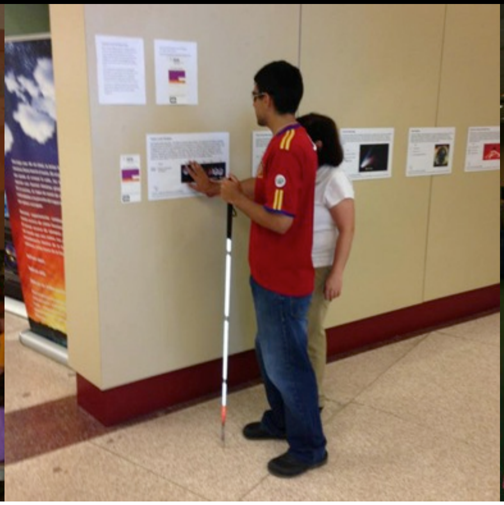
Chandra X-ray Observatory
Public Communications and Engagement

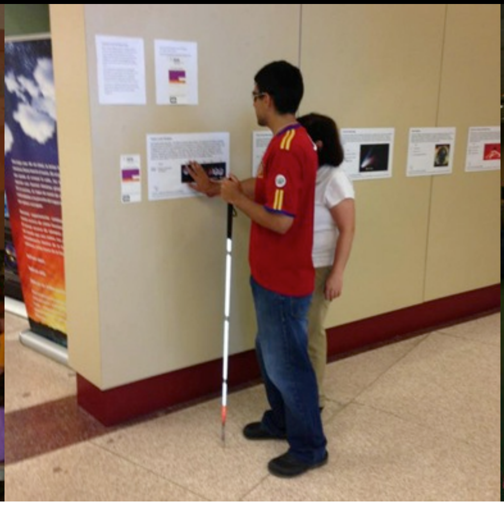
Overview

- A multifaceted Public Communications & Engagement program encompassing press relations, public engagement, and education
- Reaches a large and diverse audience of national and international scope
- Direct connection and established working relationships with the astrophysicists whose research forms the basis for all products
- Products and activities evolve from an integrated pipeline design, encourage users toward deeper engagement
- Products target underserved audiences such as women, Spanish speakers, sight and hearing impaired

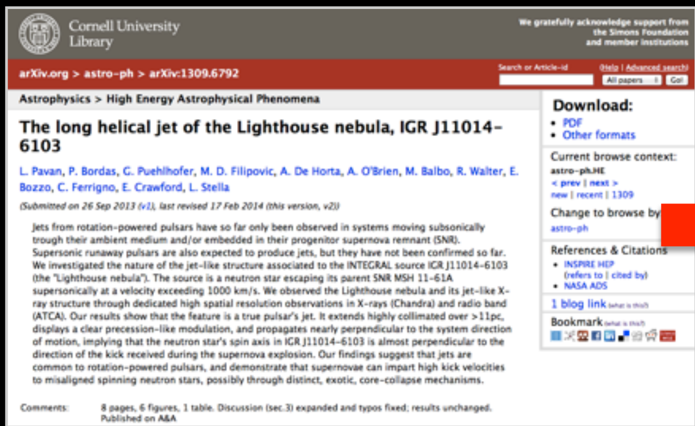


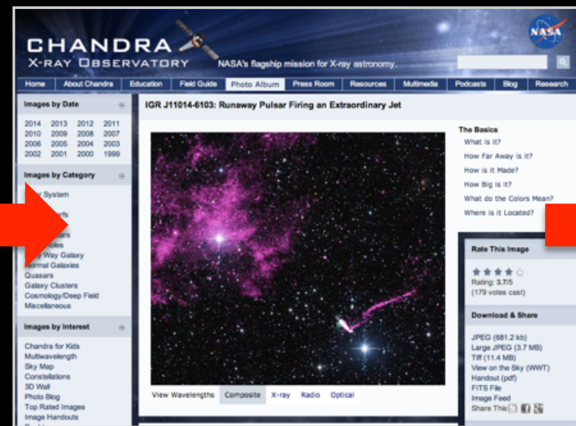
Overview

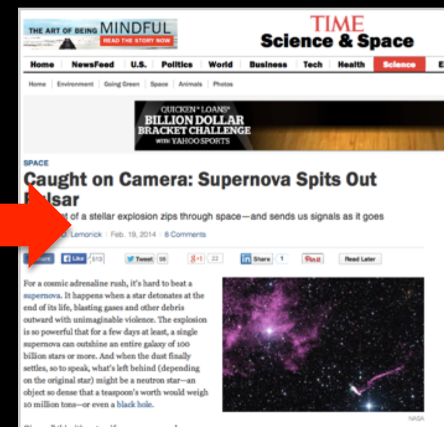
- Program conducts research into best practices which inform subsequent programs and products
- Products use emerging technologies and track user trends
- Education products undergo NASA evaluation and align with national standards
- Program undergoes comprehensive outside evaluation
- Work supported by ~11.25 FTE: 1.5 press scientists, 1 press officer, 1 lead coordinator, 1 multi-media coordinator, 1 scientific image processor, 1 web developer, 1 apps/social media developer, 1 animator/podcast producer, 1 scientific illustrator, 1.25 educators, .5 staff assistant




Publicizing Chandra Science:
From science papers to the public







Press and image releases:

- New release every other week
- *Includes:* Text, images, background info.

  Also: illustrations, podcast, blog posts, press conference

Promoted with:

- Chandra webpage, NASA and AAS press lists, social media, email

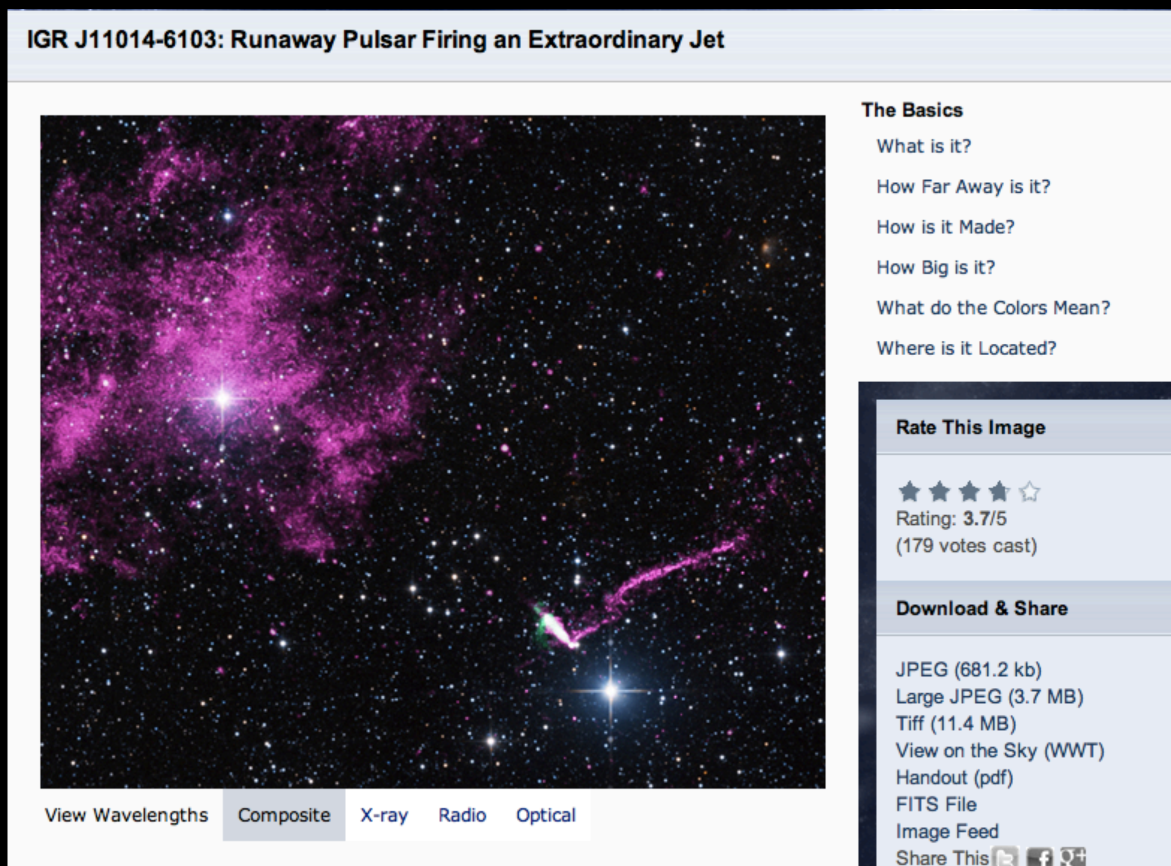
Goals include:

- Be *accurate, clear, concise* and *engaging*, and reach a large audience

Publicizing Chandra Science:
From science papers to the public

Quality, clarity and reach:

- Include reviews by authors, CXC, NASA
- Well-designed webpage:



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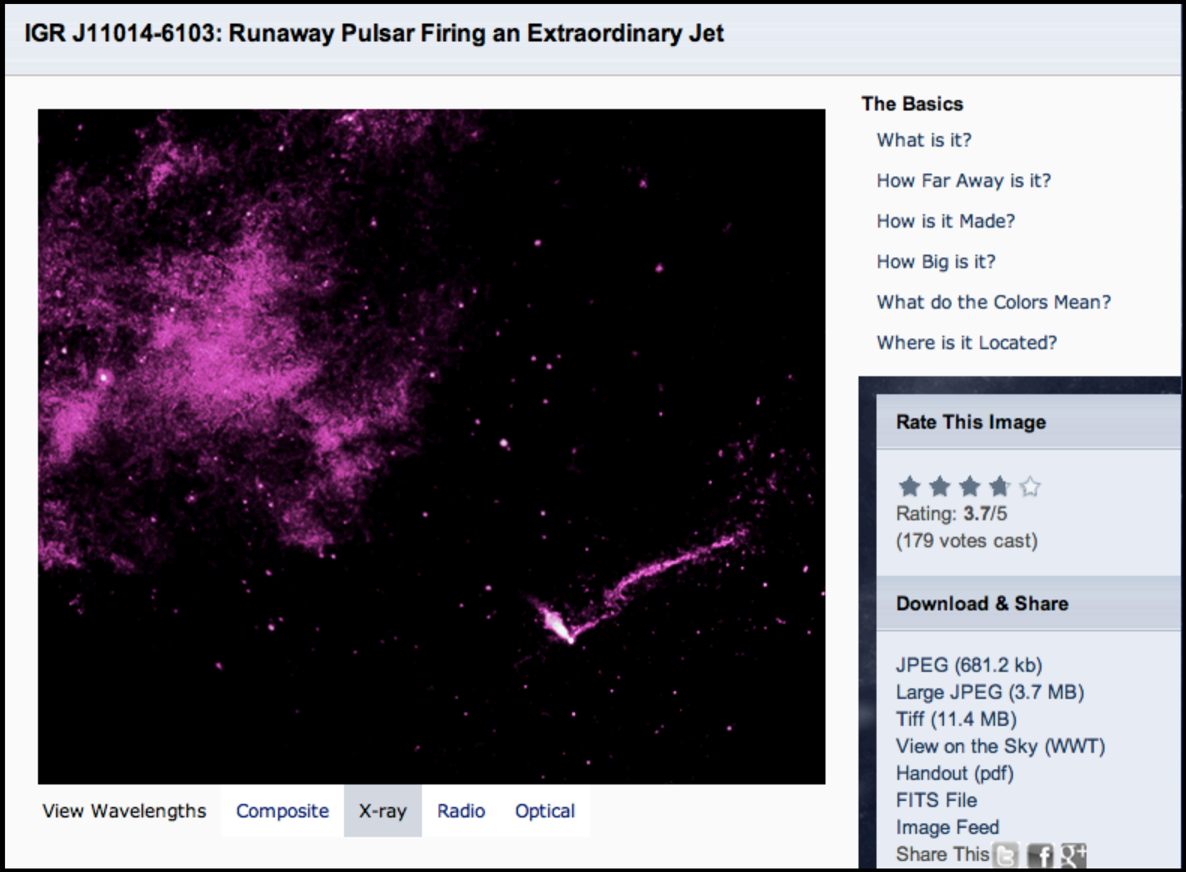

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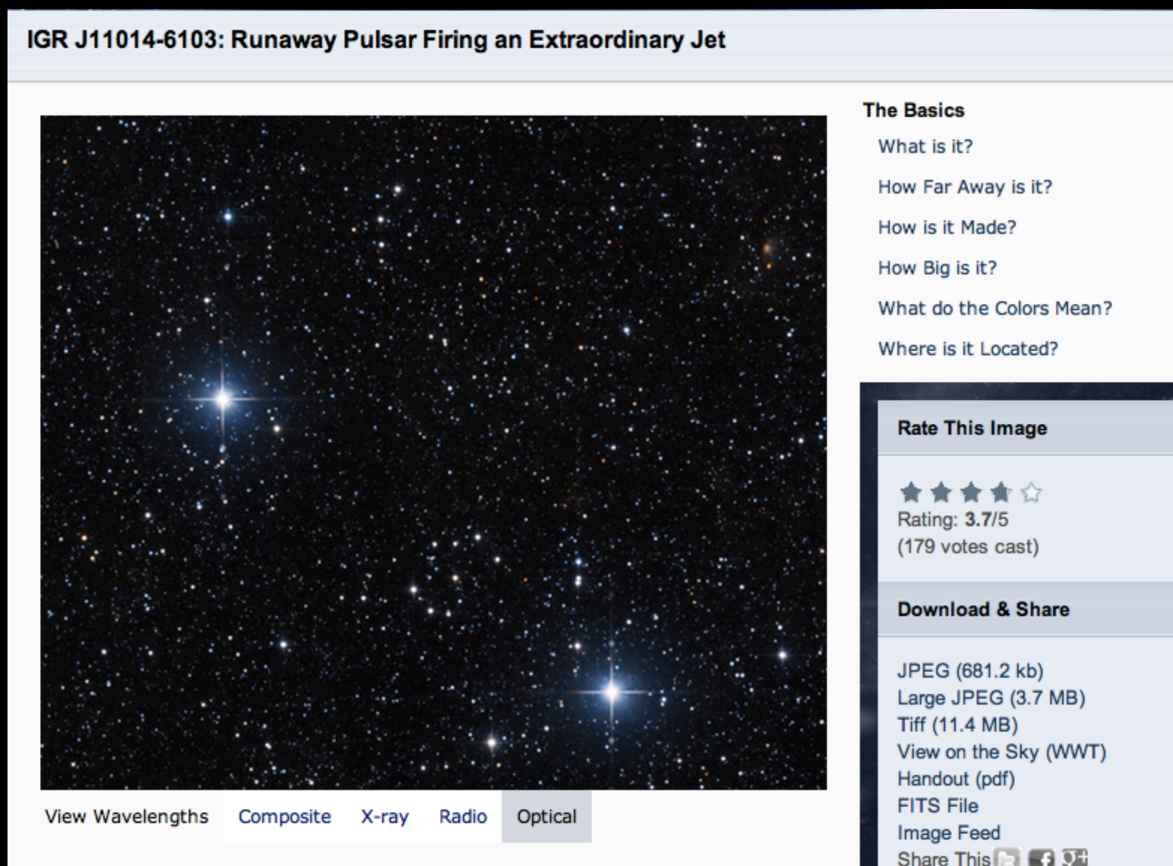

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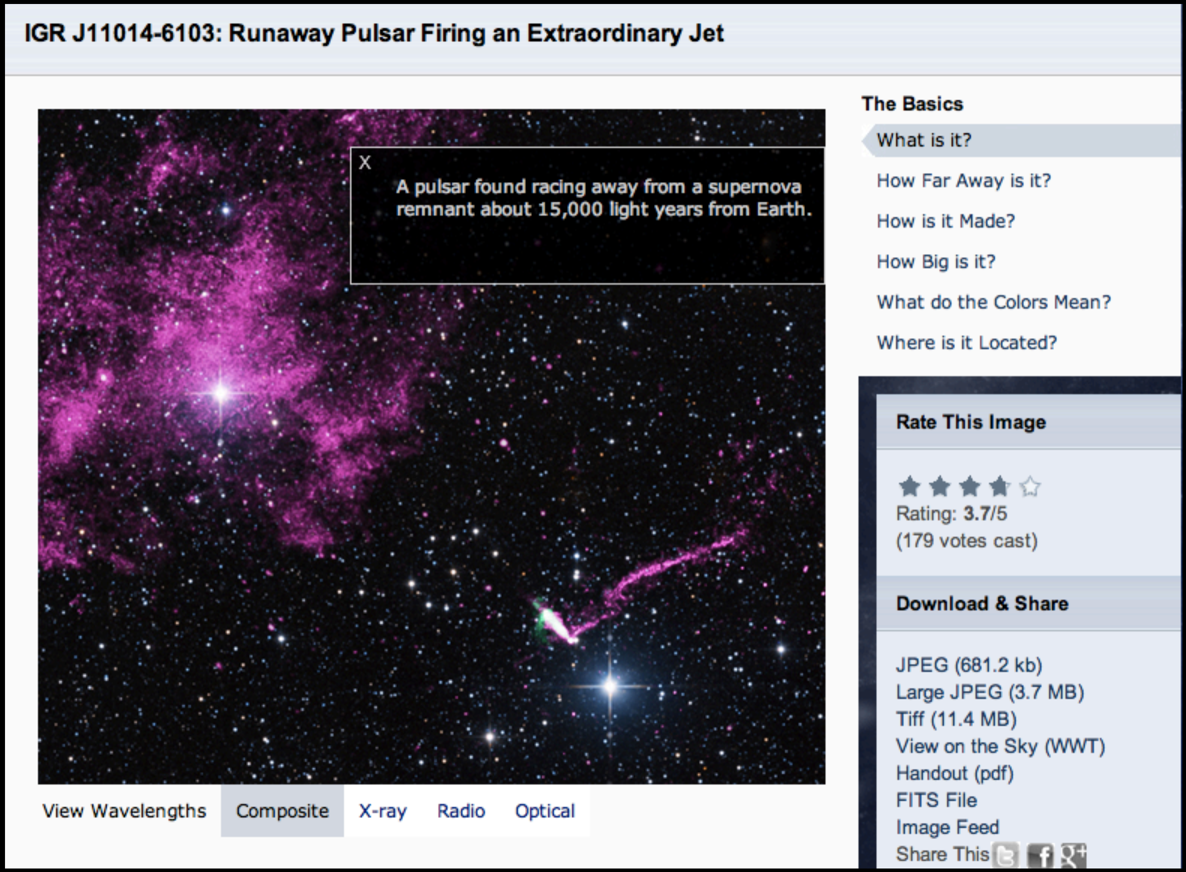
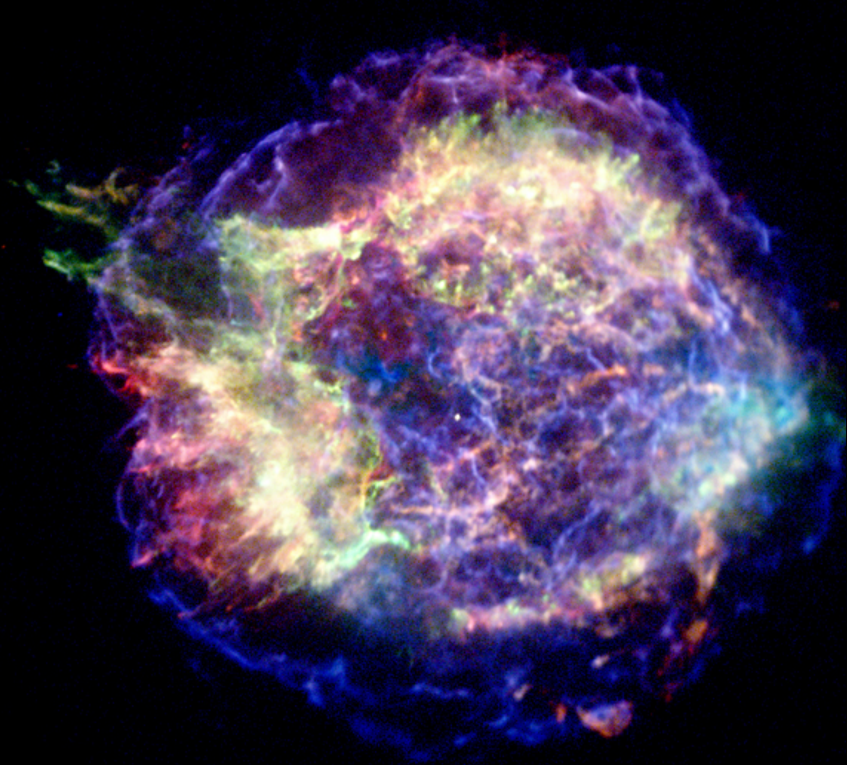
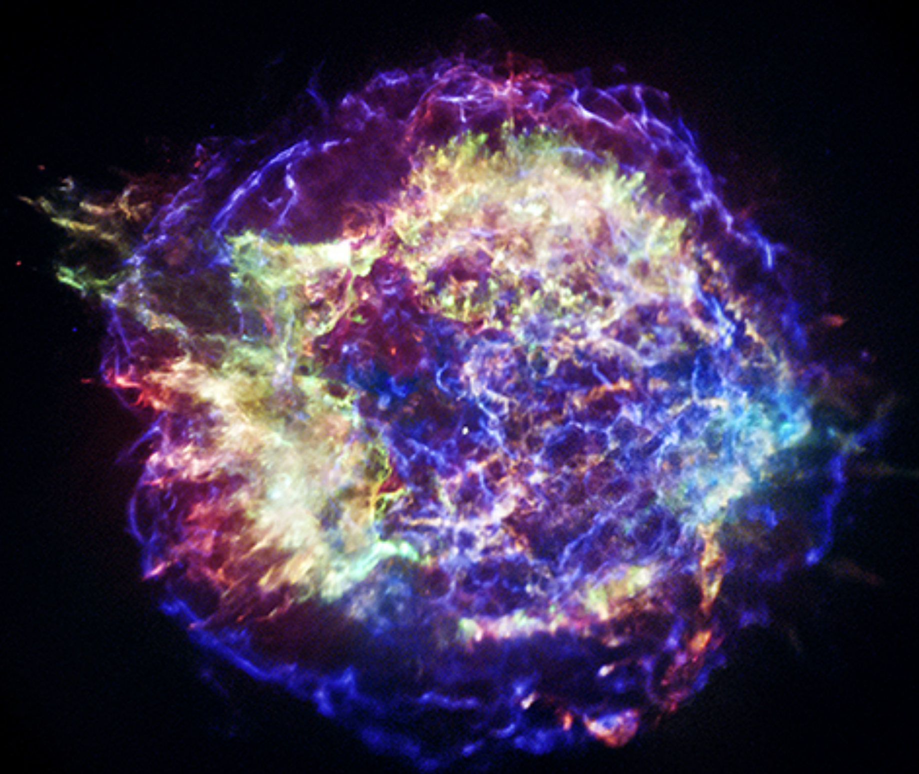


Quality, clarity and reach (continued):

- Produce best possible images, applying advanced processing techniques
- 1st example: “tone mapping”



Before



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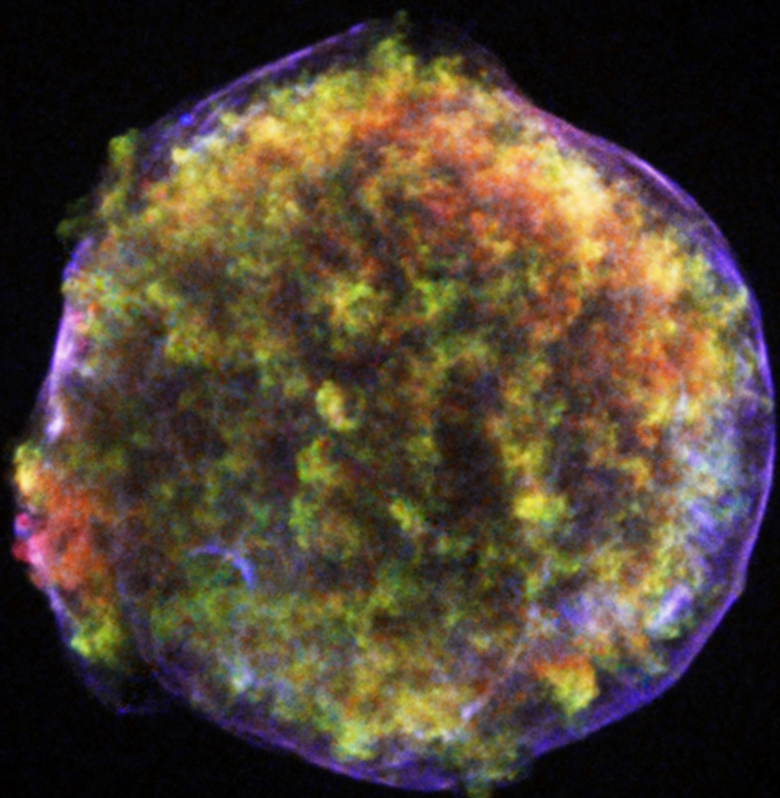

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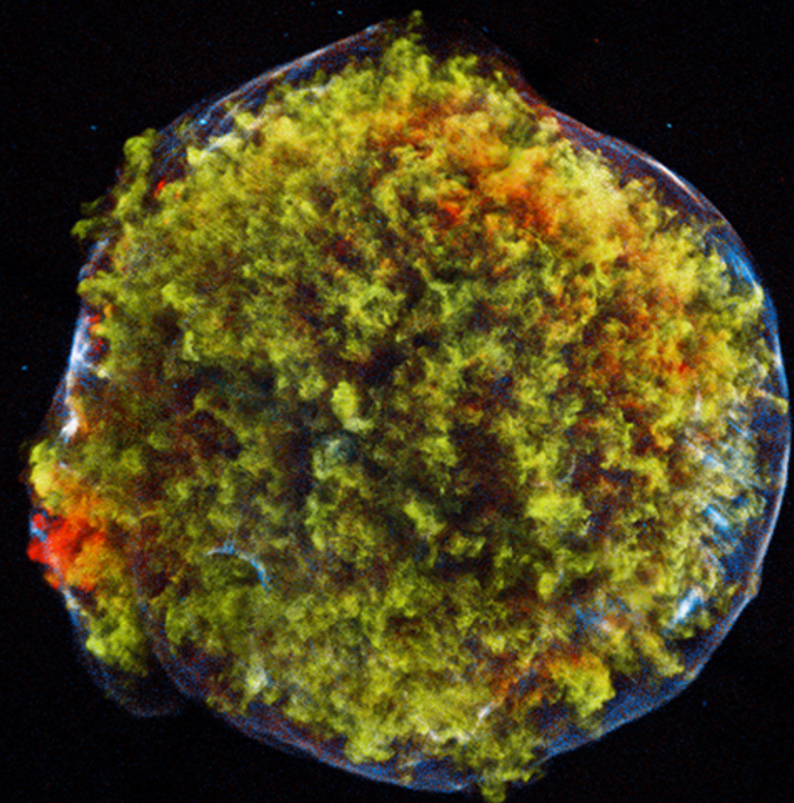
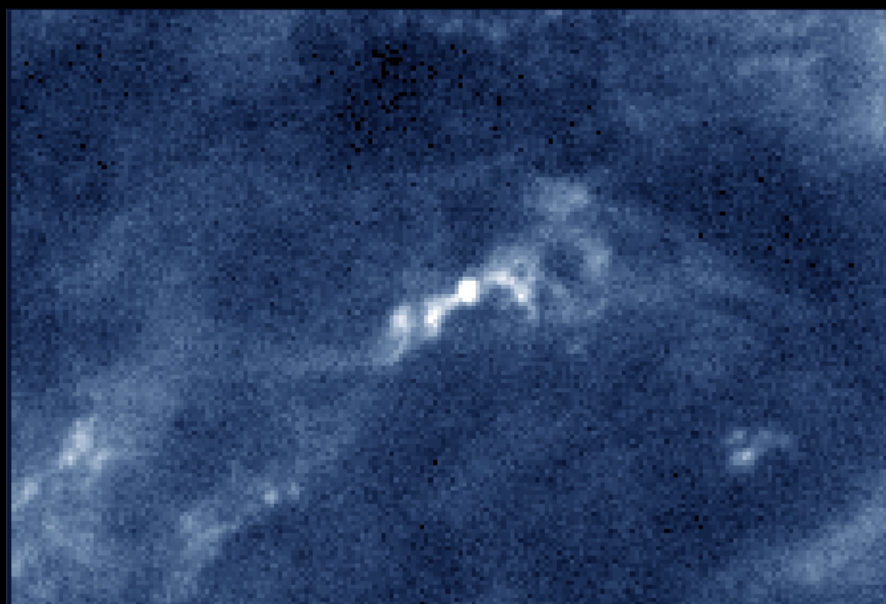
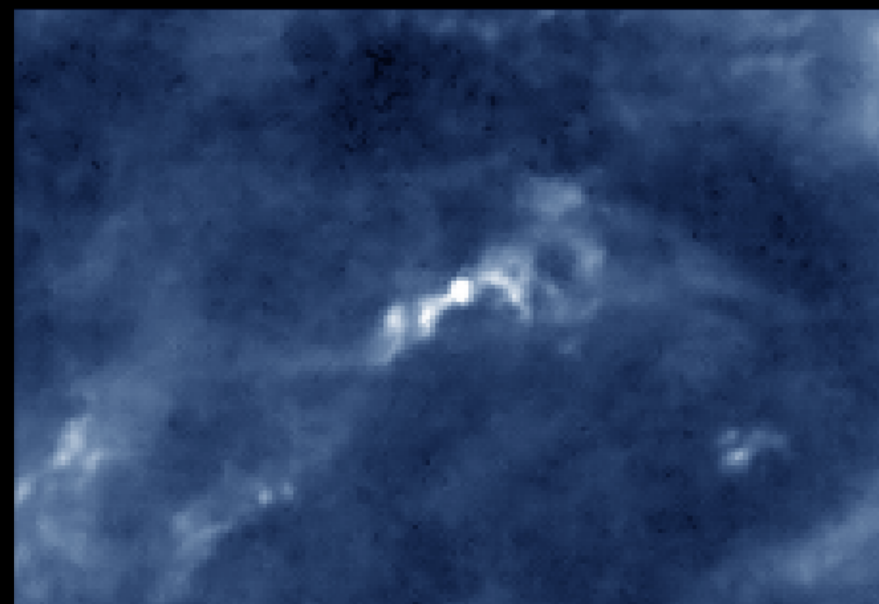


After

Quality, clarity and reach (continued):

- Produce best possible images, applying advanced processing techniques
- 2nd example: “Greycstoration”





Before

After

Publicizing Chandra Science: From science papers to the public

Also crucial to be open, transparent, accountable:

- Blog post by 1st author
- Obvious, multiple links to text of science paper
- Show separate wavelength images
- I tweet about releases under my own name
- Maintain close interactions with science writers

Overview of Chandra Public Science Program

KEY FEATURES OF PROGRAM

- High quality presence driven by science results
- Accessible to non-elite audiences
- Cross-cutting programs promote creative thinking, add relevance, support collaborative practices
- Cycle of research & evaluation informs practice at all points of program creation

HIGHLIGHTED IMPACTS

- Trusted, valuable science resource
- 10s of millions of participants served
- Learning gains, increased interest in astronomy
- Network of practitioners created and sustained

Goals: Opening access, sharing new discoveries with diverse audiences, engaging the imaginations of students, teachers, & the greater public, & increasing learning opportunities

Scaffolded Digital Presence Serves Multiple Audiences

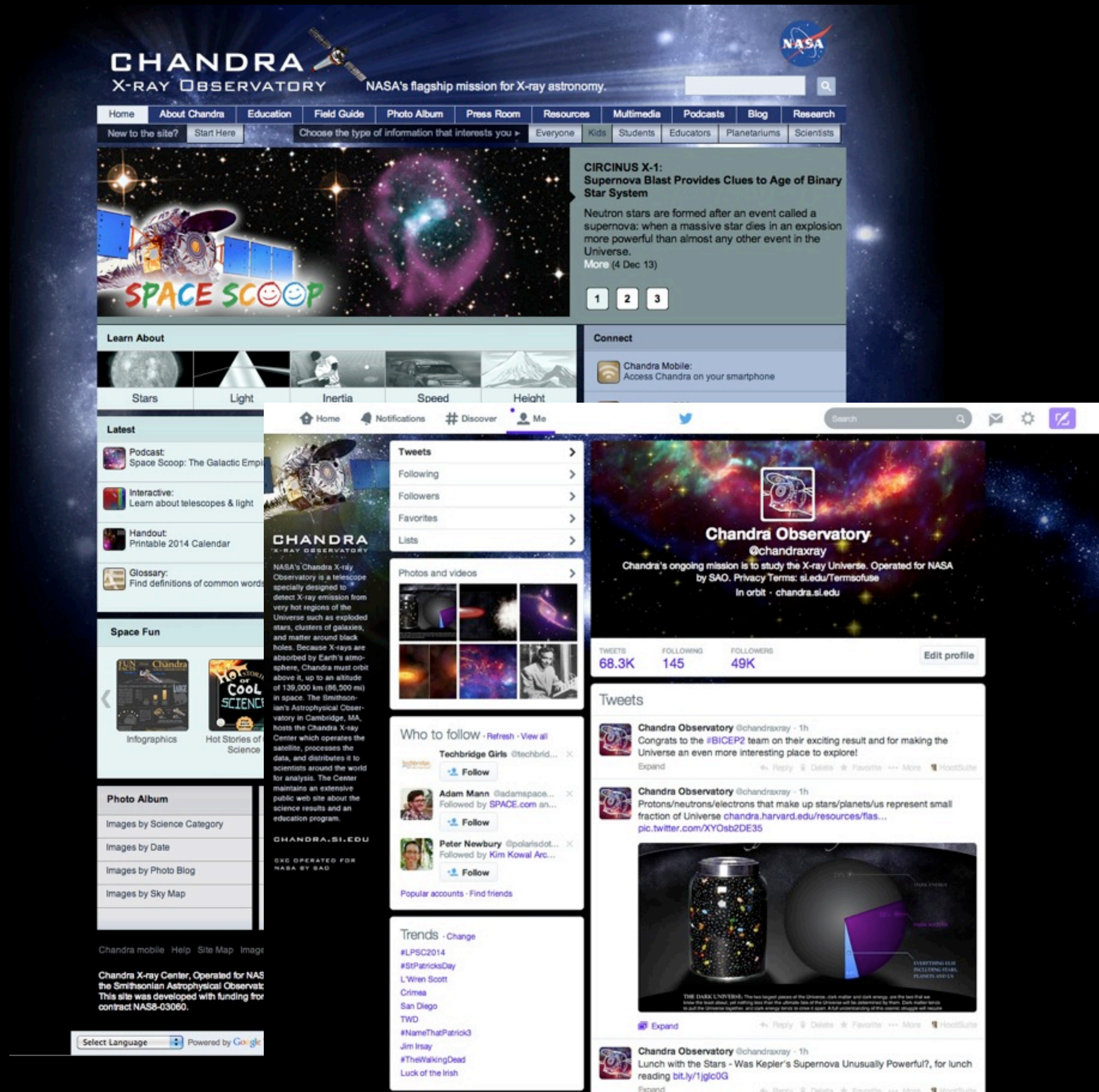
USER - DRIVEN

INTERACTIVE

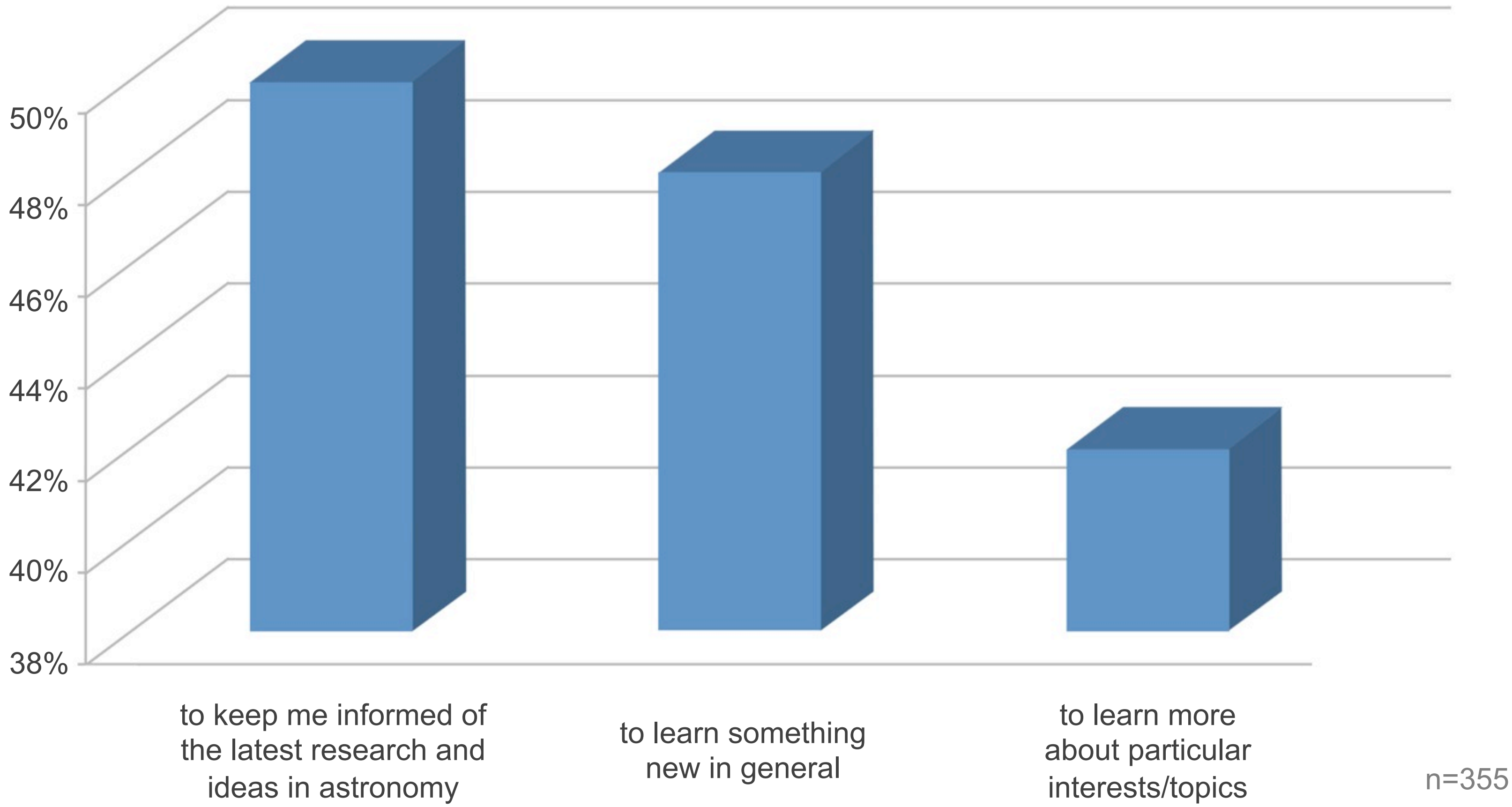
DYNAMIC

ACCESSIBLE

SOCIAL MEDIA INTEGRATION

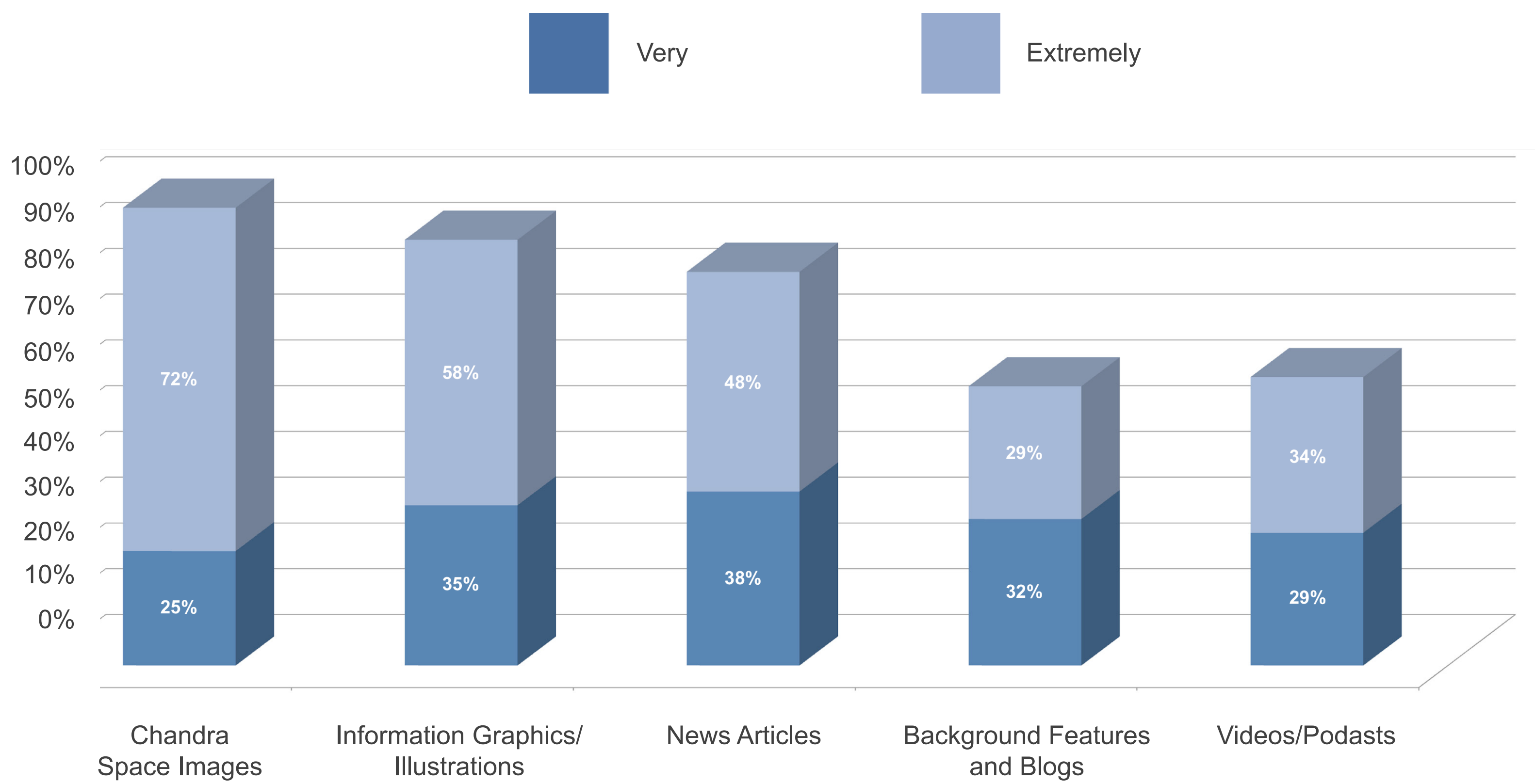


Why do you visit chandra.si.edu?



“ I love your whole web site - news, videos - and the field guide stuff is the best. I have learned more here than I ever did in high school and college. Keep up the awesome work. Thank you.”

To what extent has your purpose of visiting the Chandra website been fulfilled?



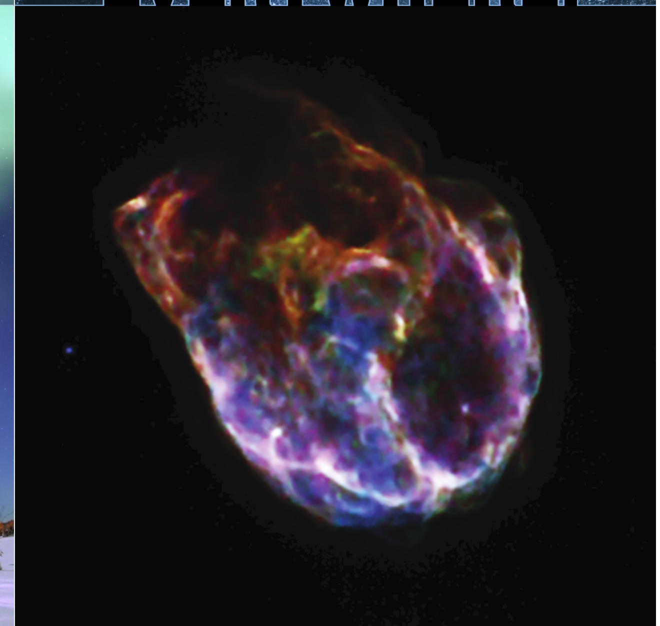
“ This site really is a gem of the internet that continues to share the discoveries of this magnificent telescope.”

“ The pictures are stunning and the science is indispensable. Please share more.”

HERE.

THERE.

EVERYWHERE.



Neon Sign.

In a neon sign, an electric current runs through a tubular glass fixture that is filled with gas. This electric current causes collisions between the electrons and atoms in the neon gas. When various electrons relax, the energy released produces light that has a very specific color that invite us through the diner door.

(Credits: Wikimedia Commons)

Aurora.

Streams of particles with electric charge are continually leaving the Sun and traveling through the Solar System. As these particles approach the Earth, some of them are channeled by the planet's magnetic field toward the North and South poles where they collide with atoms in the Earth's atmosphere. This produces the famous light shows we call auroras, or, more commonly in the Northern Hemisphere, the "Northern Lights."

(Credits: Wikimedia Commons)

Supernova Remnant.

When a massive star explodes, it generates an outgoing blast wave that travels through the space around the now-dead star. This wave heats the gas in this region to a temperature of several million degrees, making the molecules and atoms in the gas vibrate and collide. When the electrons in this superheated gas relax, they release their excess energy mostly in the form of X-ray light.

(Credits: NASA/CXC/NCSU/K.J.Borkowski et al.)

ATOMIC LIGHT SHOW Atoms, the building blocks of matter, are constantly in motion, moving around at speeds that are thousands of miles per hour at room temperatures, and millions of miles per hour behind a supernova shock wave. In a collision of an atom with another atom, or with a free-roaming electron, energy can be transferred to the atom. This extra energy can then be released in the form of a light wave.

www.nasa.gov

http://hte.si.edu/atoms

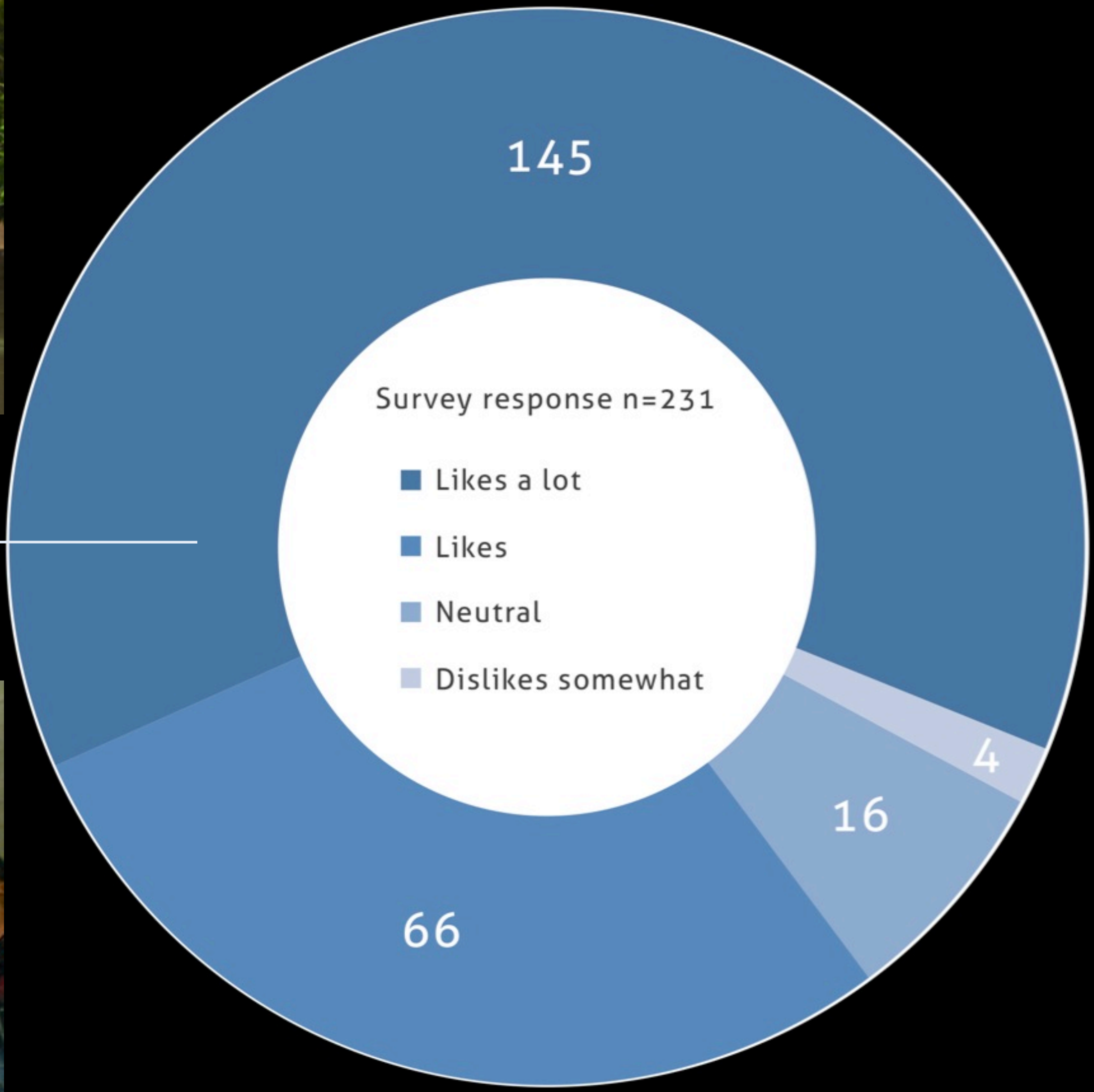
BECAUSE WHAT HAPPENS HERE,

HAPPENS THERE,

HAPPENS EVERYWHERE.

How Did Participants Feel About Their Public Science/FETTSS Experience

"Beautifully done.
Am coming back."



Leadership in astronomy/ science communications research, including creation and adaptation of "public science"

International research program conducting image and meaning studies

Results directly inform practice (see previous slides):

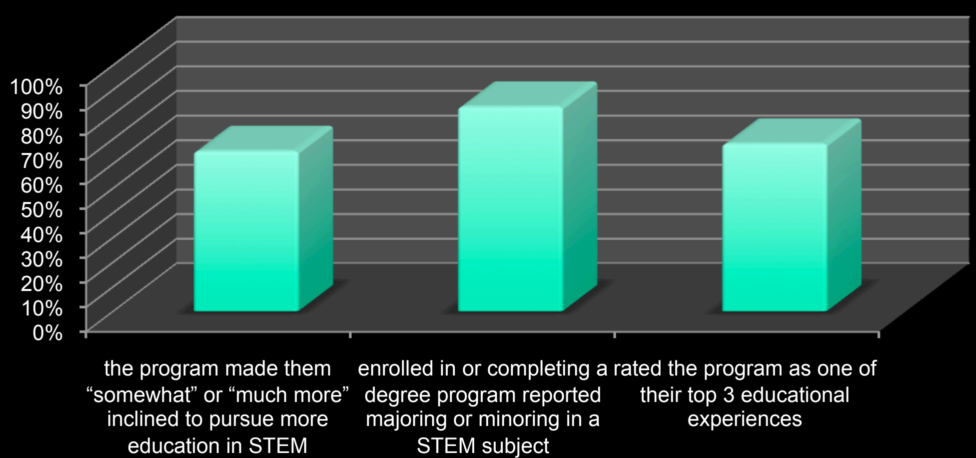
- 14 articles in peer-reviewed professional journals
- numerous conference proceedings, posters, invited presentations, articles/blogs

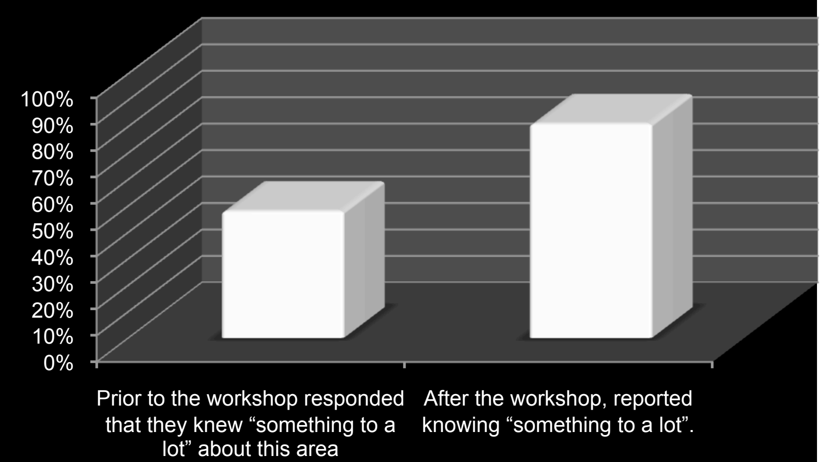
Goals

- Provide educators with the standards-based resources and knowledge to infuse NASA SMD content into their activities and classrooms.
- Develop materials and activities that give students authentic science experiences to understand the process of science including tools to analyze Chandra data
- Increase student interest in NASA SMD science and STEM subjects.

Outcomes

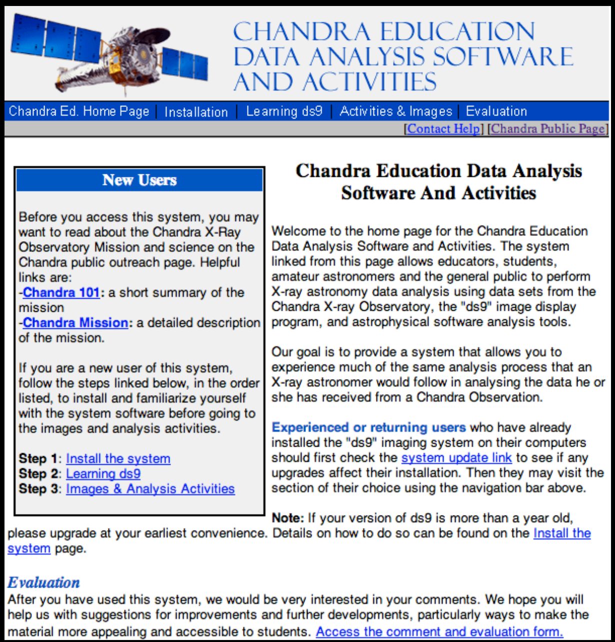
- Educators have increased ability to use NASA SMD content in formal and informal education.
- Increased participation and retention of students in STEM subjects.

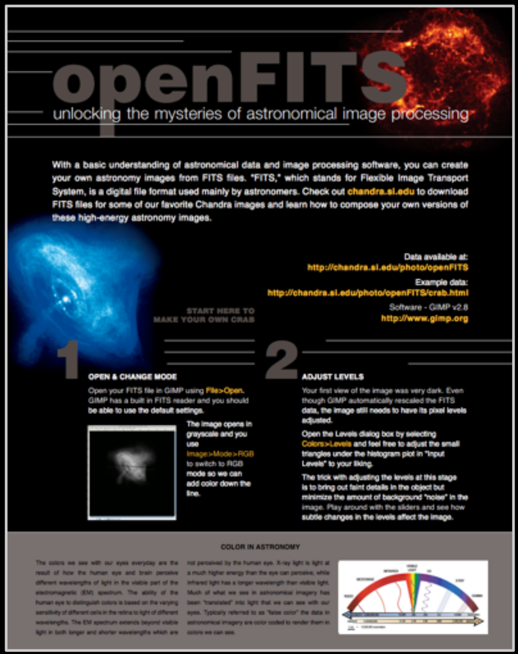


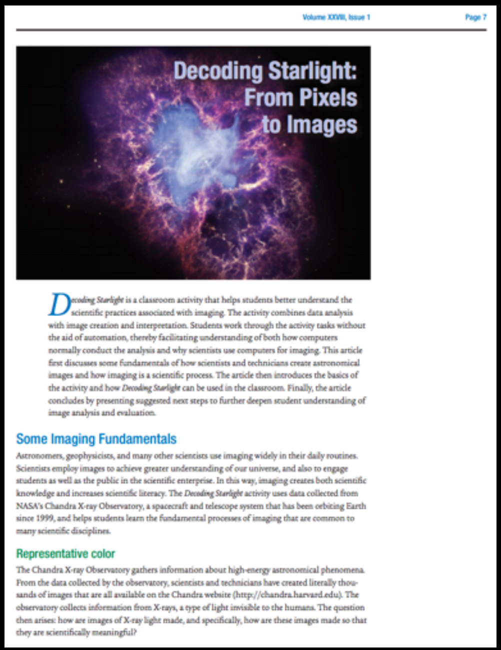


Selected programs

- Materials and activities give students authentic science experiences
- Teacher Professional Development workshops at National Science Teachers Association conferences: evaluations show participant satisfaction and learning gains.
- National Science Olympiad: teams starting at local levels in all 50 states. Over 100,000 participants yearly. Chandra educators include NASA content in astronomy competitions and study materials, hold coaches clinics.
- STOP for Science: in 250 schools distributed across 41 states, plus D.C and APO's; incl. 18 of lowest performing US school districts.



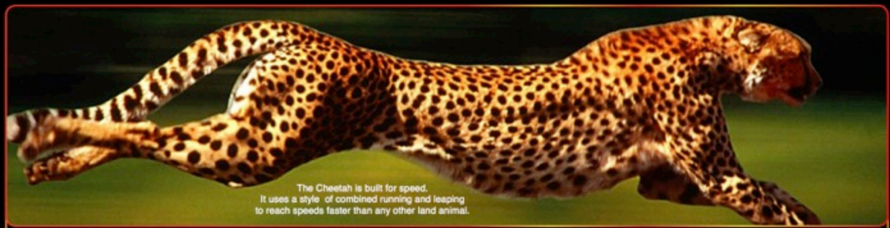




THAT'S FAST!

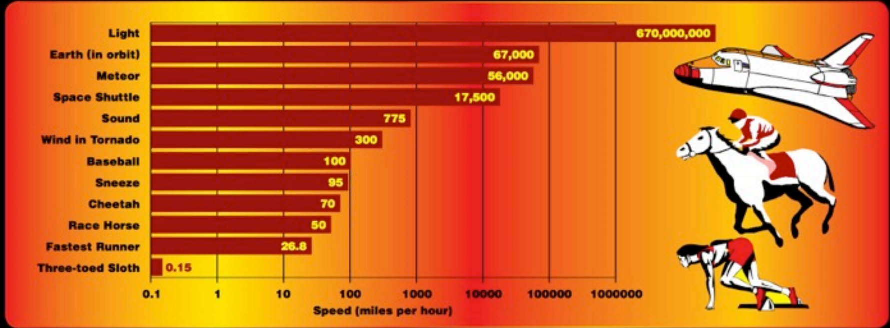
WHAT IS SPEED, AND HOW DO WE MEASURE IT?

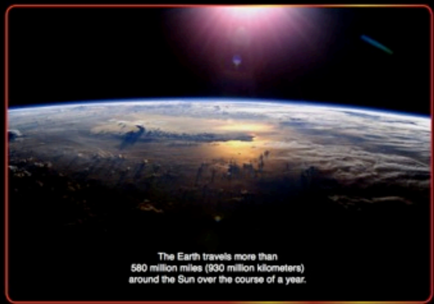
A jet plane is fast, and a snail is slow. But what exactly does this mean? The **speed** of an object is defined to be the distance it will travel in a certain amount of time. If something travels 100 feet (or about 30 meters) in 10 seconds, its speed is 10 feet per second (ft/s), or 3 meters per second (m/s). We often talk about speeds in miles per hour (mi/hr, or mph) or kilometers per hour (km/hr).


The Cheetah is built for speed. It uses a style of combined running and leaping to reach speeds faster than any other land animal.

HOW FAST, IS FAST?

The fastest land animal is the Cheetah, which can reach speeds of 70 mi/hr (112 km/hr). This is fast, but not compared to how fast a pitcher can throw a baseball (100 mi/hr, or 160 km/hr). A Peregrine falcon is so fast that it could easily outrace a baseball; it can go up to nearly 200 mi/hr (320 km/hr). But this is a snail's pace compared to how fast the **Earth moves around the Sun**! Over the course of a year, the Earth travels more than 580 million miles (930 million kilometers). That's an average speed of about 67,000 mi/hr (107,000 km/hr)!

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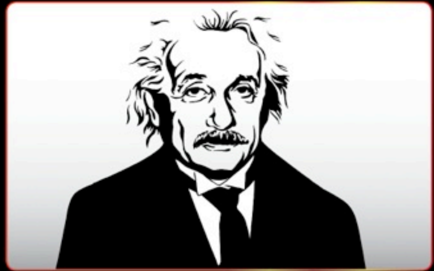
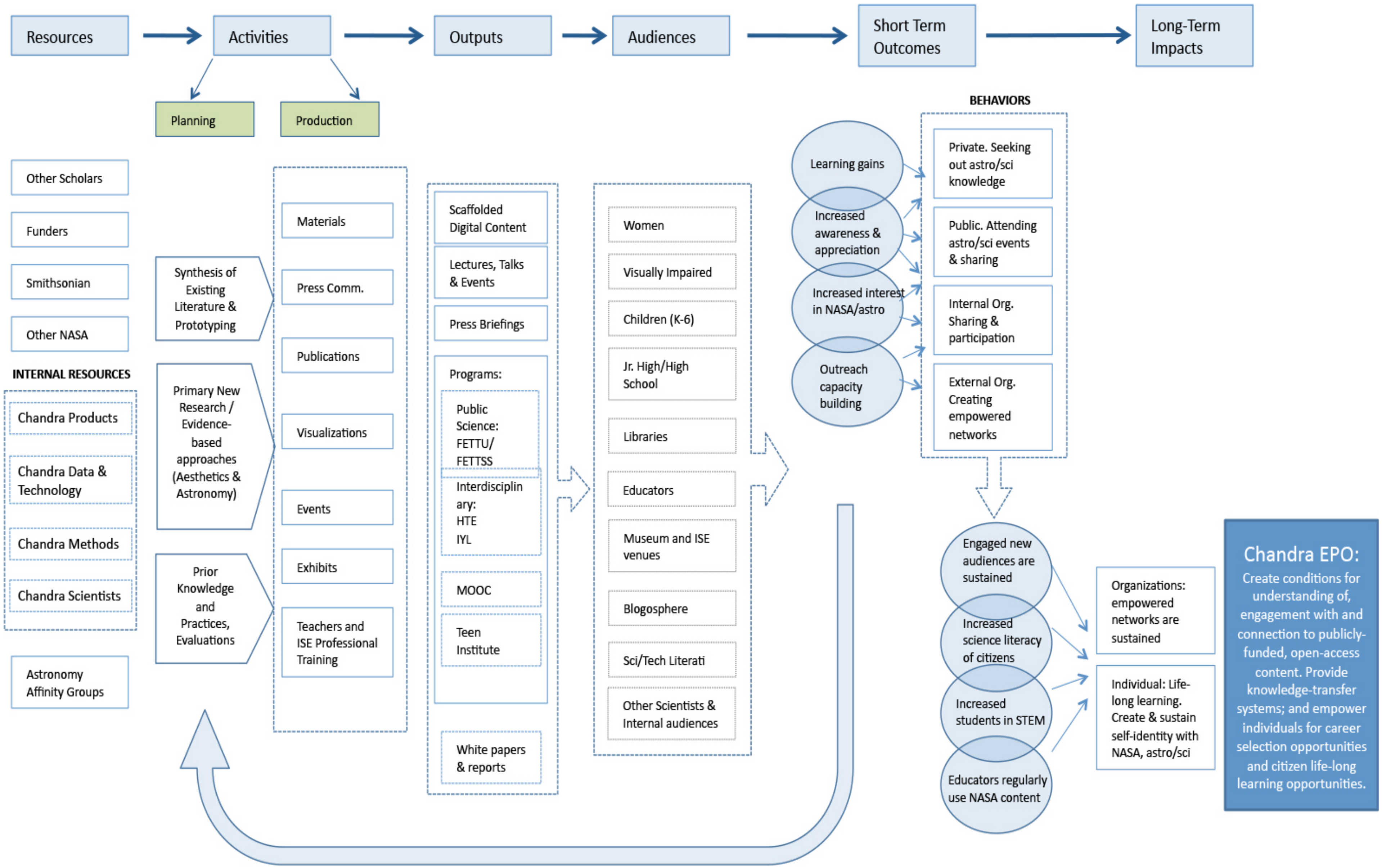


As part of his theory of relativity, Albert Einstein showed that nothing can be accelerated to speeds faster than the **speed of light** (186,000 miles/sec, or 300,000 km/sec); this is the speed limit for our Universe! This has been confirmed in many experiments. We can make things go fast, but only light (or other electromagnetic waves) can go this fast.

STOP *for science*

http://chandra.si.edu/edu/stop/

Creation Pipeline = Coordinated, Embedded Approach



Creation Pipeline = Coordinated, Embedded Approach

Chandra EPO:
Create conditions for understanding of, engagement with and connection to publicly-funded, open-access content. Provide knowledge-transfer systems; and empower individuals for career selection opportunities and citizen life-long learning opportunities.

http://chandra.si.edu/impact