

# Astronomy 230

## Section 1– MWF 1400-1450

### 106 B6 Eng Hall



*Research Papers are due on May 5<sup>th</sup>.*

This Class (Lecture 26):

Visitations

*This paper must be 4 to 5 pages of single-spaced 12 point font, not including references.*

Next Class (Last lecture!):

Contact

*Final Exam is May 7<sup>th</sup> at 1:30-4:30.*

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## Outline

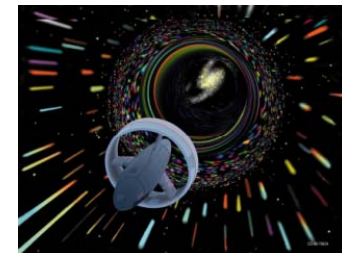
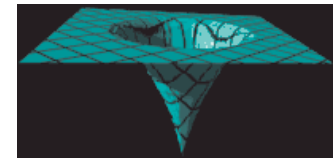


- Other far out ideas for propulsion?
  - Warp Drives?
  - Casimir effect?
  - Dark energy?
- Long haul trips are possible.
- Why have we not had ET visitors?
- What conclusions can we draw from this class?
- What are UFOs?
- ET in art?

## General relativity



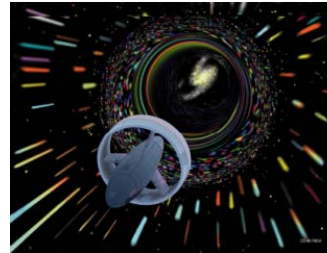
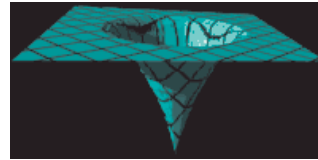
- Gravitational fields can also change space and time
  - A clock runs more slowly on Earth than it does in outer space away from any mass, e.g. planets.
- Einstein revealed that gravity is really ‘warped’ space-time.
- A black hole is an extreme example.



## General relativity



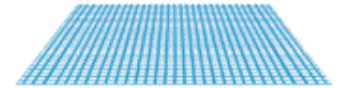
- Rotating black holes may form wormholes to “elsewhen” but they are thought to be short-lived.
- Researchers are considering stabilizing them with exotic matter.
- What if it were possible to create a localized region in which space-time was severely warped?
  - A car has a speed limit on a road, but what if you compress the road itself?



## Quantum field theory



- The subatomic world is not a world of billiard ball-like particles
- “Empty space” is full of waves/particles popping in and out of existence
  - Like a choppy sea, “virtual particles” are born and interact for an allowed window of time
- This sea of “virtual particles” that inhabits space-time can be a source of energy
  - This is real physics, not Sci-fi



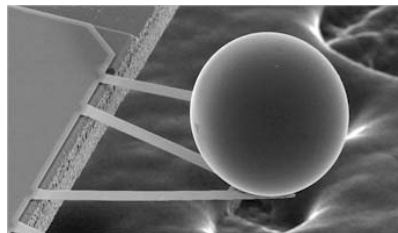
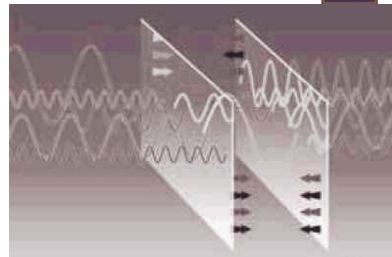
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Astronomy 230 Spring 2004 [http://zebu.uoregon.edu/~js/glossary/virtual\\_particles.html](http://zebu.uoregon.edu/~js/glossary/virtual_particles.html)

## Quantum field theory



- In 1948, Hendrik Casimir predicted a weak attraction between two flat plates due to the effect of the sea of virtual particles.
- Two 1 meter plates placed a micron apart, would have 1.3mN of force. This is like a weight of 130 mg.
- But it is force from nothing!
- Maybe this effect can create a subtle propulsion system?



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## Dark Energy



- Imagine harnessing the power of dark energy (which seems to occupy all space) to form an anti-gravity generator?
- It is crucial to investigate new ideas with open minds and freedom.
- Right now, we really don't have a firm idea for any new propulsion system (space warp-driven propulsion, etc.).
- But, be patient – a long wait may be ahead
  - Hundreds of years?
  - Thousands of years?
  - Remember that the civilization lifetime can be millions of years!

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## ET's Spacecraft?



- We really don't know yet how to get to the stars realistically, so we don't know what advanced civilizations might use.
- But it is
  - Smarter
  - Cheaper
  - still very informative and
  - Realisticto send an unmanned probe into stars first
  - Lighter payload!
- Self-replicating probes?

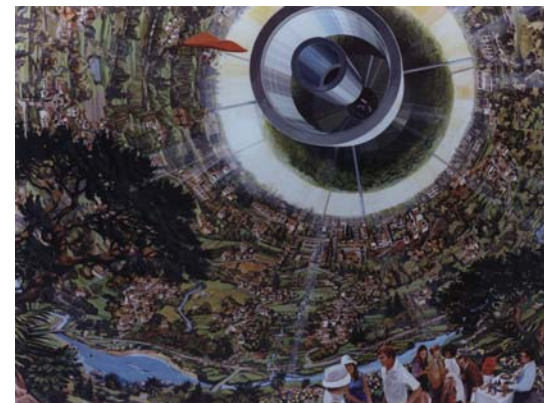
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## Long Haul Space Travel



- Spacecraft that we can envision easily would take a lifetime to get to the nearest star.
- Colonizing missions would be multi-generation missions.
- Space colonies with propulsion systems would slow down things, so maybe it would take 1000 yrs.
- How many of you would sign up today?



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## Nikolai Kardashev: Civilization Types



- Type 0:** Not in complete control of planet's energy  
Understand the basic laws of physics  
Chemical and nuclear propulsion, solar sails
- Type I:** Harnesses energy output of an entire planet.  
Laser sails.
- Type II:** Harnesses entire output of their host star  
Dyson Sphere—can provide a trillion times more energy than we use on the Earth now  
Antimatter drives?
- Type III:** Colonizes and harnesses output of an entire galaxy  
Use a trillion times the energy of Type II civilizations  
Use a trillion trillion times the energy of Type I civilizations

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Astronomy 230 Spring 2004 <http://www.unm.edu/~astro1/ET109/types/types.html>

## Galaxy Colonization



- If our Drake equation estimate is roughly right, there should be civilizations that are 1 billion years old!
- Think of the accomplishments.
- Even if interstellar travel is limited to 0.1c, civilization with advanced telescopes could send colonizing craft to new planets.
- That group regenerates for 500 yrs and sends out another craft.
- An advanced civilization could colonize the entire galaxy in 5 million yrs!

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## But...



- There is no ET life on Earth, so there are only 5 possible explanations (according to Michael Hart):
  1. Space travel is not feasible.
  2. Other civilizations have chosen not to colonize.
  3. Other civilizations have not had time to colonize the Galaxy.
  4. The Earth has been visited in the past, but we do not observe any visitors now.
  5. There are no other advanced civilizations in the Galaxy.

Hart argues against all but #5. He is saying that our Drake Equation result is wrong!

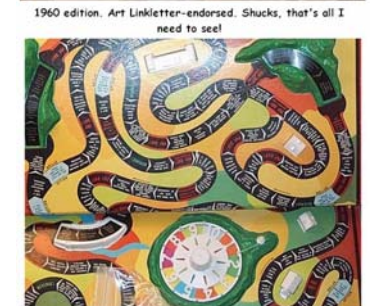
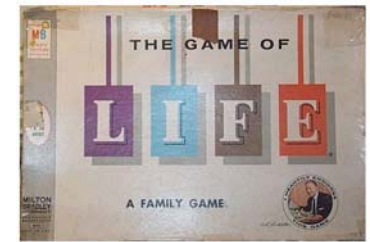
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## Maybe Life is Hard



1. Maybe colonization is much more difficult than we assume. Might expect robotic probes first, which slows down the process.
2. Maybe travelers prefer to explore more than colonize. Overpopulation is not the issue.
3. Are planets suitable for life? If one of the 20 amino acids is missing in that life system, food is a problem.
4. By colonization timescale, the space creatures may prefer to stay in space—weightlessness evolution. Comfy clothes.



1960 edition. Art Linkletter-endorsed. Shucks, that's all I need to see!

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<http://www.wesclark.com/am/life.jpg>

## Class Conclusions?



- There is no reliable evidence that leading us to believe that life exists somewhere else in the universe.
- As this class has shown, life is possible, but that is all we know now!
- May the future enlighten us!
- Still, let's use what we do know and see what sort of conclusions we can make.
- Is it possible that someone may see a UFO?

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## Fact 1



- It is possible that ETI life is abundant in our galaxy
  - With 300 billion stars and plenty of opportunities for life to develop.
  - Our estimate for civilizations was  $3.6 \times 10^6$  right now!
  - So, there are clearly arguments for common life.

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## *Fact 2*



- If ETI is abundant in our Galaxy, then we expect that, statistically, there exist or have existed ET civilizations that have achieved a technological capability greater than that which we now demonstrate— an advanced civilization!
  - The time to reach Type 0 status was about 4.5 billion years on Earth, but it could easily be only 3.5 billion years somewhere else
  - An intelligent civilization can do a lot in a billion years

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## *Fact 3*



- The distances and times associated with interstellar travel are great, but as far as we know, it is conceivably possible that a civilization conduct significant interstellar exploration, especially with enough time.
  - At very least, a more advanced civilization could have sent out nanoprobes across the Galaxy.

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## *Fact 4*



- It is possible therefore that an ET civilization has explored our region of the Galaxy, the Sun, and even our Earth at some point in its history
  - This is not pseudo-science but real logical consequences of abundant ETI.

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## *Fact 5*



- We have no reason to believe that this has not happened
  - We also have no reason to believe that it has.
  - It is an open question.

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## What are we left with?



- These are two distinct but still very significant claims
  - The Earth has been visited by ETs.
  - The Earth has not been visited by ETs.
- Neither of these statements has been validated.
- So, the only statement we can make is
  - We do not know whether or not the Earth has been visited by ETs.



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<http://www.cgl.uwaterloo.ca/~csk/washington/graphics/logos/validated.gif>

## UFOs



- What is a UFO?
- Can all of these sightings be traced to ETIs?
- Stands for Unidentified Flying Object.
- Was introduced as neutral bureaucratese term to replace the emotionally charged term “flying saucer”
- Originally, the term UFO did not have anything to do with extraterrestrials.
- Scheme did not work, and now UFO has all of the connotations that “flying saucer” originally carried.



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<http://www.screensavershot.com/misc/ufo-02a.jpg>

## Close Encounters?



### Scientific approach— you gotta classify

1. Nocturnal lights: bright lights
2. Daylight lights: usually oval or disklike
3. Radar-visual: those detected by radar
4. Close encounters of the 1<sup>st</sup> kind: visual sighting of an unidentified object.
5. Close encounters of the 2<sup>nd</sup> kind: visual sightings plus physical effects on animate or inanimate objects
6. Close encounters of the 3<sup>rd</sup> kind: sightings of occupants in or around a UFO.

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## We Need Hard Evidence?



- A probe or remains of a probe somewhere on our planet or in our solar system
- The remains of ET biological activity somewhere on our planet or in the solar system.
- If you expect to have your scientific investigation received seriously, you have to follow simple logic and common sense
  - The rules for the scientific method are just logic and common sense



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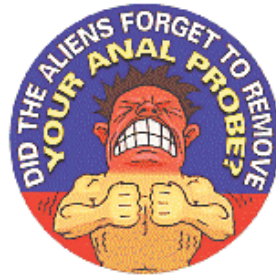
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[http://www.biochem.wisc.edu/wickens/jpgs/2001\\_spac\\_odd.jpg](http://www.biochem.wisc.edu/wickens/jpgs/2001_spac_odd.jpg)

## Witness This



- In a court of law, testimony is used and it has to be judged for legitimacy
  - Bad testimony often gets judged as good and vice versa
- Science is not a court of law
  - We know that testimony can be flawed, so we can not rely on it as a reliable source of information
  - The mind can deceive or be deceived or it can relate observations accurately
    - We don't ever know which for sure



<http://www.buttonhouse.com/catalog/aliens-ufo.html>

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## Pictures



- Pictures are getting close to evidence...
  - What is in the picture?
    - It could be forged (photoshoped)
    - It could be a misprint
    - It could be real
  - We don't know.
- Even if we have a picture or a reliable sighting of, say, a space craft the most logical explanation is still that a human-made object was seen.
  - Occam's razor.
  - We know that governments work on advanced projects in secret.
  - Without evidence of ET life, this explanation is simplest.



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Astronomy 230 Spring 2004 <http://home.tiscali.be/mathias.appelmans/alien.jpg>

## Give Me Evidence



- Evidence:
  - A piece of a probe or spaceship
  - Some trace which can be uniquely linked to an ET probe
  - A reliable, logical calculation
- That is the same we require of ANY scientific investigation



<http://www.alien-ufo.com/images/ufo/miscufo4.jpg>

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## The ET Visitor Hypothesis



- As far as we can tell, no reliable evidence exists for ET visitation
- But, the idea that we have been visited and traces exist somewhere is a valid **THEORY**
  - Maybe improbable but still valid
- *Don't expect people to believe your theory unless it is substantiated with reliable evidence*

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## But Ancient ET Visits?

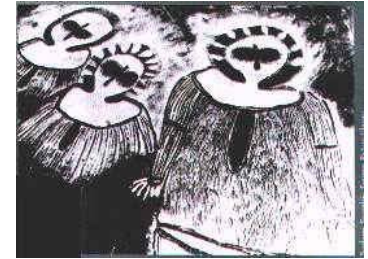
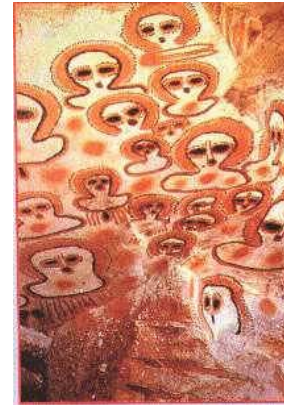


- There are a number of ancient images and artifacts that have been associated with UFOs by modern “UFO researchers”.
- Let’s look at some of those. They’re easy to find on the web– too easy.

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## Cave Paintings



<http://homepage.ntlworld.com/jackaram/>

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## Images from an ancient eastern text *Prajñâpârâmita - Suna*



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## The Madonna with Saint Giovannino



Domenico Ghirlandaio–  
15<sup>th</sup> century.

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## *The Annunciation with Saint Emidius*



Carlo Crivelli– 15<sup>th</sup> century.

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## *The Crucifixion*



A fresco above the altar at the  
Visoki Decani Monastery in  
Kosovo, Yugoslavia– 14<sup>th</sup> century.



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## *The Baptism Of Church*



Aert De Gelder–  
18<sup>th</sup> century.



<http://homepage.ntlworld.com/jackaram/>

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## *Etc..*



- Although there are numerous examples of interesting paintings, drawings from the middle ages or ancient times can not sensibly be used as evidence of UFO visitation!
- The most logical explanation is that people saw something in the sky (a comet or meteorite or clouds) and let their imaginations run wild.
- Why not?
- Strange sights does not mean aliens.
- What about artifacts?

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