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ASTR 2401

Observations in Other Wavelengths

Observational Astronomy

Labs This Week

- None
- Remember, final lab note book is do on Tuesday 11/29 by the end of night lab.

Final Project Talks

Be sure to be be in class both days.

uestions about projects will be on the final!

Thursday, December 1st, 2016

Baillie
Sam
Montana
Andy
David & Kyle

Tuesday, December 6th, 2016

Dominic
Justin & Dylan
Victoria
Brittany
Tannor
Jason

Don't make slides that look like this!

- Don't kill you audience with bullet points
- People will read every word you put on a slide. You are not writing the great america novel. If you put a lot of text on the scene, you'll be tempted the read it. For the love of Newton, please don't do that. Why would you do that to the poor slobs watching you talk? Don't you have any mercy in your soul. Remember the golden rule: do unto others as you would have them do unto you. That goes triple for talks.

Also don't make the font too small to read

WHEEEW!!! Animation is FUN!!!!!

Don't use "fun" fonts, they look tacky

Don't scale up low-res images

Dark/busy backgrounds make it hard to read text!

Keep it simple stupid

Minimize text & use clean, professional fonts

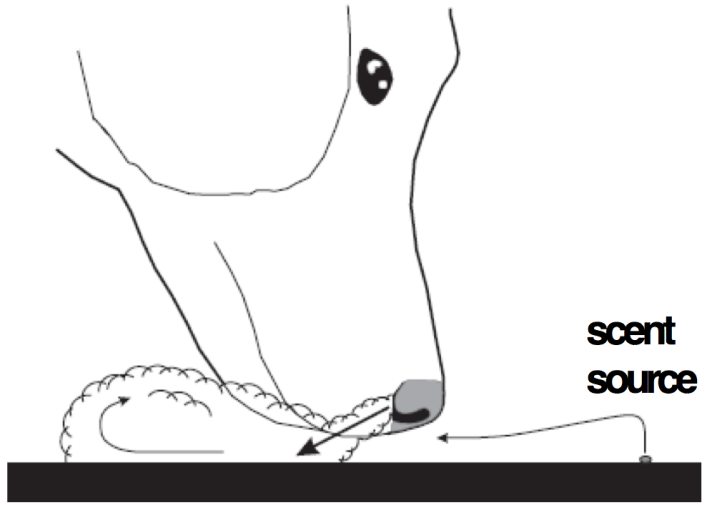
Use high-res or vector graphics

Light backgrounds with contrasting text

Rethinking Scientific Presentations: The Assertion-Evidence Approach

Michael Alley
College of Engineering
Penn State

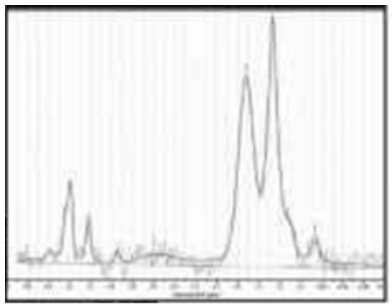
The way a dog sniffs does not contaminate the vapor stream from the scent source

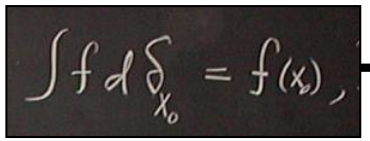


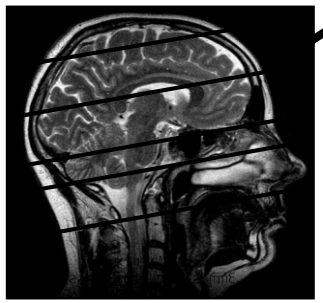
[Settles et al., 2002]

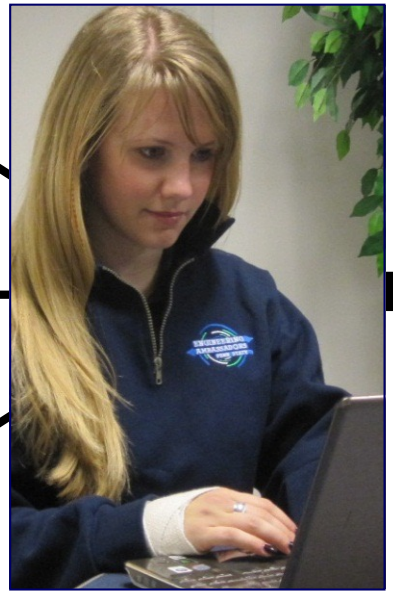
[Alley, 2013]

Slides influence the preparation, delivery, and understanding of a scientific presentation



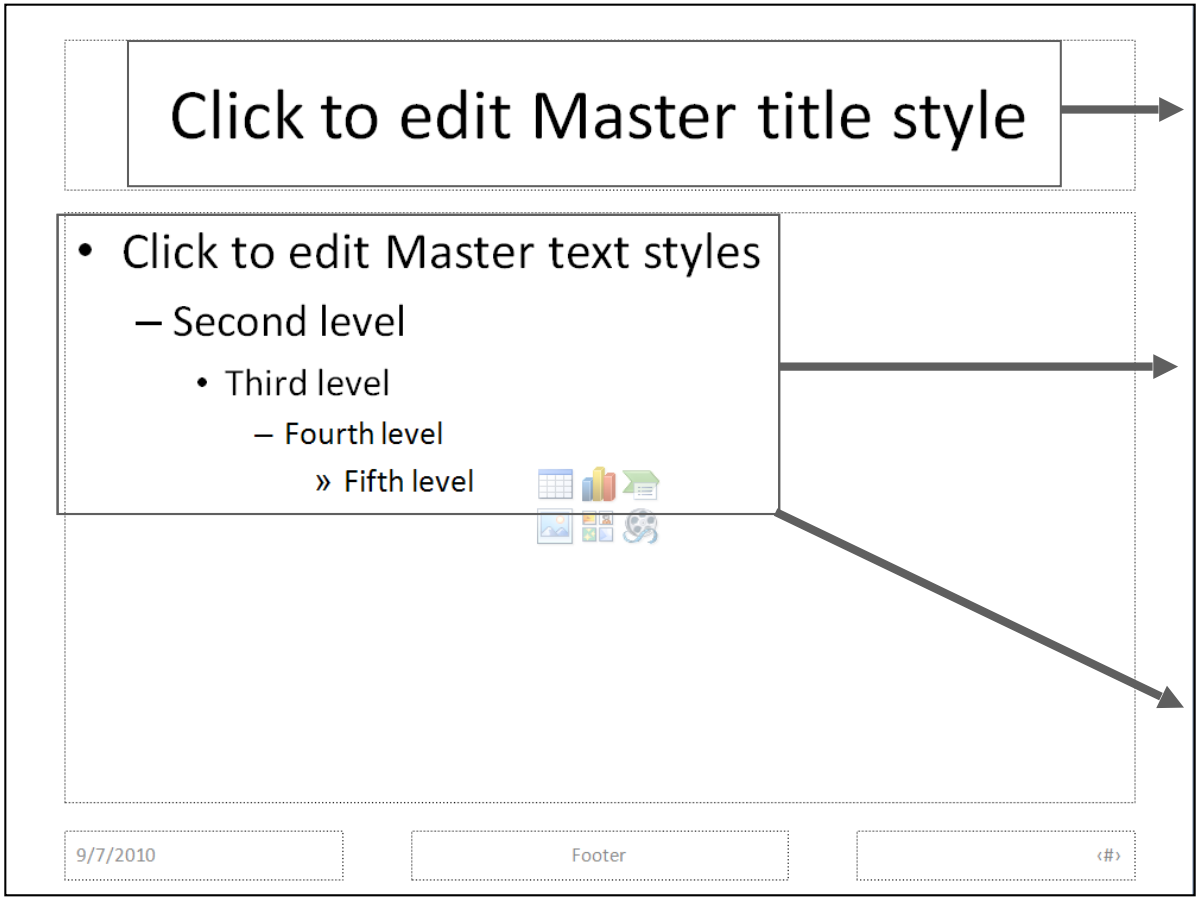






[Alley, 2013]

PowerPoint's defaults run counter to how people learn



Does not filter noise

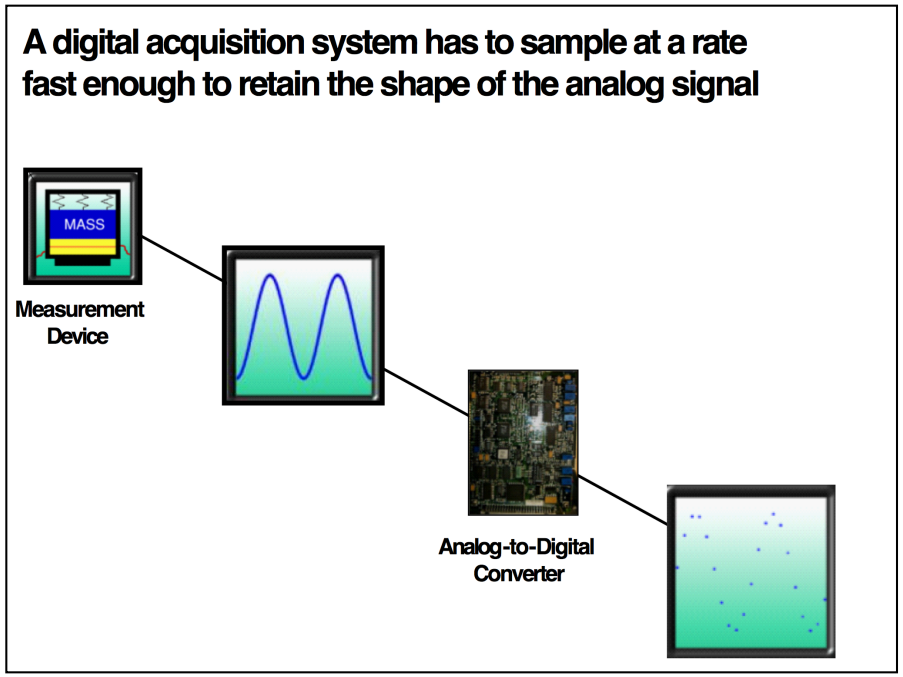
Leads to too many words

Consumes valuable space

[Alley, 2013]

[Garner et al., 2009]

Another assumption is that the slides that we project are for our audience, rather than for us

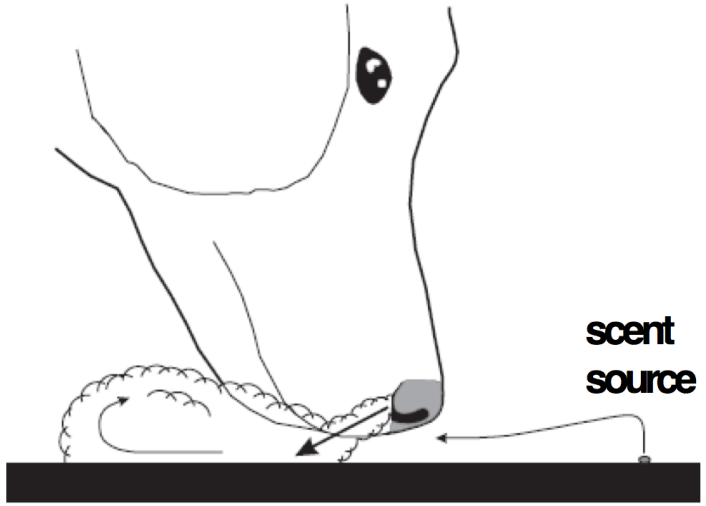


≠

[Alley, 2013]

The assertion-evidence structure consists of a message headline supported by visual evidence

The way a dog sniffs does not contaminate the vapor stream from the scent source

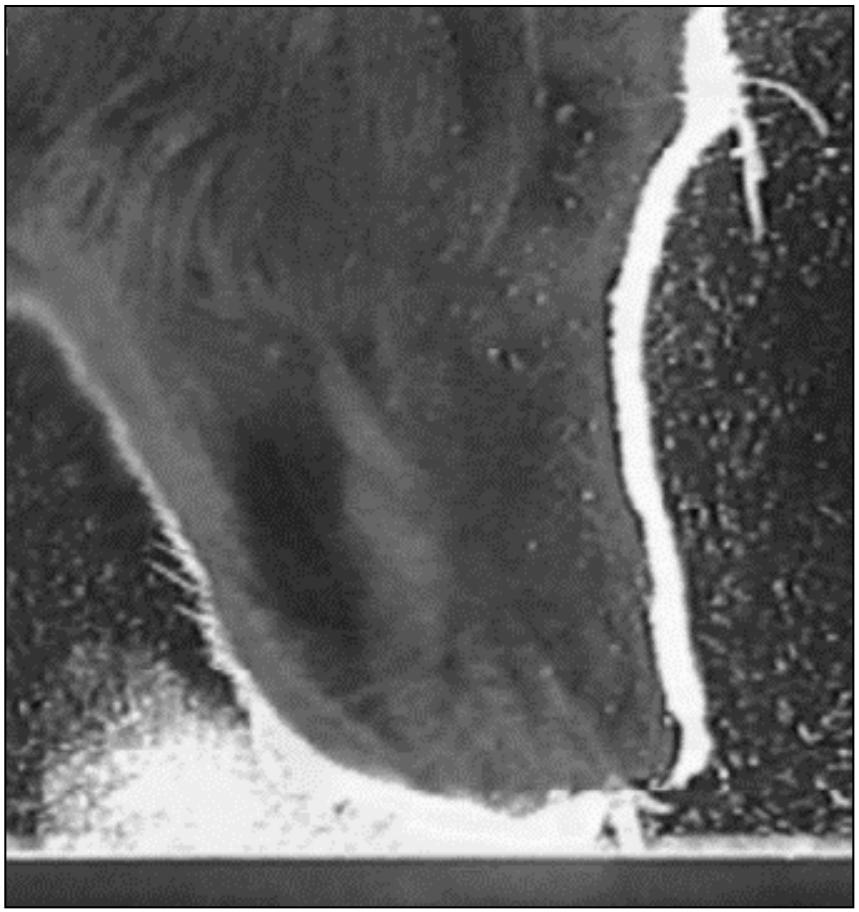


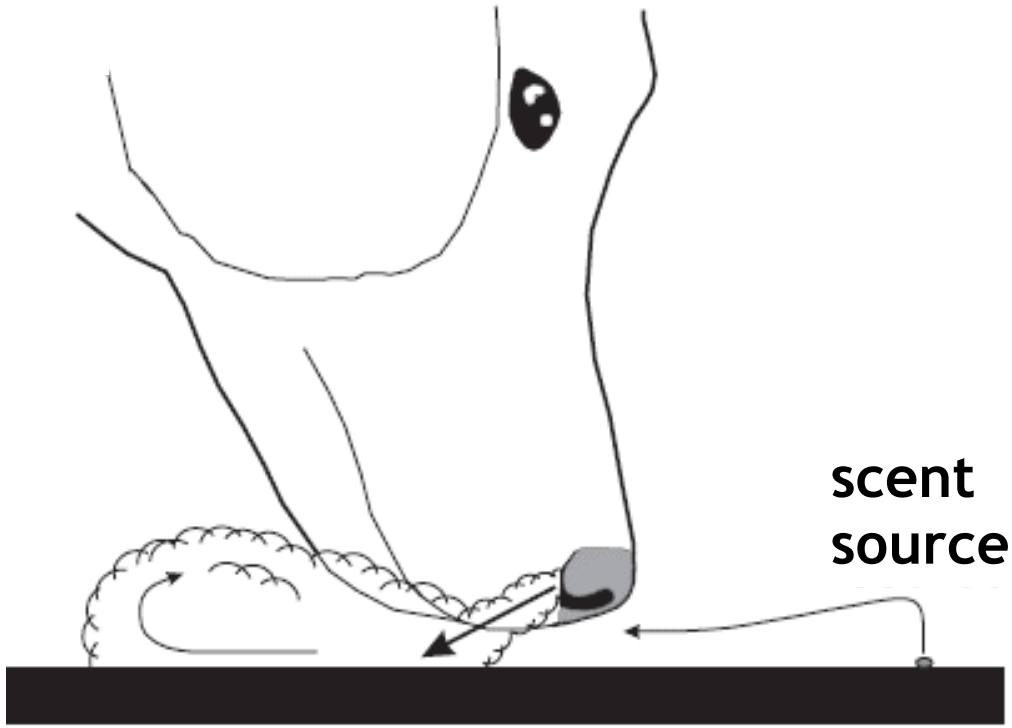
[Settles et al., 2002]

[Settles, 2002]

[Alley, 2013]

The way a dog sniffs does not contaminate the vapor stream from the scent source

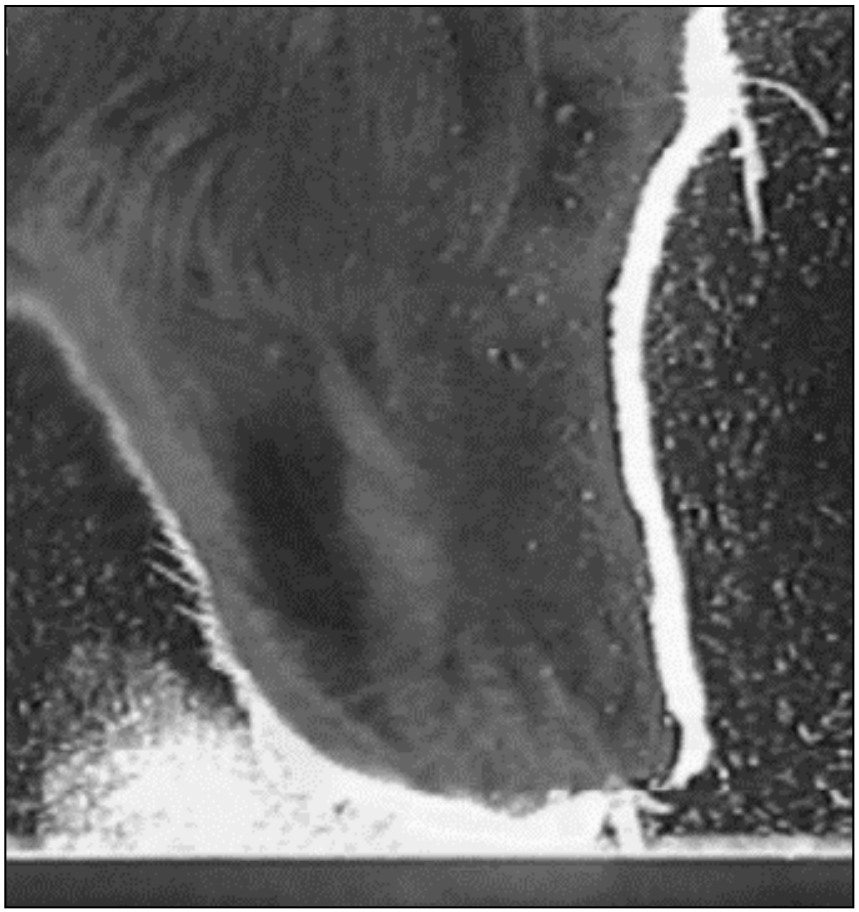


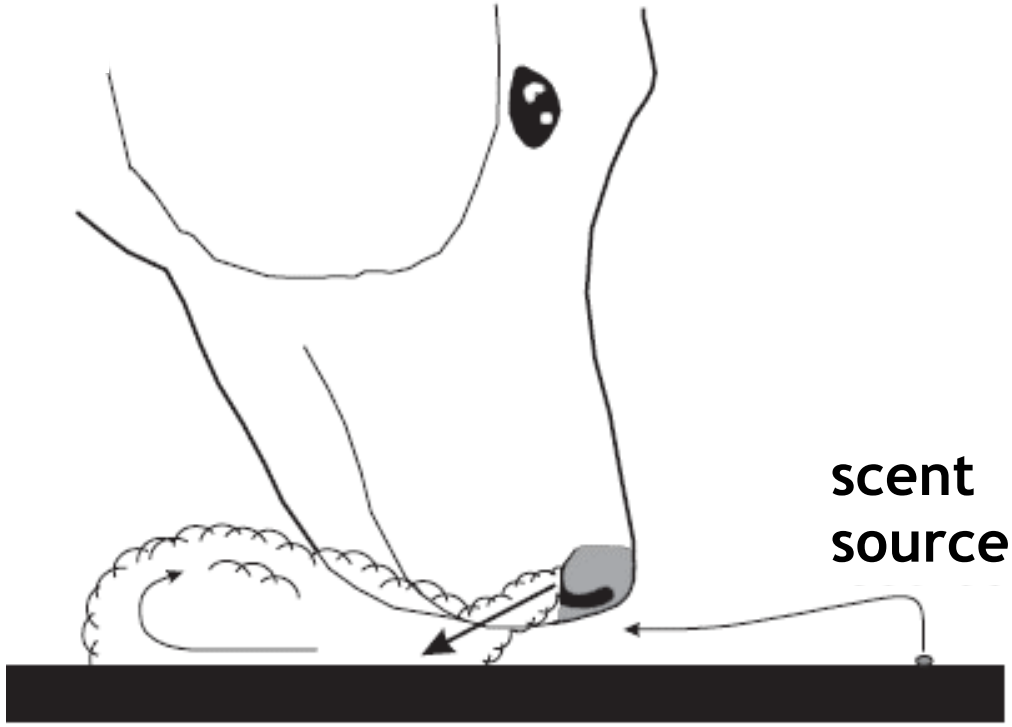


[Alley, 2013]

[Settles et al., 2002]

The way a dog sniffs does not contaminate the vapor stream from the scent source





[Alley, 2013]

[Settles et al., 2002]

The first step is to write a sentence headline that states the main message of the slide

Xenon headlights illuminate signs better than halogen headlights do

Halogen Headlight

Xenon Headlight

[Alley, 2013]

[Sylvania, 2008]

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← sentence headline

[Alley, 2013]

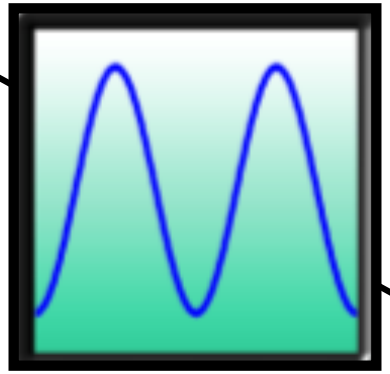
Digital Acquisition System Sampling

- Vibration measured by accelerometer
  - Analog voltage produced
  - Sinusoidal shape
- Analog signal converted to digital signal
- Signal sampled at a specific rate
- Rate → high enough to retain analog shape

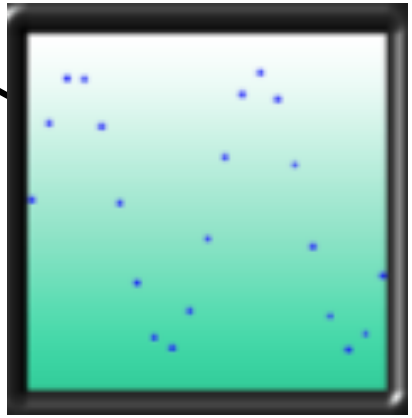
[Alley, 2013]

A digital acquisition system has to sample at a rate fast enough to retain the shape of the analog signal

Measurement Device

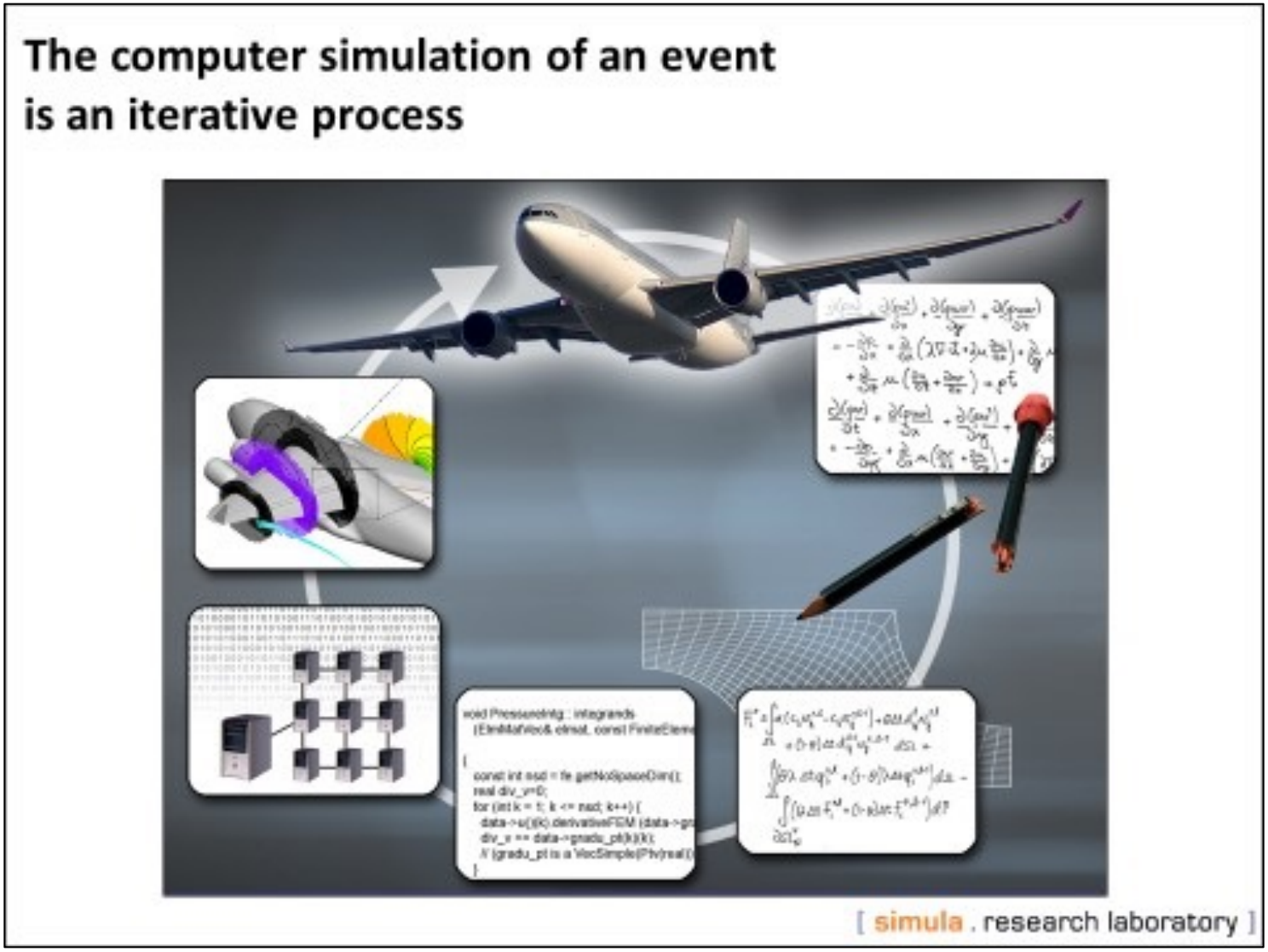


Analog-to-Digital Converter



[Alley, 2013]

The second step is to find or create visual evidence that supports the sentence headline



visual evidence

[Alley, 2013]

Most streams were classified in fair condition because of high chloride concentrations

West Virginia Parks:

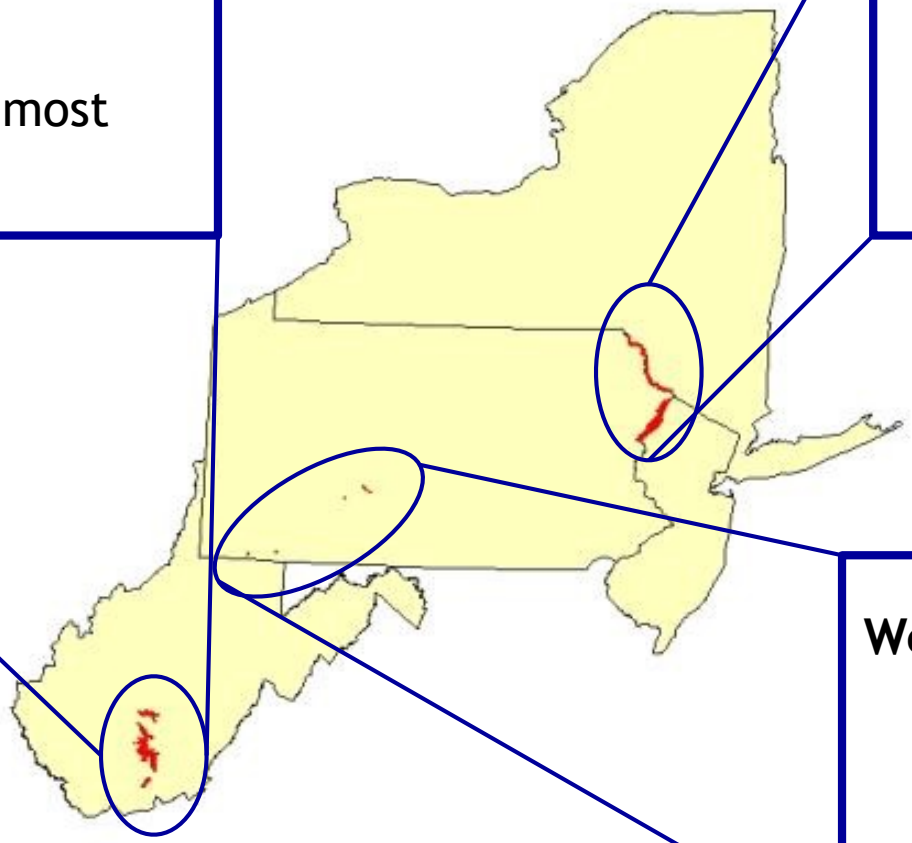
48% Fair

Sulfate caused most problem

Delaware River Parks:

79% Fair

Chloride caused most problems



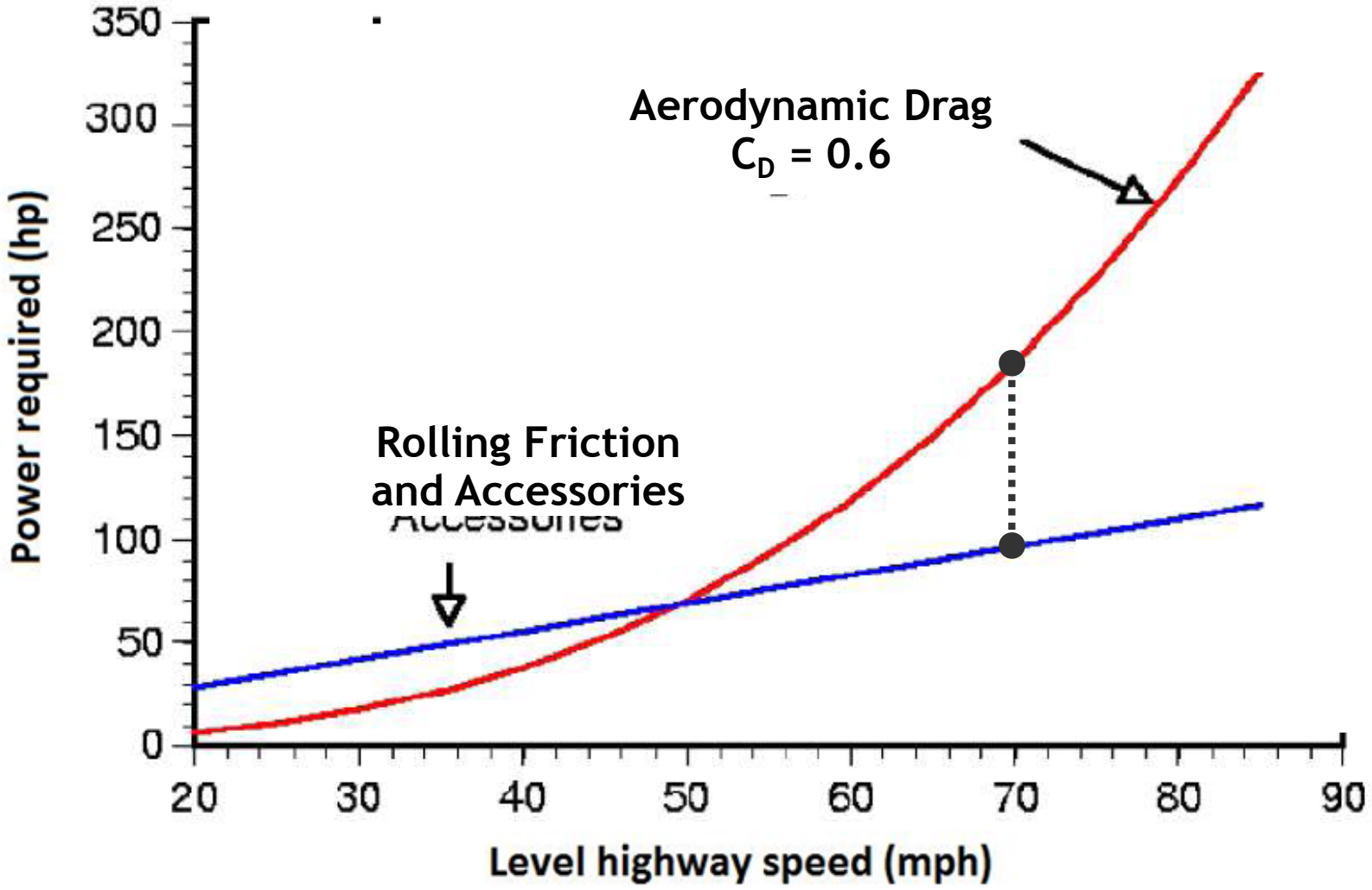
Western Pennsylvania Parks:

75% Fair

Chloride caused most problems

[Alley, 2013]

At typical highway speeds, overcoming drag requires about two-thirds of a truck engine's output

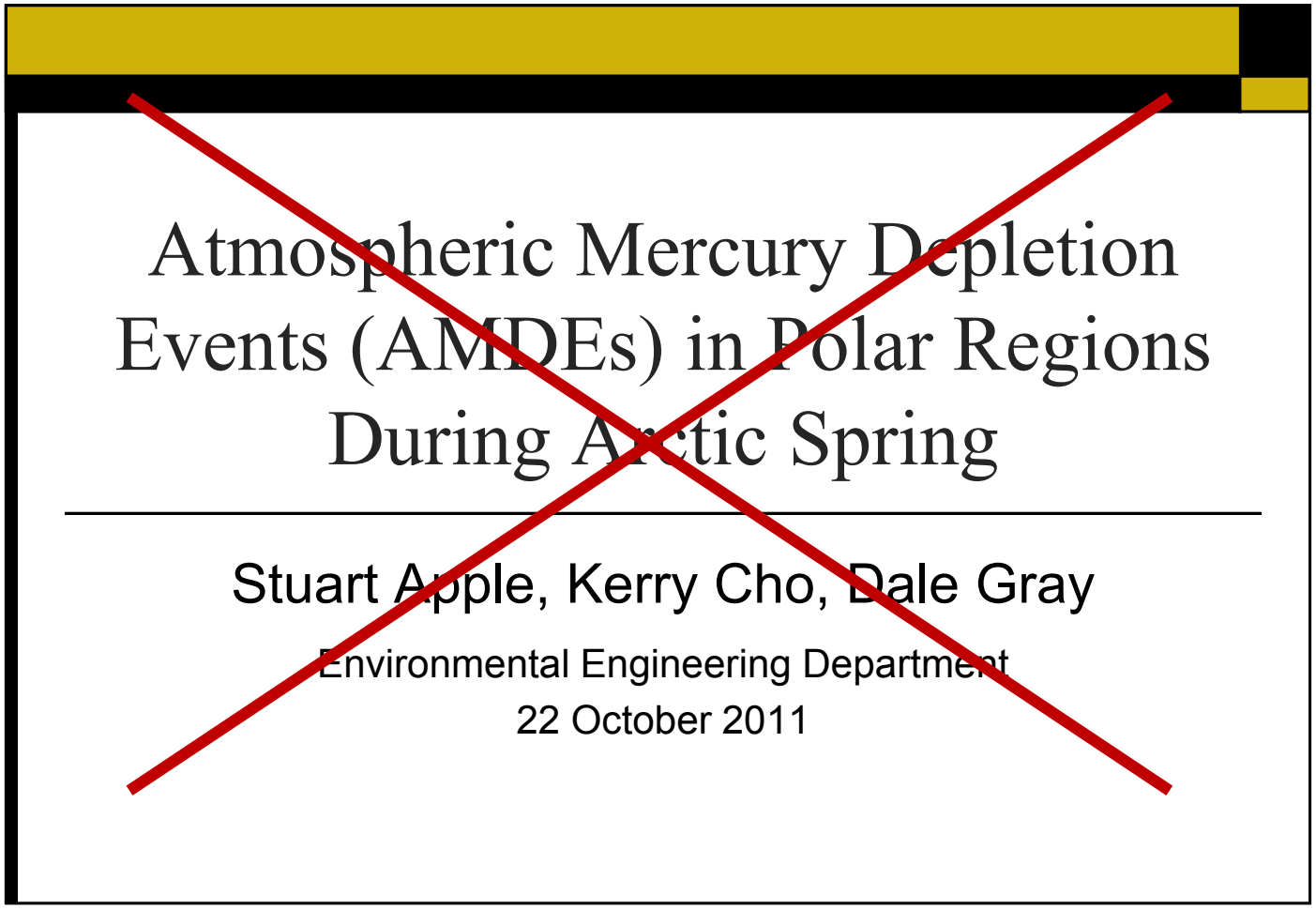


[Alley, 2013]

[McCallen, 2004]

PENNSTATE
1855

A common error in the beginning of scientific talks is to leave the audience behind



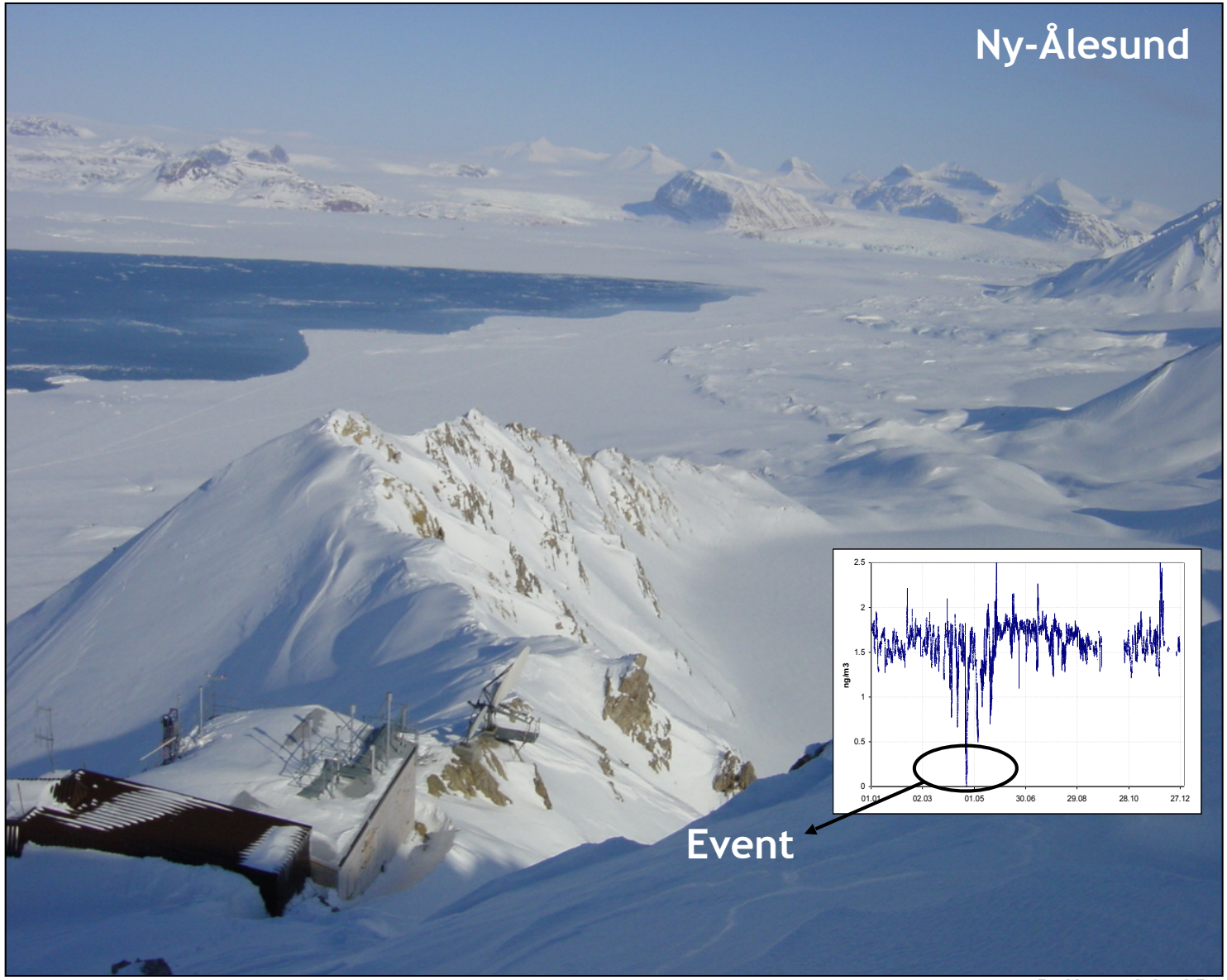
[Alley, 2013]

Determining Whether Atmospheric Mercury Goes into Surface Snow after a Depletion Event

Katrine Aspmo
Torunn Berg
Norwegian Institute for Air Research

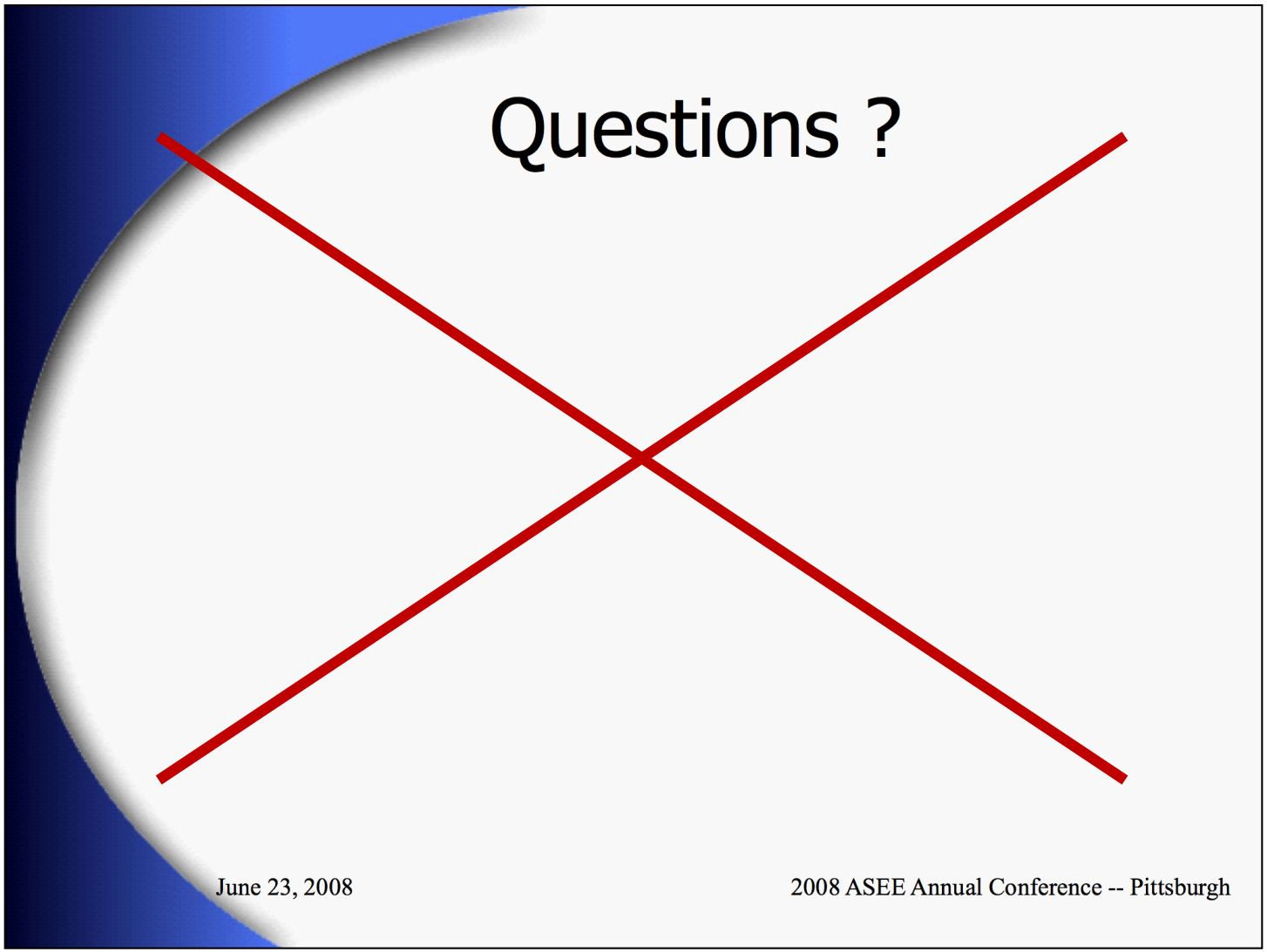
Grethe Wibetoe
University of Oslo, Dept. of Chemistry

June 16, 2004



[Alley, 2013]

A common error in the endings of scientific talks is to waste the last slide

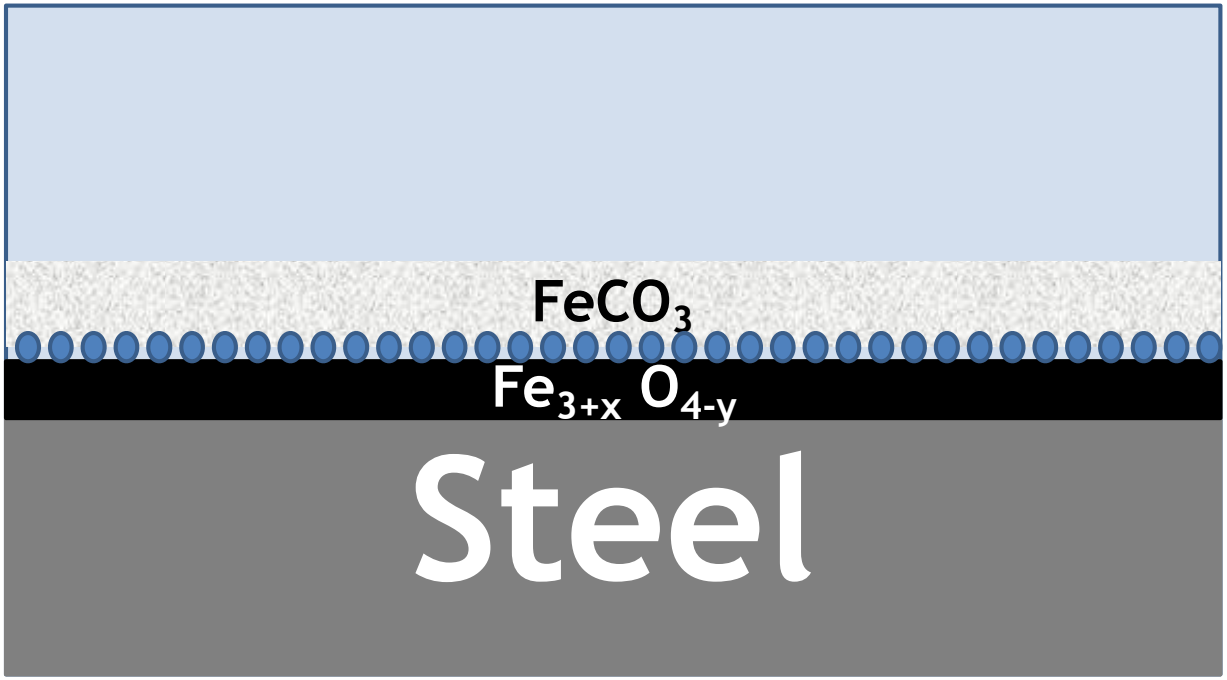


[Alley, 2013]

In summary, high concentrations of acetic acid help protect steel from corrosion

Adsorbed HOAc allows the growth of siderite

A thick siderite layer protects the steel from corrosion



Questions?

[Alley, 2013]

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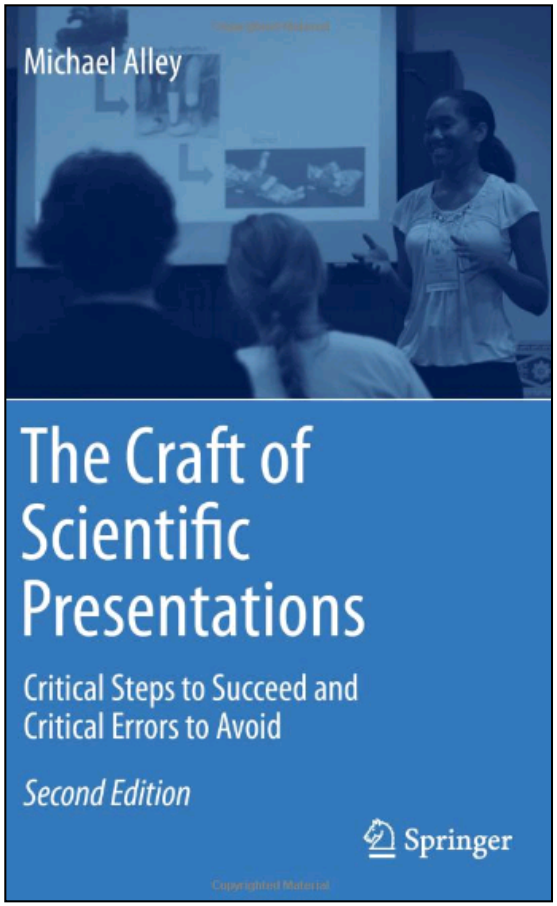
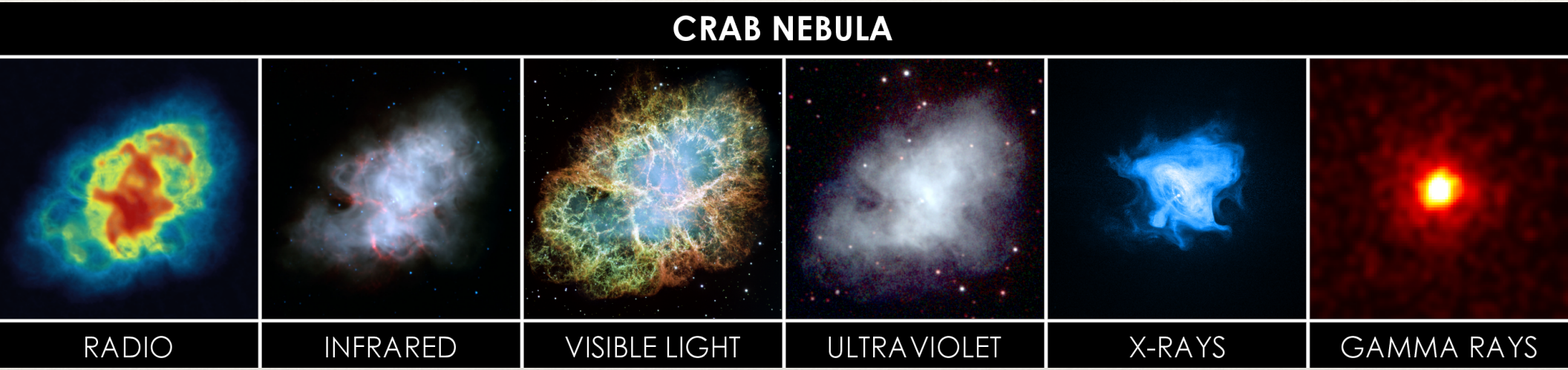
Many engineers and scientists have had success using the assertion-evidence approach

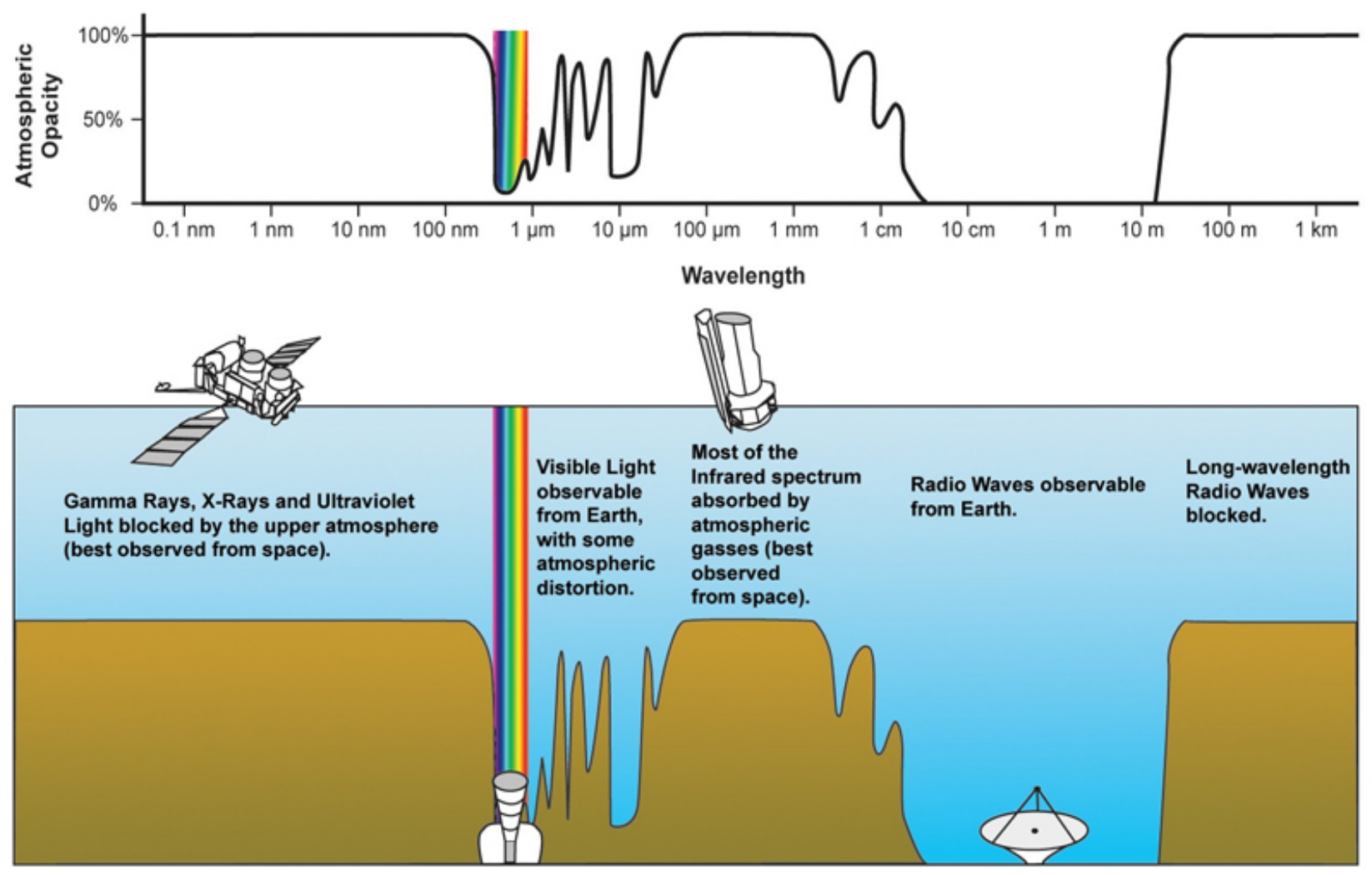


writing.engr.psu.edu/speaking.html

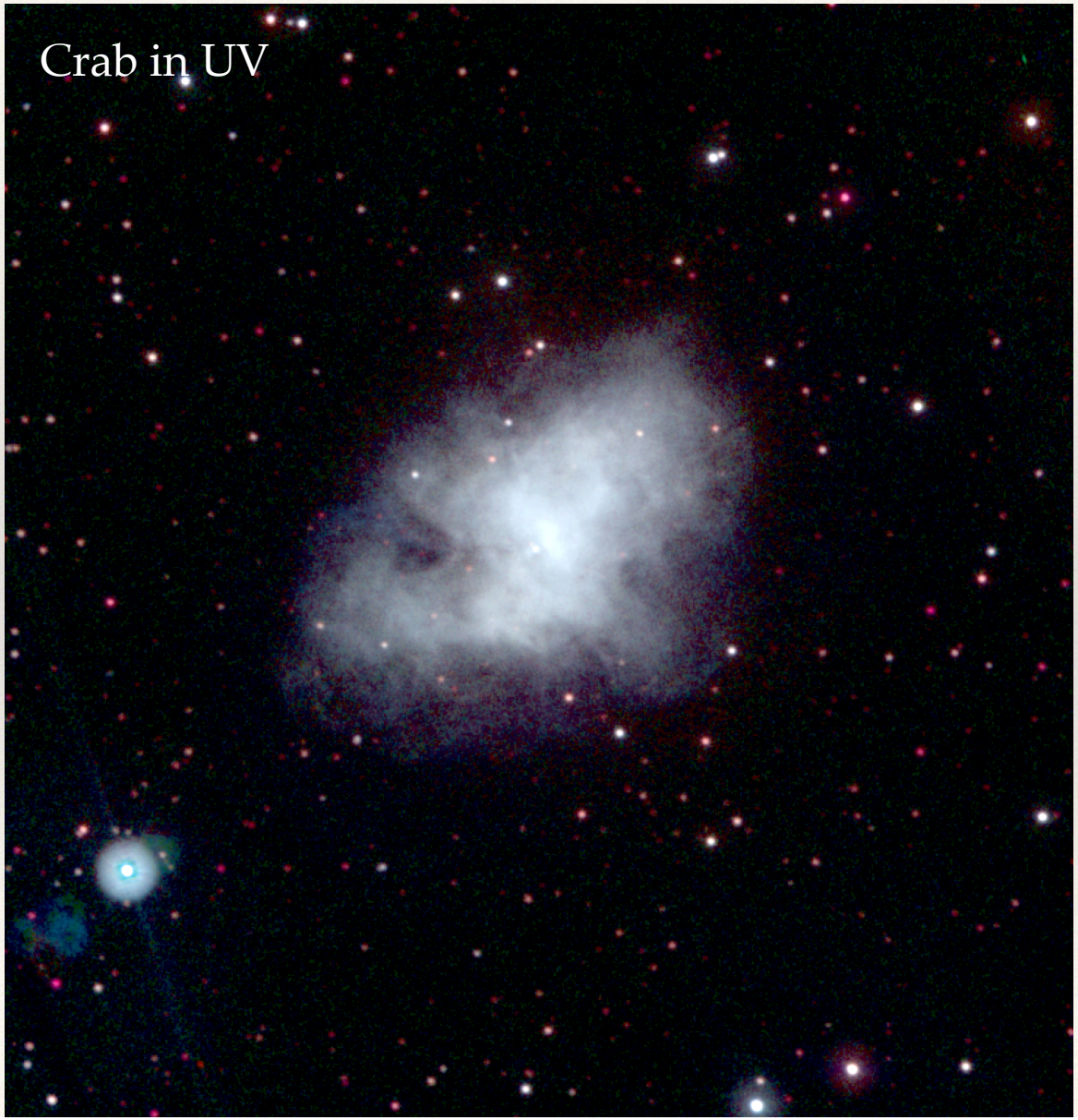
Astronomy in Other Wavelengths



The atmosphere is a big issue for most wavelengths



UV Astronomy



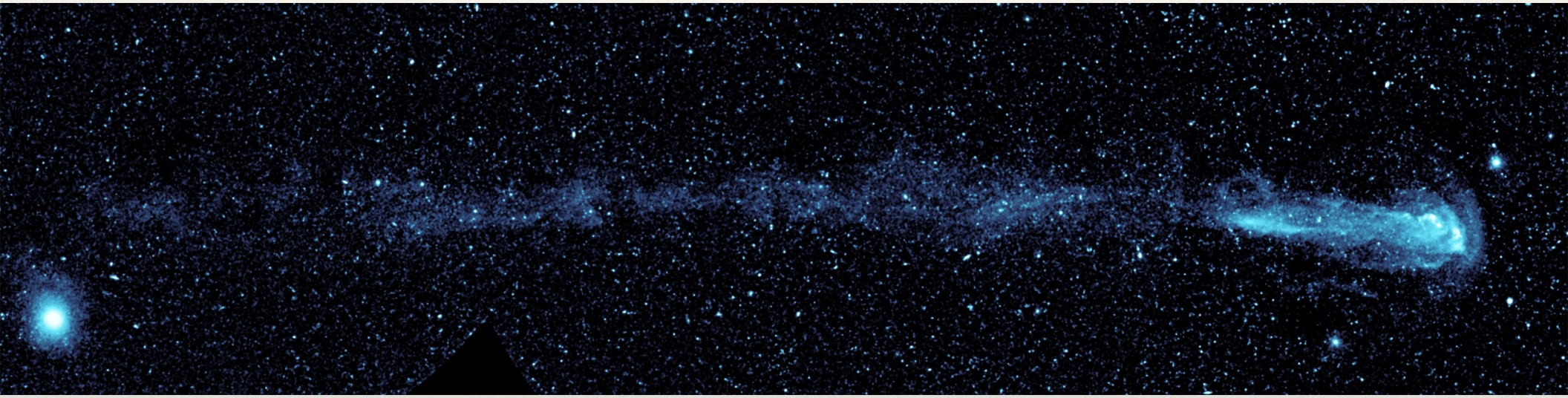
- Similar to optical astronomy
- Needs to be above the atmosphere so space, rockets, balloons……
- Tracks star formation and the interstellar medium

UV Astronomy

M81 Visible

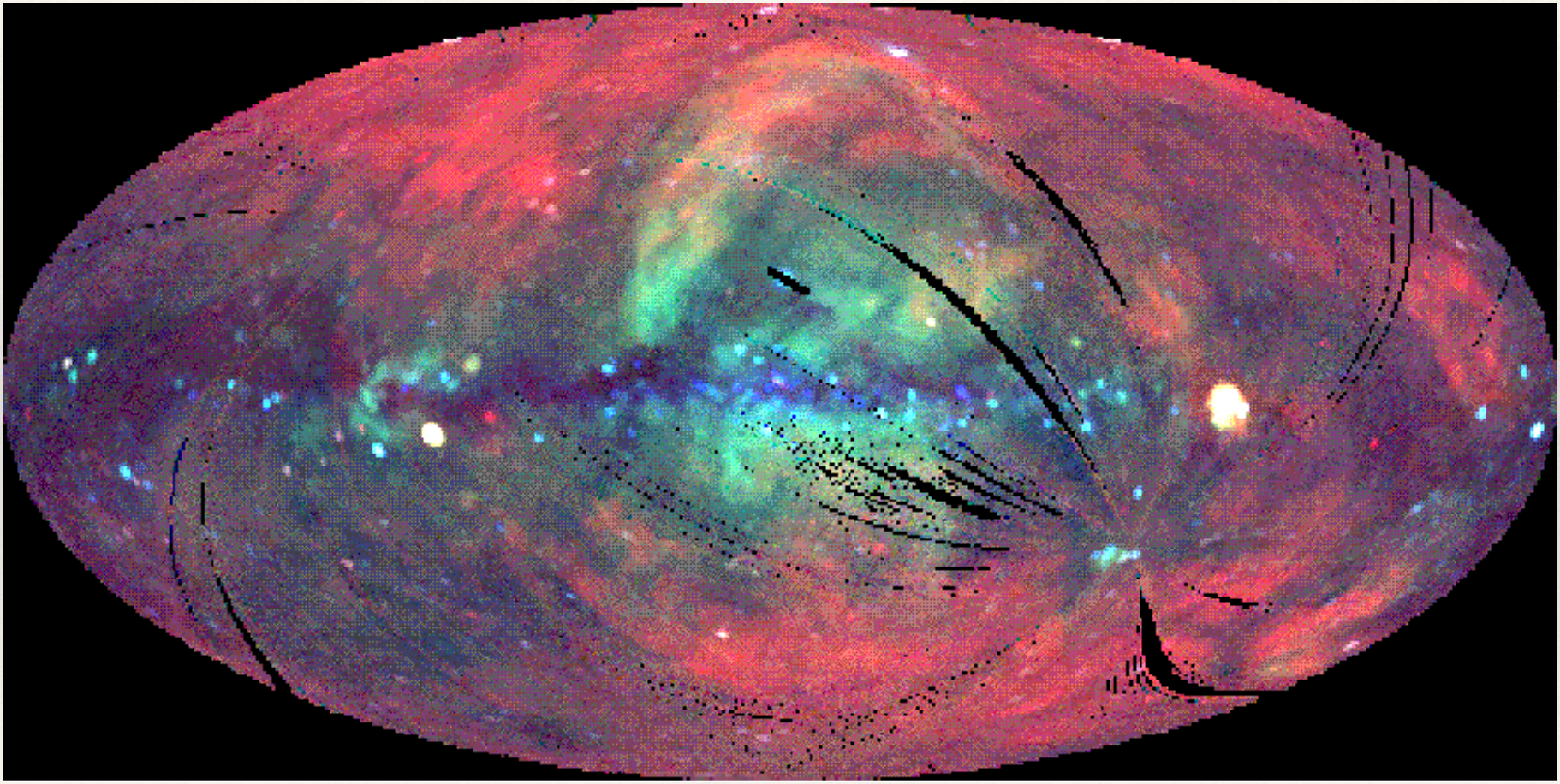
M81 UV

UV Astronomy



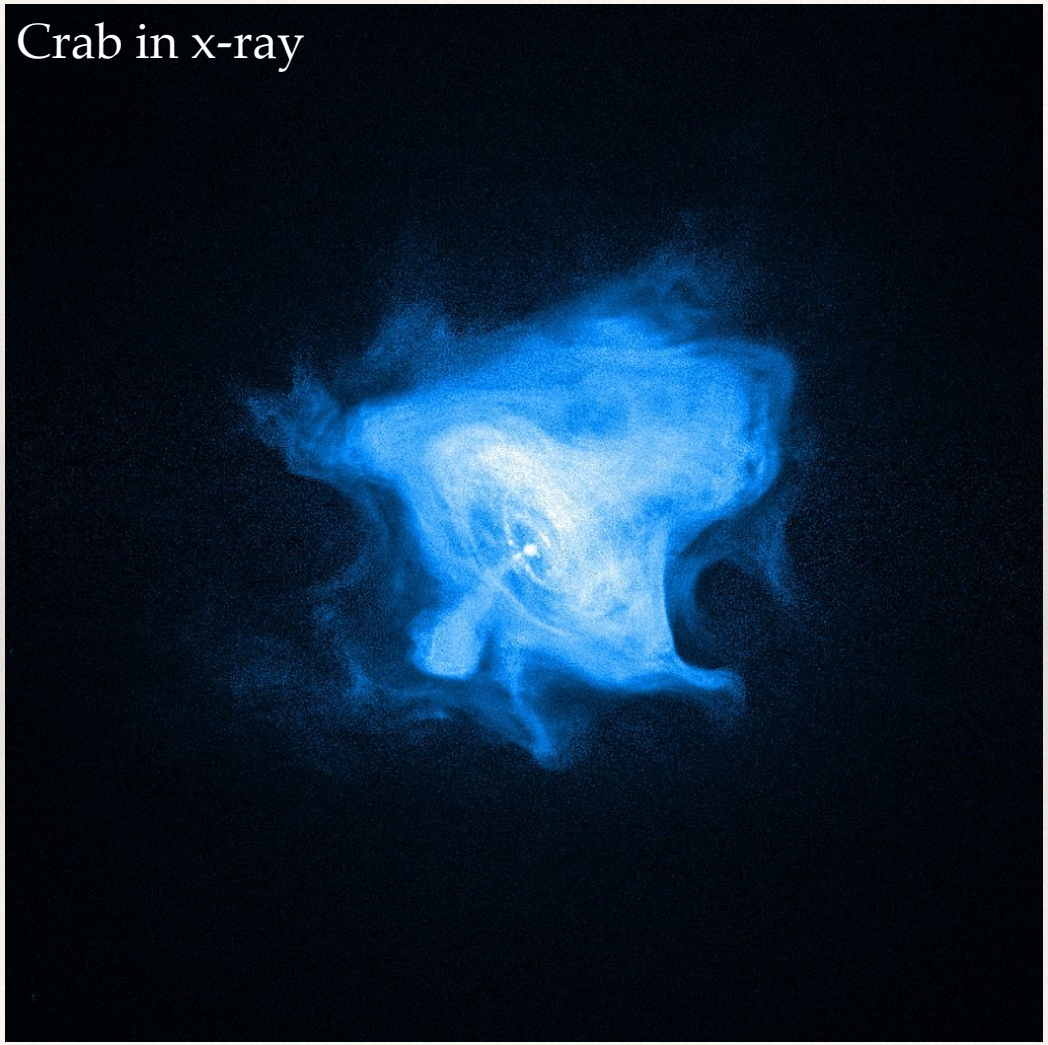
Mira's 13-light year bowshock

UV Astronomy



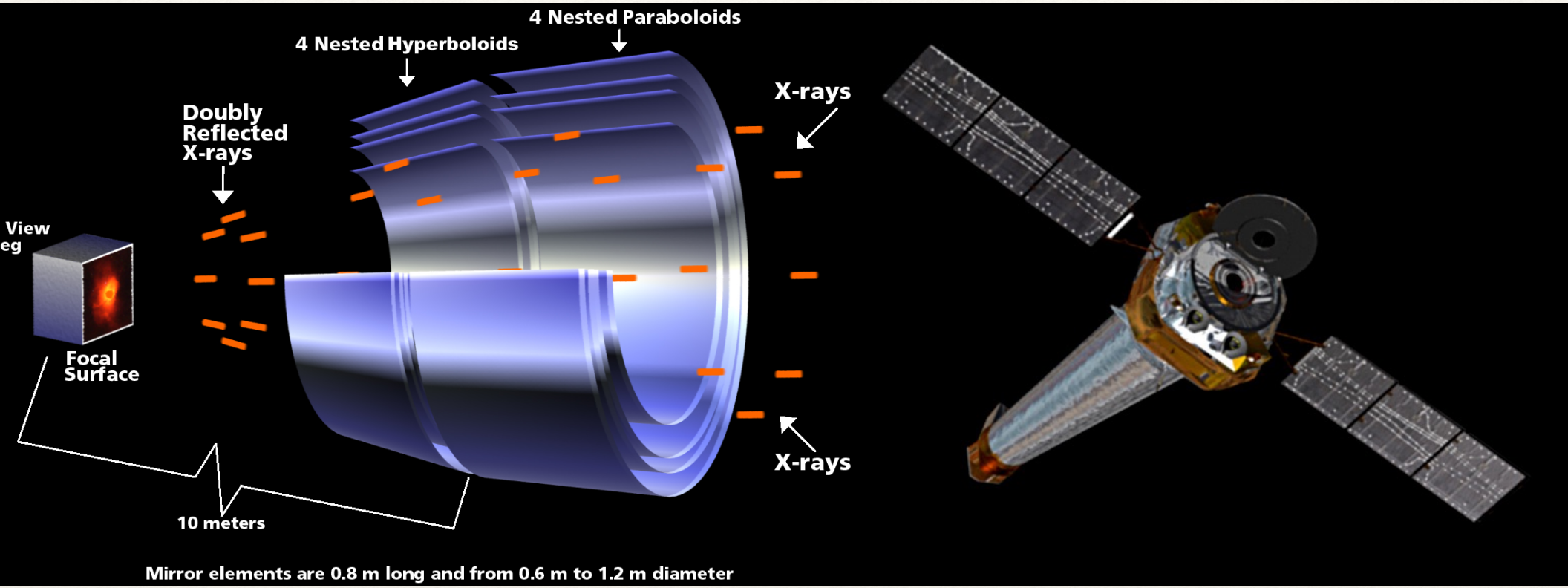
ROSAT all-sky uv image

X-Ray Astronomy



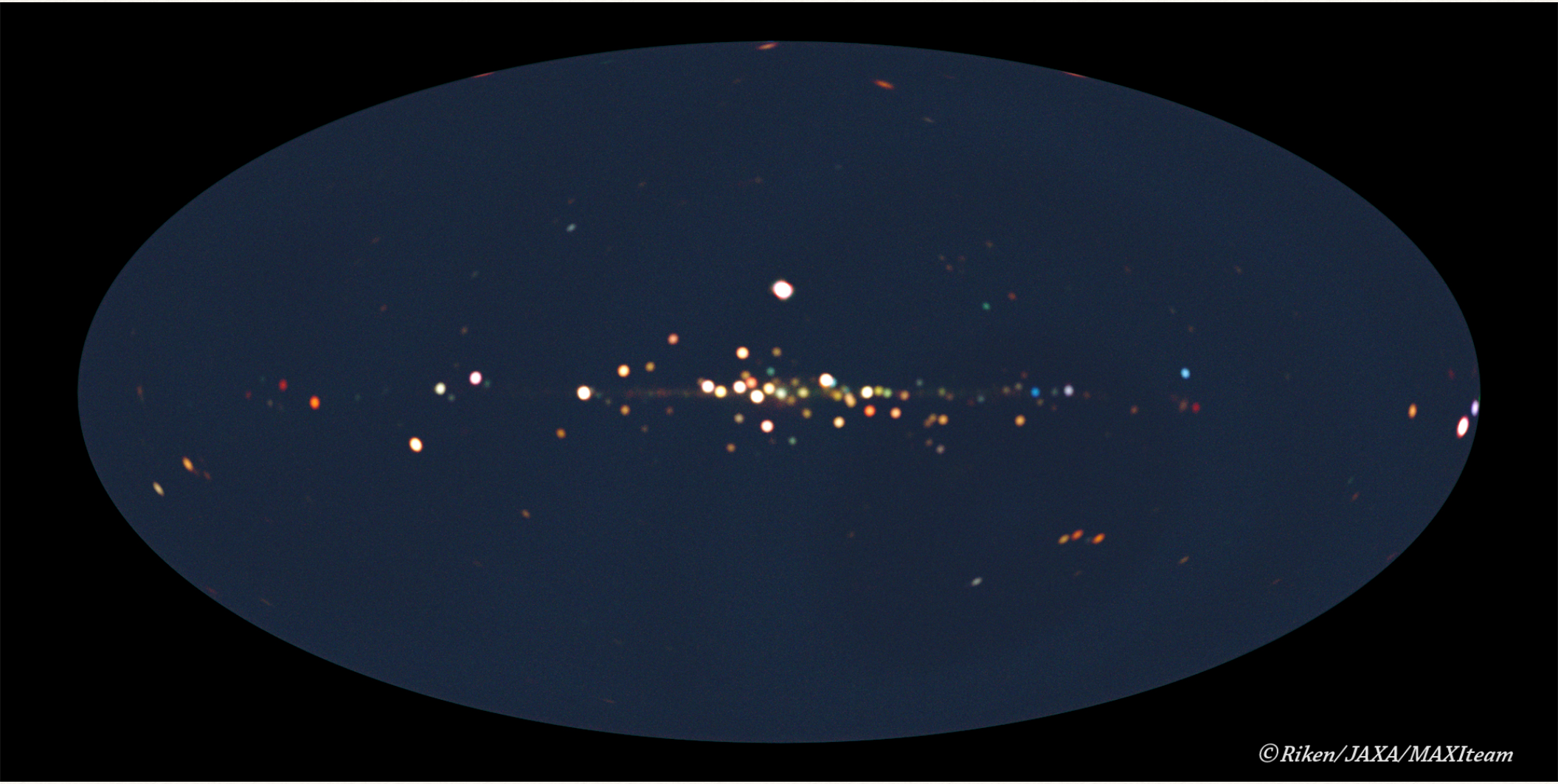
- X-rays track hi-energy events and very hot objects
- X-ray fluxes tend to be low, exposure time for images are kilo-mega seconds.

X-Ray Astronomy



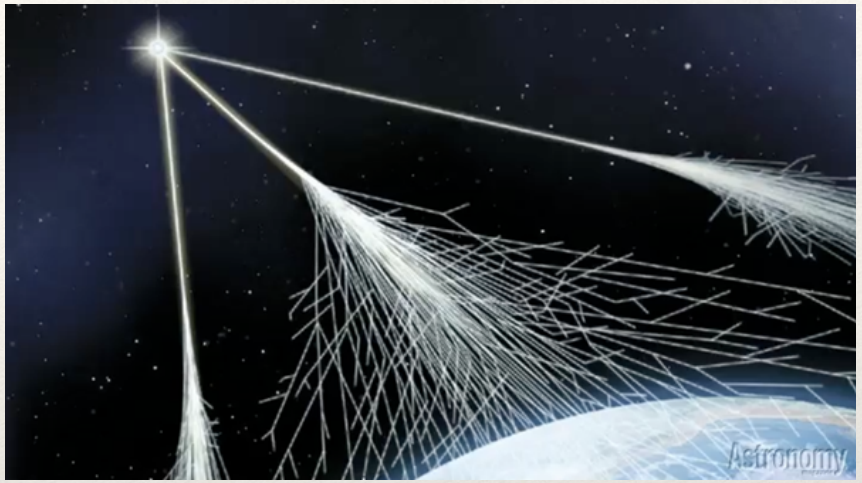
X-ray imagers require grazing incidence mirrors and long focal lengths

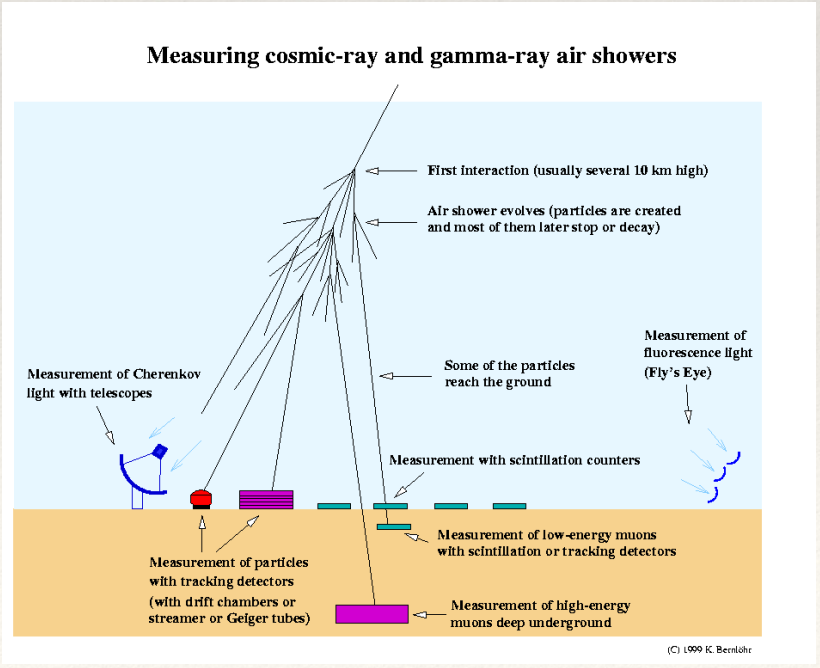
X-Ray Astronomy



Gamma and Cosmic Ray Astronomy

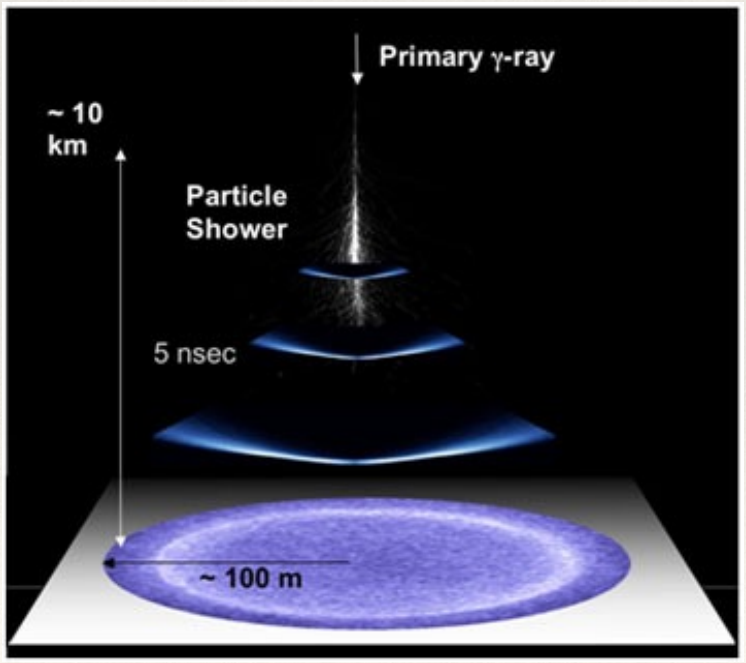
- Gamma rays can be detected in space and on the ground through particle showers
- Cosmic rays can also be detected this way.

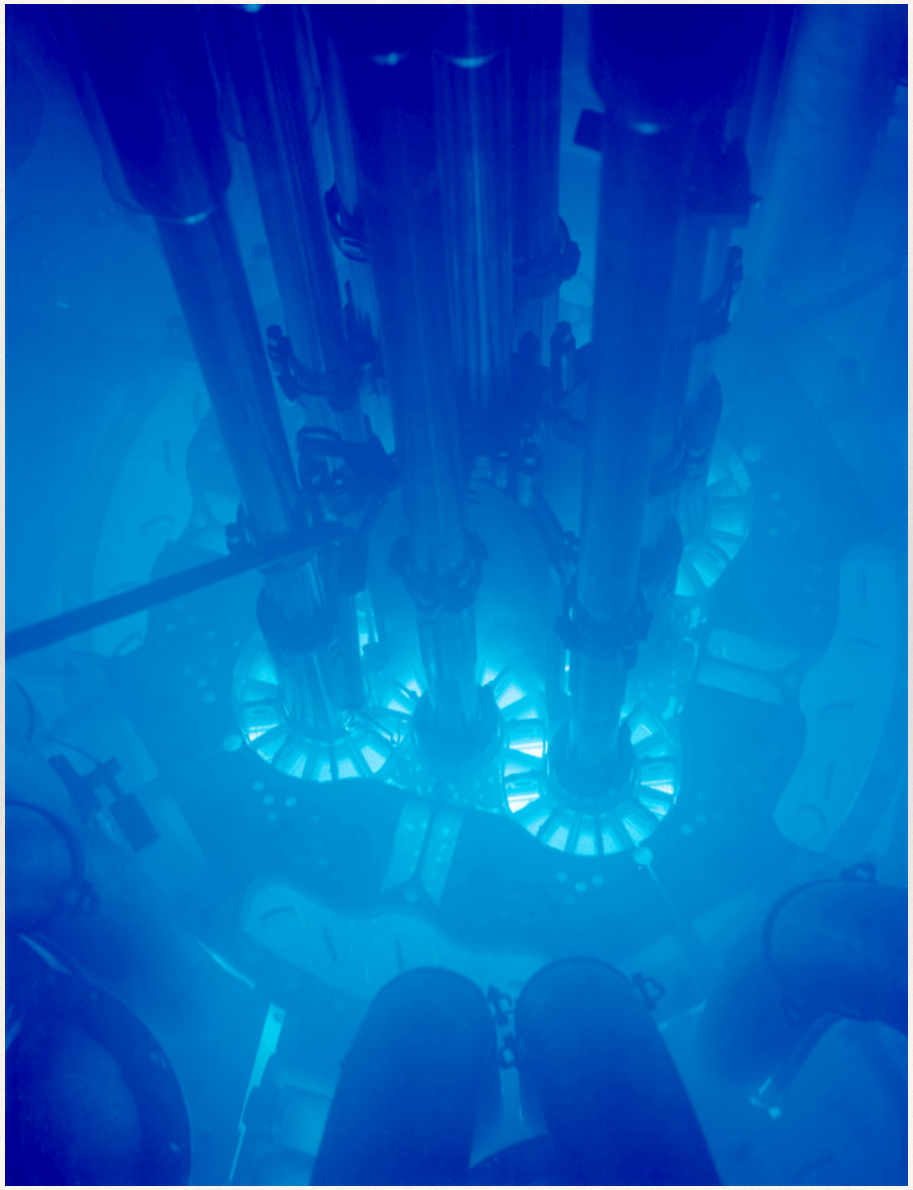




Gamma and Cosmic Ray Astronomy

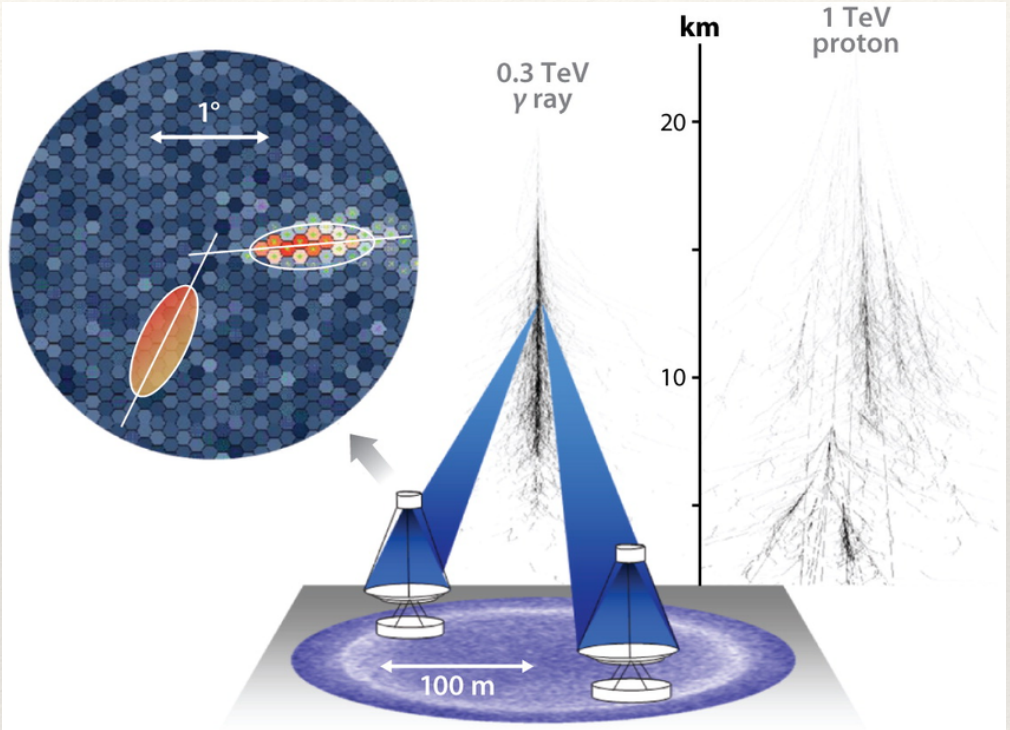
- Besides direct detection of the particles, we can also detect the Cherenkov radiation from the impact





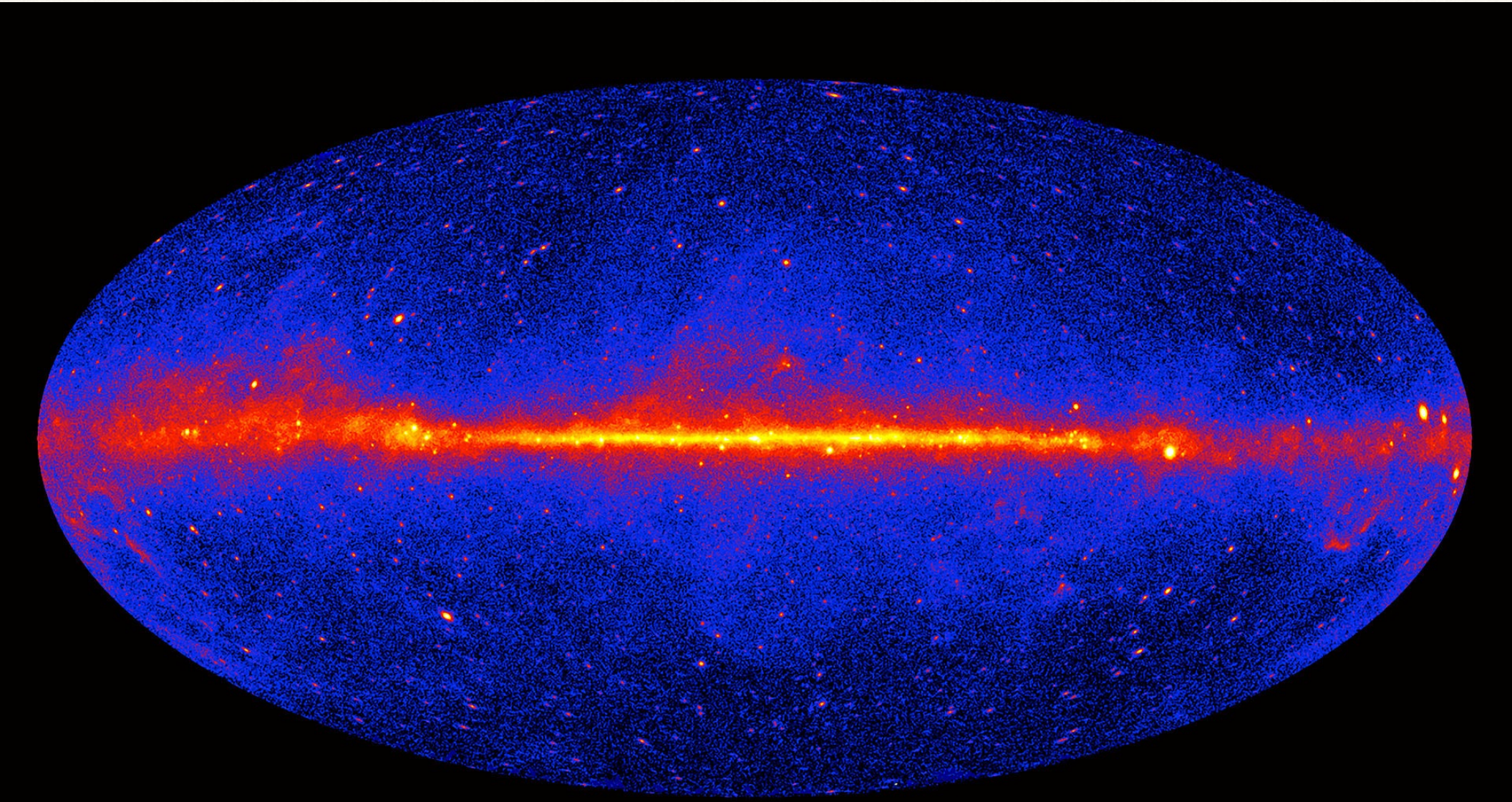
Gamma and Cosmic Ray Astronomy

- Can't make images, but multiple detectors can located source on the sky



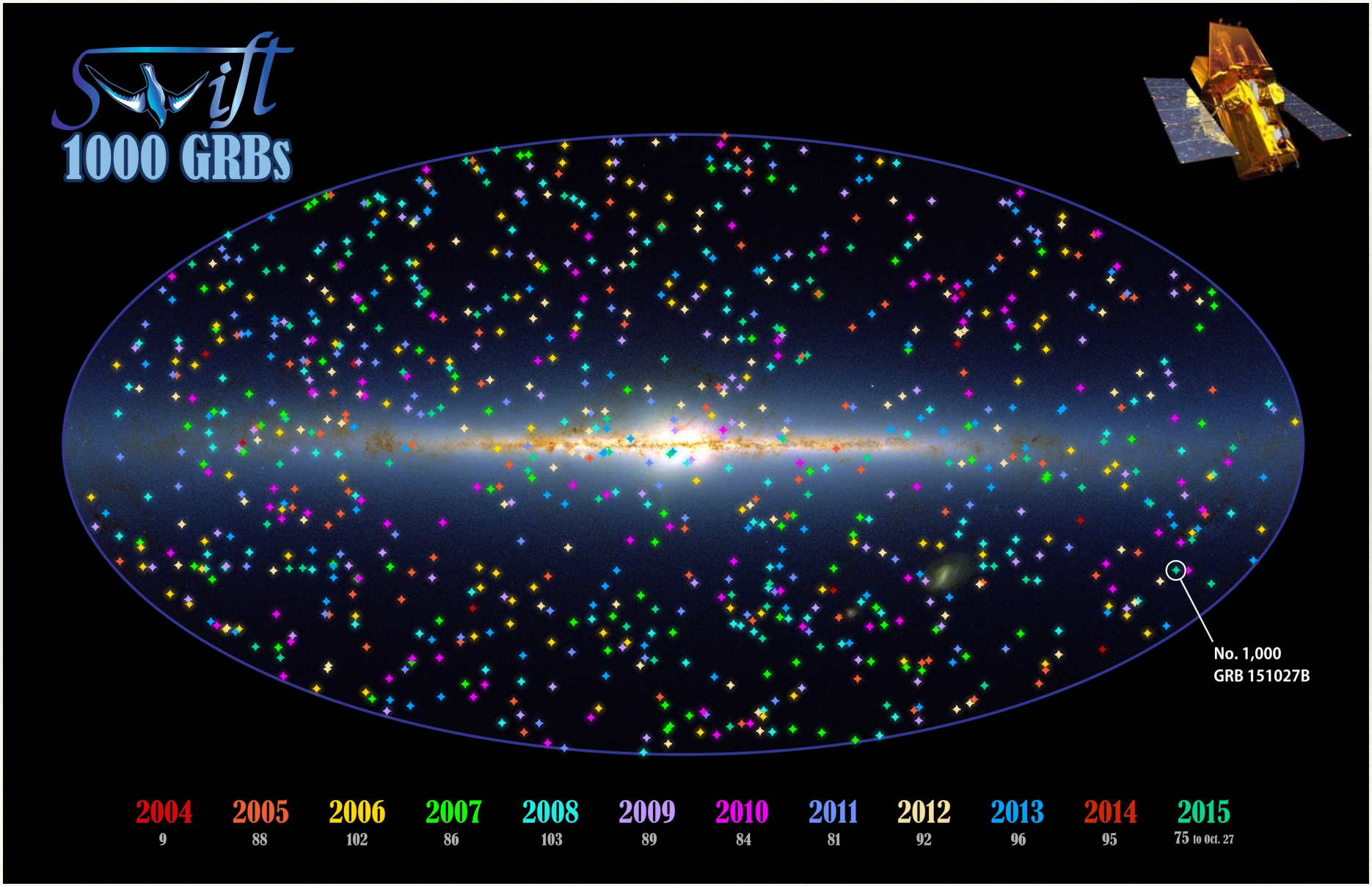
Hinton JA, Hofmann W. 2009.
Annu. Rev. Astron. Astrophys. 47:523–65

Gamma Ray Astronomy from space

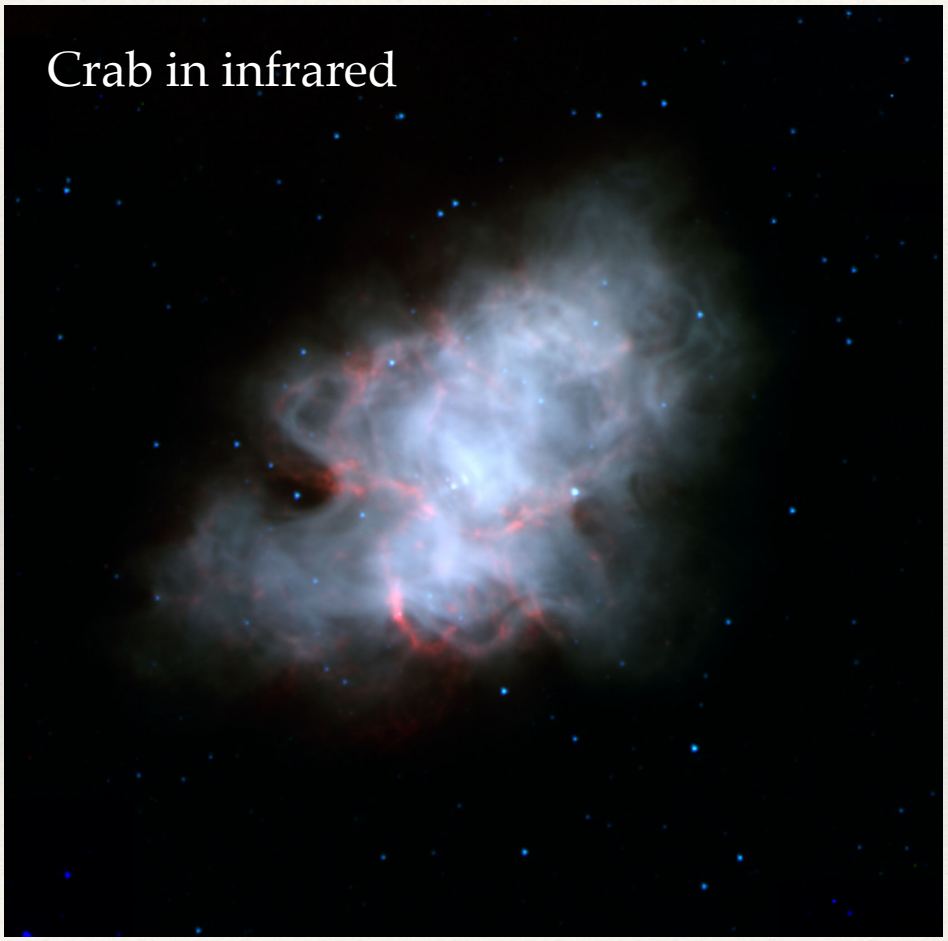


https://upload.wikimedia.org/wikipedia/commons/b/b0/What_is_Fermi.ogv

Swift tracks gamma ray bursts in real time.



Infrared Astronomy

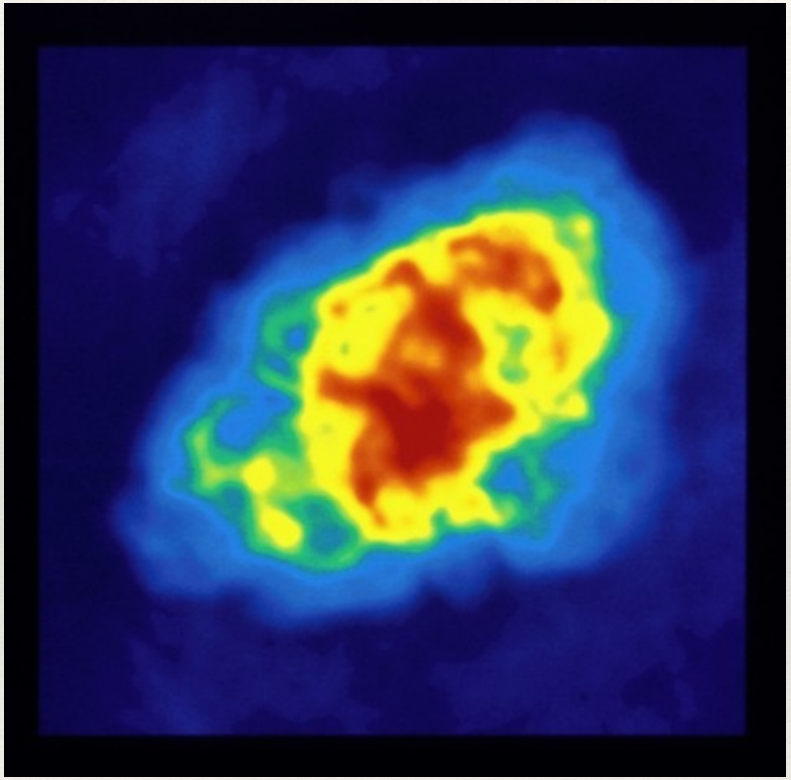


- Infrared is a lot like visible, but you need different detectors and techniques.
- Must work cryogenically
- Great for tracking dust and for high-redshift cosmology (Motivation for James Webb Telescope)

Infrared Astronomy

SOFIA airborne IR observatory

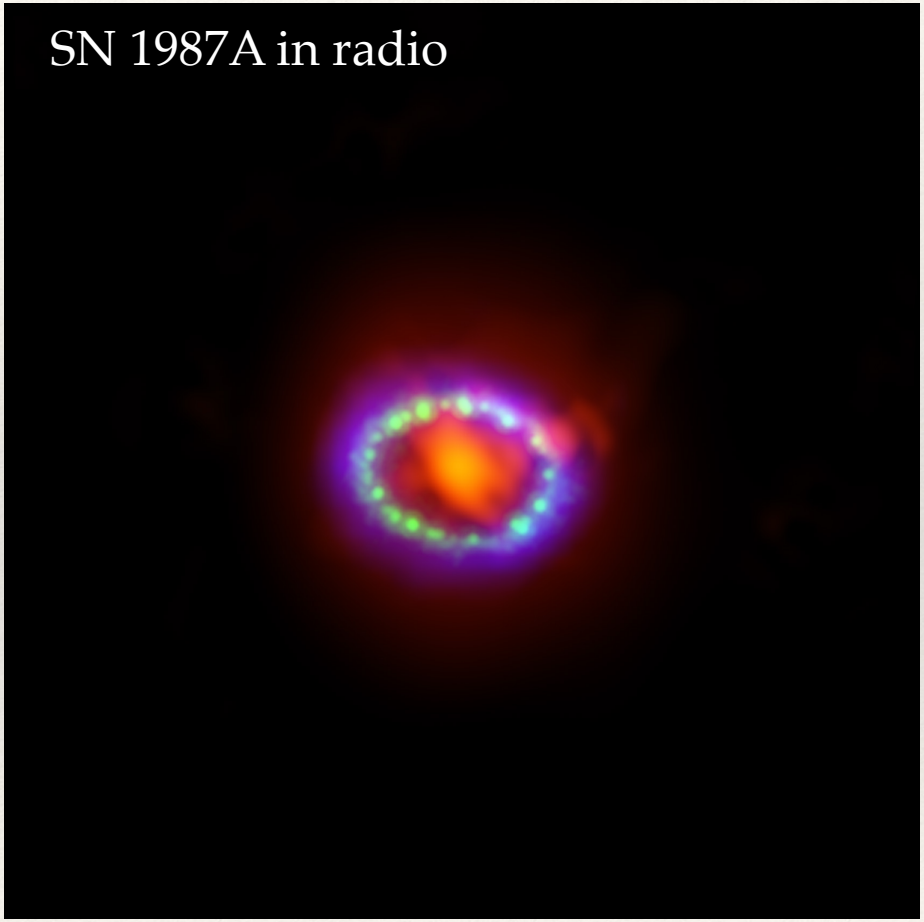
Radio Astronomy



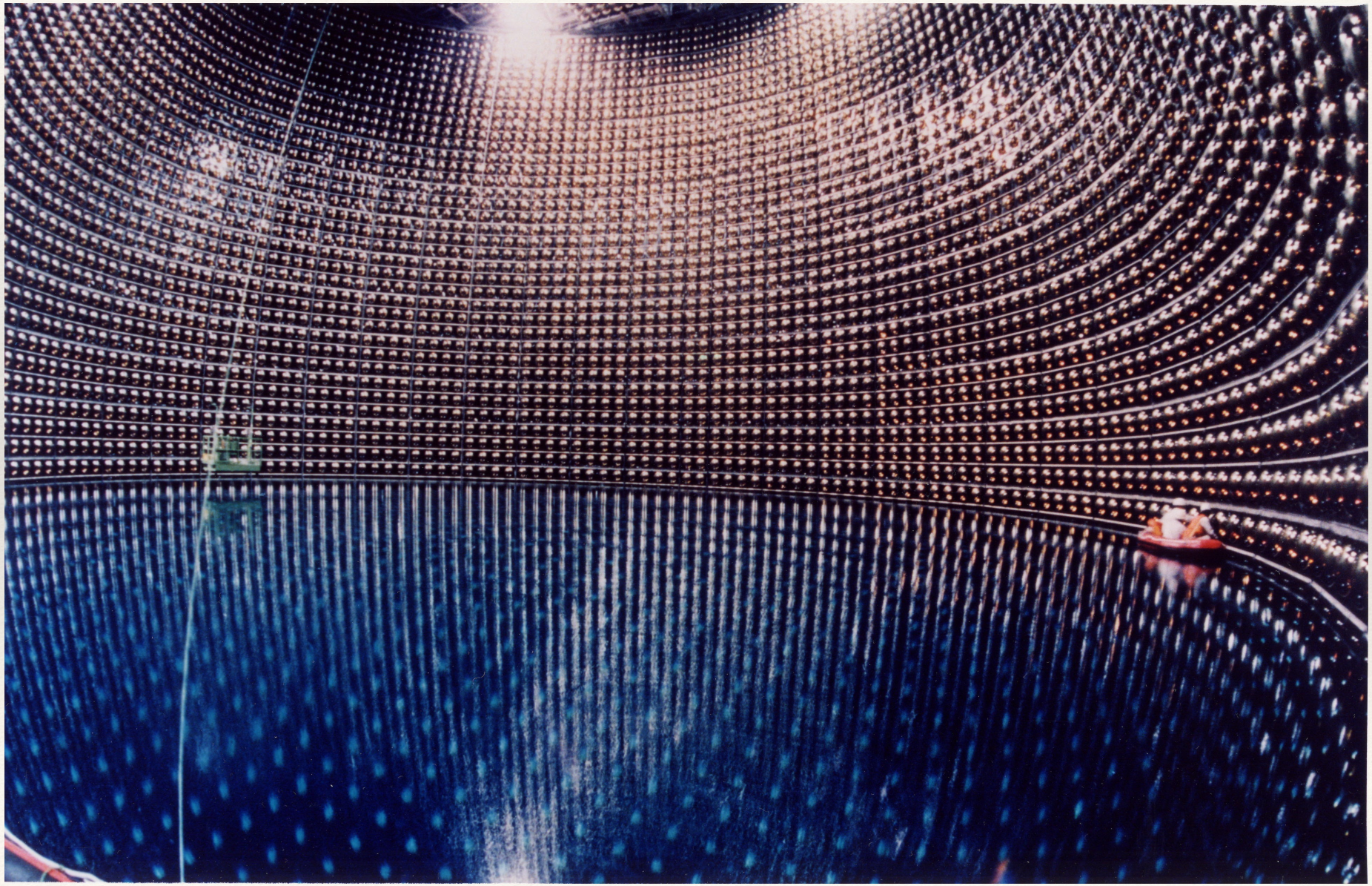
Whole class next week with guest Lecture by Dr. Maccarone

Neutrino Astronomy

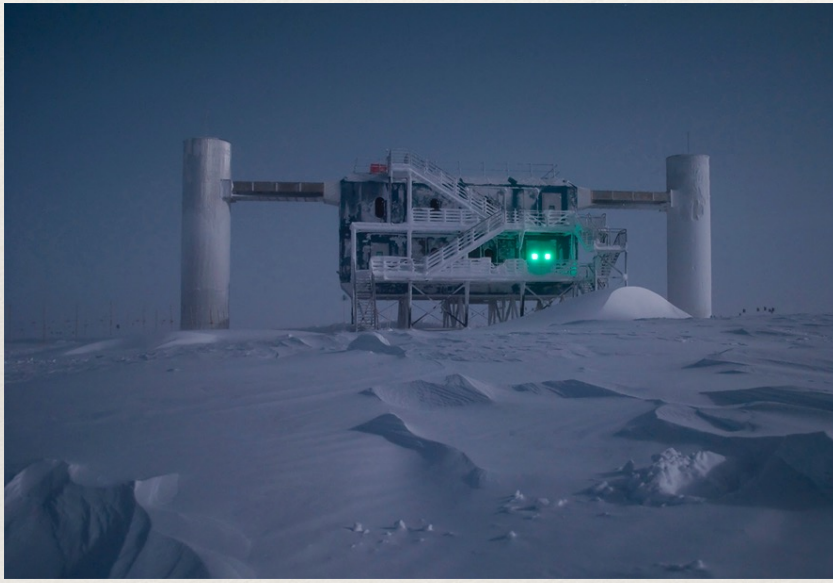
- Nuclear processes (fusion in the Sun, supernovae produce astrophysical neutrinos
- Since the only interact with the weak force they are hard to detect.

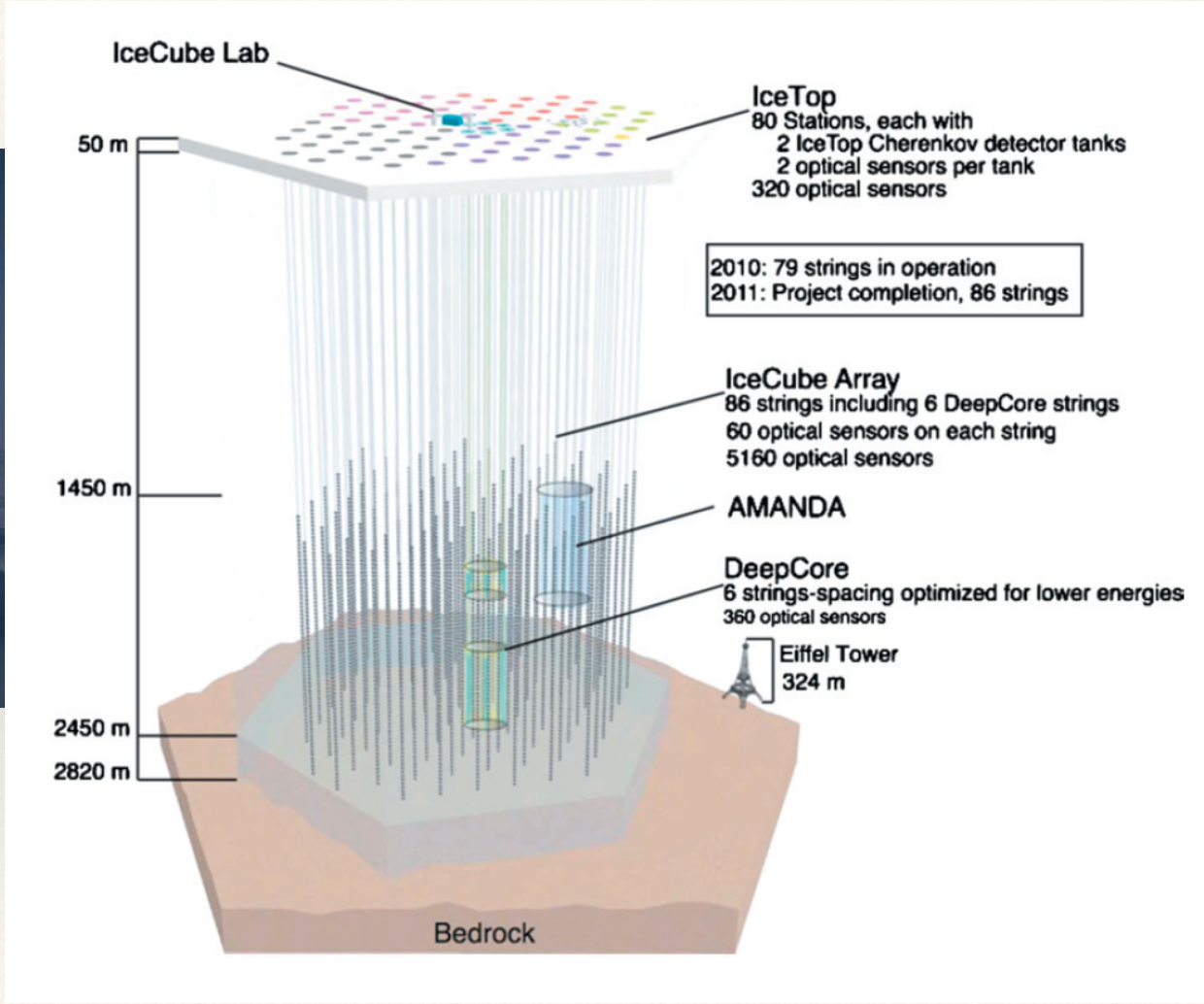


Neutrino Astronomy

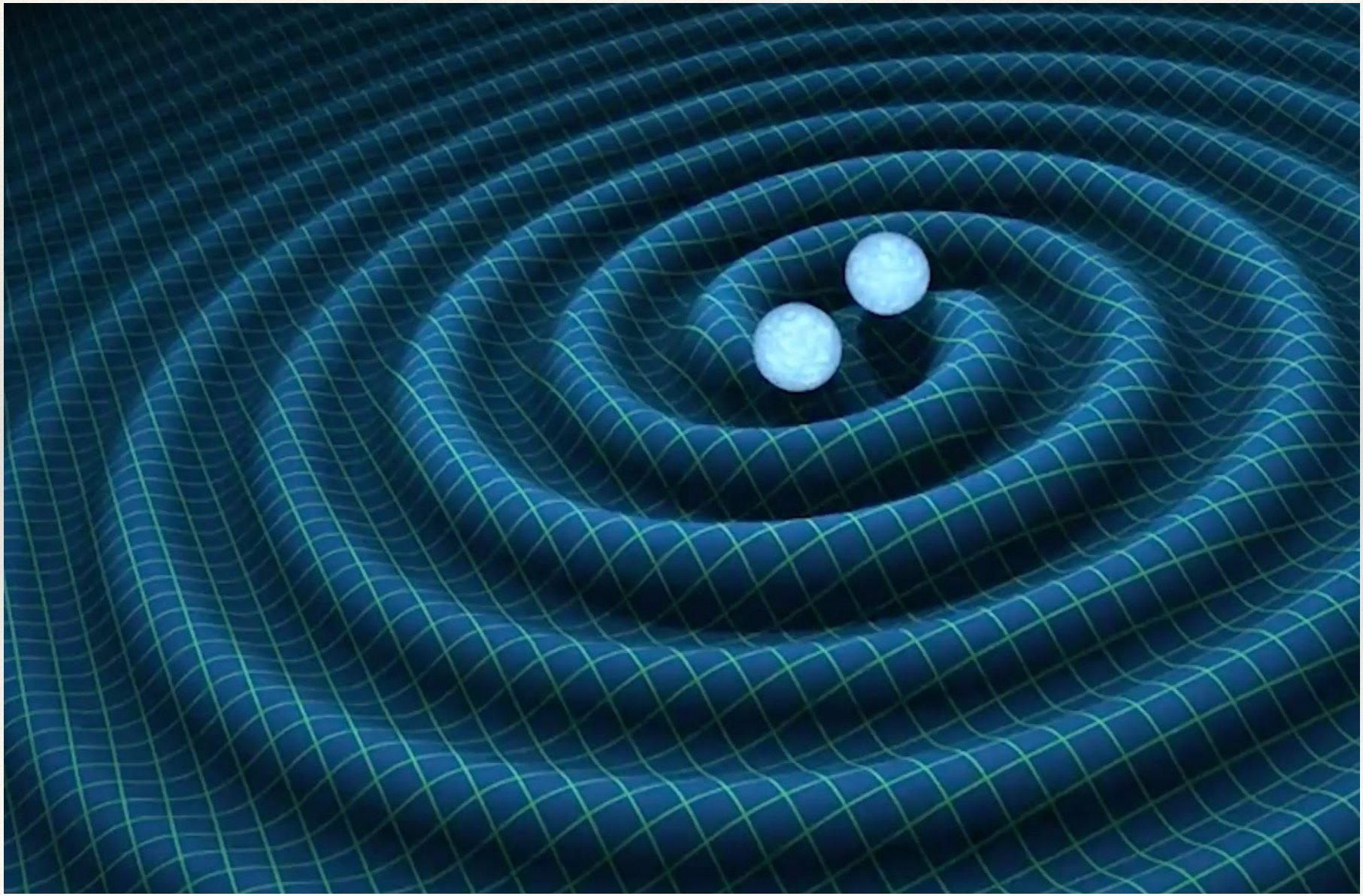


IceCube



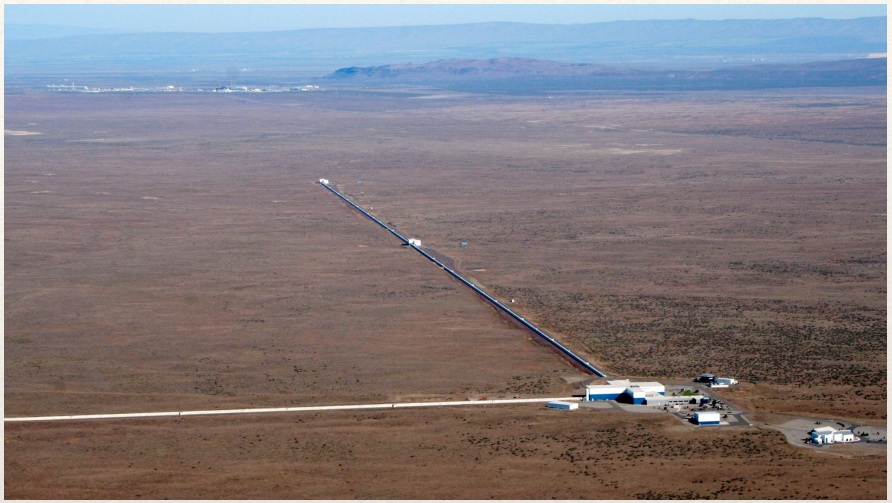

IceCube Lab
IceTop
80 Stations, each with
2 IceTop Cherenkov detector tanks
2 optical sensors per tank
320 optical sensors
50 m
2010: 79 strings in operation
2011: Project completion, 86 strings
IceCube Array
86 strings including 6 DeepCore strings
60 optical sensors on each string
5160 optical sensors
1450 m
AMANDA
DeepCore
6 strings-spacing optimized for lower energies
360 optical sensors
Eiffel Tower
324 m
2450 m
2820 m
Bedrock

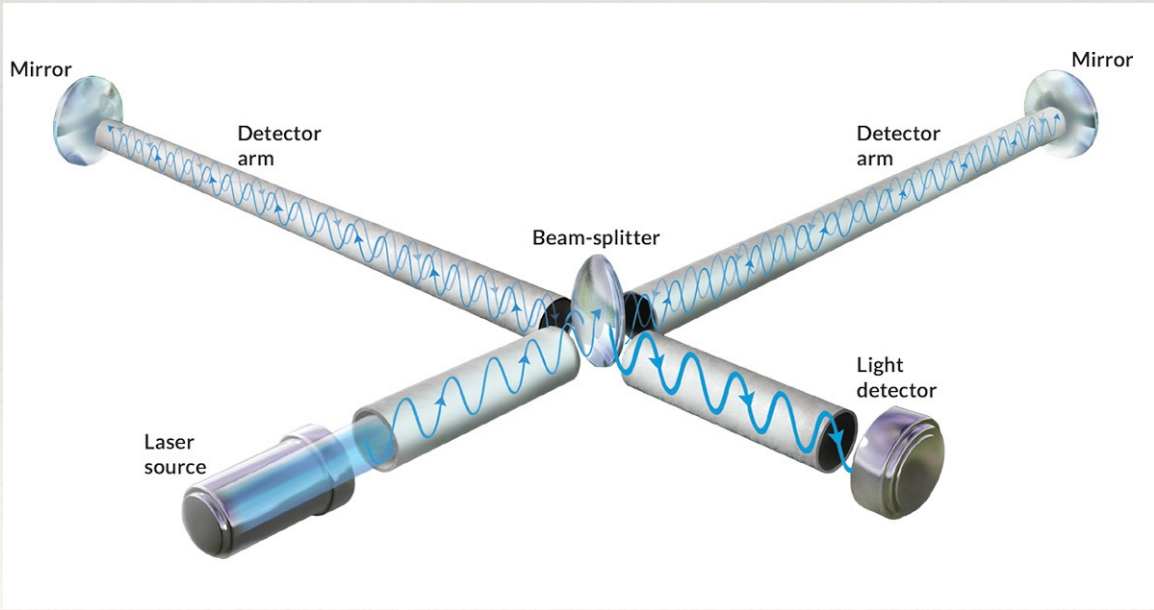
Gravitational Wave Astronomy



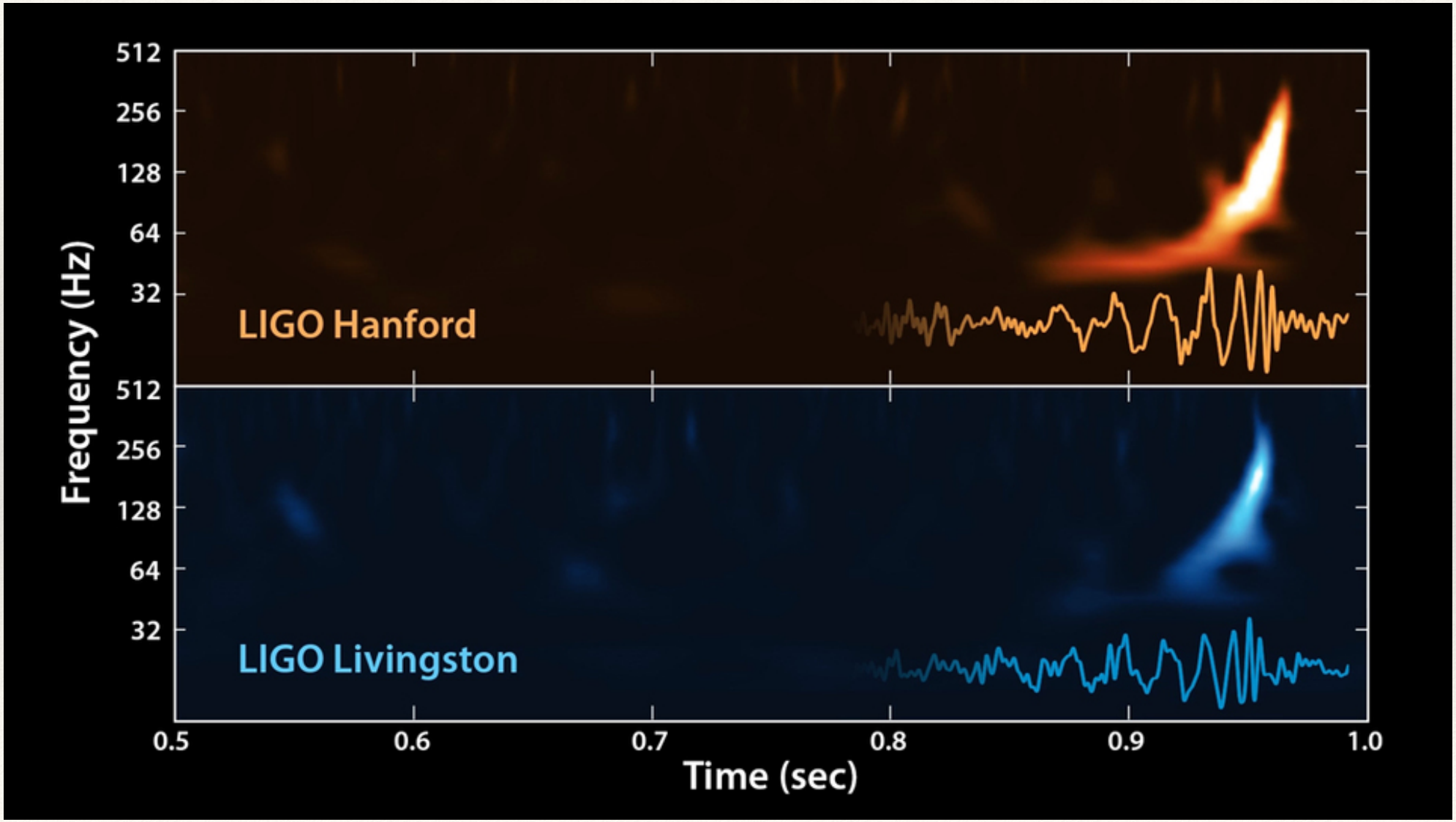
Gravitational Wave Astronomy

- Gravitational waves are distortions in space-time cause be extremely energetic events. (ex. black-hole mergers)
- Need to measure change in distances to at least 10^{-18} m

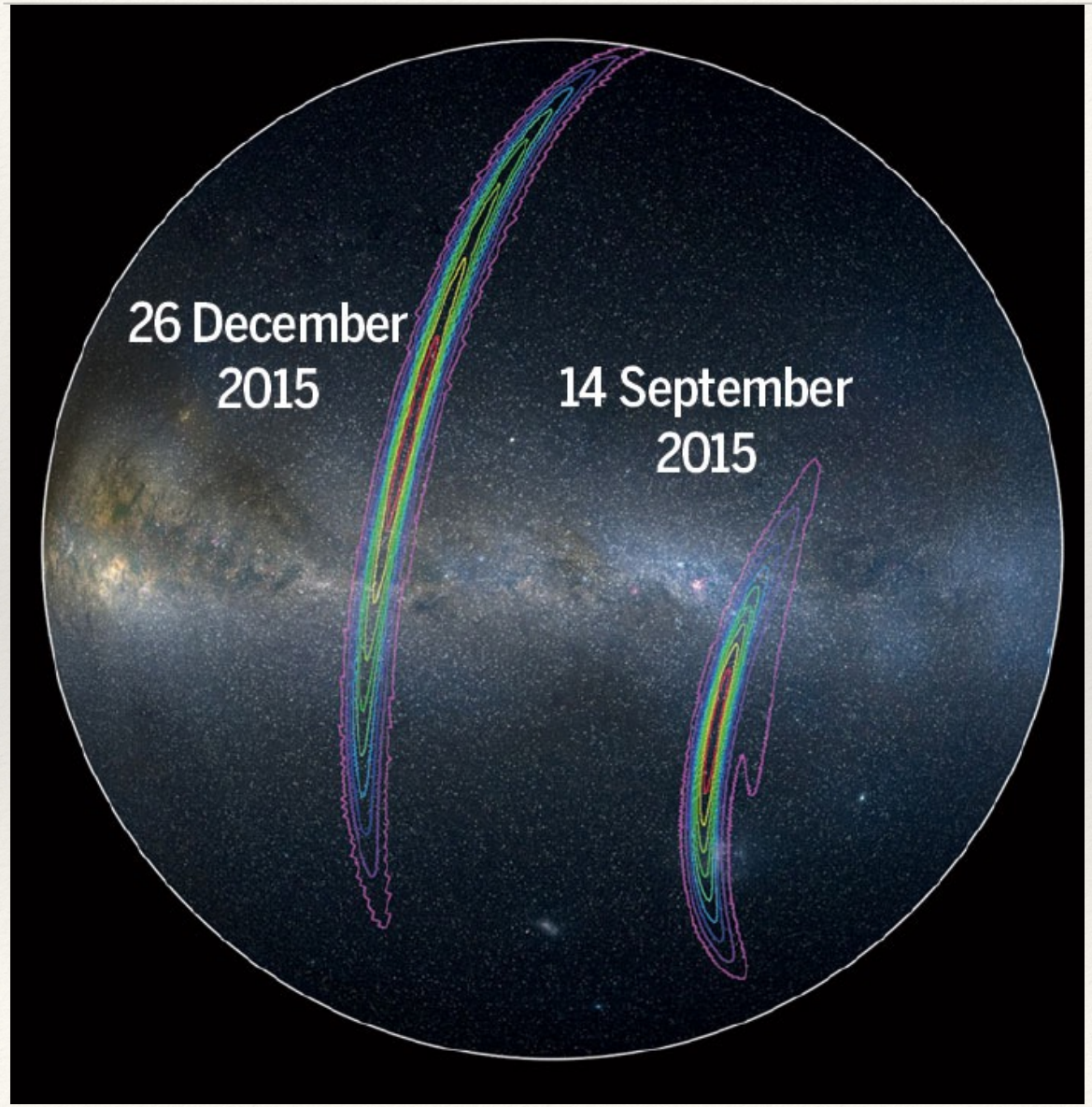




14 September 2015 first GW signal



Multi-messenger astronomy



- As of now, finding GW counterparts in light is hard
- This will get better as future detectors come online

The future for GWs is in space