Natural Radio

News, Comments and Letters About Natural Radio

February 2014

January Musings – I am sitting at my desk writing this column looking out the window at a beautiful blue sky, dotted with white fluffy clouds and a wintry snowy landscape. Just a yard or so from my window is a Serviceberry tree frequented by squirrels and a variety of birds and an occasional raccoon on his way to perform nefarious deeds on or to my roof.

But I was taken aback today, as throughout the afternoon, Robins landed in the tree and peered at me through the window as if to question why I would be inside on such a bright and balmy day. (The temperature actually made it up to 25F after being in the deep freeze of 20 below last week.)

I wondered at why they had arrived in the middle of January and then thought that maybe, just maybe, they were harbingers of an early spring and possibly knew something about the weather patterns that the National Weather Service didn't.

So, off to Google and Wikipedia for information on the migratory habits of Robins. I discovered that Robins don't have regular migratory patterns and it is not unusual for them to winter over in northern climates. Robins' migrational instincts are not driven by temperature or length of the day, but by the availability of food. In late summer or early fall, the Robin shifts its diet from worms and bugs to fruit, and the majority of them assemble in flocks and head southward in search of fruit. They stay where the fruit is until it is gone, and then move on.

My old belief that the Robins arrive with the warm weather was totally discredited. The bulk of them do, but having a few show up in January is normal, and has little to do with the arrival of spring. This was another thing that I thought I "knew" that had a more complex explanation than I first thought it did.

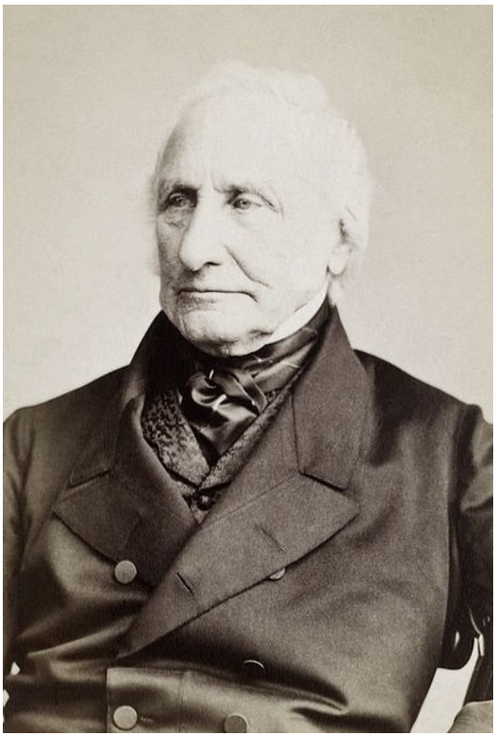
This is the way of science. We observe, we hypothesize an explanation and then we test. Usually, it's the first results that get the publicity and become ingrained in everyone's mind. Often, further research and testing prove the first results wrong or at least makes the answer a little more complex than we had hoped for, but the initial information is what is permanent in the brain.

For example, I have, for a long time worked under the assumption that the best time to hear whistlers is in the pre-dawn and early morning hours, and that has been my experience. But, is it my experience because I listen mostly in the early morning hours because of my expectations? Hmmm.

I found some graphs today as I was researching Prof. Millett Morgan and his work at Dartmouth that would indicate that there are more whistlers heard during the day than in the early morning hours. However, the accompanying text stated that the listening and data recording took place only during times of active whistlers. What exactly does that mean? Some clarification is needed to determine what that data really means. My assumption has been challenged and I need to do more research.

It’s a good thing to periodically question our assumptions and find out if they are really based on fact and the latest research data or if there are some qualifying factors needed to make them a useful approximation.

Early Pioneers **–**The nineteenth century was a time of scientific awakening and a time that greatly challenged the beliefs and assumptions about most natural phenomenon. One new idea was the realization that there might be interaction between the sun and earth and this laid the groundwork for the discovery of the ionosphere and all of the things that go along with it. One of the pioneers in this groundbreaking research was Edward Sabine.



General Sir Edward Sabine was born in Dublin Ireland on October 14, 1788. Sabine was educated at Marlow and at the Royal Military Academy, Woolwich, London, and saw action in the War of 1812. Shortly after the war, he returned to England from Canada and spent the rest of his long life pursing the more peaceful endeavors of astronomy, physical geography and terrestrial magnetism.

Navigation was very important to the British Empire, the ruler of the seas at that time. By the beginning of the nineteenth century it was generally realized that the earth’s magnetic field varied over time and this change complicated compass readings and caused problems with navigation. These were problems that needed to be solved.

Sabine’s interest in earth magnetism was well known and after being elected a Fellow of the Royal Society in April of 1818, Sabine was appointed astronomer for the Ross Expedition to find the Northwest Passage, and charged with making scientific observations such as finding the location of the North Pole and making magnetic measurements.

But when Ross found his passage blocked by sea ice in Lancaster Sound, he retreated and returned to Britain. Sabine was infuriated, having had his expectations raised to a fever pitch and then unable to make the measurements he wanted to make. To make matters worse, a public feud broke out between Ross and Sabine, with Sabine accusing Ross of stealing magnetic measurement data without giving him any credit, and further, not allowing him enough time to take accurate readings during the expedition.

Nevertheless, Sabine published the results of the measurements that he did make in the *Philosophical Transactions* of the Royal Society. He was a meticulous scientist and avoided theoretical speculation in his writings as he believed that the true picture of geomagnetism could only be put together through many observations from across the whole earth.

He had another chance at making useful measurements the next year, 1819. He returned to the arctic as astronomer for Lieutenant William Edward Parry's expedition in search of the Northwest Passage. While on this year and a half expedition, Sabine

noted that changes in magnetic intensity that had occurred since the Ross Expedition. He postulated that these changes were due either to a shifting of the Earth's magnetic poles or a fluctuation in the terrestrial magnetic intensity.

But he still didn't have enough data. To solve this problem of magnetic variation, and the resulting disruption of navigation, Sabine and a number of other physicists felt that a global magnetic survey was needed and worked to persuade the government to establish magnetic observatories throughout the British Empire. The government approved the idea in the spring of 1839 and Sabine was tapped to head the operation with observatories in Toronto, St. Helena, Cape Town, Tasmania and at other stations as determined by the East India Company.

While most of these observatories were small and dismantled shortly after the observations were completed, the one founded by Sabine at Toronto in 1839, The Toronto Magnetic and Meteorological Observatory, is still in existence. It was the first scientific institution in the Canada.

Sabine's analysis of the Toronto records led him to determine in 1852 that magnetic variations had a regular diurnal cycle, but there was an irregular component that correlated very closely with fluctuations in the number of sunspots. The cyclical nature of sunspots had been determined a few years earlier, in 1844, by Heinrich Schwabe, a German amateur astronomer.

Sabine was thus the first to recognize that solar phenomenon affected the Earth's magnetic field and on April 6, 1852 he formally announced that the Sun's 11-year sunspot cycle was "absolutely identical" to the Earth's 11-year geomagnetic cycle. Years before in the early 1700's, Sir Issac Newton recognized and explained the effects of the suns gravity on Earth, but this was a new phenomenon of the sun interacting with the earth and the beginning of ongoing studies of the solar-terrestrial activity.

During his long and fruitful life, Edward Sabine received many awards and commendations for his contributions to science. In 1849 the Royal Society awarded him one of its gold medals for his work on terrestrial magnetism. Sabine died in June of 1883 after a long life of 94 years. In addition to his studies of terrestrial magnetism, Sabine was noted for his experiments in determining the shape of the Earth.

Updates – Renato Romero's website, http://vlf.it, has been updated and there is an excellent receiver article by Luca Feletti and Renato Romero titled, *IDEALLOOP H301 - VLF Loop Receiver - The best compromise between sensitivity and portability*. There is an in-depth technical discussion as well as complete construction information for this "small, portable, sensitive, cheap and easy to build loop."

Also new on the site is a construction article about and underground Schumman Resonance loop receiver, designed and built by by Sven Nordin in Sweden.

As always, the in-depth articles on the vlf.it site are interesting, detailed and well crafted. Many thanks to Renato and his collaborators for creating and maintaining this website.