Astronomy 9
Concepts of the Cosmos

Monday/Wednesday, 1:30-2:45 pm, Cabot Auditorium

Instructor: Prof. Danilo Marchesini
Teaching Assistant: Eric Roebuck
In-class Assistant: Julia Fowler

Assignment for Wed, Jan. 27th

- READ THE SYLLABUS & SCHEDULE - sign last page and return it to me (required to take this course!)

- Read Ch. 1 of the textbook
- Register/Login into MasteringAstronomy
- Take the Reading Quiz #1 before 10 am on Wed. 27th

DON'T FORGET YOUR LECTURE TUTORIAL AND FLASHCARD!!!

Required Material

- Textbook: The Essential Cosmic Perspective

  6th or higher (or 5th or 4th) Edition by Bennett, Donahue, Schneider, & Voit; the textbook is not sold at the Bookstore with the other required items, you are free to find the cheapest method to get the above textbook. Ten copies on reserve in the Tisch Library

- MasteringAstronomy

  online access kit (REQUIRED to do the homework and reading tests before classes). On the Syllabus instructions on how to register. Do it ASAP - you will need it on Monday morning.

- Lecture Tutorials for Introductory Astronomy

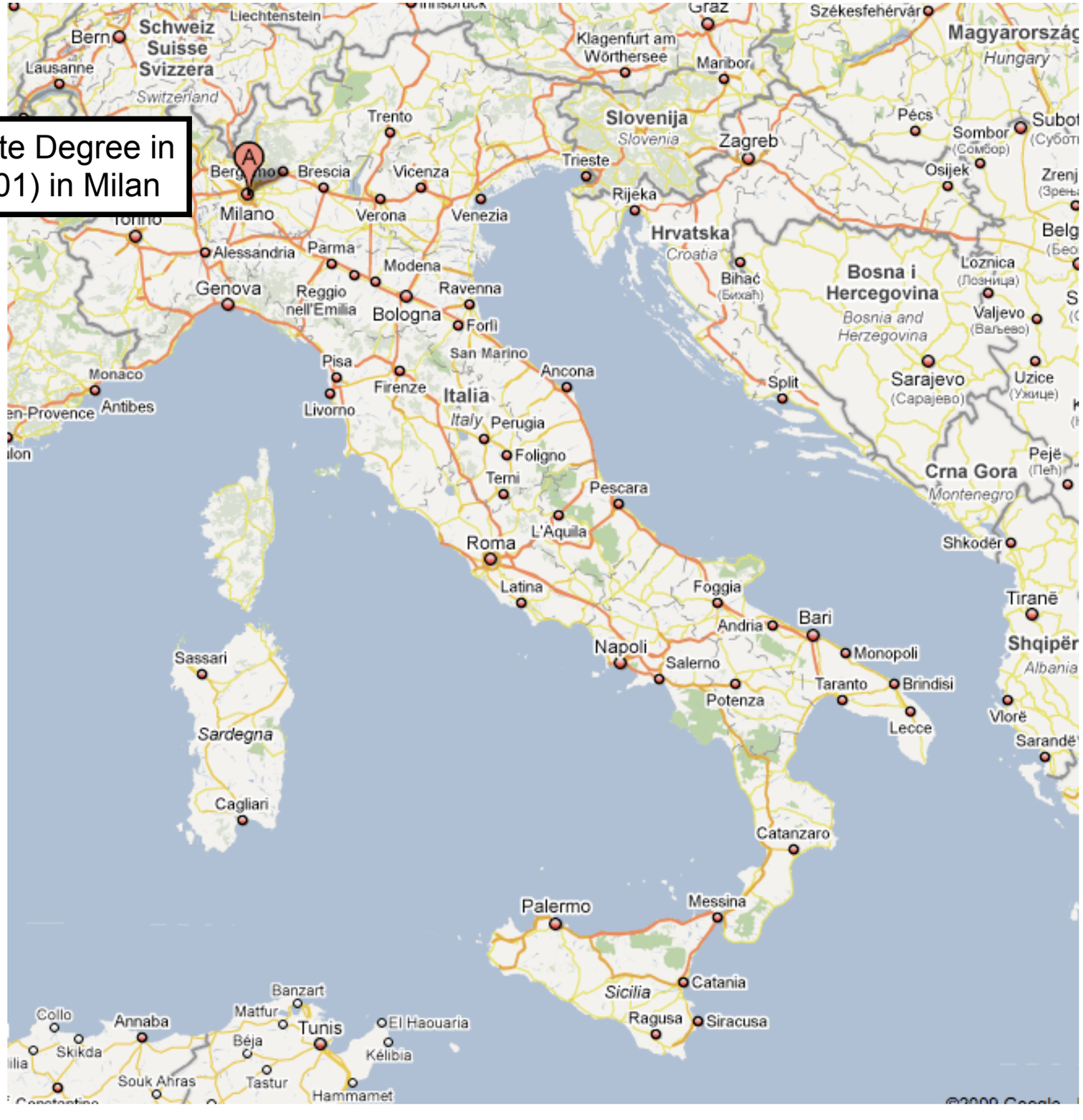
  3rd Ed. by Prather/Slater/Adams/Brissenden (REQUIRED to do the in-class activities). BRING THIS TO CLASS, EVERYDAY!!

- FLASHCARD, BRING THIS TO CLASS, EVERYDAY!!

(ISBN 9781323056769, including access code to MA and LT - available in Tufts Bookstore)

Prof. Marchesini

Undergraduate Degree in Physics (2001) in Milan



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Undergraduate Degree in Physics (2001) in Milan

PhD Degree in Astrophysics (2004) at SISSA/ISAS (Trieste)

Prof. Marchesini

Prof. Marchesini's fun time

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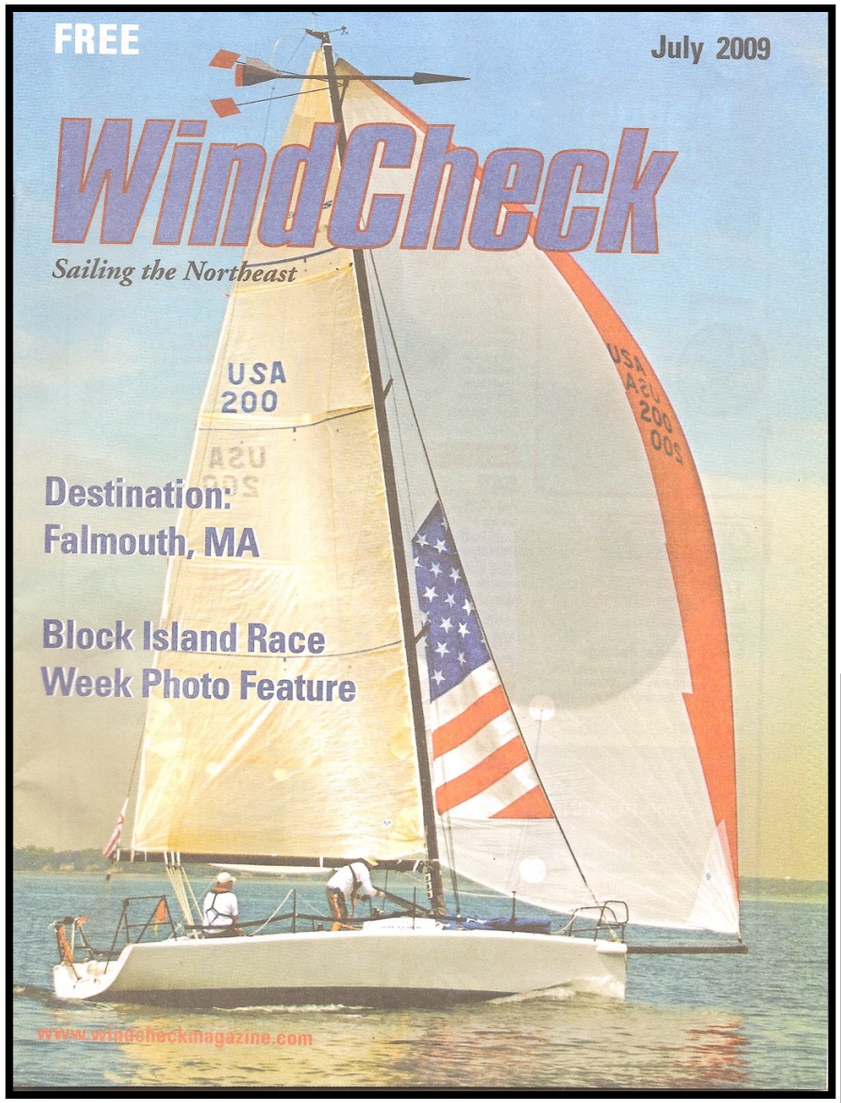
Sailing...



Prof. Marchesini's fun time

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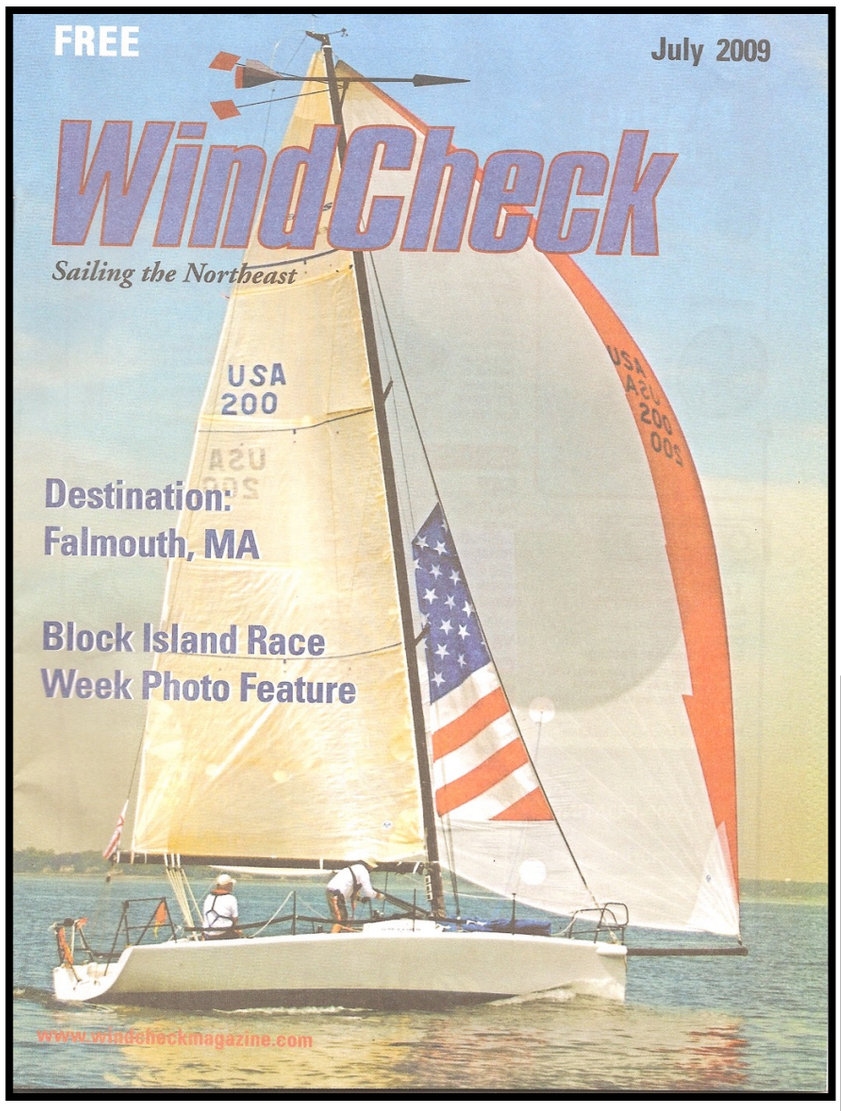
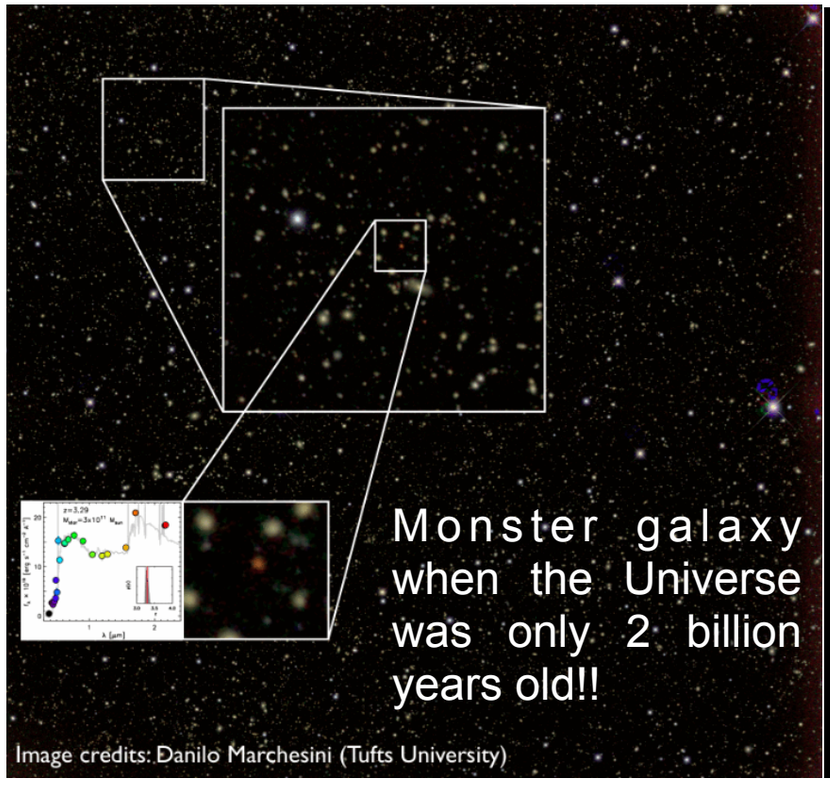


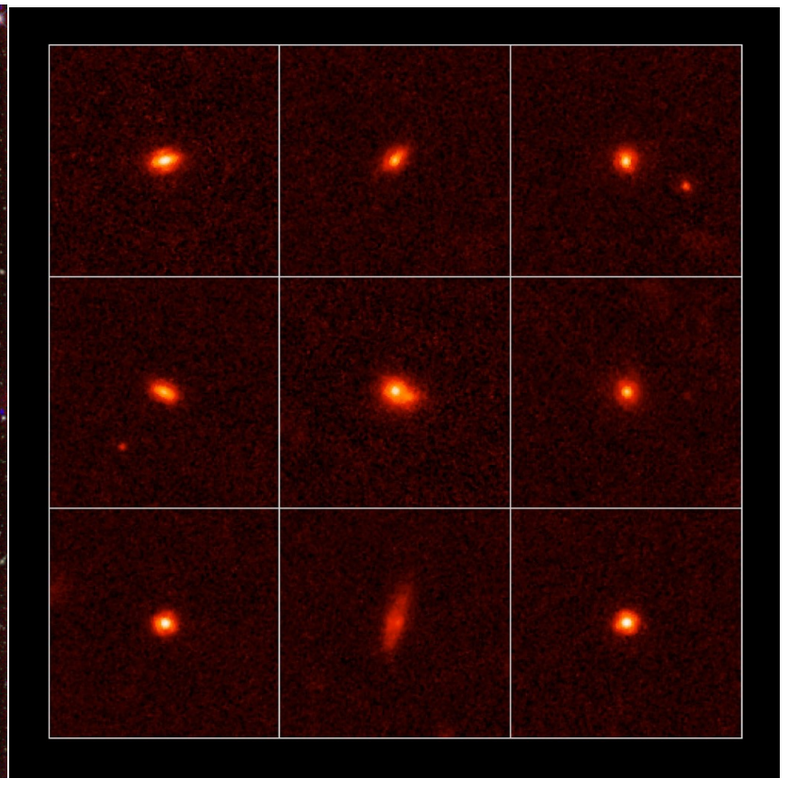
My twins...

Prof. Marchesini's research interests

- Dark Matter distribution in galaxies
- Active Galactic Nuclei (i.e., actively accreting super-massive black holes) and their Unification
- Galaxy Formation and their Evolution:
  - how do galaxies form?
  - how do they evolve?
  - study of distant galaxies
  - study of the most massive galaxies in the Universe

http://cosmos.phy.tufts.edu/~danilo/Home.html





Prof. Marchesini

You can call me: Prof. Marchesini, Dr. Marchesini, or just Professor.

Office: Collaborative Learning and Innovation Complex (CLIC) @ 574 Boston Ave. (Medford) - Room 312-E (my office)
Telephone: (617) 627-2756
Email: Danilo.Marchesini@tufts.edu

Office Hours:
Monday/Wednesday, 3:15 pm - 4:15 pm, right after class, in the Reading Room, 4th floor in CLIC OR email me to set up a time

T.A.: Eric Roebuck

Office: Collaborative Learning and Innovation Complex @ 574 Boston Avenue; open space on 4th floor
Email: eric.roebuck@tufts.edu

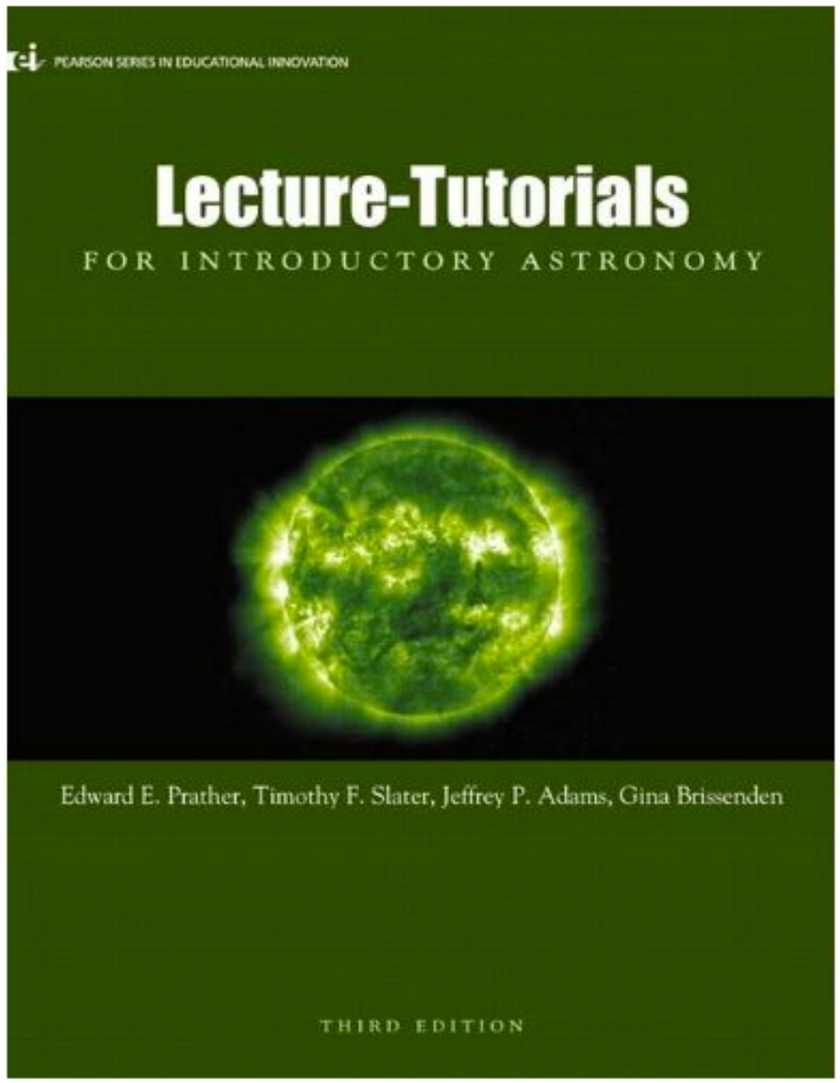
Office Hours: Wednesdays, 3-4 pm
or email the TA…

What's going to happen in this course?

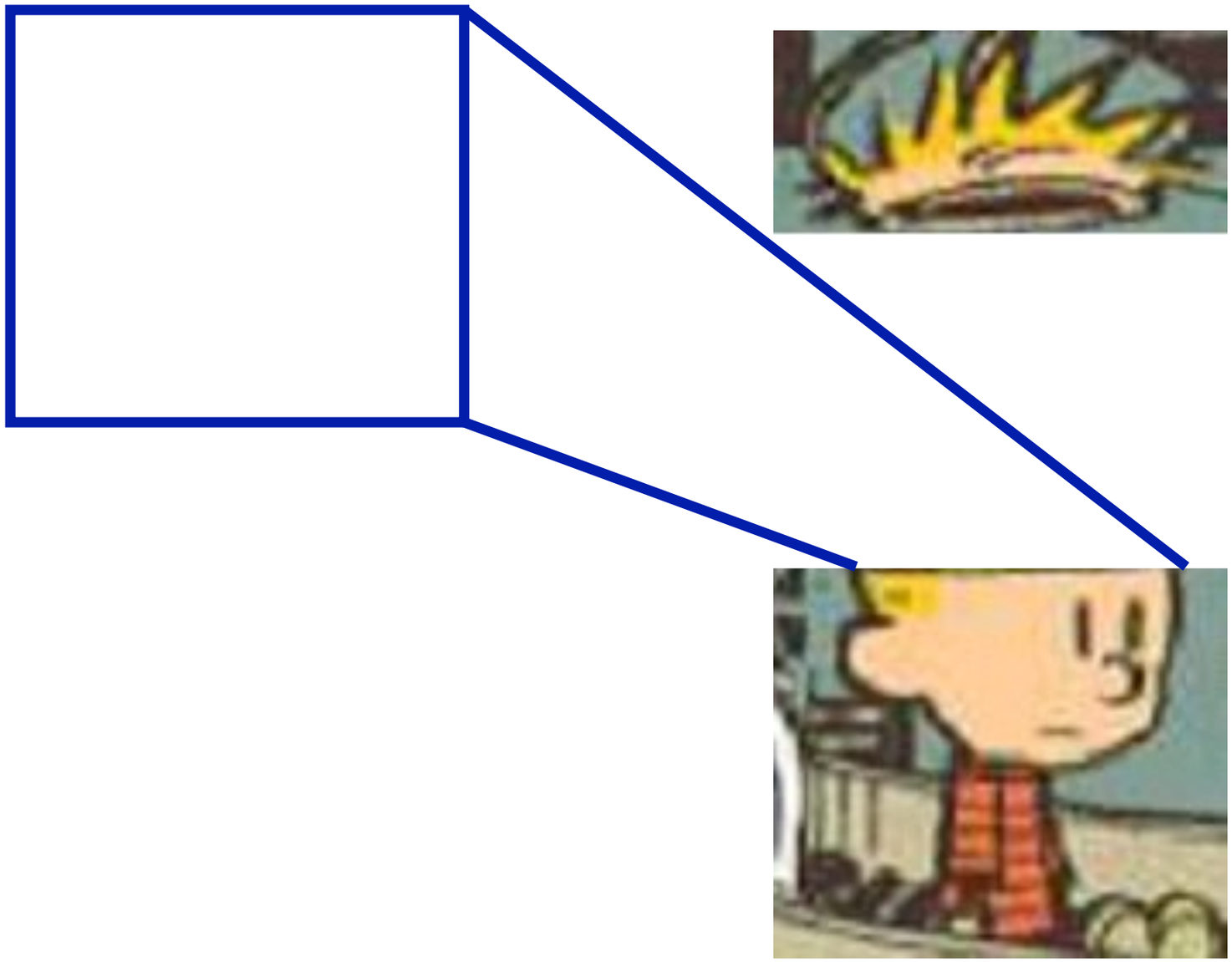
- A look at the SYLLABUS - our CONTRACT - READ IT!
  fill in and sign the last page of the syllabus and
  return it to me if you want to take this course

What's going to happen in this course?

- A look at the SYLLABUS - our CONTRACT - READ IT!
- Active engagement with nearly daily group activities



A commonly held incorrect model of a student's conceptual framework



Tabula rasa

A commonly held incorrect model of a student's conceptual framework

From “How People Learn”

(National Research Council, National Academy Press, 2000)

“Students enter your lecture hall with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp the new concepts and information that are taught, or they may learn them for the purposes of a test but revert to their preconceptions outside the classroom.”

Key results from cognitive science and education research

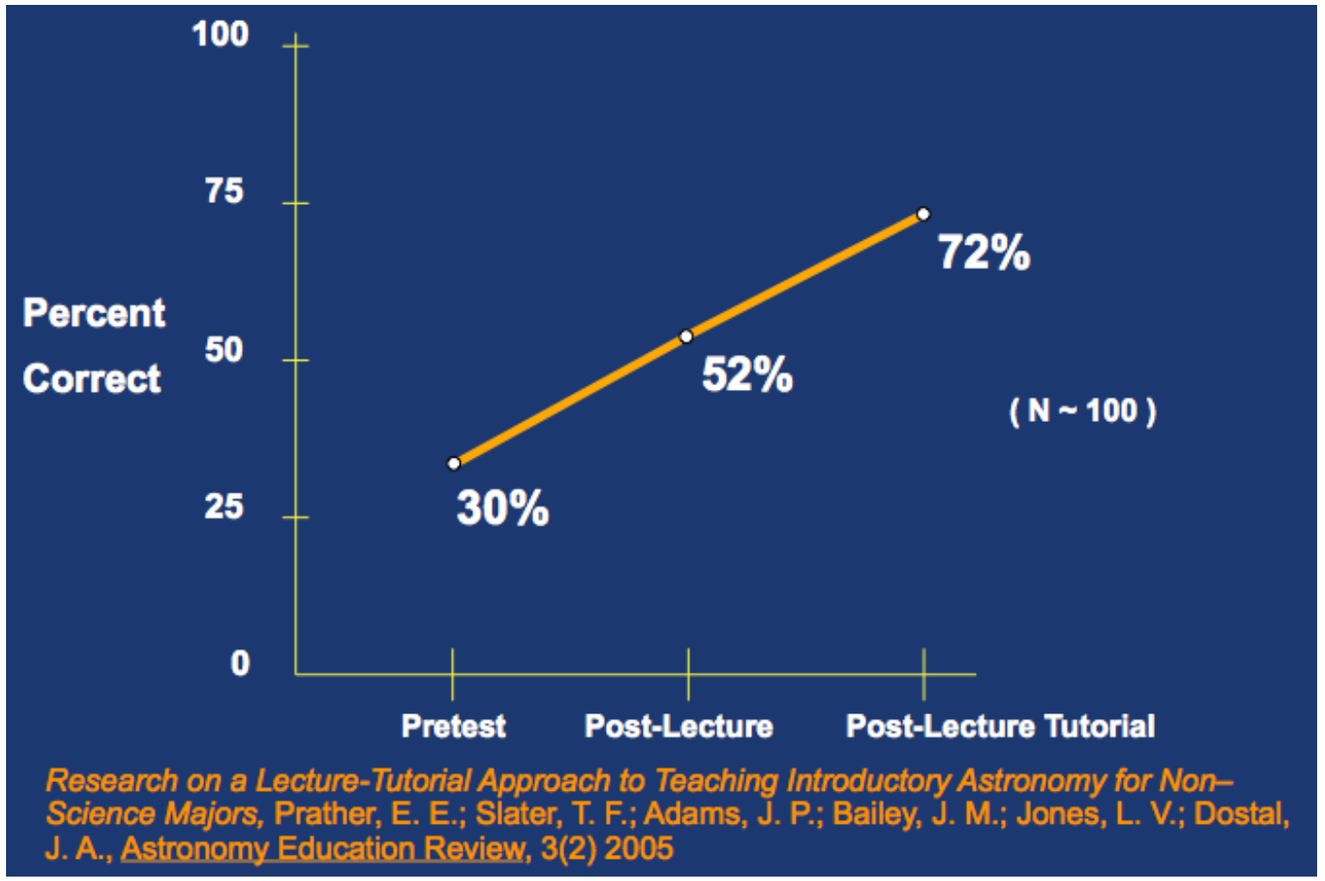
1. Learning is productive / constructive - learning requires mental effort

2. Knowledge is associative / linked to prior mental models and formal structures

3. The cognitive response is context dependent – what and how you learn depends on the educational setting

4. Most people require some social interactions in order to learn effectively

Can LECTURE TUTORIALS intellectually engage students at a level that is more effective than traditional lecture at promoting deep conceptual change?



Research on a Lecture-Tutorial Approach to Teaching Introductory Astronomy for Non–Science Majors, Prather, E. E.; Slater, T. F.; Adams, J. P.; Bailey, J. M.; Jones, L. V.; Dostal, J. A., Astronomy Education Review, 3(2) 2005

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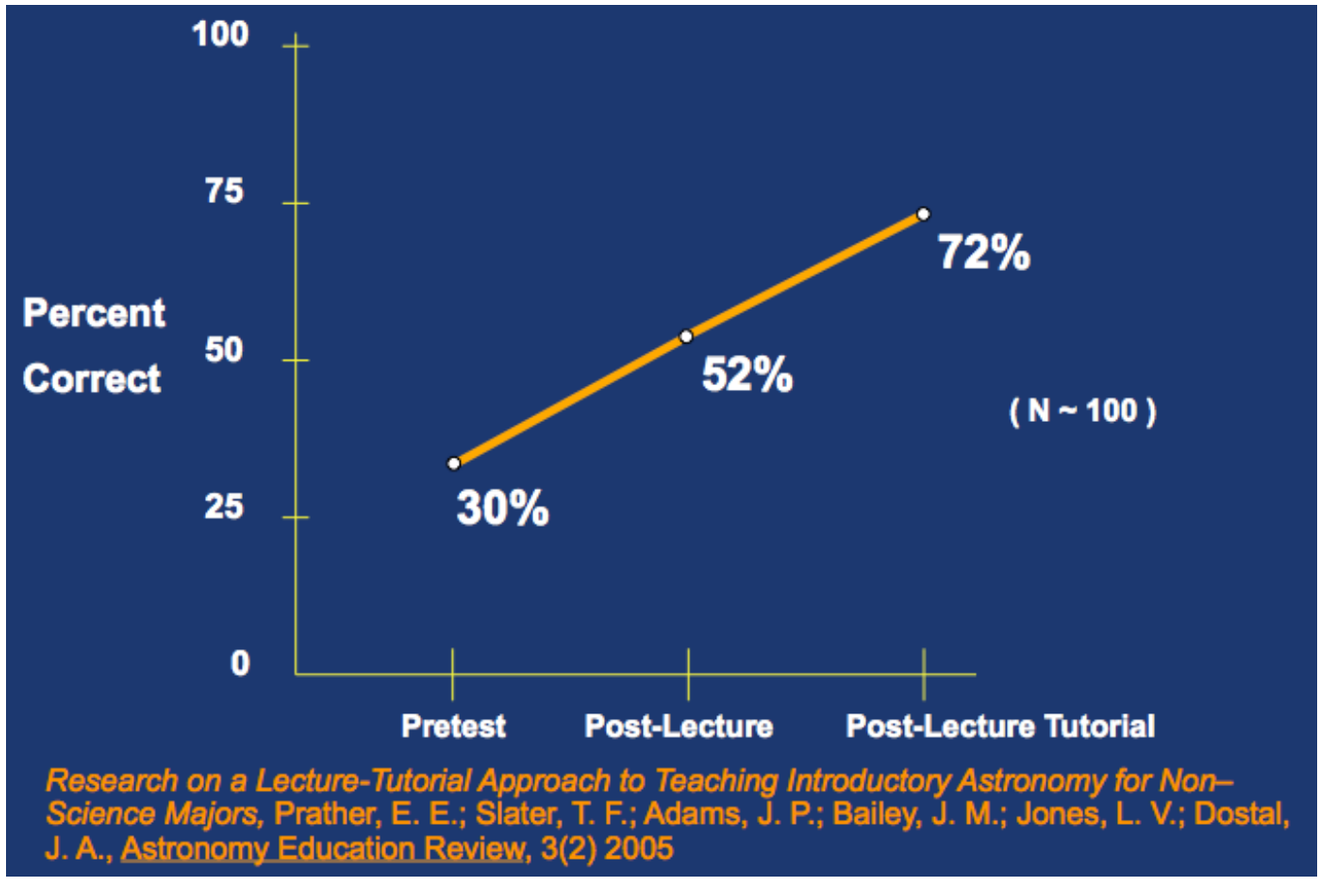
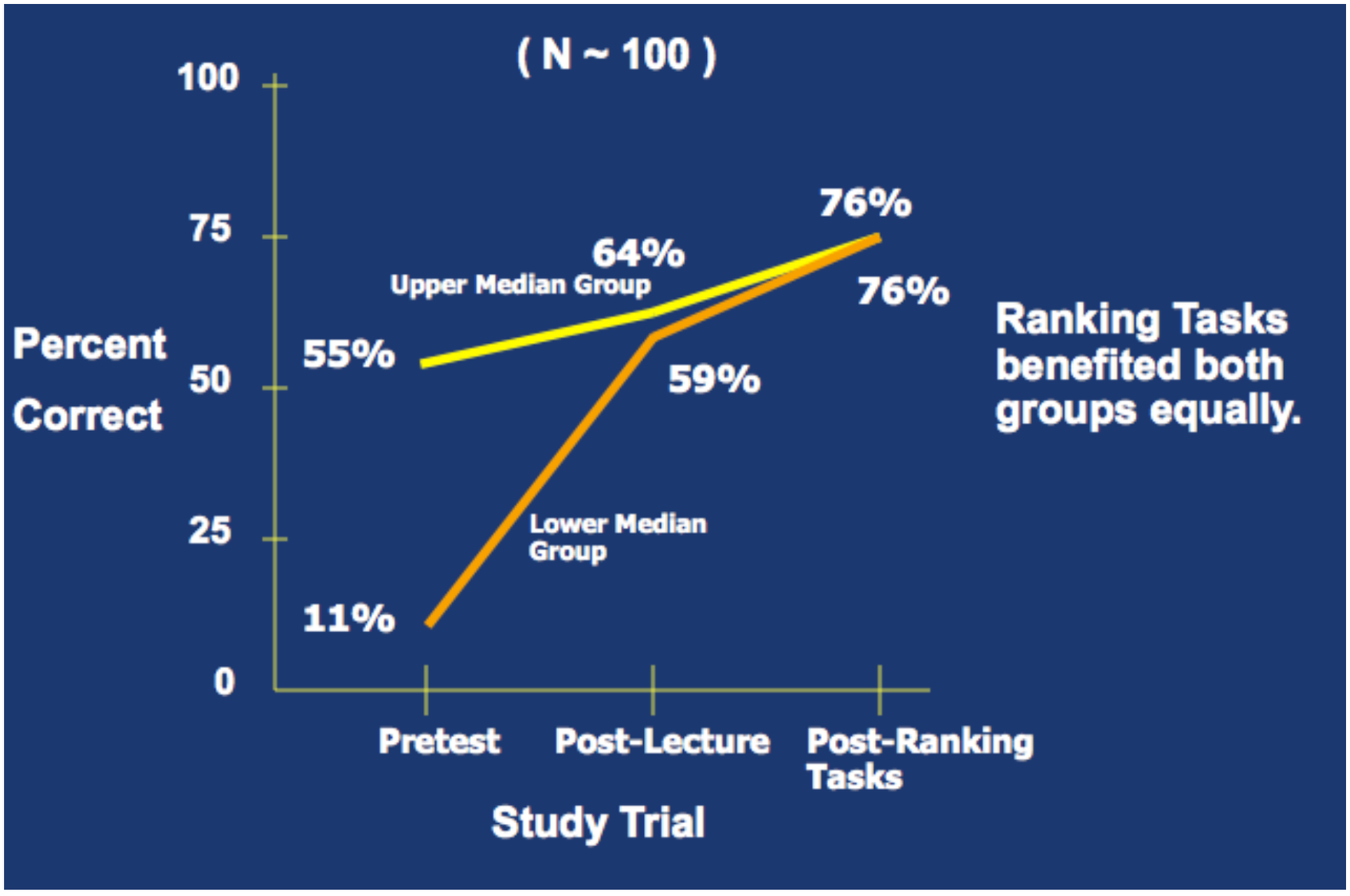


YES!, you will learn more and retain that information for longer

High- versus Low-pretest groups



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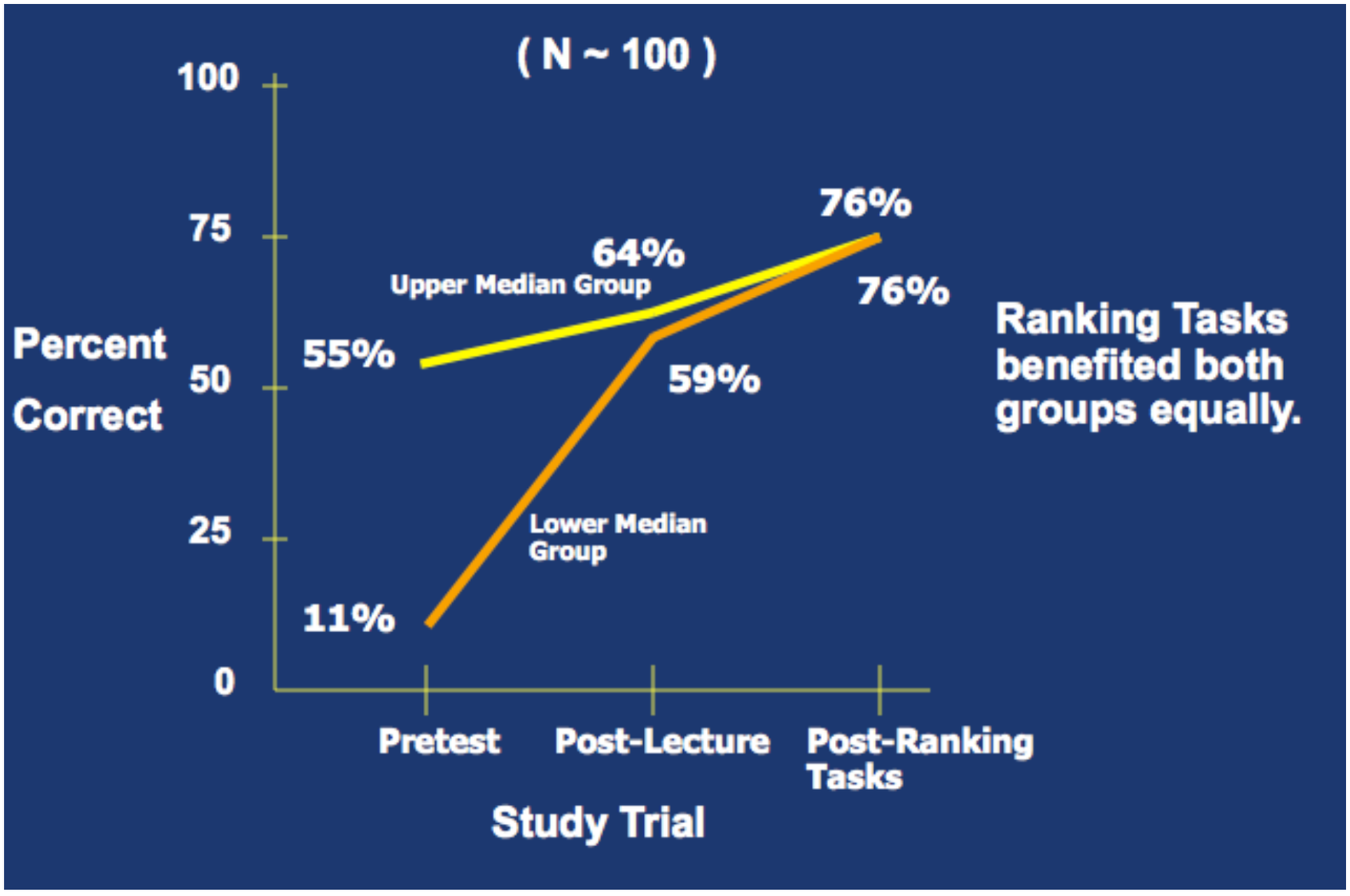

Even if you are already a genius, you will learn more

What's going to happen in this course?

- A look at the SYLLABUS - our CONTRACT - READ IT!
- Active engagement with nearly daily group activities
- ATTENDANCE is not required (you are adults), but STRONGLY SUGGESTED. 2% BONUS IF...

ATTENDANCE is not required, but STRONGLY SUGGESTED: Since this course is built around daily activities to accompany the lecture, your attendance and full participation at each class period will be an essential component of your success in the course, therefore attendance is strongly suggested. To stimulate attendance, I am introducing a bonus of 2%. In order to get the bonus, you need to attend ALL LECTURES. You will be allowed to miss two lectures (10%), excluding Lecture 5 (pre-course test), Lecture 13 (1st midterm exam), Lecture 21 (2nd midterm exam), and Lecture 26 (post-course test). These four lectures are mandatory: if missed, you will not get the attendance bonus unless for legitimate, documented emergencies. To collect attendance, you will need to write down your name on a piece of paper, along with the answer to one of the question asked in class. Before leaving you will have to give the piece of paper to the professor. It is your responsibility to make sure your paper is collected.

What's going to happen in this course?

- A look at the SYLLABUS - our CONTRACT - READ IT!
- Active engagement with nearly daily group activities
- ATTENDANCE is STRONGLY SUGGESTED (BONUS)
- Periodic Homework sets (6) will be administered

There will be six (6) homework sets on problems that are representative of the class lectures. Homework sets are done online at MasteringAstronomy (www.masteringastronomy.com). Homework sets must be completed online by Sunday 11:59 pm before the Mondays they are due.

Each homework set is worth 50 points. The course ID is MAMARCHESINI2016AST9. When asked for the student ID, use your TUFTS USERNAME.

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- Active engagement with nearly daily group activities
- ATTENDANCE is STRONGLY SUGGESTED (BONUS)
- Periodic Homework sets (6) will be administered
- Reading Quizzes BEFORE each lecture (due by 10 am on the day of class through Mastering Astronomy). The lowest two (out of 20) can be dropped*

Reading quizzes:

The purpose of the Reading quizzes is to ensure the required reading is done before each lecture. Reading quizzes are performed on MasteringAstronomy (MA) and are due by 10 am on the day they are due (nearly every lecture). There will be 20 reading quizzes throughout the course, each counting 5 points, for a total of 100 points (5%).

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- "Impress me" Project:

"Impress me" Project:

The subject of this project is (almost) completely free. The only constraint on the project is its subject, which has to be related to Astronomy, and the goal of the project is to impress me, your instructor. **UNLEASH YOUR CREATIVITY, AND FULLY EXPLOIT YOUR TALENTS!!** (Almost) anything goes: create a painting, write a poem, make a videoclip on a topic covered in class (limited to 10 min), compose a song (it has to play on any computers), remix songs which are astronomy related, observe some astronomical object or event this spring and describe it in 1-2 pages including drawing (http://www.skyandtelescope.com for targets), do a web-research project on any astronomy-related topic that appears in the news during this semester (and write a 2-3 page report including multiple references and potentially figures - use your own works), etc. The sky is the limit, literally. If your project requires some monetary support, please contact the instructor no later than March 1st (in case monetary support is granted by the instructor, all receipts must be provided for full reimbursement). **WARNING: NO OFFENSIVE MATERIAL WILL BE ACCEPTED. THE SUBMITTED PROJECTS WILL NOT BE RETURNED, AND SOME MAY BE PLAYED/SHOWED IN CLASS.**

The project MUST BE SUBMITTED by SUNDAY, April 24th. The project is worth 240 points (12% of the total).

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- Reading Quizzes BEFORE each lecture (due by 10 am on the day of class through Mastering Astronomy)
- "Impress me" Project
- Testing circumstances: 2 mid-term exams + final
  - in-class exams
  - scantron, multiple choice - bring a pencil #2
  - no make-up exams for the mid-terms or final (exceptions require a written excuse from the dean)

IN-CLASS EXAM 1: Monday, March 7th, 2016: Chapters 1,3,4,5

IN-CLASS EXAM 2: Monday, April 11th, 2016: Chapters 11,12,13, 14, 15, 16

FINAL EXAM: This exam is comprehensive and covers the whole curriculum in the textbook, lecture tutorials, ranking tests, notes, and handouts. **THE CURRICULUM IN THE TEXTBOOK IS: CHAPTER 1, 3, 4, 5, 11, 12, 13, 14, 15, 16, 17.**

MONDAY, MAY 9TH, 2016, 12:00 PM - 2:00 PM

LOCATION TBD

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  - scantron, multiple choice - bring a pencil
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- Submission of LTs and RTs (see syllabus)

Grading Policy

ABSOLUTE GRADING

Two midterm in-class exams (350 pts each)	700 pts (35%)
Final exam	600 pts (30%)
“Impress me” project	240 pts (12%)
Homework sets (6 total)	300 pts (15%)
Reading quizzes (5 pts each)	100 pts (5%)
Lecture Tutorials submission	60 pts (3%)
TOTAL ACHIEVABLE	2000 pts (100%)

A:>=94% (1880), B:>=84% (1680), C:>=74% (1480), D:>=64% (1280). TO PASS THIS CLASS, YOU NEED A MINIMUM OF 1200 POINTS (60%). If needed, the above percentiles might be lowered, but not raised.

WARNING: all grades in the class are final 72 hours after they have been posted and/or returned. Please, make sure if you have any grading dispute that you contact us BEFORE this 72 hours period is over.

Mid-term exams will be “curved” to a mean grade of B+ (~87%)

How to be “SPECIAL” in my class

- Cell phone calls or texting in class
- Don’t participate
- Be disruptive or disrespectful
- Leave before class is over
- Come late to class - often
- “Lie, Cheat, and Steal”

TRUST ME:
you do not want to be “SPECIAL” !!

Who are you??????????

Are you a professional student
or are you an amateur?

Goals of the course

Help you develop:

- a basic understanding of the central ideas of astronomy
- an appreciation for the role astronomy has played in shaping the consciousness of the world in the past, at present and what the future holds.
- a real world perspective for how astronomy is connected to your daily lives
- the skills and motivation to pursue life long learning and become a valuable member of the workforce and our society

NOT goals of the course

- Turn you into Math-oholics!
- Expect you to sit there and listen to me lecture for an hour everyday
- Force you to work through an endless array of unconnected homework, labs and writing assignments (don't worry you will still EARN your credits!)
- Teach you essentially the same stuff as I do the astronomy majors

How to succeed

- Read carefully the assigned chapter BEFORE class
- Come to class willing to participate and contribute
    - ask questions!
    - answer questions!
    - engage!! - it will be more fun for everyone...
- Review the LTs right after class, and complete it as much as possible
- Come to office hours to clear your doubts (believe me, it is worth it!)
- For exam preparation, review LTs, lecture notes, RTs
- Engage with other students in conversations about the discussed concepts - you will have a sense of your understanding...
- View this class as a legitimate college course:
    - an “easy A” course is a waste of your time

Some testimonials - 1

- *"I found the way that you teach and conduct Concepts to be very informative and useful. Instead of attending a lecture where the professor teaches what is included in the textbook, your method of emphasizing the most important, and potentially complicated concepts in class allowed me to gain much more out of attending lecture. The utilization of the Lecture Tutorials to supplement the lectures has been an approach that I have thus far not encountered at Tufts. Not only does completing these assignments in class keep me more captivated, but it is also a great way to see if I understand what we learned in class that day"*

- *"Your teaching methods made going to class very worthwhile as I was able to gain a greater understanding of the material than if I had solely read the textbook"*

- *"For test preparation, I always review my class notes, look at the lecture tutorials again, re-do all of the Homework quizzes, and Homeworks. I also found that talking with other students about the topics being tested helps to see if I understand the material, and helps reinforce my knowledge of it"*

- *"AST9 strengthened my reasoning skills and my overall knowledge about astronomy. The lecture tutorials were very helpful to reinforce concepts step by step. The course corrected many preconceived notions I had about what we know about space. I also understand the scientific approaches we use to understand the universe."*

- *"Was very interesting, had never taken a science course like this that focused on space, the universe, etc. It did sort of stimulate the beginning of an existential crisis for me however, thinking about the universe, the earth as well as the sun's life span, etc."*

Some testimonials - 2

- *"I am an Economics major, and I have not found science courses to be as interesting and engaging as other classes. I found AST9 far more interesting, engaging, and informative than the other science courses I took at Tufts".*

- *"Having a Lecture Tutorial really helped explain the topics that we learned in class and additionally provided a studying tool for exams and quizzes."*

- *"He put the material into context, and made us think about the material and engage with it"*

- *"The lecture tutorials helped a lot. After doing them I would better understand the material but also know if a certain concept was difficult for me to apply"*

- *"I really did like the lecture tutorials! It made class more interesting and engaging and it was easier to learn more difficult concepts"*

- *"The Lecture Tutorials really, really helped with learning the material. I really enjoyed the emphasis on active participation and engagement with learning, and I think it made class time so much more than just another large boring lecture class. Going back and looking at lecture tutorials really helped me study and learn the material"*

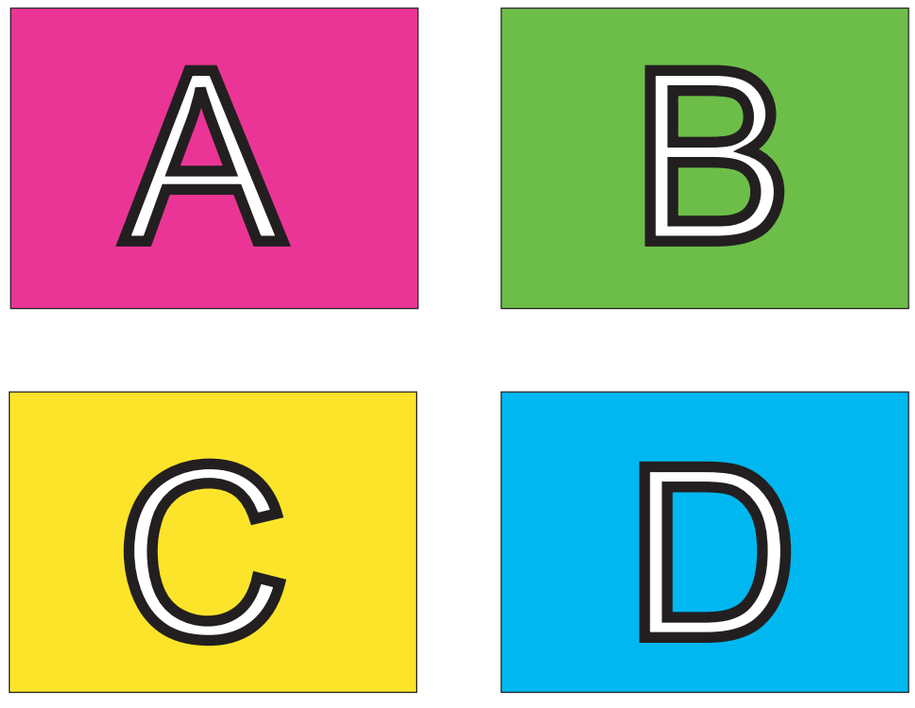
- *"I appreciated Prof Marchesini's approach to learning the course material which is not based on memorization, but understanding and reasoning"*

FLASHCARDS

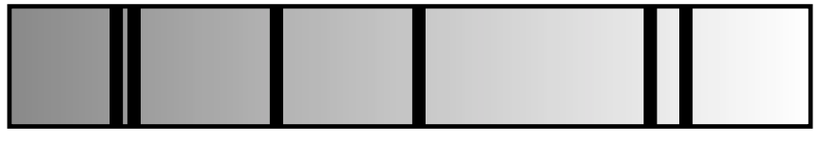
- In each and every class, we will vote on multiple-choice questions using flashcards.
- Why are flashcards better than iClickers:
  - cheaper
  - more fun
  - direct visual on how the class is performing

- REQUIRED: bring it to each and every class.

- How will we use the flashcard?



You observe two spectra (shown below) that are redshifted relative to that of a stationary source of light. Which of the following statements best describes how the sources of light that produced the two spectra were moving?

BLUE  RED

Spectrum A

Spectrum B

1. Source A is moving faster than source B.
2. Source B is moving faster than source A.
3. Both sources are moving with the same speed.
4. It is impossible to tell from looking at these spectra.

Black holes are formed by

1. A lack of any light in a region of space

2. Supernovae from the most massive stars

3. Supernovae from binary stars

4. Collapsed dark nebulae.

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