

Education and Public Outreach at the SIRTf Science Center

Doris Daou

July 2002

Abstract

Communicating the world of infrared astronomy to the public is the main vocation of the Education and Public Outreach Office of the SIRTf Science Center; but certainly not its only goal. In the past few years we have created a wide variety of educational products that explains the infrared as well as the multi-wavelength universe. We've produced a suite of award-winning websites (sirtf.caltech.edu) that speak to audiences as varied as kindergarteners to amateur astronomers. We've also filmed short videos about infrared light and created posters and brochures that has become a favorite with NASA education specialists as well as classroom teachers.

Introduction

The *Space InfraRed Telescope Facility* (SIRTf) is a space-borne, cryogenically-cooled infrared observatory capable of studying objects ranging from our Solar System to the distant reaches of the Universe. SIRTf is the final element in NASA's "Great Observatories" Program, and an important cornerstone of the new Astronomical Search for *Origins Program*.

In answering the wide public interest in space science, NASA has, for more than a decade, made Education and Public Outreach an important element in their missions. This poster describes the SIRTf Education and Public Outreach (EPO) activities and the latest additions to our products. The SIRTf EPO activities are coordinated and managed by the SIRTf Science Center, based at the Infrared Processing and Analysis Center (IPAC) on the campus of the California Institute of Technology in Pasadena.

Education and Public Outreach through the World Wide Web

As the infrared element of the "Great Observatories", the SIRTf Education and Public Outreach office has made its main vocation to communicate and explain the world of the infrared astronomy to students and the public at large. But SIRTf recognizes that its EPO efforts must be multi-faceted and cover multi-wavelength astronomy as well as the many different areas of science.

In that spirit, we have created Web Sites (sirtf.caltech.edu) that explain Infrared Astronomy (figure1), its history (figure2) as well as the many benefits and uses of Infrared in the different aspects of our lives (figure 3). We have created award-winning web sites that make the students go through the experiment that led Herschel in discovering the infrared light (figure 4). But we have also created web tutorials about multi-wavelength astronomy (figure 5) and created a multi-wavelength gallery (figure 6) that shows objects observed in different wavelengths and explains the differences between them as well as the benefits of each. We have also made an effort in keeping science in general as platform for our educational product. The "Heat & Temperature" web site (figure 7) is our latest addition in that effort. In this module we introduce the

concepts of heat and temperature, heat transfer and detection. We also introduce several examples of what we can learn by detecting heat and measuring temperature and include links to related classroom lesson plans and activities.

Education and Public Outreach Videos and Images

Some of our newest productions are Videos and Images that compare the visible with the Infrared. We have made a video that shows several visible and infrared views of the geothermal features found in Yellowstone National Park. Much of Yellowstone is on a giant volcanic crater and hot magma (molten rock) is still close to the surface. This is the source of heat for Yellowstone's hot springs and other geothermal features. The video and images taken of the different Geysers at Yellowstone have been a great hit. A geyser is a hot spring which erupts periodically. These eruptions are caused by the buildup of hot water and steam trapped by constrictions in the "plumbing system" of a hot spring. When enough pressure builds up the geyser erupts. Old Faithful is the most frequently erupting large geyser in Yellowstone National Park. Another great attraction that we thought interesting to see in both visible and infrared was the Mammoth Hot Springs. The terraces at Mammoth Hot Springs were created when hot water containing carbonic acid rose through ancient limestone deposits causing some of the limestone to dissolve. As the water reached the surface and flowed, the dissolved limestone that it carried solidified forming beautiful terraces. This is quite interesting to see in the infrared. One can actually discern the different terraces. The Bubbling Mud Pots are hot springs which do not have much water. The water in a mud pot is very acidic and it dissolves nearby rock into small pieces of clay. This clay then mixes with the hot water to create mud. Hot steam rising from below causes the mud to bubble and pop as the steam is released into the air. These were great to film. We could actually see the temperature scale of the water in the Mud. Other attractions of the park were also filmed, such as the Hot Springs, pools of hot water that have seeped to the Earth's surface to form small ponds; Geyser Runoffs; images of the forest and some of the animals that inhabit it.

The Yellowstone National Park video, as well as the video of Volcanoes in Hawaii and the Infrared video and images are available from the Education and Public Outreach web pages. Figure 8 shows a sample of some of the photos taken with these videos.

Brochures, Posters and Other paper products

With all the electronic products such as web sites, photos and videos, nothing reaches the students and the public like old fashioned paper products that they can take back to their classrooms and homes. With that in mind, we have created posters and brochures that have become favorites with NASA education specialists as well as classroom teachers. One old favorite is the award winning Herschel experiment brochure. This experiment has been used by students in their school's science fair and the results have been returned back with letters of excitement from the students as well as their teachers.

From the start we were wondering how to communicate and visualize the universe in a kind of light that is totally invisible to the human eye: the Infrared. This answer to this question has been the subject of two of our posters: "The Infrared Universe" and "Infrared: Seeing the world in a different light".

Our newest addition to these paper products is “The Multiwavelength Universe” poster. The Universe sends us light at all wavelengths, with each portion of the spectrum bringing us unique information about the cosmos. In this poster we show dramatic images in many different wavelengths such as the visible, the infrared, the x-rays, ultraviolet and radio.

At the SIRTf Science Center, we recognize the importance of communicating the message with images as well as text that could be used in schools lessons. One of the reasons that our posters are popular with educators is that we use the back for explanations about the subjects, as well has some exercises and links where they can research the subjects.

Conclusion

Helping the students and the public at large to discover the world of astronomy in general and infrared in particular is a pleasure. The continuous positive response of the public has been an absolute motivation to create new and innovative methods to reach them. The Education and Public Outreach Office at the SIRTf Science center is a dynamic group that has made its vocation to revive the interest, excite the dreams and hopefully answers some of the questions and satiate the public thirst for knowledge of Space.