

SCIENCE, ATMOSPHERE AND MY ART

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Fields of interest: Art & science.

Awards: various types of art awards and/or support from different branches of the Canadian and Quebec Governments from 1991 to 2005-which include four project awards/grants (in the 1990's) for my painting /drawing from-Government of Quebec- Ministere des Affaires Culturelles (1991,1993) & Conseil des Arts et des Lettres du Quebec (1995) and one from the Canada Council for the Arts (1991).

Publications and/or Exhibitions: My work on Red sprites has appeared in many international forums in museums/centers such as The 3rd U.K. Space Art Forum held at the Ferens Art Gallery in Hull, United Kingdom (2001),

SCINEMA'04 at The National Museum of Australia in Canberra & The Australian Centre for the Moving Image (ACMI) in Melbourne (2004),

The Inspiration of Astronomical Phenomena Conference (INSAP V) at the Adler Planetarium & Astronomy Museum in Chicago (2005),

Vedere la Scienza 2005 at the Spazio Oberdan in Milan- Italy (2005).

Abstract: *I am involved in a collaboration based on Red Sprites with American scientist Walter A. Lyons, 2005 President of the American Meteorological Society & President of FMA Research Inc. (Colorado, USA). I have also been cooperating with Dr. Colin Price from University of Tel Aviv- Israel /NASA Space Shuttle Columbia's MEIDEX mission. Red sprites are upper atmospheric optical phenomenon associated with thunderstorms that have recently been only documented using low level television. The first images of a sprite were taken in 1989 and from 1990 to 1994 the space shuttle obtained twenty more images. Despite nearly a century of anecdotal reports from airline pilots, most scientists didn't really believe in sprites until the first images were captured on high-speed video. The blink of an eye last 250 milliseconds: sprites often last only ten. Cameras and computer models freeze sprites in time. I am currently involved in an art & science collaboration-research regarding the psychological aspects of atmospheric & climate change in the Polar region.*

1 RED SPRITES

In 1925, the Nobel Prize-winning Scottish physicist C.T.R. Wilson first proclaimed the existence of brief flashes of light high above large thunderstorms.

Wilson's theory proposed that electric fields create ionization at great heights and could

therefore give rise to discharges, or “sparks,” between clouds and the upper atmosphere [1]. He theorized that such sparks occurred at an altitude of approximately 45 miles and were followed by a burst of upward- and downward- propagating electrical streamers [2]. In 1956, Wilson declared:

It is quite possible that a discharge between the top of the cloud and the ionosphere is a normal accompaniment of a lightning discharge to earth. . . . Many years ago, I observed what appeared to be discharges of this kind from a thundercloud below the horizon. They were diffuse, fan-shaped flashes . . . extending up into a clear sky [3].

Red sprites are upper atmospheric optical phenomenon associated with thunderstorms that have been recently documented using low level television as well as other instruments. The historical attributes of sprites have combined to inspire the designation of an upper-atmospheric optical phenomenon associated with thunderstorms. For nearly a century, the phenomena of red sprites went without even scientific confirmation that it existed and without a name. The only evidence of red sprites was casual observations. Newspaper reports of glowing red flashes in the sky go back at least a century and as a result, the general scientific response, however, was “This cannot be!” For many years pilots also saw strange red flashes of light glowing above the thunderstorm clouds, but never officially reported what they saw, lest it be interpreted as a crazy UFO sighting [4]. Despite this accumulating anecdotal evidence, scientists remained sceptical. In 1989, however, the first camera images of sprites were captured, quite by accident [5]. Spurred by this serendipitous discovery, inspection of videos taken aboard the space shuttle *Atlantis* [6] in the 1990s elicited 20 more visual specimens. The discovery of incontrovertible evidence produced “a major frenzy of excitement” among scientists and subsequently a great cache of inspiration for me.

The first images of a sprite were taken in 1989 (Franz,R.C., R.J. Nemzek, and J.R. Winckler,- Television image of a large upward electrical discharge above a thunderstorm system, *Science*, 249 48-51,1990) and from 1990 to 1994 the space shuttle obtained twenty more images.

Two independent field programs were created and focused their research on this new phenomenon which was inspired by these initial findings. Davis Sentman of the University of Alaska Fairbanks (UAF) sought to record the flashes from an aircraft flying over the Great Plains in the summer of 1993 [7]. During that same summer, playing on a hunch Walter A. Lyons of FMA Research Inc. set up detectors on Yucca Ridge in the foothills of the Rocky Mountains [8]. Within a day of each other, these two research teams had documented what turned out to be a common phenomenon in the mesosphere. It was during this process, that they initiated a new kind of continental-scale field experiment and more importantly a new interdisciplinary area of research [9]. Sentman and Lyons found two broad classes of flash: sprites (named by Sentman) and elves (named by Lyons).

1.1 Lightning’s Angels

After The Glory Project [10], I wanted to continue working with natural phenomena as

my subject matter, particularly phenomena residing in the upper atmosphere. One day, after an exhaustive internet search on new phenomena, the words “red sprite” appeared. I opened the web-page and up popped the first visual image of a sprite. It looked so fantastic that I assumed it could not be real; if it were real, everyone would be talking about it. I soon learned, however, the intriguing history behind sprites, and that this was indeed a newly discovered— or at least a newly corroborated—natural occurrence. I knew immediately that I had found my inspiration for another series of paintings.

I contacted Walter A. Lyons (President of FMA Research Inc. and 2005 President of the American Society of Meteorology) via e-mail, introduced myself and suggested that we might collaborate. Months later, Walter was convinced of my commitment to art & science collaborations then agreed to work with me. Immediately, he wanted a proposal, describing my end of our collaboration, in order to submit for funding to the National Science Foundation. Several months later our application was approved and our sprites collaboration commenced. I created over 200 sprite paintings that were eventually edited down to 26 for inclusion in the multimedia exhibit—a 6- minute video titled *Lightning's Angels*. This video was my part of the collaboration with Lyons, which included his home/classroom multimedia components on sprites and other aspects of the electrical earth, and an interactive website. In producing the video, I first scanned each (6 X 6 inch) painting into the computer to be digitally enhanced. Many people have questioned why I went through this process. I am melding old and new mediums, or translating the old practice of oil painting into the multimedia realm I grew up with.

1.2 Azimuthal Symmetry

Azimuthal symmetry (or asymmetry) is very simple. Azimuth means angle (azimuthal = angular) and symmetry in regards to sprites, means basically each side of the phenomenon is the mirror image of the other. As a result, azimuthal symmetry (AS) simply means that the phenomenon (sprites) show the same form, brightness, shape, color, etc. no matter what direction you look. Now depending on where you are looking from, the phenomenon may or may not have azimuthal symmetry. For example, if you are sitting in the middle of a sprite looking outwards, then I would expect you to observe AS, i.e. the same view in all directions (360 degrees). An example of AS with regards to my work, could found in my series titled Inner Sprites. I hypothesize that my series titled Inner Sprites, would be the views of a person sitting in the middle of a sprite, looking outwards in all directions (360 degrees). But looking downwards would give a different view from looking upwards (from the middle). However, from the side, the sprite may be brighter in the middle and have different features in the middle and at the edges (hence azimuthal asymmetry).

2 POLARIS TERRARUM

I am currently involved in an art & science collaboration-research project titled *Polaris Terrarum*. The name *Polaris* comes from the Latin, *Stella Polaris*, meaning “Pole Star.” *Polaris Terrarum* explores the psychological aspects of atmospheric & climate change in the Polar region. Some of my works from *Polaris Terrarum* would explore the psychological aspects of the shrinking size and changing color of the polar region as seen

from views from up above or from a high altitude aircraft and/or Space Shuttle. One of the psychological aspects of atmospheric & climate change is a sense of depression and powerlessness is a major stage of environmental awareness about climate change. When people grasp the serious threat of climate change, their survival reflex is triggered and this results in action.

References

1. C.T.R. Wilson, *Proceedings of the Physical Society of London* 37 (1925) p. 32D.
2. W.A. Lyons et al., "The Hundred Year Hunt for the Sprite," *Eos, Transactions, American Geophysical Union* 81 (2000) pp. 373–377.
3. Lyons [3].
4. O.H. Vaughan, Jr., and B. Vonnegut, "Recent Observations of Lightning Discharges from the Top of a Thunderstorm into the Clear Air Above," *Geophysical Research Letters* 94 (1989) pp. 131, 179–131, 182.
5. The late John R. Winckler of the University of Minnesota made the observation while testing a low-light television (LLTV) camera for an upcoming rocket launch.
6. During a Shuttle *Atlantis* STS-34 mission, on 21 October 1989 (Orbit 44), using the shuttle's LLTV cameras, the first vertical-appearing discharge was observed and recorded moving out from the top of a thunderstorm illuminated by intra-cloud lightning. Video observations from the space shuttle acquired from 1989 through 1991 provided 17 additional examples to confirm the existence of the sprite phenomenon. Subsequently, the shuttle fleet of *Atlantis*, *Discovery*, *Endeavour* and *Columbia* documented other sightings in the 1990s.
7. D. D. Sentman, E. M. Wescott, *Geophys. Res. Lett.* 20, 2857 (1993).
8. C. J. Rodger, *Rev. Geophys.* 37, 317 (1999).
9. C. T. R. Wilson, *Proc. Phys. Soc. London* 37, 32D (1925).
- 10 A Glory is a circular rainbow formed on top of clouds. The Glory Project is- I projected digitally enhanced slides of my paintings of a cloud Glory on the 20 meter dome ceiling of the Planetarium de Montreal..

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