Universe Interactive: Static Displays with Active Components

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As the World Year of Physics (WYP) approaches, the AAPT WYP Committee would like to encourage everyone to consider ways to engage those around us in celebrating the science that makes us the proud geeks we are. The geek sentiment is my own, and does not necessarily reflect the views and opinions of the committee. This paper offers simple and inexpensive astronomy-related ideas for a bulletin-board-type display. The particular ideas presented below are hands-on classroom activities that I've adapted for display purposes. The display is static in that once constructed it does not require a personal facilitator, but each component invites interaction. At the end of the paper I revisit the idea of building a sundial[1] as a highly visible and artistic way to engage students and communities in physics. The activities presented here are available for use when constructing your own display. In addition, these examples are meant to illustrate how instructional products might be modified for display purposes, and I encourage others to consider their favorite activities for an interactive display.

Solar X-ray/White Light Image Matching

Through detailed observations, solar physicists have determined that active regions in the Sun's outermost layer, the corona, are correlated with sunspot locations on the Sun's gaseous surface, the photosphere (Fig. 1). The 1-million-Kelvin corona is observed in x-rays while the 6000-Kelvin photosphere is observed in visible or white light. By examining white light and x-ray images of the Sun taken simultaneously by instruments on board the Yohkoh solar satellite in 1992, you can discover the sunspot/active region correlation yourself!

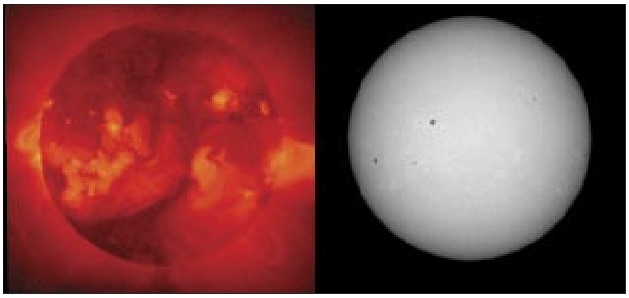

Fig. 1. An x-ray image (left) of the Sun's corona and a white light image (right) of the photosphere taken simultaneously by instruments on the Yohkoh solar satellite in 1992.

This solar matching exercise was originally designed as an ice breaker activity, which can be found at http://solar.physics.montana.edu/YPOP/Intermission/Icebreaker. To adapt the activity for display purposes, print one set of x-ray images and the corresponding white light images from the website above. Adhere the images to a display board in two columns with one set of images on the right and the other set of images on the left (Fig. 2). Do not place matched image pairs next to each other when constructing the columns. Attach a piece of yarn to the corner of each x-ray image and a small piece of Velcro (hooks side only) to the corner of each white-light image so that visitors to the display can connect each pair as they identify a match. Post the answer key, covered by a paper flap, below the image display for people to check their answers when they are finished. With a small sign, ask participants to release all strings before walking away.

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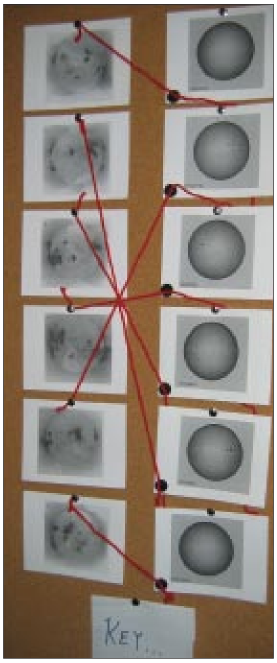

Fig. 2. A solar image matching activity adapted for display.

Fig. 3. A color filter wheel activity showing multi-wavelength emission from the Crab Nebula.

Do You See What I See? An Astronomical Imaging Filter Wheel

NASA's cadre of telescopes that observe the universe in different wavelengths have opened our eyes to how differently the same astronomical object can appear when viewed, for example, in white light by the Hubble Space Telescope, in x-ray by Chandra, and in infrared by Spitzer. Even with the same telescope, observers can use different filters to gather information about astronomical objects at slightly different wavelengths. By constructing a simple color filter wheel from paper plates and department-store cellophane, one can experience this phenomenon as well.

This color filter wheel activity was originally designed as a classroom activity that can be found at http://solar.physics.montana.edu/YPOP/Classroom/Lessons/Filters. To adapt this activity for display, follow the instructions at the website above to construct three separate filter wheels (Fig. 3). Print three color images of the Crab Nebula (also available at the above website). Adhere the three Crab Nebula images to the display board, either vertically or horizontally as space allows, separating them by the diameter of the filter wheels. Place a filter wheel over each image with the single window plate closest to the display board. Secure only the bottom plate, with the Crab image showing through the opening. The top plate should be allowed to rotate freely, revealing the appearance of the Crab Nebula in different colors (Fig. 3). The three separate wheels allow visitors to view the different filtered images simultaneously. Supporting material can be found at the above website for display alongside the filter wheels to describe what is being viewed.

Fun Time with Sunshine: Building a Sundial

In "Constructing a Portable Sundial"[1] I described the equations and steps necessary for constructing a working sundial for any latitude. A complete discussion of this process can be found at http://solar.physics.montana.edu/YPOP/Classroom/Lessons/Sundials/ for both the Northern and Southern hemispheres. The classroom activity detailed at this website focuses on building individual pocket-size sundials, which is itself a worthwhile World Year of Physics activity. However, the process is applicable to building any size dial, and you might consider working with a local student group to construct a display-size sundial in celebration of the World Year of Physics 2005. The addition of a sundial to your school or community is a passive display that is sure to stand the test of time.

The ideas presented here have provided an example of how classroom activities may be used as an interactive display. Whether through the use of these activities, or the adaptation of activities of your own, think about putting together an interactive display board in your school, workplace, or community to celebrate physics in 2005! You may also visit the World Year of Physics website, http://www.physics2005.org, for a myriad of activity ideas and community event suggestions. In addition, the site offers a calendar of planned public events where viewers can look for scheduled activities in their region, or submit an event of their own.

References

1. M.B. Larson "Constructing a portable sundial," *Phys. Teach*. **37**, 113–114 (Feb. 1999).

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