**

**Impacting the Earth: Asteroid Meets Earth  
(Saturday Lunch)**

From Ceres to Apophis the story of asteroids is the story of our planet. "We humans likely owe our existence and current position atop the animal food chain to these space rocks." What is the world doing about possible future impacts?



**Climatologist Claire Parkinson (NASA Goddard Space Flight Center)**

**Changes in Arctic and Antarctic Sea Ice as a Microcosm of Global Climate Change  
(Late Saturday Afternoon)**

Sea ice is a vital component of the global climate system and has now been well observed since the late 1970s through satellite observations. The changes the polar ice covers have undergone over this period can serve in some ways as a microcosm of the changes in global climate. This talk will describe the role of sea ice in the climate system, the ability of satellite sensors to measure sea ice coverages irrespective of the amount of sunlight and under cloudy as well as cloud-free conditions, and key results from the satellite record, with consideration of those results in the broader context of global climate. Although results show considerable interannual variability in both hemispheres, they also show a prominent downward trend in Arctic sea ice coverage and a much lesser upward trend in Antarctic sea ice coverage, illustrative of the important fact that climate change entails spatial contrasts. The decreasing ice coverage in the Arctic correlates well with contemporaneous Arctic warming and exhibits particularly large decreases in the summers of 2007 and 2012, influenced both by preconditioning and by atmospheric conditions. The increasing ice coverage in the Antarctic is not as readily explained, but the spatial differences in the Antarctic trends suggest a possible connection with atmospheric circulation changes that have perhaps been influenced by the Antarctic ozone hole.



**Oceanographer Captain Philip Renaud's (Living Oceans Foundation)**

**Can coral reefs survive the onslaught of man and climate?**

**(Saturday, Dinner 5:30pm)**

Coral reefs have exhibited remarkable resilience throughout deep time. Modern reef building corals have been in existence for over 200 million years. The wild swings in earth's climate, accompanied by large sea level fluctuations have controlled coral's boom and bust cycle. Five major extinction events over the fossil record have, on each occasion, effectively reset the coral reef clock. For example, the end-Cretaceous cataclysm terminated the reign of the dinosaurs, rain forests and coral reefs. But within a million years or so, rain forests covered the earth and coral reefs proliferated. Adding to the suite of natural stressors, humans have systematically over-exploited coral reef resources. Exploitation of reef resources has increased proportionately to human population growth and industrial age capabilities over the past 100 years. The abundance and diversity of "free" coral reef resources have collapsed following the predictable path of the "tragedy of the commons." Human geo-engineering talents have dramatically altered coral reef environments through land development, land reclamation, eutrophication, general water pollution, and habitat destruction. Industrial age air pollution has boosted the greenhouse effect thereby warming the oceans beyond the tolerance of modern reef building corals causing frequent mass "bleaching" events. The onslaught of man and climate on coral reefs has reached unprecedented levels. Can coral reefs survive the onslaught of man and climate?



## **Computer Scientist and WAS Awardee Mary Theofanos (NIST)**

### **Too many passwords – are we there yet? Mary Theofanos, NIST (Sunday Morning)**

The human computer interaction is a critical component of cyber-security that has often been overlooked especially with respect to computer security policy. Policy or decision makers have a great deal of data with respect to security but little or no data with respect to usability. This lack of data has led to solutions that are not optimal for users and thus may undermine overall computer security. Consider passwords; theoretically a longer password that is changed frequently is more secure, however, from a usability perspective how users manage this process affects the overall security. There is a great deal of research about password usage on websites but little actual data on true password usage within large organizations like the United States Federal Government. For instance we don't even have a good idea of how many passwords the average Federal employee has to juggle in the course of their job, how they keep track of their passwords or their strategies for creating passwords. The goal of this effort is to provide decision makers with actual data on passwords that takes into account user behavior so that password policies are secure in practice and not just secure in theory.



## **Paleontologist Ray Stanford**

### **Tracking Dinosaurs in the Smithsonian's Backyard (Sunday Lunch)**

Until recently, Cretaceous footprints were virtually unknown in the eastern U.S.A. Now, discovery of hundreds of footprints in iron-rich siliciclastic facies, mostly out of the Patuxent Formation (Potomac Group) of Aptian age, has vastly broadened knowledge of dinosaur and other vertebrate fauna that once lived in what might now be figuratively called the Smithsonian's backyard.

A wide range of dinosaur footprint and small trackway discoveries include those of theropods, sauropods, ankylosaurs, and ornithopods. Several pterosaur footprint types have been recovered, along with diverse types and sizes of mammal footprints, and even crocodylian and chelonian ichnites.

The unprecedented array of vertebrate ichnite discoveries suggests, conservatively, a diversity of over 22 morphotypes. That is about three times the previous maximum estimate for any other known Early Cretaceous vertebrate ichnofauna.

An exciting feature of the Patuxent track assemblage is the large proportion of small dinosaur tracks indicative of hatchlings, independently reinforced by the author's discovery of a hatchling nodosaur, *Propanoplosaurus marylandicus*. The Patuxent evidence suggests the proximity of nest sites of diverse dinosaur types in what was then a deltaic floodplain.

Most surprisingly, the Patuxent finds include the largest mammal and pterosaur footprints ever reported anywhere, challenging previous concepts of the upper limits of size for those Cretaceous vertebrates.