**AST 301: Collisions in the Solar System**

**General Information**

**Spring 2023**

Tuesday/Thursday 1:15 - 2:35 PM  
**Room:** Psych A 137

**Instructor**:  
[Prof. Frederick M. Walter](http://www.astro.sunysb.edu/fwalter/) (ESS 459; 632-8232; frederick.walter *at* stonybrook.edu)  
Office Hours: by appointment.

Quick Links:  
[Prerequisites](http://www.astro.sunysb.edu/fwalter/AST301/general.html#prerequisites)

[Texts and Required Readings](http://www.astro.sunysb.edu/fwalter/AST301/general.html#texts)

[Assignments](http://www.astro.sunysb.edu/fwalter/AST301/general.html#assignments)  
[Grading rubric](http://www.astro.sunysb.edu/fwalter/AST301/general.html#assessments)  
[University-Mandated Notices](http://www.astro.sunysb.edu/fwalter/AST301/general.html#req)

**Overview**:

The Galaxy is made of stars - about 400 billion of them - and most of them are orbited by planets. Even if the probability of intelligent life developing is small, it must have occurred many times in the Galaxy. But we are faced with the *"Great Silence"*: there is no evidence for intelligent life elsewhere in the Galaxy. It has been posited that there is a *"Great Filter"* that either prevents the evolution of intelligent life, or kills it off shortly after developing a certain level of technology.

In this course we will consider the various factors that make the Earth a potentially dangerous place to live. Astronomy informs us that we live in a shooting gallery. Every year about 20,000 tons of extraterrestrial matter collide with the Earth, mostly burning up harmlessly in the upper atmosphere. But occasionally some larger bodies get through, with potentially disastrous consequences. Geology and Paleontology inform us of frequent mass extinctions, some triggered by collisions, and others triggered internally. Together they testify to the fragile hold of multicellular life on the surface of our planet.

While collisions within the Solar System may seem the most concrete danger, we will broaden the focus to include the relation between the Sun and the Earth, the potential for solar flares and coronal mass ejections to affect our civilization, consequences of the evolution of the Sun and the Earth, and our ability to do ourselves in.

This is a course about understanding and assessing risk. Our ultimate goal is to comprehend the risks of living on a fragile planet in an indifferent universe, and, where possible, to learn to minimize those risks.

**Some familiarity with Astronomy is assumed.** This is a science course, with prerequisites (see below). We will use basic physics and mathematics. Quantitative work will be required.

Among the topics we will cover are:

* Risk percention and assessment
* The birth of stars, their evolution, and their deaths
* The formation of planets and planetary systems
* Dangers posed by interplanetary and interstellar debris
* The Solar-Terrestrial Connection
* The changing climate of the Earth and past and present edisodes of Global Warming
* Solar flares and coronal mass ejections
* Extrasolar risks: novae, supernovae, and gamma ray bursters
* Lessons from the Cosmos: does *the Fermi Paradox* inform us about long term prospects for Humanity?

**Prerequisites**: A lower-division 3-4 credit AST course (101, 105, 203, 205); one semester of calculus (MAT 125 or 131 or 141 or AMS 151); and the first semester of the PHY sequence (121 or 125 or 131 or 141)

**Expectations**: I expect that all students enrolled are interested in the topic, have satisfied (and not forgotten) the prerequisites, will attend the lectures, will read the assigned materials, and are willing to invest 6-9 hours weekly outside class.

**Texts and Required Readings**: The required texts are:

 *"Disturbing the Solar System"* by A. Rubin.

 *"Global Warming Primer"* by Jeffrey Bennett. This text is available on-line at [this site](http://www.globalwarmingprimer.com/primer/). You can also purchase a paper version if you wish to support a starving author.

 *"The 23rd Cycle"*, by Sten Odenwald. This book is out of print, but is available online at [solarstorms.org](http://www.solarstorms.org/S23rdCycle.html).

Please also be prepared to review your texts from the prerequisites. If you need an astronomy refresher, I recommend *The Cosmic Perspective* by Bennett *et al.* (any edition).

**Grading and Assessments**:

* There will be about 10 homework assignments, accounting for 40% of your grade. Homework will be due Thursdays by 1:15 PM, excluding the weeks that papers are due. Assignments will be posted on the course web page by close of business Fridays. Late assignments will not be graded. Your two lowest grades will be dropped, so each of the 8 graded assignments will be worth 5% of your grade.

Homework assignments should be turned in on paper, though e-mail submissions (pdf files) may be acceptable.

* Three **papers** (each 15% of your grade).  
  Each paper should be on a topic I will assign, and will require use of reference material in addition to the course notes. References must be cited (the exact style is unimportant). References can include textbooks, popular science books, magazine or newspaper articles, but should not include TV documentaries, social media material, podcasts, or the required readings. Please avoid biased, inaccurate, or non-scientific sources. An incomplete list of recent articles which may prove useful on certain topics is [here](http://www.astro.sunysb.edu/fwalter/AST301/articles.html).
  + The topic for the first paper is discussed [here.](http://www.astro.sunysb.edu/fwalter/AST301/ast301_paper1.html)

The topics for the second and third papers are discussed [here.](http://www.astro.sunysb.edu/fwalter/AST301/ast301_paper23.html)

* + Each paper should be no less than 5 double-spaced pages (12 point font), and should be no more than 10 pages, exclusive of figures and references.
  + Papers will be graded on the basis of effort, originality, clarity, and relevance to the topic posed.
  + Paper due dates are listed in the [Important Dates](http://www.astro.sunysb.edu/fwalter/AST301/dates.html) page. If you cannot meet a deadline, please advise your instructor by e-mail in a timely manner. Accomodations can be made. Otherwise, late papers will not be accepted.
* One [**oral presentation**](http://www.astro.sunysb.edu/fwalter/AST301/oral.html), taking up half a class period (including questions). This is worth 15% of your grade. You will be expected to prepare a powerpoint (or equivalent) presentation, and submit it for grading. The presentation may be based on the topic of either the second or third paper. The schedule of presentations will be [posted here](http://www.astro.sunysb.edu/fwalter/AST301/announcements.html).
* There will be no exams.

**Grading rubric**: Students who obtain a cumulative score of 90% or better on the assigments are guaranteed an A. 80% guarantees a B, and 70% guarantees a C.

**Contacting the Instructor**:  
The instructor welcomes e-mail, but is innundated with spam. As many of you have e-mail addresses that are not instantly recognizable, especially if they originate from yahoo.com or hotmail.com, **please make sure that the subject line of your e-mail contains either of the following phrases: *AST 301* or *Collisions***.

**Classroom Decorum**:  
Students attending class are asked to exhibit common courtesy. See [Critical Incident Management.](http://www.astro.sunysb.edu/fwalter/AST301/general.html" \l "seccim)

**Attendance Policy**:  
Students who know in advance that they will miss a class because of university-related activities (including athletics) or civic obligations (e.g., jury duty) should contact the instructor as soon as possible in advance of the date of absence.

Otherwise, two unexcused absences are allowed; each subsequent absence will lower your grade. An excused absence is documented before or immediately after it occurs -- advance notice of a necessary absence is also a good thing! Attendance will be taken.  
Note that given the uncertainties due to the pandemic, I shall be lenient on absenses.

An absence, excused or not, is not sufficient reason to be late with papers.

Requests for extra credit assignments will not be entertained.

**University-Mandated Notices**

**Academic Integrity**:  
Plagiarism is bad, and unbecoming of university students. Always give credit to all your sources. Failure to cite quoted references, or cutting and pasting text and presenting it as your own, is plagiarism, and is unacceptable.

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. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the [academic judiciary website](http://www.stonybrook.edu/commcms/academic_integrity/index.html) at http://www.stonybrook.edu/commcms/academic\_integrity/index.html

Students suspected of plagiarizing their writing assignments, or of any other form of academic dishonesty, will be assigned an F grade for the course and will be reported to the [academic judiciary](http://www.stonybrook.edu/commcms/academic_integrity/).

Students who suspect others of cheating are encouraged to report them. Reports will be kept confidential. Dishonest students make things that much harder for the majority of students, who are honest.

**Critical Incident Management**:  
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

**Americans with Disabilities Act/ Student Accessibility Support Center Statement:**

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, Room 128, (631) 632-6748. They will determine with you what accommodations, If any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Student Accessibility Support Center. For procedures and information go to [this website](http://www.stonybrook.edu/ehs/fire/disabilities) (http://www.stonybrook.edu/ehs/fire/disabilities).

**Student Support Services:**  
Updated for the Semester of COVID-19

* To access mental health services, call Counseling and Psychological Services at 631-632-6720; Counselors are available to speak with 24/7.
* For updated information on the Academic Success and Tutoring Center please check [www.stonybrook.edu/tutoring](http://www.astro.sunysb.edu/fwalter/AST301/www.stonybrook.edu/tutoring) for the most up-to-date information.
* For IT Support: Students can visit the Keep Learning website at <https://sites.google.com/stonybrook.edu/keeplearning> for information on the tools you need for alternative and online learning. Need help? Report technical issues at <https://it.stonybrook.edu/services/itsm> or call 631-632-2358.
* For information on Library services and resources please visit the [Continuity of Library Operations guide](https://guides.library.stonybrook.edu/continuity).

**Course Materials and Copyright Statement:**  
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