Astronomy 101: Week #12 Handout, 2006.04.04
San Diego State University, Prof. Leonard

Announcements

• **Discoverer of the 10th planet to talk at SDSU!** Every year, the Department of Astronomy presents a public talk (read: you will definitely understand the talk) by a distinguished astronomer, at its annual John D Schopp Memorial Lecture. This year, it will be given by Dr. Michael Brown, from the California Institute of Technology, who has done pioneering work on the detection of distant solar system objects. Very recently (just last year!), Prof. Brown made headlines with the discovery of an object larger than Pluto in a distant orbit about the Sun. This object, given the temporary (and unromantic) designation 2003 UB313, is the largest body found in the solar system since the planet Neptune was discovered in 1846. As this year’s Schopp lecturer, Mike will discuss this discovery in a talk entitled: “Beyond Pluto: Discovery of the 10th Planet”. The talk will be given THIS Friday, April 7, at 7:30 p.m. Here are all the details:

**What:** Public talk, by Prof. Mike Brown: “Beyond Pluto: Discovery of the 10th Planet”.

**When:** Friday, April 7, at 7:30 p.m.

**Where:** Room 333 of the Geology, Mathematics, and Computer Sciences Building (GMCS; located just northwest of the physics/astronomy building).

**Why:** Mike Brown is a brilliant lecturer, and gives wonderful public talks about his science. This is also one of the most exciting, and reported on, astronomical discoveries of recent years.

**More information:** Additional information about the talk, including specific driving directions (FREE parking is available in Parking Structure 1, levels 1, 2, and 3) can be found at:


Please plan to attend this event if you are free; while not required, I think you will have a great time, and learn a lot. You are also invited to a reception following the talk with Mike at the Faculty-Staff center.

• **Second Midterm Exam:** The second midterm exam will be given in class this Thursday, April 6. Please see the “Second Midterm Exam Guide” that was given out last week for details concerning its structure and content. Be sure to bring the following to the exam:

1. One pink SCAN-TRON Form No. F-288-PAR-L. You may fill out the informational portion of the SCAN-TRON prior to the exam: On the front side, this includes writing your name, class, and hour/day at the top, and then bubbling in your I.D. Number (use only the first nine columns for the I.D., leaving the 10th column blank) and name (leave the Phone Number and Code sections blank); on the back-side of the form, you may bubble in your I.D. Number (again, use only the first nine columns, leaving the 10th column blank), and leave the Exam # and “Test Form” columns blank.

2. A #2 pencil.

3. Your “Official Second Midterm Exam Cheat-Sheet”, with your name at the top and all the information you want inside the black box on the page. This sheet is found in the “Second Midterm Exam Guide” that was given out last week, and should be detached from the end of that packet.

4. A good eraser! This is to remove any stray marks on your SCAN-TRON left from changed answers and so forth. Note: if the SCAN-TRON machine rejects your form for any (legitimate) reason, your final raw exam score will be reduced by one point (out of the 50 total). The SCAN-TRON machine will reject a form for having (a) more than one answer filled in for a question; (b) having no answer filled in for a question; (c) having the informational section of the sheet filled out incorrectly or incompletely; or (d) having stray smudges on the sheet. Please ensure that your sheet does not suffer from any of these ailments!

When you come to class on Thursday, you will find exams already laid out in alphabetical order on the desks with last names written on them. Find your exam, sit down at that desk, take out your cheat-sheet,
pencil, and eraser, and wait for the exam to begin (it will begin promptly at 9:30 A.M.). No calculators are needed or permitted.

- **Help Before the Exam:** Help is available before the exam through:
  1. *My office hours:* Tuesday April 4, 2-4 PM (Rm. 238 Physics building.)
  2. *TA help room hours* (Rm. 215, physics-astronomy building):
     - Tuesday: 4-6 PM
     - Wednesday: 12-2 PM

**Reading Assignment for Tuesday, April 11**

This week we start our discussion of the (sometimes violent) deaths of stars, and answer the question: What happens when the fuel runs out? Note that the material contained in this week’s reading assignment will *not* be tested on Thursday’s exam.

- ***Voyages Through the Universe*, Chapter 22: Sections 22.1, 22.2.1, 22.2.2, 22.2.3.**
  Here we finally tackle the deaths of stars, and experience the full fury of gravitational collapse. Section 22.1 starts us out by describing the comparatively peaceful deaths of low-mass stars to the strange endpoint known as a white-dwarf. A key point here is that all stars with masses somewhat less than $8M_\odot$ find a way to lose enough mass during their lives so that they wind up with $\leq 1.4M_\odot$ at the end (i.e., less than the Chandrasekhar limit). Then, in the first three sections of §22.2, we take on the death of massive stars. Remember, the key thing here is that the formation of iron in the core of a star represents a point of no return: further fusion into heavier elements does not *produce* energy, it *requires* it. Thus, once that iron core is built up and reaches a critical density, the core of the star is doomed to collapse. Explaining how this collapse is turned into an explosion remains a challenge that is at the forefront of supernova research; §14.2.3 paints a rather more confident picture of our present degree of understanding than is probably justified – we shall discuss the remaining uncertainties in class a bit.

- **On-Line Material:** Chapter 22 – I found all of the *Active Figures* and *Astronomy Exercises* to be quite useful. In particular, the *Active Figure* called “Stellar Evolution of High and Low Mass Stars” is particularly important. The Active Figures “Neutron Star” concerns material that we have not yet covered. Hold off on taking the Post-Test on this chapter until after we finish it up next week.

**Writing Assignment for Tuesday, April 11**

Please answer the following question. This assignment will be collected on May 4, when the 4th and final homework collection will take place.

1. Please answer Chapter 22, *Thought Question* #10, on p. 509 of the text. Be sure to completely explain the reasoning behind your answer.