Engaging Our Inner Scientist to Foster Connections and Broaden Our Understanding of This Land

By Greg Lester and Zabe MacEachren

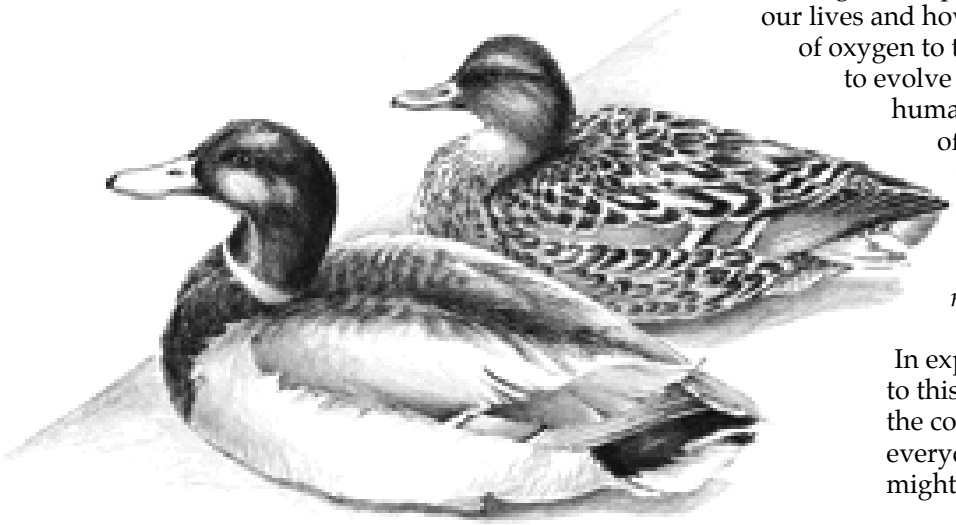
This workshop came about because a storyteller and a scientist kept going out for walks in the forest and explaining the things that they saw to each other. The storyteller (Zabe) used folklore, Native myths and imagination to explain the wonder of the land, while the scientist (Greg) used chemical analysis, a geological timeline and physical principles to explain things. After many discussions about why they each explained things differently, they realized that different purposes and ways of seeing the world gave rise to different forms of engagement and occupations. There is a time and place for using creative storylines to captivate a young audience, but there is also a time and place for understanding the way the periodic table can be used to explain everything between the core of the Earth and outer space black holes. It is the wonder and desire to be outside on the land sharing our understanding of things that is important. For many educators working with elementary students, it is easy to simplify scientific concepts, but we must always remember that the inherent natural curiosity aroused when our senses interact with the landscape creates the opportunity for the development of interdisciplinary, integrated, higher thinking skills. So it is with this intention that we polished our magical thinking wand and donned our laboratory skull caps to explore some of the inner workings of the environment that succour our daily existence.

We structured our workshop to offer the participants choices among many simple story titles and questions, which, like a mature tree, offer a myriad of branches and roots, pathways that can be taken in order to illustrate the connection between science and the wonder we observe in our daily lives. The following are some examples and briefly outlined concepts that we offered. In this article, we will present just enough to spark a bit more inquiry so that you can hopefully provide explanations and tell stories at levels that are appropriate for your students.

Here are some of the choices we presented:

The story of life on Earth as told by your cast iron frying pan.

We went back in time 200 million years (exploring the concept of geological and ecosystem time) and told the story of a species (stromatolites) that changed the Earth's atmosphere, as we are doing now, causing iron to rain from the seas, wiping out numerous species. We then explored the resulting iron deposits, the role iron plays in our lives and how the concomitant addition of oxygen to the atmosphere allowed life to evolve in a direction that includes humans. We used the example of seasoning a frying pan to illustrate the process in reverse.



Why does a copper kettle make a better cup of tea?

In exploring the many answers to this question, we dealt with the concept of heat transfer in everyday materials that we might experience while camping,

such as tea kettles, rocks by the lake and fire, and even snow insulation in a quinzhee. Copper transfers heat at a faster rate than other cooking materials.. (It is useful to know that aluminum and cast iron work best when you want that cup of liquid hot now.) We also deconstructed two cookstove designs to demonstrate their efficiency in moving heat from a fire into your cook pot.

Purple New England asters—locoweed (neurotoxin) or critical vitamin supplement?

We used the example of the New England aster (the purple flower we are all familiar with in the autumn) to introduce the concept and broaden our understanding of biogeo-indicators, plants that can tell us much about the geochemistry of the soil, bedrocks and dependent ecosystem we are in and some of the perils of transporting species out of their native habitat. We explained how New England aster concentrates the element selenium from the soil it grows in. In eastern North America, the native home of the aster, the bedrock and the derivative soils contain very little selenium. When the plant was introduced to the selenium rich soils of western North America, the plant took up toxic levels of selenium; when consumed by cattle, this kills the cattle and poisons the milk so it is unfit for human consumption. At the same time, trace amounts of selenium are absolutely critical to human health.

In the process of exploring the seemingly paradoxical effects of selenium, the story helps introduce the complex nature of chemical-human interactions and illustrates the importance of scientific literacy in facilitating informed decision making.

What does a foram's diet have to do with climate change?

In this presentation, we introduced the foram, one of a myriad of simple, single-celled creatures that have lived in the oceans for millions of years. We explained how forams and their cohorts remove billions of tons of carbon dioxide from the atmosphere and help buffer (balance) the CO^2 equilibrium of the air we breathe. In the discussion, we shared the importance of variable rates of change (through time) in global processing. This led to the question, can the oceans help mitigate the global warming caused by CO^2 emissions? In the long term, yes; in the short term,no; knowledge and understanding of rates are requisite to the adoption and design of wise public policies.

Corollary branches of the story explore the limestone seen in southern Ontario and how it was formed and how the chemistry of bedrock impacts everything from the food we eat, the roads we drive on and the quality of our drinking water. (Note: When Greg learned all this in a lab, he used a $500 plus taxonomy textbook in trying to decode which foram he was looking at in each fossil. He had to determine the period of time and ocean it lived in after sorting through hundreds and hundreds of diagrams of cute little forams. Learning foram identification makes learning to identify a few local plants a breeze in comparison.)

We had other stories and questions but they will have to wait until you can join us on a hike.

Greg Lester is both a geologist and avid amateur ecologist who divides his time between the forest of Ontario and the near Carolinian forest of Alleghenian plateau of upstate New York. He was very impressed and delighted that the workshop participants were so eager to stretch beyond their comfort zone and deal with scientifically complex, technical material, to better serve their students.

Zabe MacEachren is always amazed at the new colours of rock Greg is able to find along the roadside. She is still very determined to prove that those purple apatite crystals Greg dug up along the roadside near her home in Kingston can be used in casting spells to wake up students to the magic found in the gray, white and black inanimate matter, sometimes referred to as rocks, as well as the chemical formula called photosynthesis that turns plants green.