Announcements

**Homework Collection:** The third homework collection of the semester will take place this Thursday, March 30. Please gather together all of your homework assignments from weeks 6 through 11 (note that there IS a writing assignment for this week, due this Thursday!), clearly label each week’s assignment, and circle all numerical answers. Then, staple all of the assignments together into one packet. This will be turned in at the START of class on Thursday, and no late homework will be accepted. Note that many of the assignments have been essay questions, for which the ‘solutions’ will consist of example responses from your classmates that I thought were particularly well done; they will be made available to you next week at the reserve room in the library.

**Second Midterm Exam:** The second midterm exam will be given in class on Thursday, April 6. (Note the date change from what is indicated on the syllabus.) More information about the exam will be given in class on Thursday March 30 and on Tuesday April 4.

**Writing assignment due this Thursday!** As mentioned above, note that this week’s writing assignment is due this Thursday; there will therefore be no writing assignment due next Tuesday.

**Reading Assignment for Tuesday, April 4**

This week, we are primarily concerned with how stars live and the changes they undergo as they start to use up their supply of fuel for nuclear fusion. This is all part of the study of *stellar evolution*: the changes of a star’s properties with time.

**On-Line Material:** Chapter 18 – Take the Post-Test. These questions are sometimes challenging, but I think all are fair and similar to those that I might ask on an exam.

**Voyages Through the Universe, skipping Chapters 19 and 20.**

While you are not responsible for reading these chapters, I do want you to be aware of the major concepts contained in them that we went over quickly in class. The slides from the lecture that contain what you need to know are reproduced at the end of this handout. (If any of these concepts are confusing to you, you may find it helpful to just skim through these two chapters.)

**Voyages Through the Universe, Chapter 21: All sections.**

This chapter describes the evolution of stars off of the main-sequence, after the core hydrogen has been exhausted. Though the details are important, do not lose sight of the BIG picture: A star’s life is a constant struggle between the opposing forces of gravity (trying to collapse the star) and radiation and gas pressure (keeping the star puffed up). *The details of this struggle depend largely on the star’s mass*, with more massive stars living shorter (but more brilliant!) lives than the less massive ones do.

**On-Line Material:** Chapter 21 – I found all of the Active Figures and Astronomy Exercises to be useful. In particular, I thought the Active Figure called “Cluster Turnoff” was particularly good, to assist in understanding how clusters are used to verify our understanding of stellar evolution. When you are through reading the chapter, take the Post-Test; I thought all of the questions were good ones, similar to those that you might expect to find on an exam.
Writing Assignment for Thursday, March 30

Two contrasting views on beauty, art, and science were presented in class on Tuesday: The first from a poem by Walt Whitman, and the second from an interview with the physicist Richard Feynman. Here they are again:

When I Heard the Learned Astronomer
by Walt Whitman

When I heard the learned astronomer
When the proofs, the figures, were ranged in columns before me,
When I was shown the charts and diagrams, to add, divide, and measure them,
When I sitting heard the astronomer where he lectured with much applause in the lecture-room,
How soon unaccountable I became tired and sick,
Till rising and gliding out I wandered off by myself,
In the mystical moist night-air, and from time to time,
Looked up in perfect silence at the stars.

Excerpt from an Interview with Richard Feynman

I have a friend who’s an artist, and he sometimes takes a view which I don’t agree with very well. He’ll hold up a flower and say, “Look how beautiful it is,” and I’ll agree. But then he’ll say, “I, as an artist, can see how beautiful a flower is. But you, a scientist, take it apart and it becomes a dull thing.” I think he’s kind of nutty.

First of all, the beauty that he sees is available to other people - and to me, too, I believe. Although I might not be quite as refined aesthetically as he is, I can appreciate the beauty of a flower. But at the same time, I see much more in the flower than he sees. I can imagine the cells inside, which also have a beauty. There’s beauty not just at the dimension of one centimeter; there’s also beauty at a smaller dimension.

There are the complicated actions of the cells, and other processes. The fact that the colors in the flower have evolved in order to attract insects to pollinate it is interesting; it means insects can see colors. That adds a question: does this aesthetic sense we have also exist in lower forms of life? There are all kinds of interesting questions that come from a knowledge of science, which only adds to the excitement and mystery and awe of a flower. It only adds. I don’t understand how it subtracts.

With this as background, please answer the following in the form of a typed essay:

1. Of the two viewpoints presented, which one do you find yourself most closely philosophically aligned with? Do you believe that knowledge of science takes away from the artistic appreciation of beauty?

Please include your response to this question with your other homework that you turn in on Thursday, March 30.
Chapter 19: Between the Stars -- Gas and Dust in Space.

Main points to know:

- The space between the stars is not empty, but contains *interstellar* dust and gas.
- Interstellar dust consists of tiny solid grains in interstellar space.
- Interstellar dust can obscure our view of background objects.
- Interstellar gas consists predominantly of hydrogen.
Chapter 20: The Birth of Stars and the Discovery of Planets Outside our Solar System.

- New stars form out of interstellar matter, through gravitational contraction.
- Over 100 planets have been discovered orbiting other stars.