

TN39463

DATE: 02/16/2017

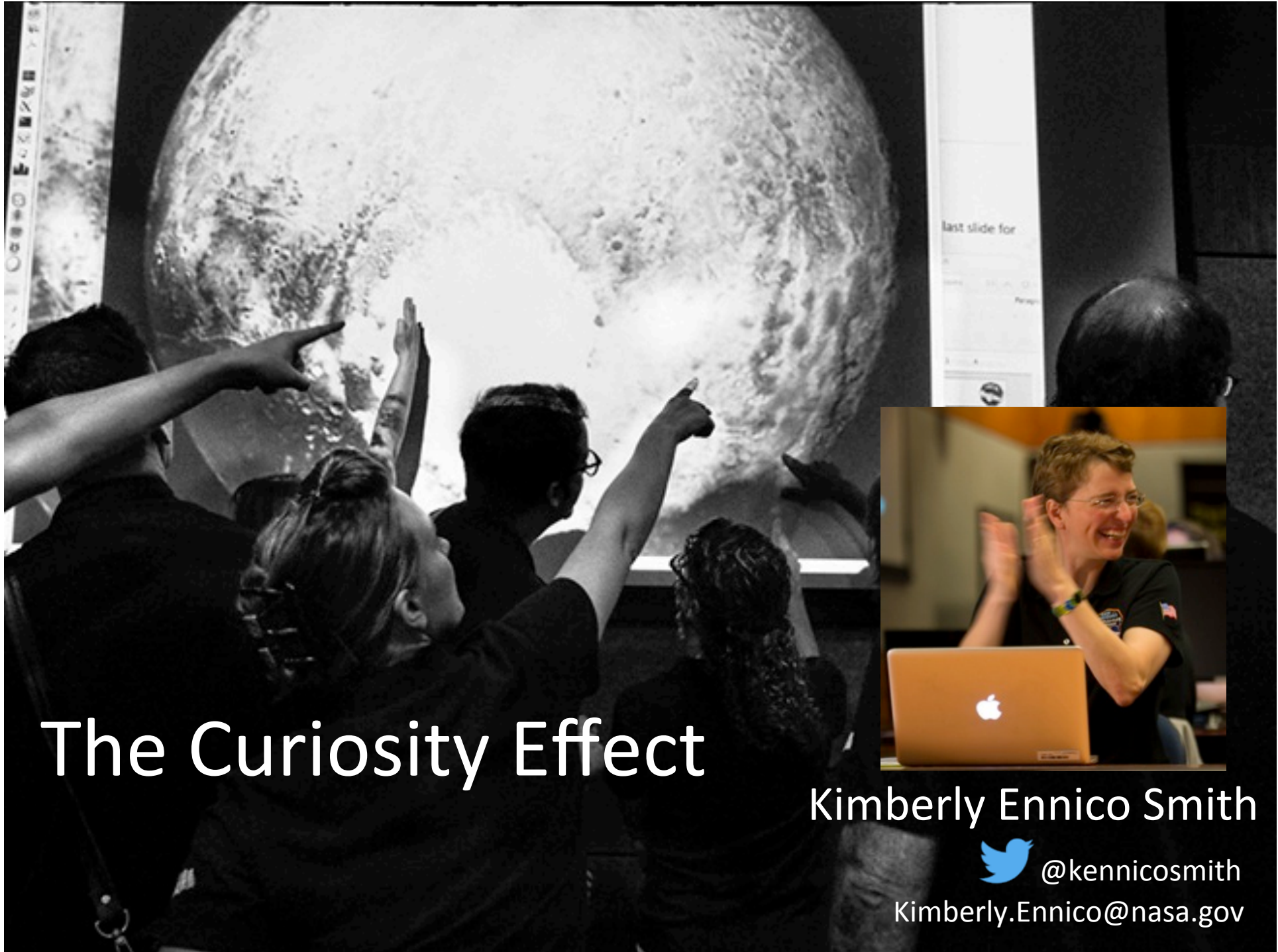
TITLE: The Curiosity Effect

AUTHORS: Smith, Kimberly Ennico, Kimberly.Ennico@nasa.gov

STI TYPE: Meeting, Oral or Visual Presentation


DESCRIPTION:

Abstract: This conference aims to improve how we learn through integrative project and discovery-based methods. My talk highlights areas in my experience as a scientist, and most recently working for our national space agency, NASA, where we work in teams with a “discovery-based” mindset. When you demonstrate broad curiosity, you become open to different viewpoints and ways to approach and manage situations. Sometimes working only from “what you have been trained to do” or “what you know” is not enough, especially when the rules may be changing. Increasing our openness in our learning, and sharing what we know, can lead to a more diverse and innovative community, solving problems in new ways, overcoming resistance to new ideas, and hopefully creating a dynamic and faring-forward society. Let us not kill curiosity, at any age, in any situation. Let us remind ourselves, at any time, in any circumstance, to continue to learn, to mentor, to stimulate, to engage and reconnect with that “open sense of possibility.”



# The Curiosity Effect

Kimberly Ennico Smith

 @kennicosmith

Kimberly.Ennico@nasa.gov

Copyrighted Material  
"A refreshingly commonsensical voice in the ongoing argument over how to best mold human minds." —*Scientific American Mind*

*The* DESIRE to KNOW and WHY  
YOUR FUTURE DEPENDS ON IT



IAN LESLIE

Copyrighted Material

*If there is a heaven, do people have sex? How can I make my life more exciting? When is killing justified? How much "free will" do I have? What will people say of my funeral? How would my life be different if I was more willing to explore instead of avoid challenges? Are there more sides of me I have yet to know? How can I overcome my fears? Why am I so easily bored? Why do I always end up in such awful relationships? How can I become more productive and creative at work? Why is a leaf*

# CURIOUS?

*Discover the Missing Ingredient to a Fulfilling Life*

**TODD KASHDAN, PH.D.**

*were vibrant in color when it's dying? Why do I do so many things I don't like and like so many things I don't do? Why do I find it so hard to open up to others? Why am I so worried about what other people think of me? Is time travel possible? Is there such a thing as "love at first sight"? Why do bad things happen to good people? Why do we fear death? How can I reignite passion in my marriage? How can uncertainty be both terrifying and fun? Am I happy? What can I do right now to change? How long does it take to make a real, lasting change?*

A CURIOUS MIND  
The SECRET to a BIGGER LIFE



BRIAN GRAZER  
CHARLES FISHMAN

"*A Curious Mind* is a window on Brian Grazer's notion, reckless, remarkable imagination. It is a captivating account of how the simple act of asking questions can change your life." —MALCOLM GLADWELL

#1  
NEW YORK  
TIMES  
BESTSELLER

THE POWER OF CURIOSITY is the leadership handbook for the 21st century giving you a simple step by step method to have real conversations that navigate conflict with innovative outcomes.  
—DAYMOND JOHN, Award Winning Entrepreneur and Star of ABC's Shark Tank

# THE POWER OF CURIOSITY



How to Have Real Conversations  
That Create Collaboration,  
Innovation and Understanding

KATHY TABERNER AND  
KIRSTEN TABERNER SIGGINS



<http://raisesavvykids.com/education/school/ways-nurture-spirit-inquiry/>





The Fall of Man... by Lucas Cranach the Elder

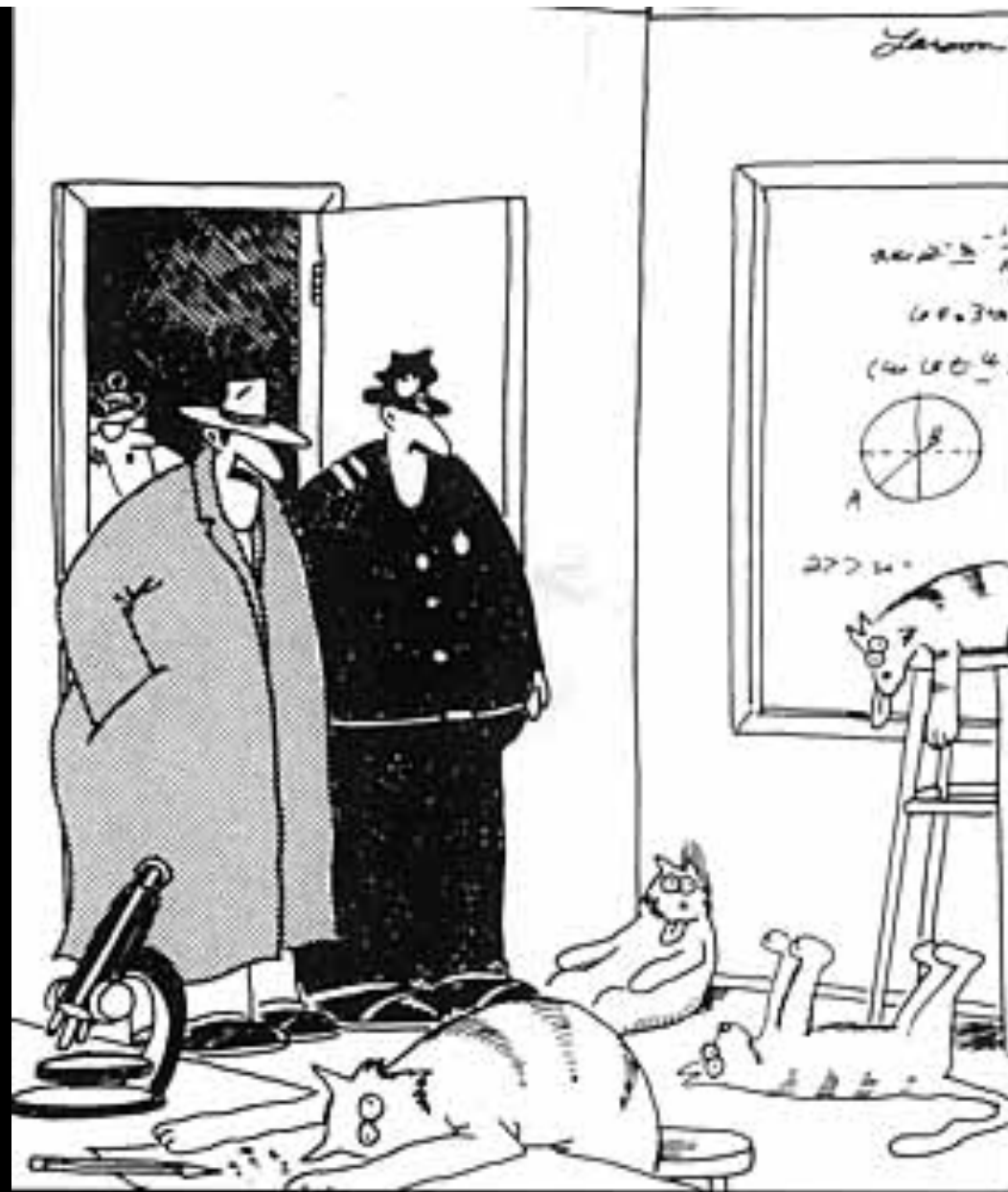


The Flight of Daedalus and Icarus ... by Roger Brown



Pandora... by John William Waterhouse





"Notice all the computations, theoretical scribbles, and lab equipment, Norm. ...  
Yes, curiosity killed these cats."



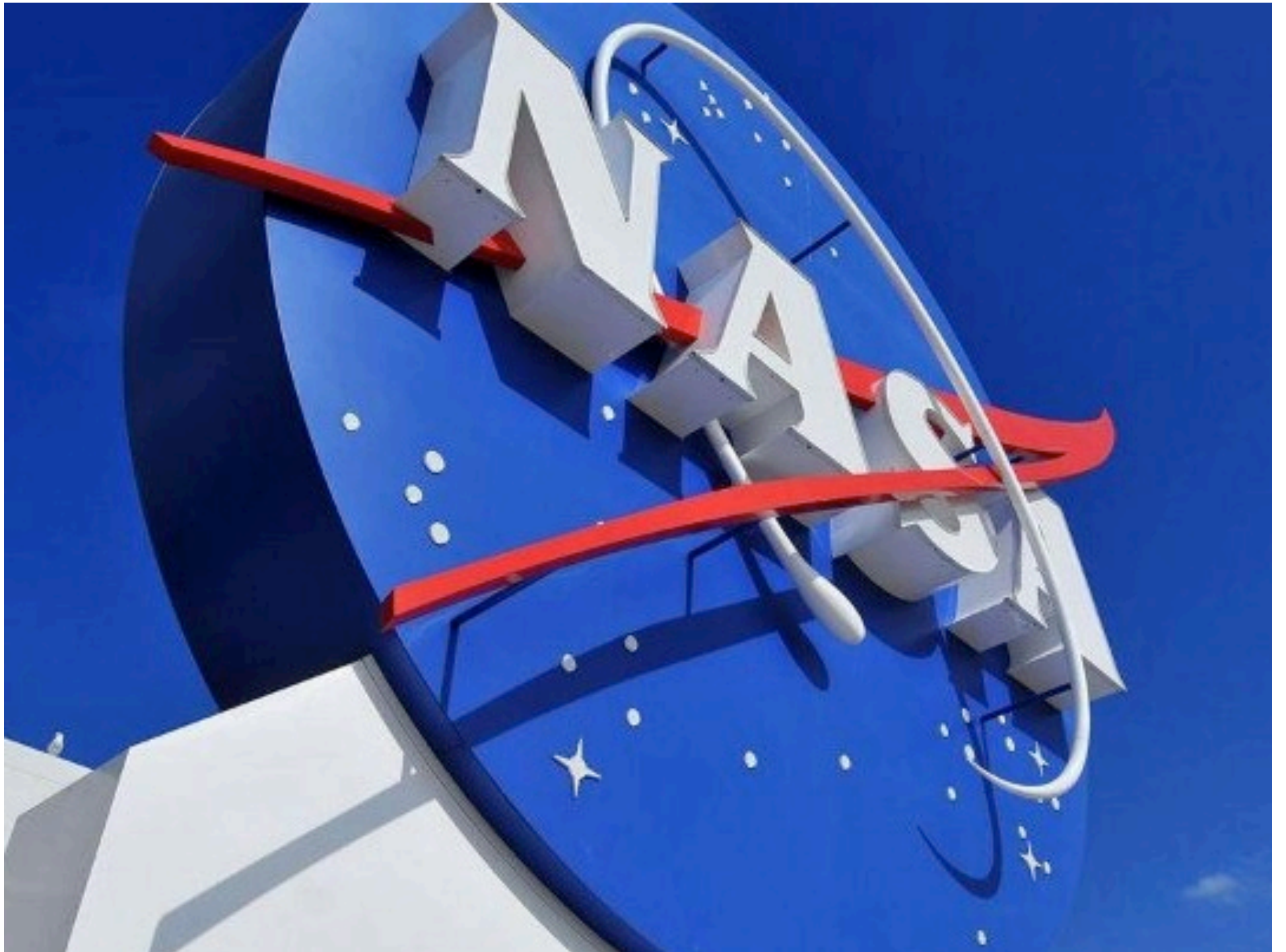
“If people sat outside and looked at the stars each night, I'll bet they'd live a lot differently.”

--Bill Watterson



Part 1

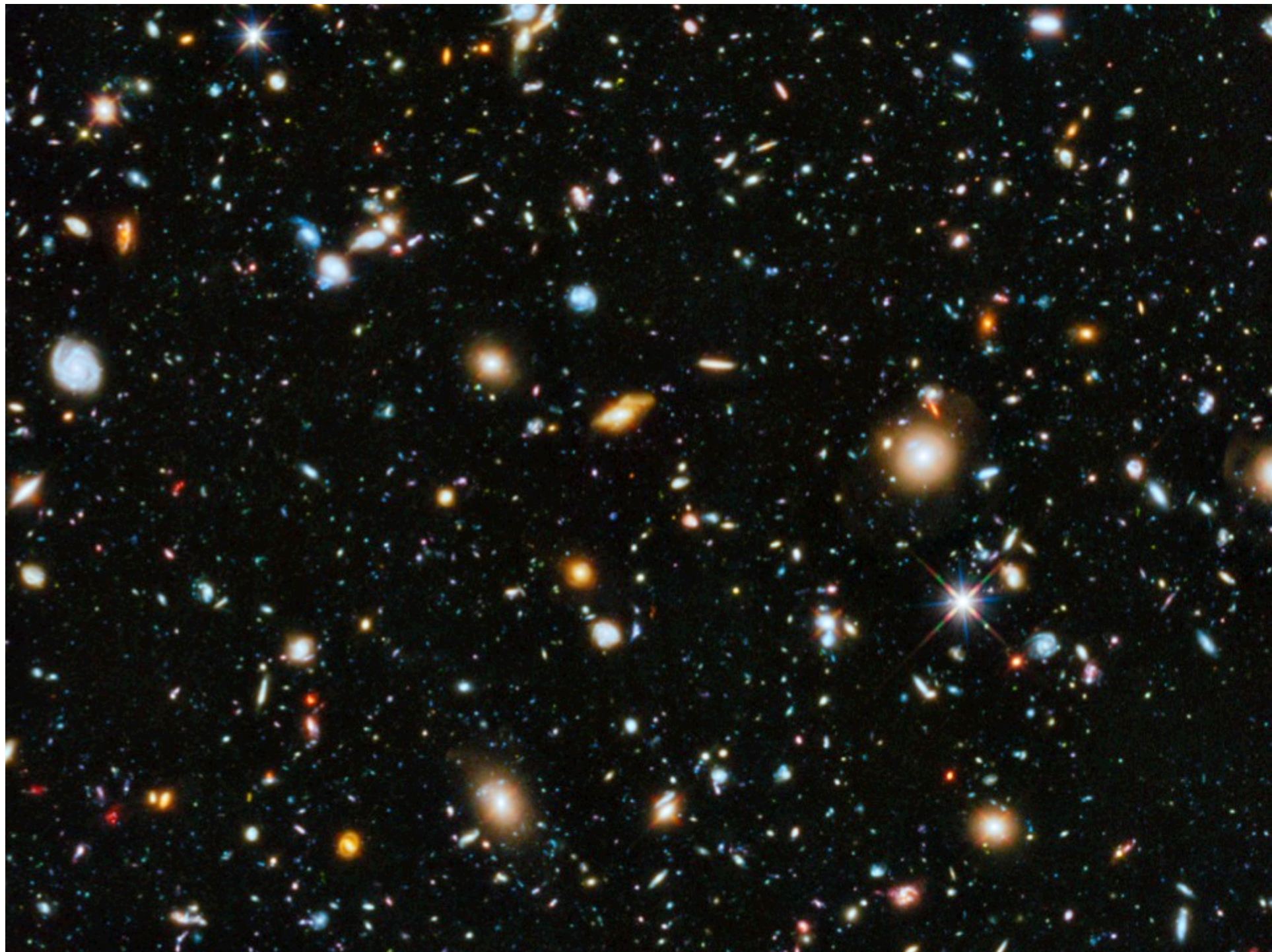
**START WITH WANTING TO KNOW  
MORE**



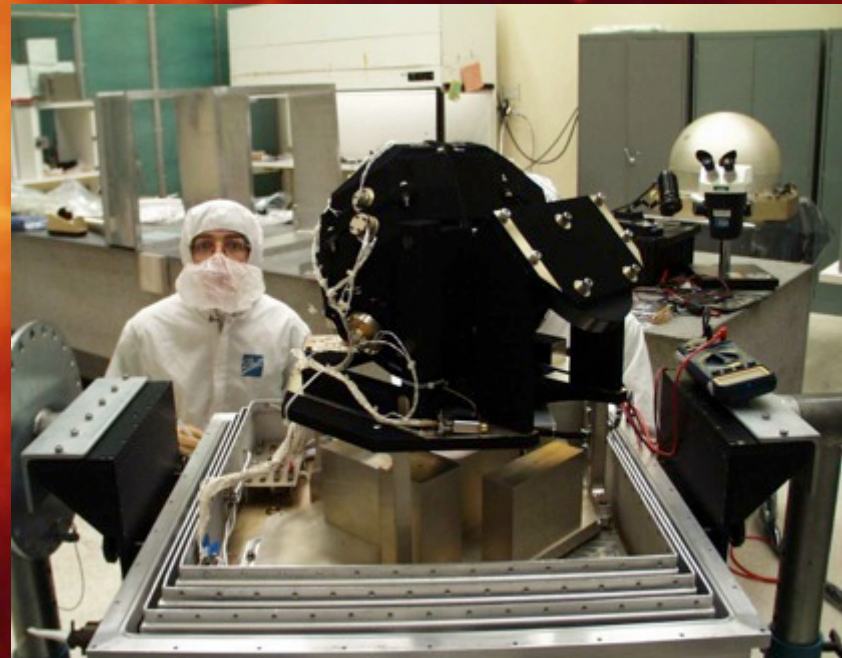
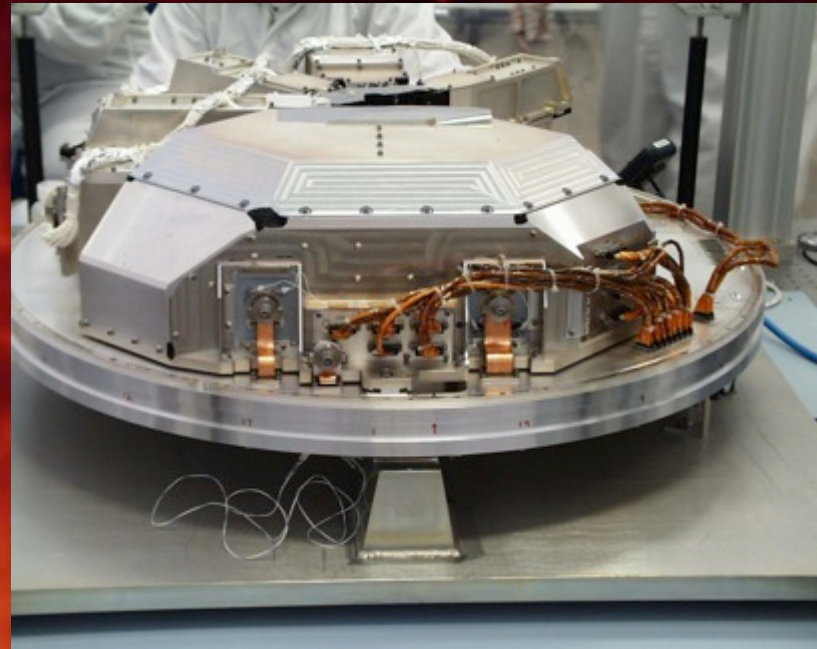
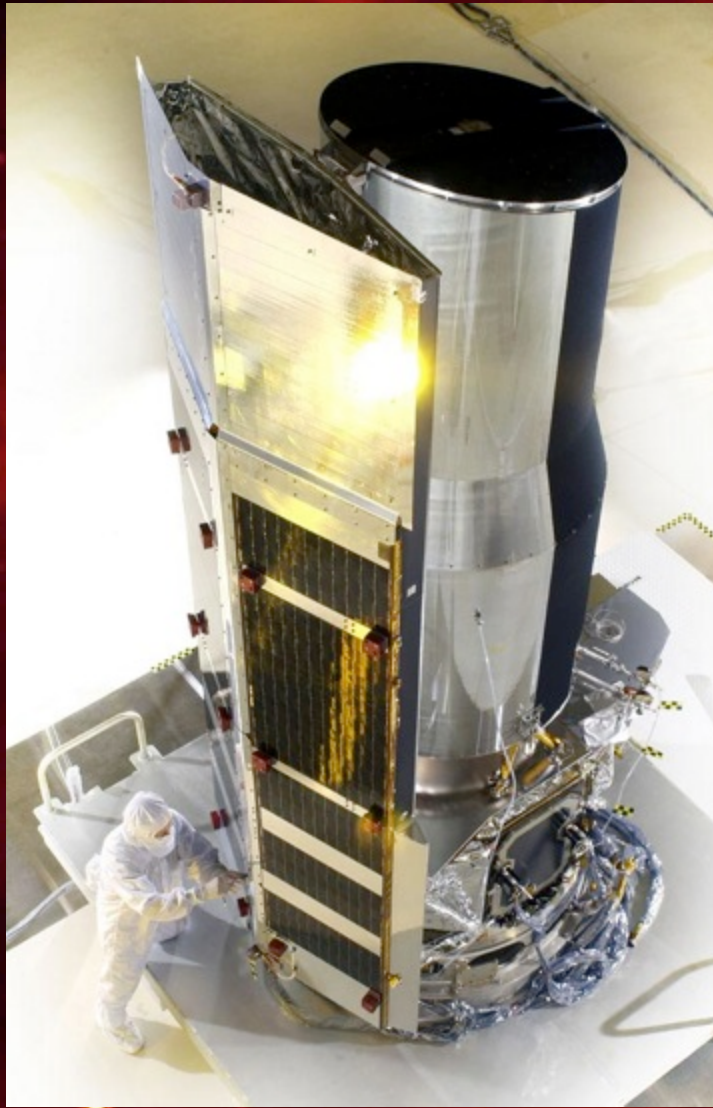




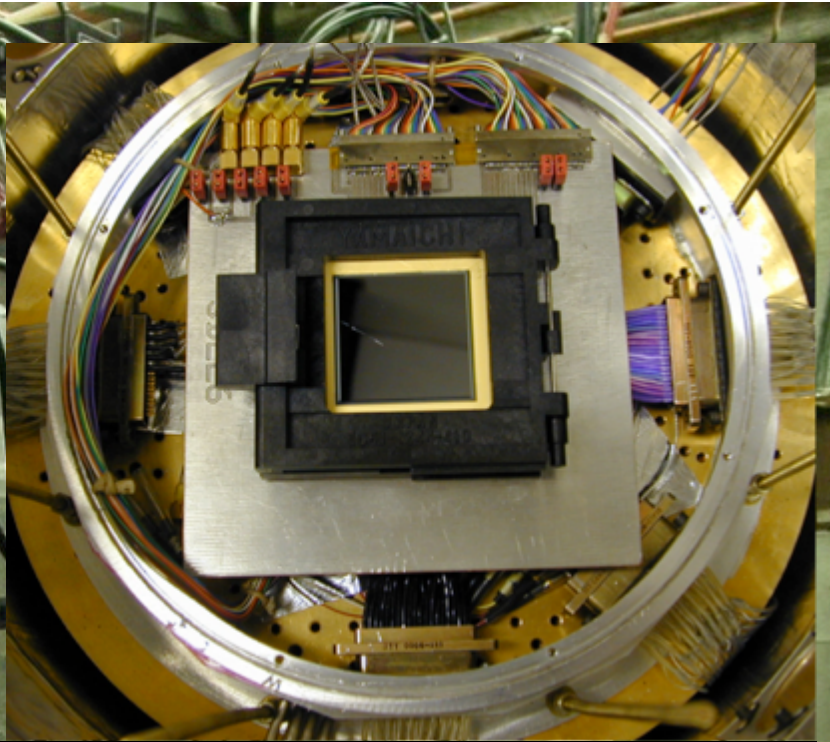










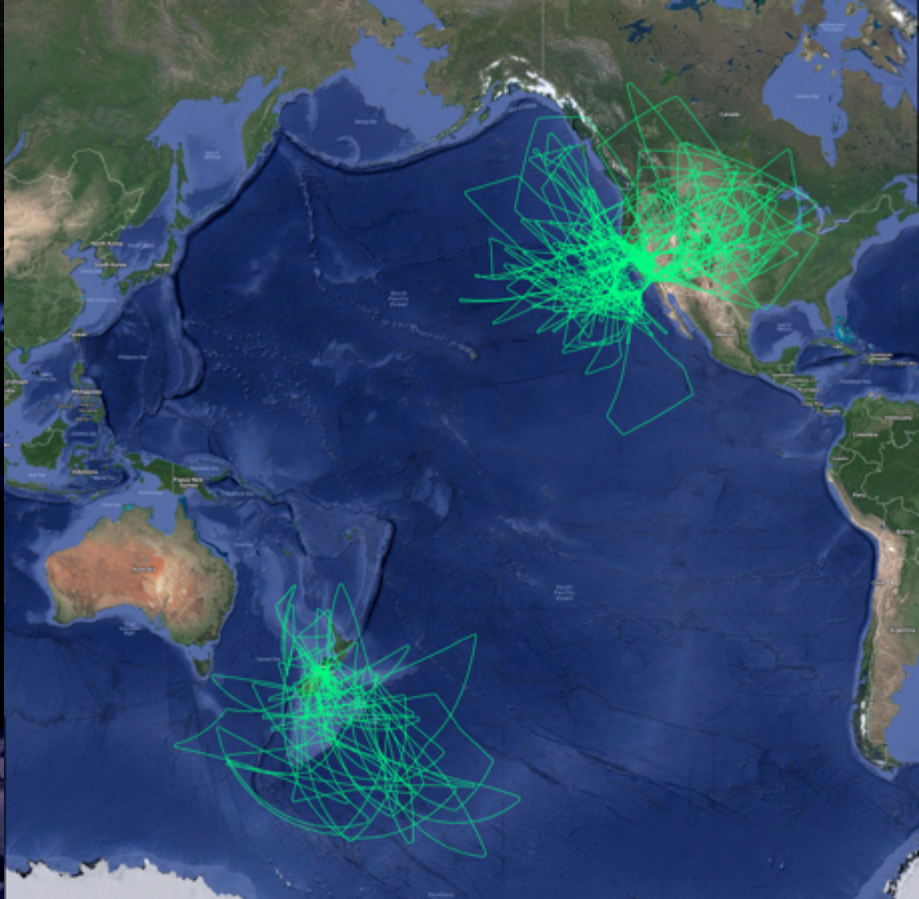
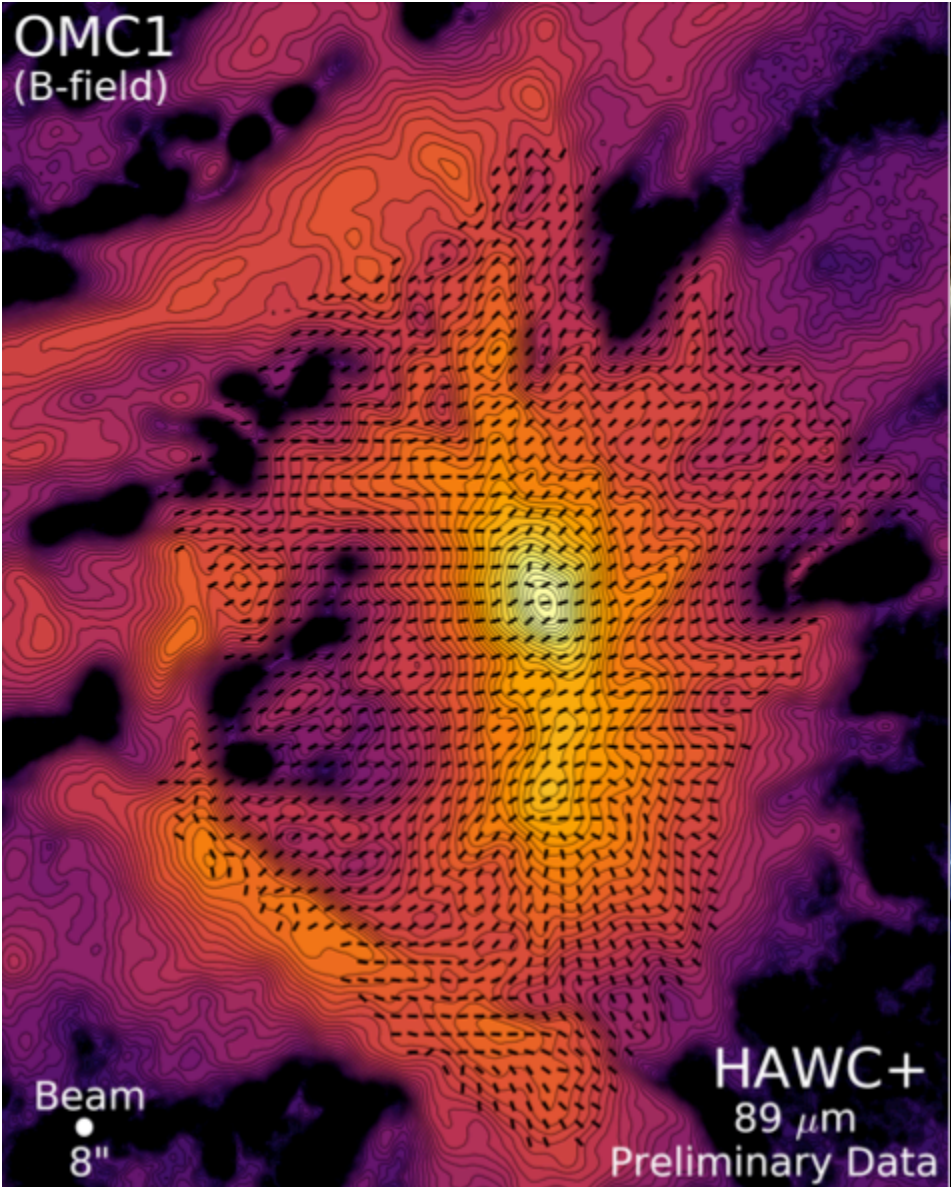








OMC1  
(B-field)





# NASA Airborne Astronomy Ambassador Program

<http://www.seti.org/aaa>  
<http://www.seti.org/sofia>



Cycle 5/6 2017-18 AAA Program Applications are closed  
Next Applications due in 2018



# NASA Airborne Astronomy Ambassador Program

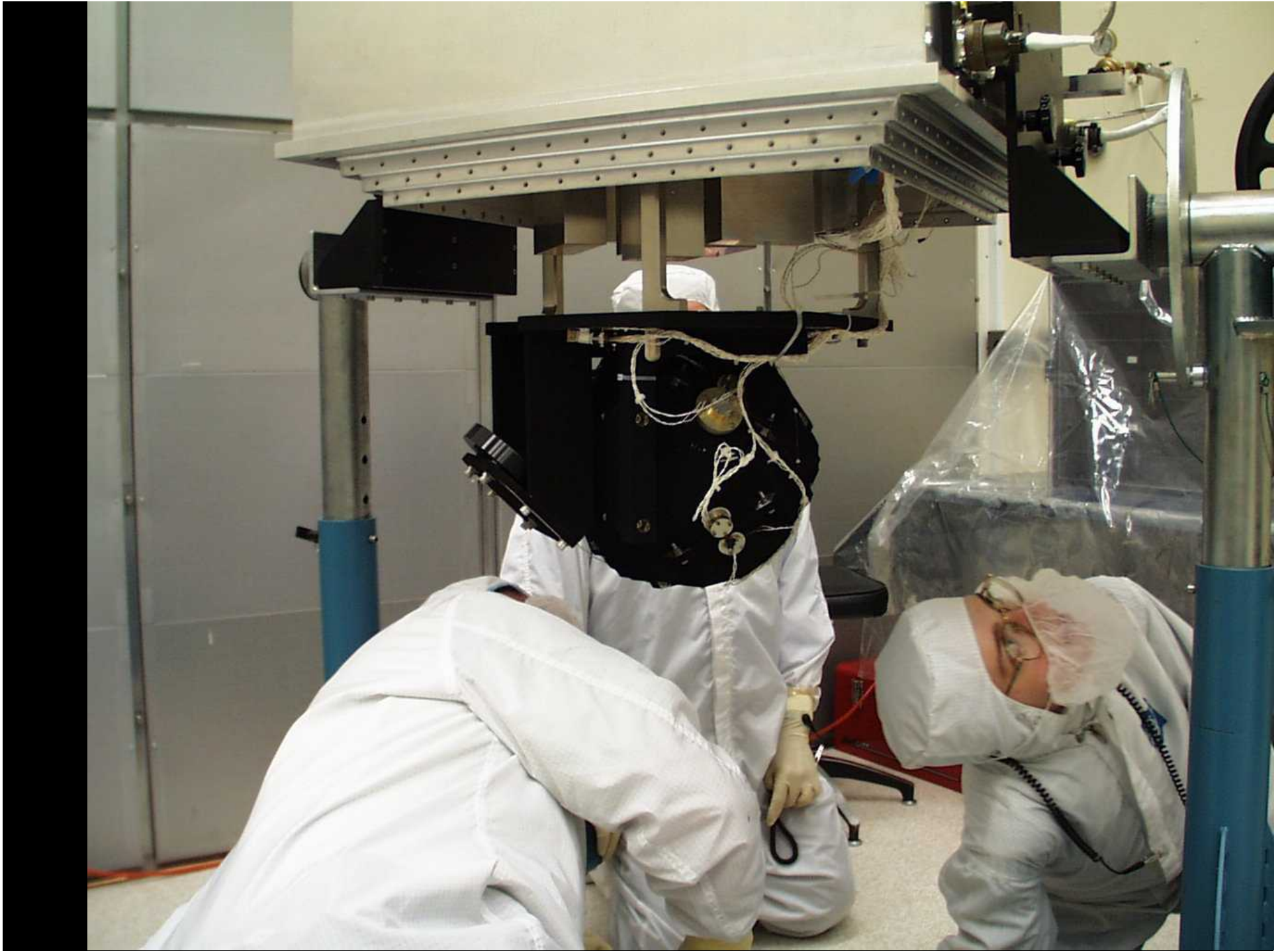
<http://www.seti.org/aaa>  
<http://www.seti.org/sofia>



Cycle 5/6 2017-18 AAA Program Applications are closed  
Next Applications due in 2018



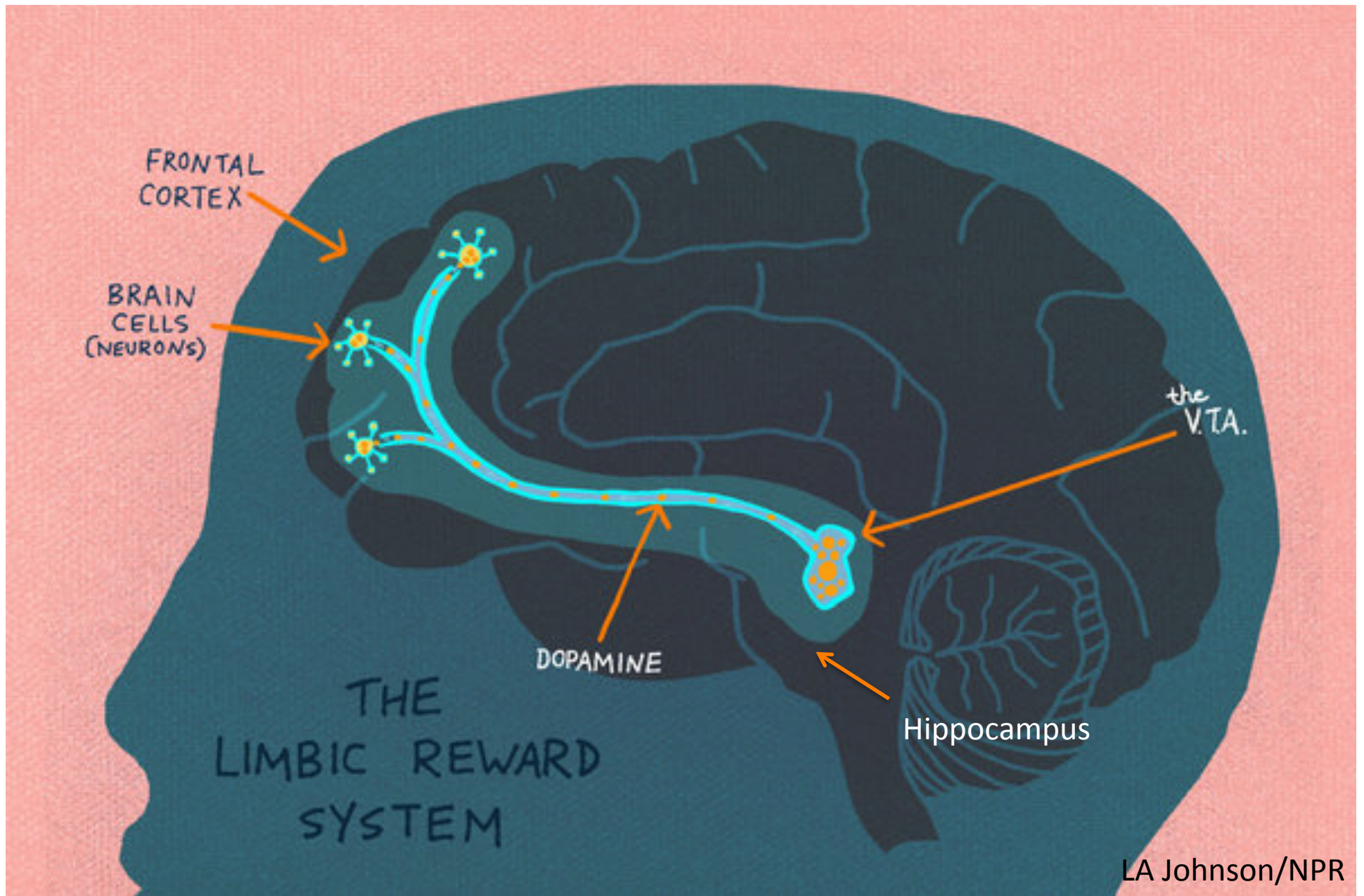








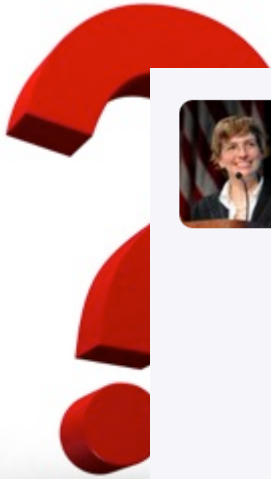




“States of Curiosity Modulate Hippocampus-Dependent Learning via the Dopaminergic Circuit,”  
Gruber, M.J. et al *Neuron* 84, 486–496 (2014)







**Kimberly EnnicoSmith** @kennicosmith · 43m

That's where I'm headed today! I wonder what I'm going to learn today? What conversations to be had? What new ideas to take away? [#STEM](#)

**Integrated STEM Ed.** @IEEE\_ISEC

Welcome to #ISEC17! [twitter.com/dankostelec/st...](https://twitter.com/dankostelec/status/764111111111111111)

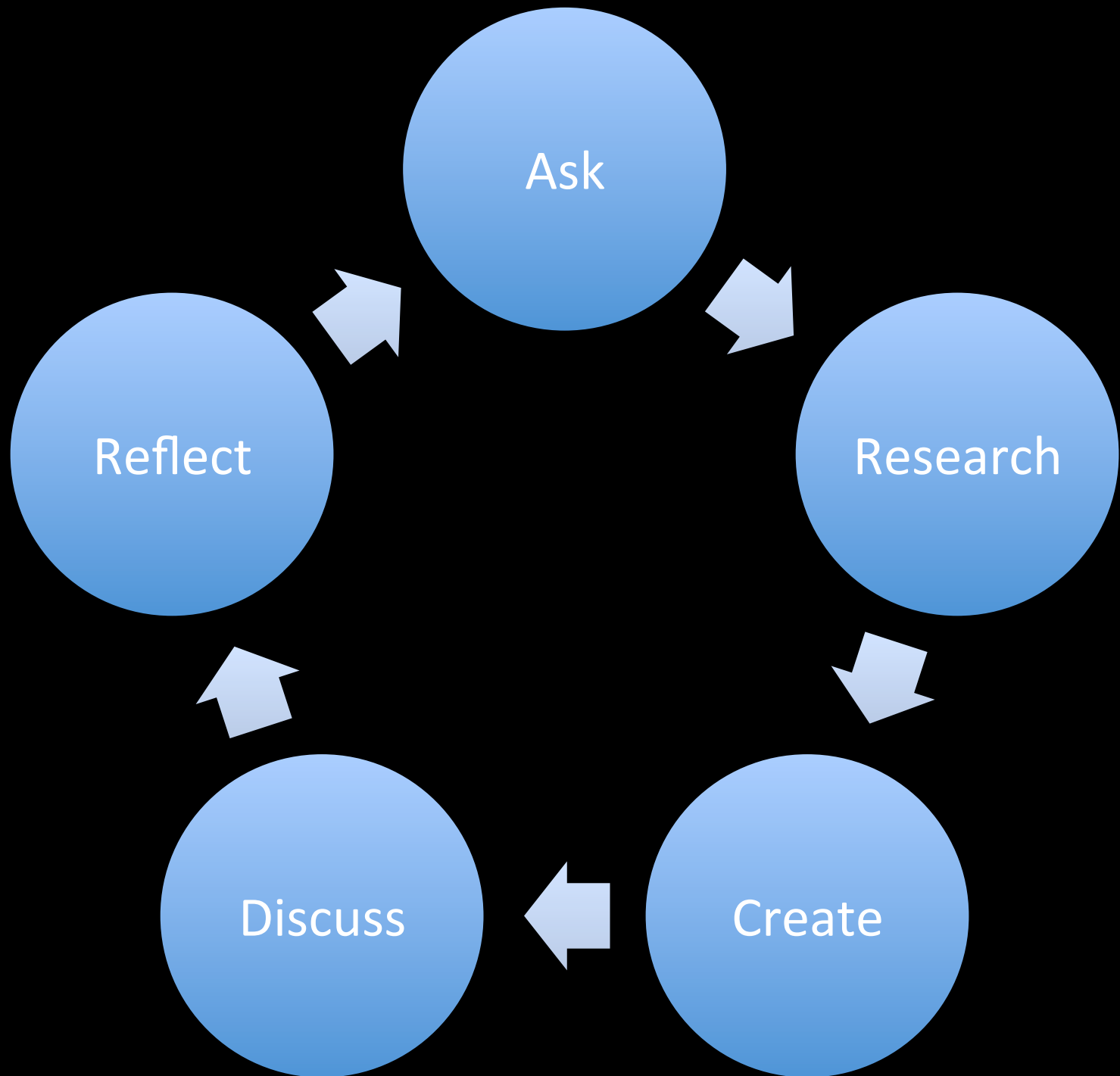
1:23 AM - 28 Jun 2016

“How might I actually do this?”

“What am I missing?”

“Who can I find to learn more about this?”





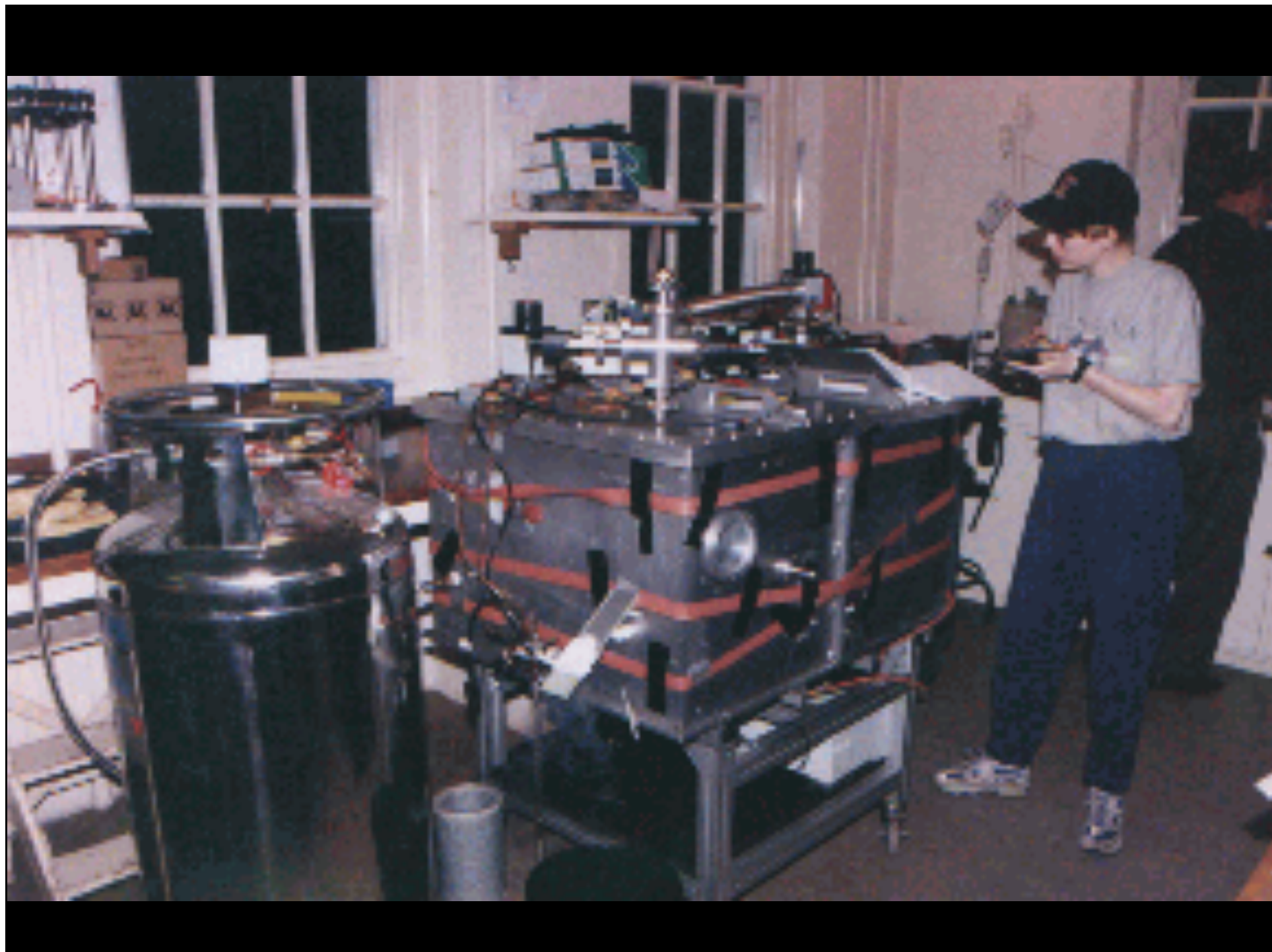
Ask

Research

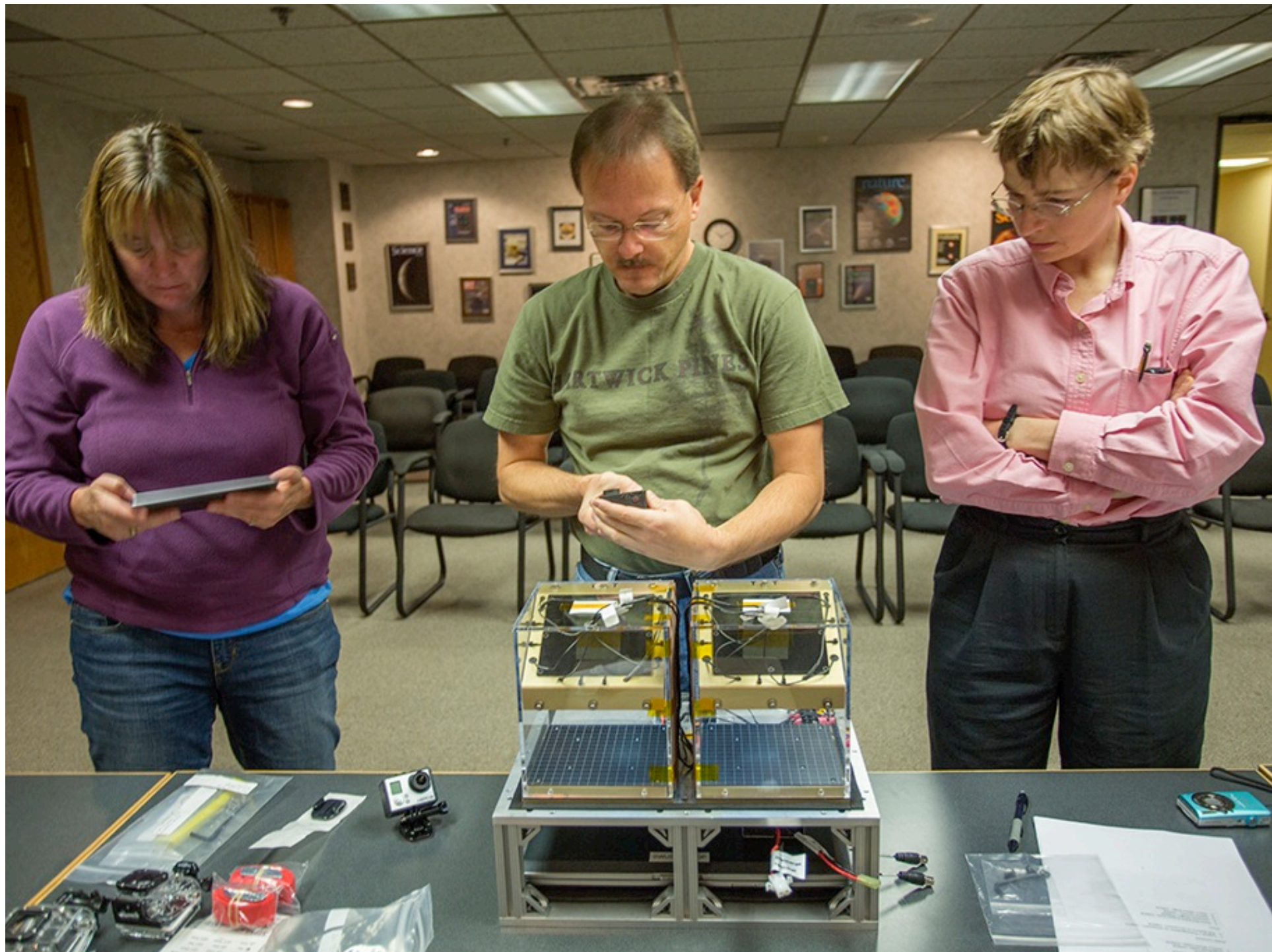
Create

Discuss

Reflect



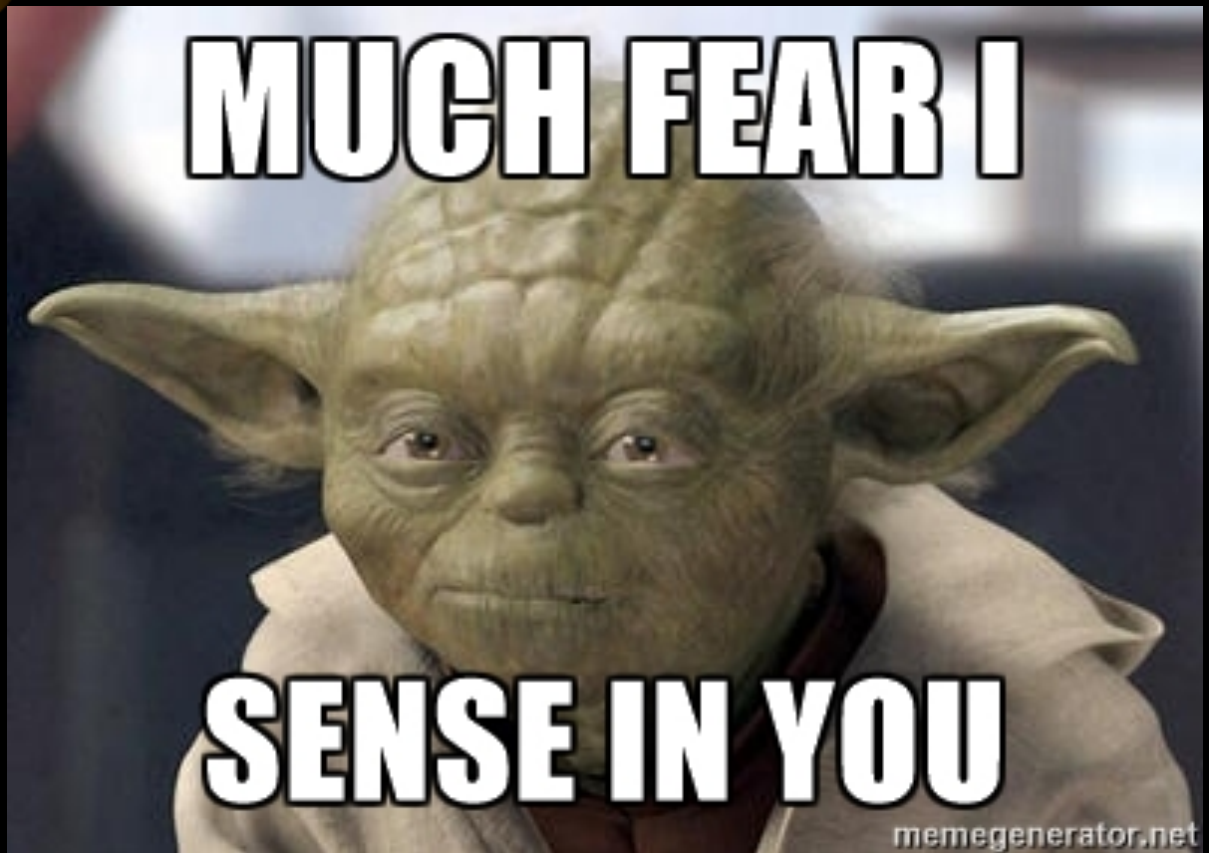




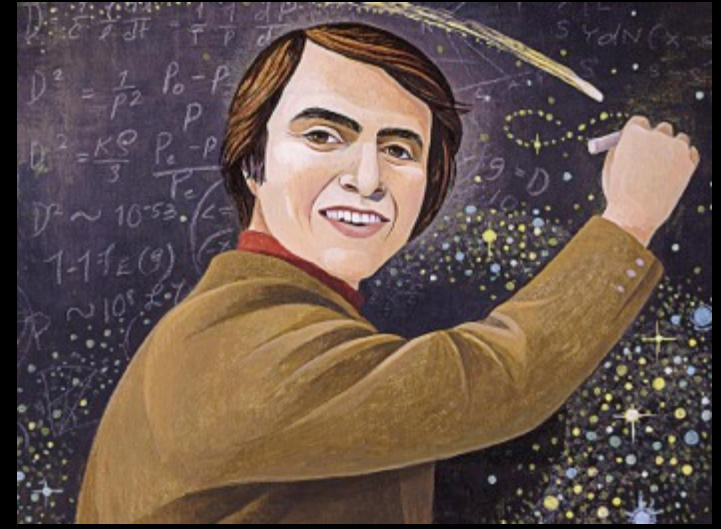








“Ask courageous questions.  
Do not be satisfied with  
superficial answers.”  
– Carl Sagan



“Learn as much as you can at every  
moment. You never know when it  
can come in handy.”  
– my father-in-law, Rev Jeff Smith



Part 2

**GET COMFORTABLE WITH BEING  
UNCOMFORTABLE**







It was 2006....





# The LCROSS Mission Concept

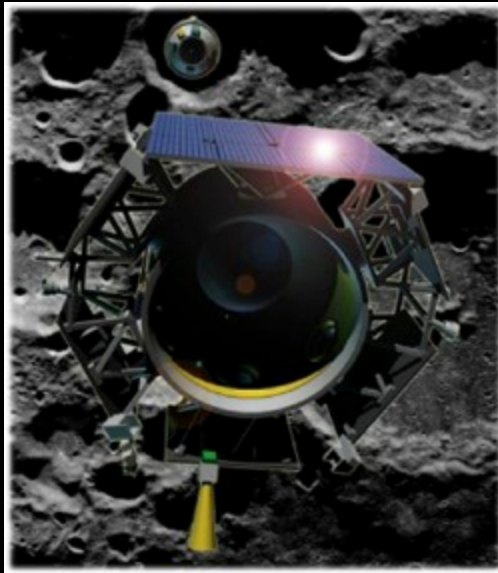
1. Launches stacked with LRO  
June 18, 2009



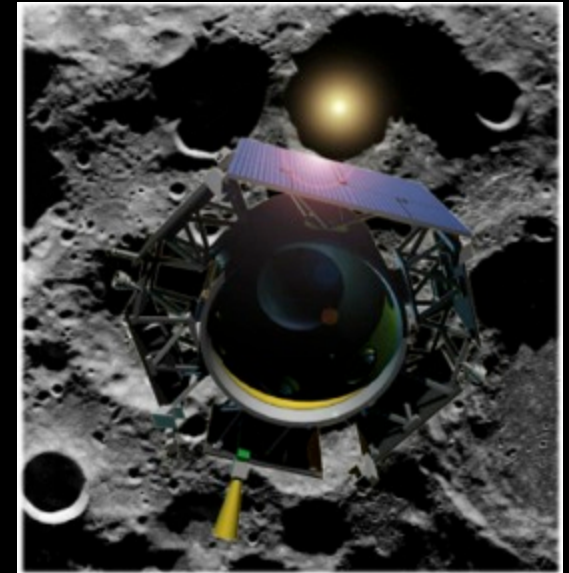
2. After Lunar swing-by, enter a 4 month cruise around Earth



3. October 9, 2009, target the Centaur Upper Stage and position S-S/C to fly 4 minutes behind

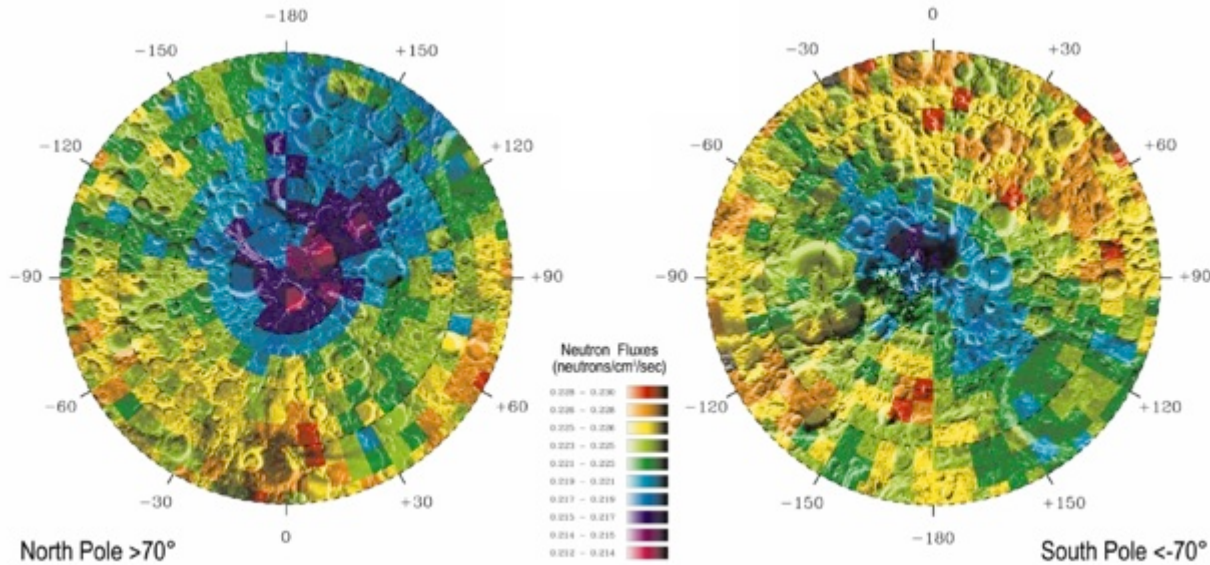


4. S-S/C observes impact, ejecta cloud and resulting crater, making measurements until impacting itself

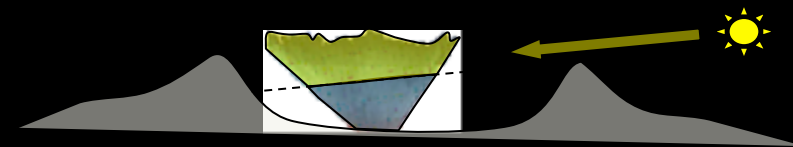


# Mission Primary Objective:

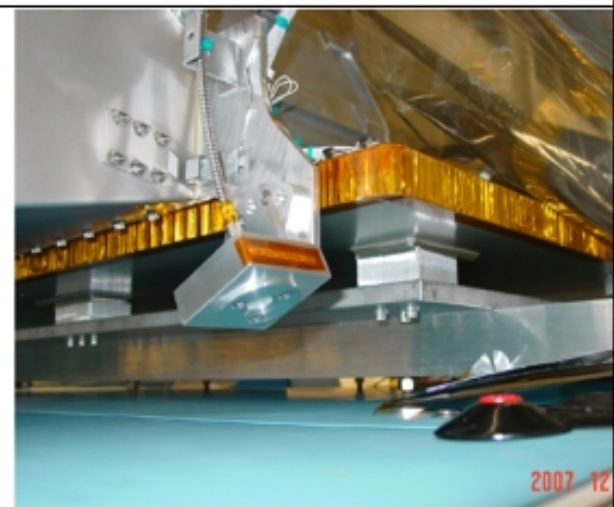
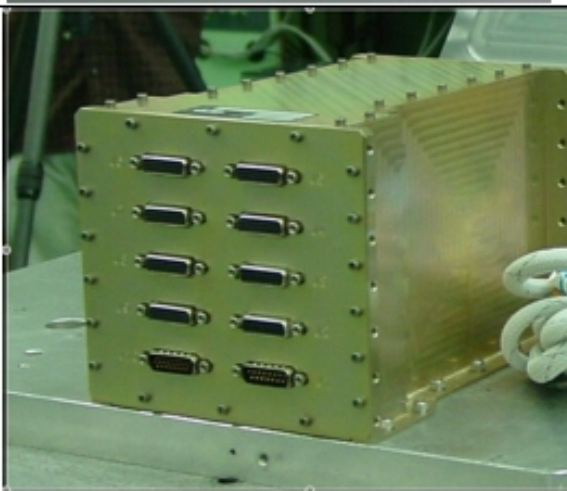
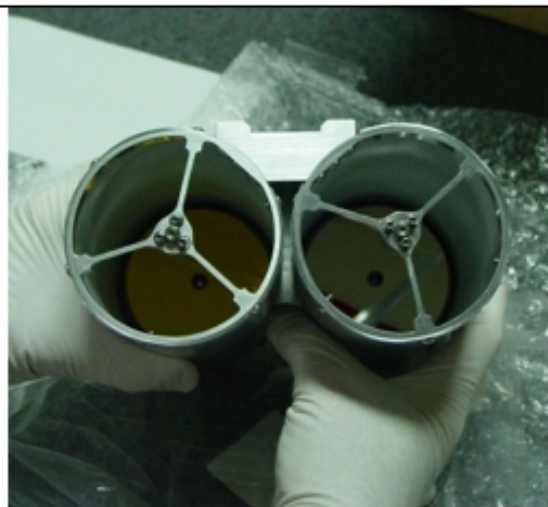
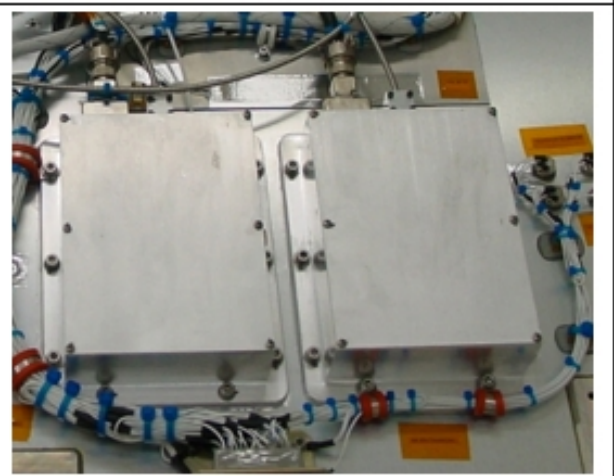
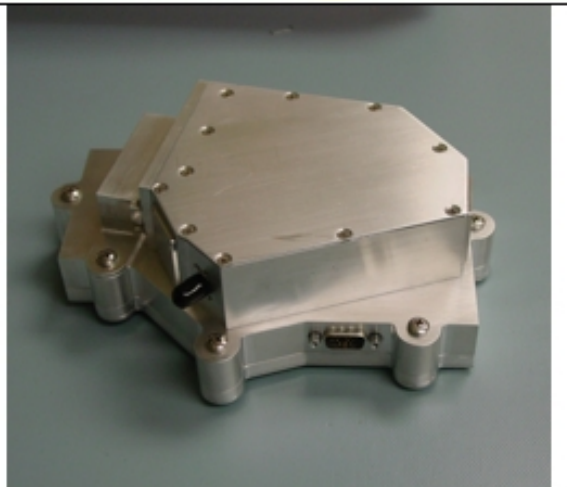
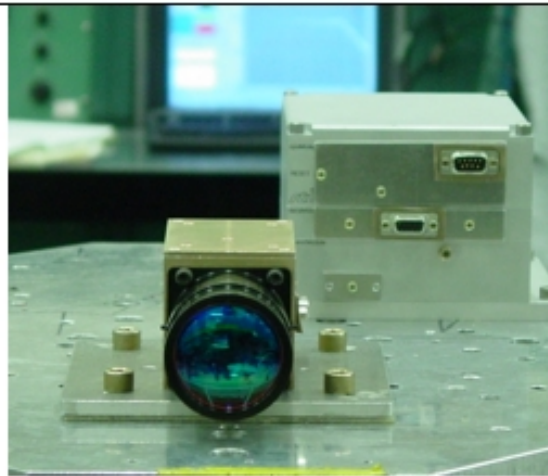
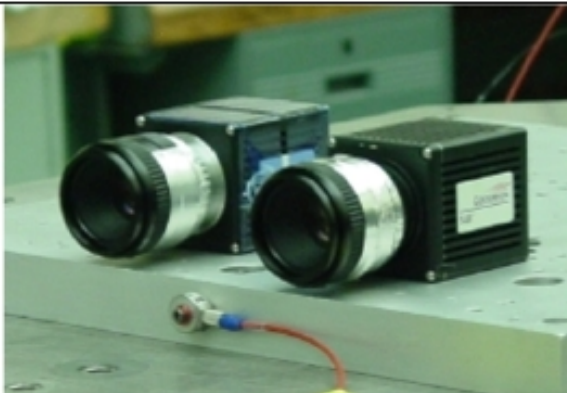
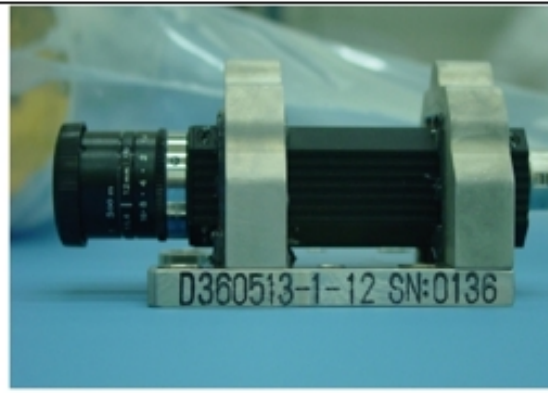
To test whether or not water ice deposits exist on the Moon.



*Feldman, W.C. et al. Science 281, 1496-1500 (1998)*



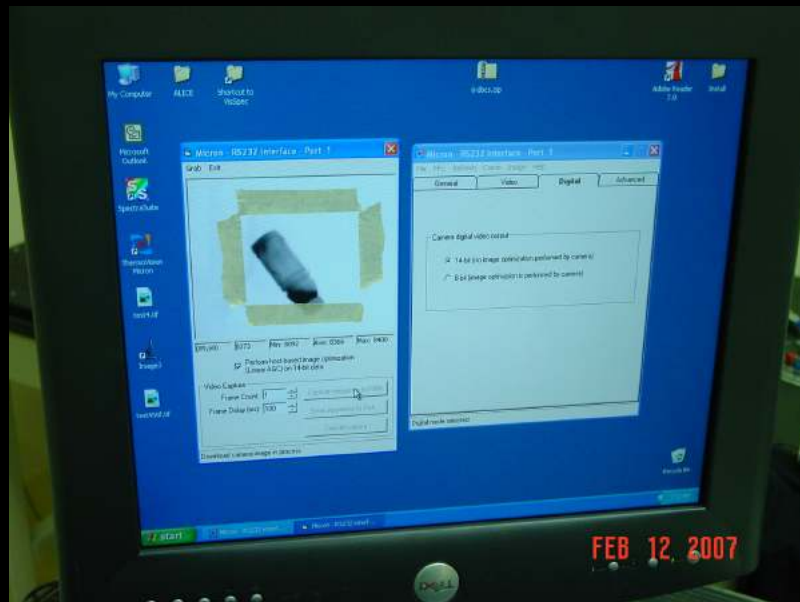






















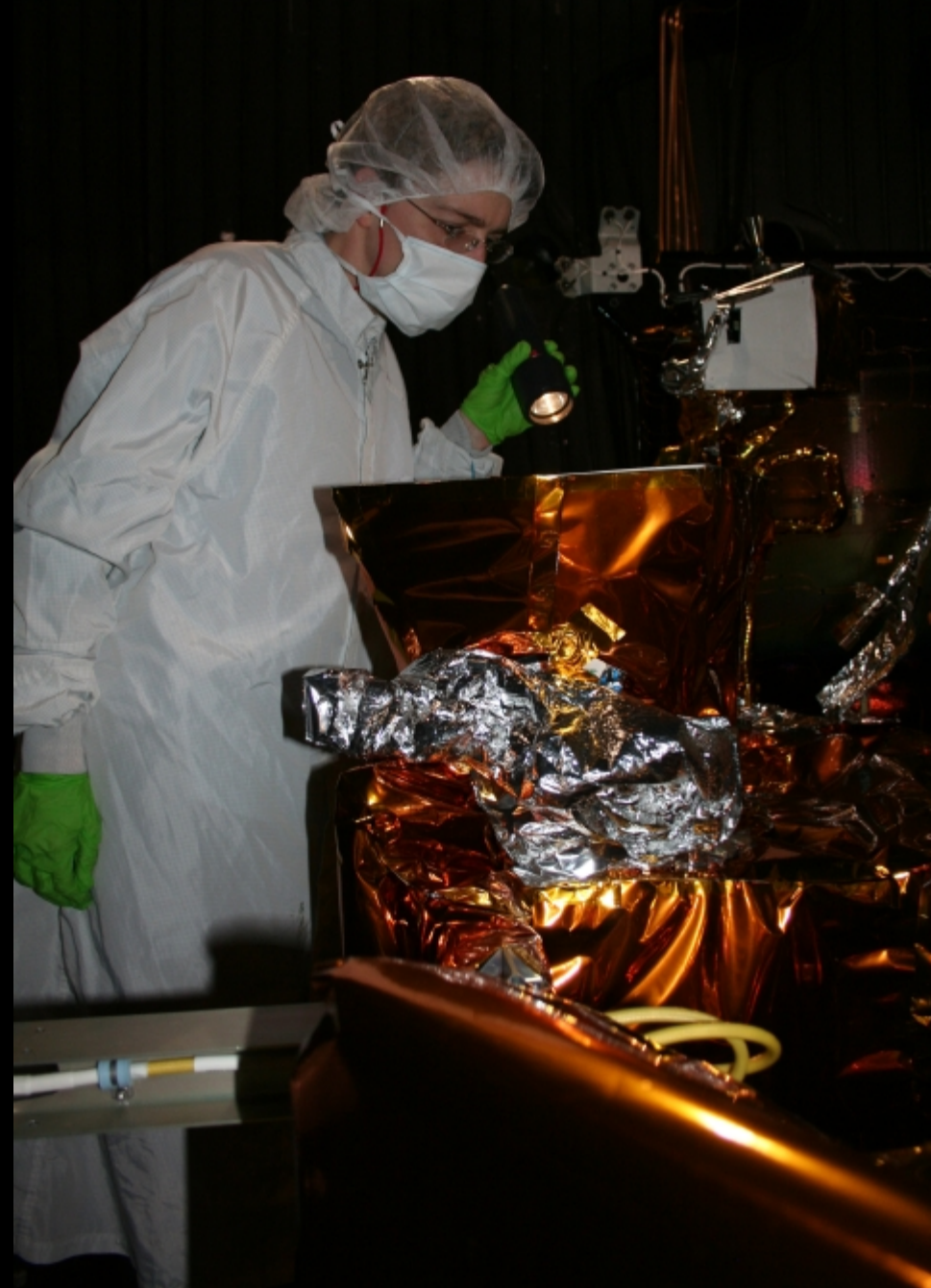


















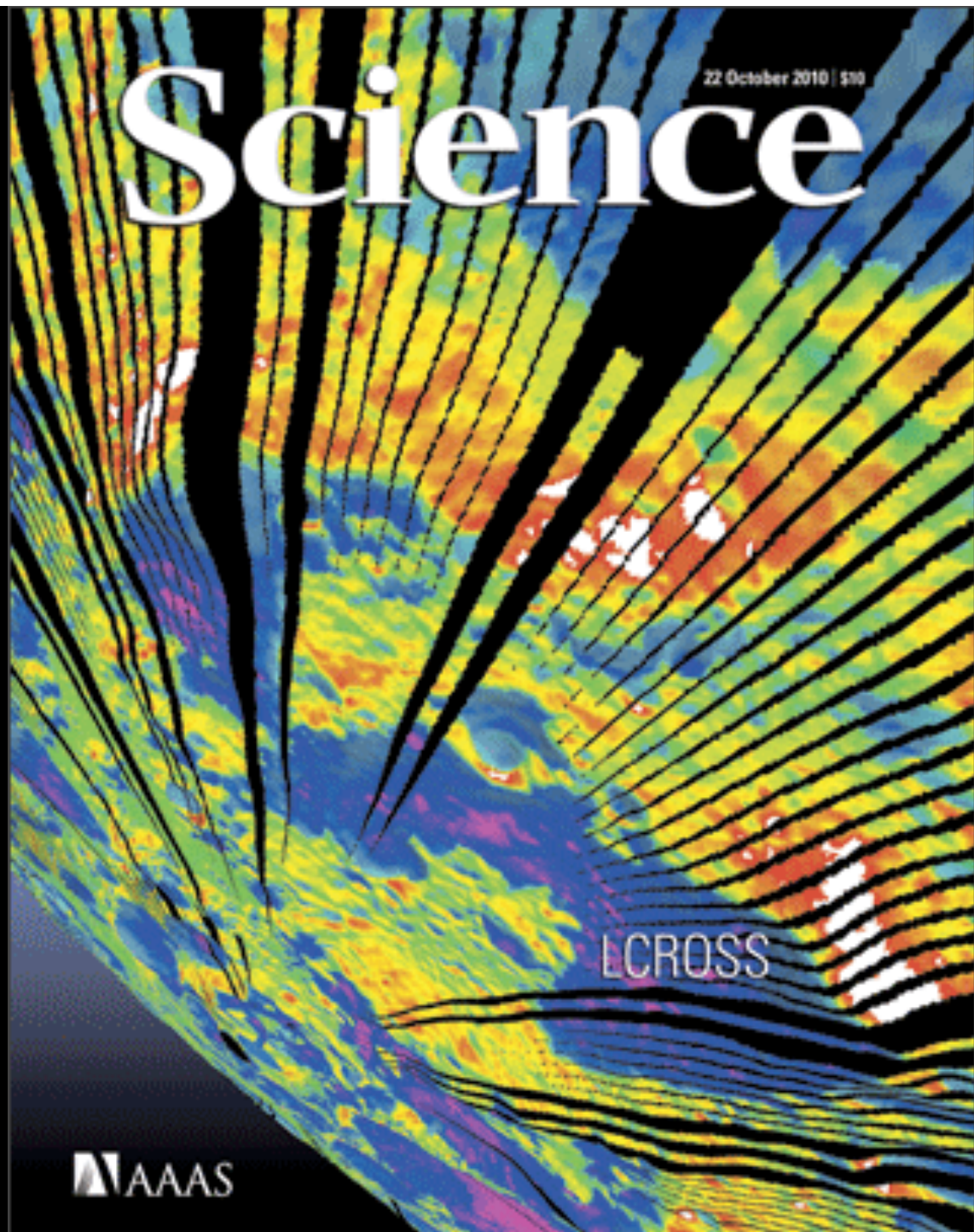
*Ames Research Center*

Public Outreach



22 October 2010 | \$10

# Science



LCROSS

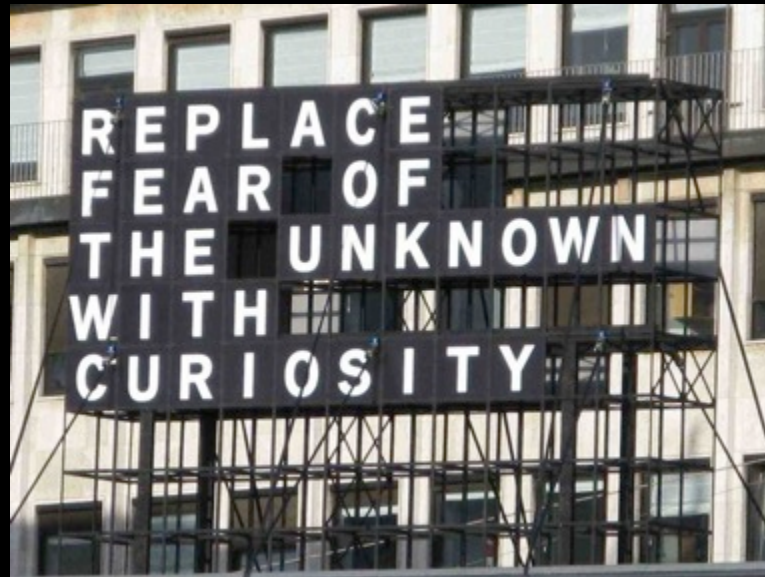
AAAS



Avoid  
the trap



“We keep moving forward,  
opening up new doors and doing  
new things, because we're  
curious... and curiosity keeps  
leading us down new paths.” –  
Walt Disney





Part 3

# **COMMUNICATING CURIOSITY**









# Seventeenth IEEE International Vacuum Electronics Conference – IVEC 2016

April 19-21, 2016 Monterey, CA USA

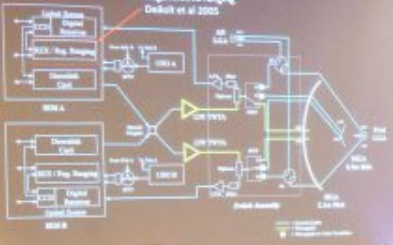


**GOLD SPONSORS**  
Supported By Army Research Office  
Electron Energy Corporation  
L-3 Communications

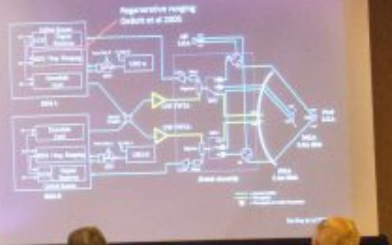
**SILVER SPONSORS**  
3M Corporation  
Applied Physics Systems  
Colorado State University  
Communication Research Center  
Lockheed Martin Space Systems G  
Northrop Grumman Corporation  
Raytheon  
Space Technology

**Bronze Sponsors**  
Eaton Corporation, Inc.  
Hittite Microwave Technologies  
Kongsberg, Ltd.  
Kongsberg Technology (CST)  
L3Harris Corporation  
Petrus, Inc.

## Other Deep Space Enablers



## Other Deep Space Enablers



























Be a thinker-er

Be a seeker

Be a curious catalyst

“Curiosity is an everlasting flame that burns in everyone’s mind. It makes me get out of bed in the morning and wonder what surprises life will throw at me that day. Curiosity is such a powerful force. Without it, we wouldn’t be who we are today.”



– Clara Ma, at age 12, won the Mars Science Laboratory naming contest



# The Curiosity Effect

[http://disney.wikia.com/wiki/  
The\\_Second\\_Star\\_to\\_the\\_Right\\_\(Peter\\_Pan\)](http://disney.wikia.com/wiki/The_Second_Star_to_the_Right_(Peter_Pan))



@kennicosmith  
Kimberly.Ennico@nasa.gov

# References

1. *A Curious Mind: The Secret to a Bigger Life* by Brian Grazer & Charles Fishman (2016) ISBN: 9781476730776.
2. *Curious: The Desire to Know and Why Your Future Depends on It* by Ian Leslie (2014) (“be a thinkerer”) ISBN 9781770894037
3. *Curious? Discover the Missing Ingredient to a Fulfilling Life* by Todd Kashdan (2010) (“get comfortable with being uncomfortable”) ISBN 0061661198
4. *The Power of Curiosity: How to Have Real Conversations that create Collaboration, Innovation and Understanding* by Kathy Taberner & Kirsten Siggins (2015) ISBN 1630473944
5. States of Curiosity Modulate Hippocampus-Dependent Learning via the Dopaminergic Circuit, Gruber, M.J. et al *Neuron* 84, 486–496 (2014)
6. Komoroske, L.E et al. ‘A Scientist’s Guide to Achieving Broader Impacts through K-12 STEM Collaboration, *BioScience* 65: 313-322 (2015) <http://bioscience.oxfordjournals.org>
7. Inspired Teaching Report <http://inspiredteaching.org/wp-content/uploads/impact-research-briefs-inquiry-based-teaching.pdf> and references therein.
8. Clara Ma’s essay “Curiosity” [https://www.nasa.gov/mission\\_pages/msl/essay-20090527.html](https://www.nasa.gov/mission_pages/msl/essay-20090527.html)
9. LCROSS Case Study <https://appel.nasa.gov/knowledge-sharing/publications/lcross-html/>