Bill Gates' Great Great Grand-daughter's Honeymoon Trip:
The 10 Tourist Wonders of the Universe
Astronomy Lab by Andrew Fraknoi *(Foothill College)* (© copyright 2009 A. Fraknoi)
Notes for Instructors

Before You Start:

- At our college this lab takes about 2.5 hours to do fully, particularly if you have discussion (a symposium, where groups present examples of their work) at the end.
- Groups consist of 3 to 4 students at a computer. No student is allowed to work alone, since much of the benefit comes from sharing information and having a spirited discussion.
- I find it useful to put the web site: http://hubblesite.org/newscenter/archive/browse/images/ on each computer ahead of time. Some students may need to review the meaning of the categories into which the images are organized on this most useful page.
- It's good to remind students of the components of each Hubble news release: not only are there images and captions, but there are often pages of fast facts, background information, animations, etc.
- I encourage students to spend at least 20 minutes before they start writing on the lab sheet just trying out ideas, making a preliminary list, putting down some notes, etc.
- The lab is "open everything" -- they can use their notes, their textbook, or other web sites
- In introducing the lab, I emphasize that just about anybody can find 10 pretty Hubble pictures and write down the URL; most of their grade will depend on the justification they give for selecting a particular tourist attraction. A number of groups come up with cute explanations, such as selecting the Ring Nebula because it reminds the couple of the rings they just exchanged. While I encourage such creativity, I always remind them that the science reasons are the ones that count.
- Among the ground rules I set is that, if at all possible, students should include only one example of each type of object: so only one supernova remnant, only one red giant, only one region of star formation, only one solar system moon, etc.

Grading Rubric

- There are, of course, no right answers for this lab exercise. Unless the student disregards the instructions, or doesn't take the exercise seriously, I give credit for any reasonable choice of tourist destinations.
- With each of the ten answers worth ten points, I give two points for the selection of a reasonable tourist sight, one point for getting the URL of the image correct, and seven points for the justification.
- In the justification, I look for answers that explain what the object is, why the selected object is part of an important class and why it is representative of or a special member of that class. So, for example, a good answer about the Crab Nebula should include:
    a. The fact that it is a supernova remnant;
    b. Why supernovae are an important stage in stellar evolution (they are the last event in the life of a massive star, they recycle the elements stars make, etc.); and
    c. Why the Crab Nebula is an important example of its class (it's arguably the best studied supernova remnant, the first one in which a pulsar was found, one whose explosion was recorded in human history, etc.)
- See the sample answer sheet for some informative and humorous justifications.