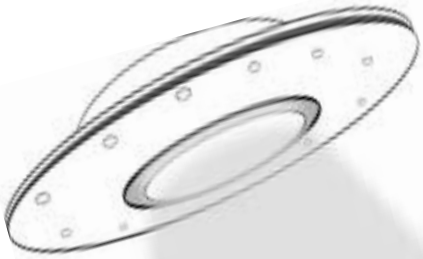

Science and Controversy in Astronomy

(why reasonable people can think crazy things)
Astronomy 3470
MWF 11:00-11:50AM

Professor: Kelsey Johnson
Office: Astronomy #234
Email: kej7a@virginia.edu
Office Hours: xxxxx

Course Description

Did you know that President Reagan employed an astrologer who gave him advice on issues of national importance? Does it bother you that a girl committed suicide because she thought the Large Hadron Collider had created a black hole that was going to destroy the Earth? Are you surprised that there only need to be 23 people in a room for there to be a 50% chance that two of them share the same birthday? Our society is permeated with issues that hinge on science literacy that range from silly to serious.

Through this course, you will develop and exercise your scientific thinking skills, and gain the resources to participate in discussions of scientific controversies that are taking place now. Our approach will be to analyze case studies of specific controversies in astronomy from the past and present. In the process, we will overview the methods of science, the limits of human perception, and a range of both serious and "fringe" topics.

Right Up Front

(things about me and the course that you might find beneficial to know in advance):

The Course: We will deal with topics that are controversial (duh), which means everyone (including me) needs to be sensitive and respectful of different viewpoints. This will not be a "typical" science course, by which I mean we will spend much of our in-class time on group activities of various kinds in order to help you practice the skills you are learning. You may make some new friends over the semester, but this won't be graded.

Me: I think I have the best job in the world. My husband tells me I don't have a sense of humor, but that doesn't keep me from telling bad jokes. I live out in the country, and internet is spotty. I have three kids, about whom I will undoubtedly tell embarrassing stories through the semester. I always keep a bucket of chocolate on the table in my office to entice students to come by (no dementor necessary). One of the other fun things I do besides teaching is study extreme modes of star formation throughout the universe. I also direct the Dark Skies Bright Kids program (you should volunteer!), and serve on way too many boards and committees. I get to (have to?) travel a lot, but so far I haven't left Earth.

What I want you to get out of this course
At some point in the not-too-distant future you will go out into the "real world" where you will interact with people from a range of backgrounds who hold a range of positions. These positions are likely to reflect differing levels of logical thinking and scientific literacy. I want you to not only be able to identify non-scientific thinking, but perhaps more importantly to be able to respond to non-scientific thinking in a way that is productive. If you learn some astronomy along the way, that is good too. Here are the goals I want to help you achieve this semester:

- Recognize common logical fallacies, and identify them in arguments.
- Explain the rational behind different positions in a range of controversies and summarize their main strengths and weaknesses.
- Analyze arguments in a range of scenarios and determine the assumptions on which arguments are based.
- Appreciate the impact of science literacy on modern society and be aware of the ways in which scientific thinking affects every day life.
- Assess the role of media in shaping cultural scientific knowledge and evaluate objectivity of popular articles.
- Articulate a position contrary to your own in a way that a reasonable person who holds that position would agree with.

What can you do to succeed in this course?
Take ownership of the learning process
What you get out of this course will be directly related to how much you put into it. In order to get the most out of our precious class time, your peers will rely on you to do "prep" work in advance. Depending on the topic, this prep work might involve reading a set of articles, submitting text on-line, filling out a survey, giving feedback on a written assignment, or creating a list of discussion questions.

Interact and collaborate with your classmates
Your classmates are a valuable resource to help you fill in holes in your understanding, provide feedback on your work, and expose you to a different perspective than your own. I strongly encourage group work both inside and outside of class.

Engage with the material
With all of the material you consider in this course, I want you do keep these questions in mind: What are the main points? How is this relevant to you or to society? What do you not understand? For material you don't feel you have mastery of, what action could you take to patch your understanding?

Put yourself out there and participate
Having a class on controversies is much more fun if people aren't afraid to say crazy things. If you are intimidated and scared to speak out, pretend you are

someone else who isn't afraid to say anything, or pretend (for the sake of discussion) that you hold an opinion of someone besides yourself.

Talk to me
I have chocolate. I understand that sometimes you are just stuck, or need feedback, or want feedback on an idea, or really need to get something off your chest. No one has been abducted by aliens while visiting my office, yet.

How will your progress be evaluated?

Weekly blogs – 30%
This assignment is intended to help you practice two important goals of this course: to heighten your awareness of logical fallacies and non-scientific thinking in the world around you and to practice explaining concepts to other people without the same background you have. In order to facilitate this, every week you will make entries in a blog on-line (details available on Collab).

Dialogue Scenarios – 30%
The goal of these projects is to give you practice distilling the strengths and weaknesses of arguments on different sides of controversies and constructing hypothetical dialogues between proponents of each position. These dialogues will be created collaboratively with your classmates, and the exact instructions will vary throughout the semester (you will practice being aggressive, passive, conciliatory, etc).

Controversy "cheat sheets" – 15%
In the final few weeks of the semester you will create "cheat sheets" on three controversies covered in class (5% each) aimed at your fellow students who are not in this class. If one of your peers is going to engage in a discussion about the controversy, what information is essential for them to know? These can only be a single one-sided page, and should also be visually compelling. (Examples will be given in class). We will create a digital book of these from the course that all students will have access to.

Advising Congress – 10%
One essential role of scientists is informing government agencies on contemporary topics. For this assignment you will practice writing a "brief" to a congressional representative on the NASA budget, providing a recommendation on the appropriate level of support. In true government form, you will have a committee for this. (Example briefs will be given in class).

Participation – 10%
"Participation" means a lot of things in this context, beyond simply talking in class. Are you giving quality and constructive feedback to your classmates on their projects? Are you actively participating in groups? Are you making an effort

to not only succeed yourself, but also help your classmates improve their understanding and skills? The activities will be monitored via your on-line comments and input.

Extra Credit! The "You" in Youtube – up to 10% over your nominal score. Together with a team of classmates, you will create a short (3-5min) video to be posted on Youtube regarding a current controversy in society related to this class. The goal of this project is to get informative and engaging material out to the general public on a contemporary issue. Let your creative side go wild!

What are the course materials?

(BA) Bad Astronomy, by Phil Plait
(DHW) The Demon-Haunted World, by Carl Sagan
(HTAWTs) How to Think About Weird Things, by Schick & Vaughn
There will also be lots of web resources provided through the Collab site.

Late Policy:
This is a large class, which means late work will be a nightmare to handle logistically. If (and only if) you have an official note from a doctor (or other appropriate authority) will your work be accepted after the due date (although I welcome you to do the assignment anyway to enhance your learning!). Please note that much of the work in this class is done in teams, and therefore your entire team will be depending on you to complete your responsibilities on time.

Screens in the classroom:
In the first week of class we will collectively determine an appropriate policy for use of laptops and phones in the classroom, as well as the corresponding repercussions. You will take a roll in enforcing whatever policy the class decides on.

Grades:
I would rather you learn for the sake of learning, but I recognize that many of you value you grade you will earn in the class. I use my creativity in other ways, so grades are pretty standard*:

A+ = > 100%
A = 90-99.9%
B = 80-89.9%
C = 70-79.9%
D = 60-69.9%
F = < 60%

* If the course average is lower than a ~B-, I will raise the grades accordingly.

Course Plan:

Specific Readings will be assigned via Collab

1) Scientific thinking and logical fallacies
   (Spotting Baloney instead of eating it)
2) The Human Factor
   (Did you see the face on Mars?)
3) What can we learn form how historical controversies were resolved?
   (Did you know Galileo was kind of a jerk?)
4) Astrological Theory and Cold Reads
   (Why does your horoscope fit you?)
5) Alien artifacts and UFOs
   (Is the truth really out there?)
6) The Big Bad Universe
   (Will a meteorite destroy life on Earth? Will the LHC kill us all?)
7) The Big Bang
   (How do we know which creation narrative is correct?)
8) The role of media
   (How does the general population know things?)