

AST301: Cosmic Catastrophes (AKA Collisions)

Spring 2019

TuTh 1:00-2:20, Frey 309

- Instructor: James Lattimer (email James.Lattimer@Stonybrook.edu)
 - Office: ESS 449; office hours are Tu, W, Th 2:30 - 3:30
- Course URL is <http://www.astro.sunysb.edu/lattimer/AST301/>
- Required texts: “Cosmic Catastrophes” by Wheeler; “Disturbing the Solar System” by Rubin; “Extreme Explosions: Supernovae, Hypernovae, Magnetars, and Other Unusual Cosmic Blasts” by Stevenson
- Supplementary material (not required) “The Life and Death of Planet Earth” by Ward and Brownlee; “Rare Earth” by Ward and Brownlee, and “Rogue Asteroids and Doomsday Comets” by Steel.

Supplementary books and Stevenson’s book (not needed until the last half of the course) were not ordered, but can easily be found on Amazon.com, bookfinder.com or addall.com. They are provided as assistance for homework problems and for class reports.
- Prospectus: This course will focus on collisions that occur in the solar system, ranging from those in the early solar system, which affected planetary orbits and spins and also produced the Earth’s moon, through the impactors, including meteorites, asteroids and comets, that threaten the Earth today. In addition, other catastrophic events occurring both in the solar system and in the rest of the universe that could affect life on Earth are explored. Within the solar system, besides impacts, these include solar activity, tectonic and volcanic activity, magnetic field reversals, ice ages, and human activity. The effects of climate change, and mankind’s role in causing them, are discussed. External threats investigated include radiation and shocks from supernovae, explosions on neutron stars (magnetars), gamma-ray bursts, and mergers involving neutron stars. We will explore if these events could have affected the Earth in the past. Risk assessment is an important component of this course; should we try to prevent or mitigate climate change and impacts? The uneven and often irrational human response to various risks is an important aspect of this question, so will examine the relative risks posed by power generation by coal, oil and nuclear power, radiation, automobile accidents, and guns in order to place terrestrial and extra-terrestrial catastrophes in context.
- Exams: There are no exams for this course.
- Homeworks: There will be 10 homework assignments that will count for 40% of your final grade. There is a homework due every week except for the first week, weeks involving vacations, and weeks in which a report is due. Homeworks will be posted on Blackboard about one week before their due date. Completed homeworks must be submitted to Blackboard before the due date and time; multiple submissions are accepted if you want to revise your submission. Late homeworks are downgraded and will not be accepted later than 1 week following the due date. I am not opposed to persons working on homeworks together, especially for researching, but this must be limited to discussions and not writing. The submitted homeworks are to be your own creation and you must not plagiarize from one another or from your sources.

- **Reports:** Three class reports will each count 20% of the total grade. The due dates for the reports are March 8, April 5 and May 3 and are to be submitted to Blackboard as PDF files. Late papers will be downgraded 1 letter grade for each week they are overdue. We may want to discuss your reports, so you may be expected to give a short oral summary of your report to the class during the two or three classes following the due date; I will assign these dates after you submit your report to Blackboard. These summary presentations should be about 15 minutes in length, and you can use the blackboard or present a power-point style presentation. It is easiest to prepare a few slides in PDF format which you should send me prior to your presentation so that my computer will be used to project them. Your paper grade will be based primarily, but not exclusively, on your written report.

Suggested topics for the term papers will be posted on the course website, or you can propose to me alternate topics relevant to the lecture material. The suggested length for a report should be 8 - 12 double-spaced typed pages, not counting figures and tables, but this is not a hard and fast rule. They must be uploaded to Blackboard as PDF documents. I am happy to discuss your paper or look at an outline during office hours or other arranged times at your convenience. For each paper, it is expected that you should find appropriate sources. Books and magazine or newspaper articles are acceptable, as are internet web pages if you identify them and conclude they are providing reliable information. TV documentaries are not acceptable sources of information. You should not use biased, inaccurate or non-scientific sources (examples are Fox News, the Heritage Foundation, Breitbart News, or the Bible) unless you are making a point and have a scientific source to compare with. Your report should not use the required or supplementary texts as primary references; this will lead to downgrading.

Footnotes and detailed referencing are not required, but your paper must include a bibliography containing the sources from which material was taken. If you use figures or tables, you must identify their source. The papers will be graded on the basis of originality, effort, clarity, and relevance to the course. Book reports or rehashes of class notes or readings are not acceptable.

- **Plagiarism:** Copying from currently or previously submitted papers or homeworks, copying directly from the WWW without attribution, or copying part of an article or book without reference will result in an “F” for the report or homework and a complaint will be filed with the student judiciary.
- If you have a physical, psychological, medical or learning disability that may impact your ability to carry out assigned course work, contact the staff in the Disabled Student Services office (DSS), 128 Educational Communications Center, 632-6748/9. DSS will review your concerns and determine with you what accommodations are necessary and DSS will advise me. All information and documentation of disability is confidential.

Stony Brook University expects students to maintain standards of personal integrity that are in harmony with the educational goals of the institution; to observe national, state, and local laws and University regulations; and to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students’ ability to learn.

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person’s work as your own is always wrong. Any suspected instance of academic dishonesty will be reported to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to www.stonybrook.edu/uaa/academicjudiciary/.

AST 301 – Cosmic Catastrophes (AKA Collisions) – Syllabus

Date	Chapters			Topic
	R	W	S	
Jan 29	1	1	1,2	General Introduction
Jan 31	1,2	–	–	Origin of Solar System
Feb 5	3	–	–	Heat Sources
Feb 7	6	–	–	The Moon and its Origins
Feb 12	–	–	–	Comets
Feb 14	7,8	–	–	Asteroids
Feb 19	9	–	–	Meteorites
Feb 21	10,11	–	–	Craters
Feb 26	12	–	–	The K-T Extinction
Feb 28	13	–	–	Impact Rates and Catastrophes
Mar 5	–	–	–	Impact Mitigation
Mar 7	4	–	–	Magnetic Earth
Mar 12	5	–	–	Ice Ages and Climate Change
Mar 14	–	–	–	Volcanos and Earthquakes
Mar 19	–	–	–	Spring Break
Mar 21	–	–	–	Spring Break
Mar 26	–	–	–	Solar Flares and Activity
Mar 28	–	–	–	The Climate Change Debate
Apr 2	–	2,3	–	Binary Stars and Roche Overflow
Apr 4	–	4	–	Accretion Discs
Apr 9	–	5	–	White Dwarfs and Novae
Apr 11	–	6	11	Thermonuclear Supernovae
Apr 16	–	7	2,3	Core Collapse Supernovae
Apr 18	–	13	14,15	Supernovae and Life
Apr 23	–	8	–	Neutron Stars
Apr 25	–	8	–	Neutron Stars
Apr 30	–	–	–	X-Ray Bursts and Magnetar Flares
May 2	–	11	4,5	Gamma-Ray Bursts and Hypernovae
May 7	–	11	–	Compact Object Mergers
May 9	–	9,10,14	–	Galaxy Collisions and Black Holes

R=Rubin; W=Wheler; S=Stevenson; **Bold dates** are due dates for papers (-1 day)