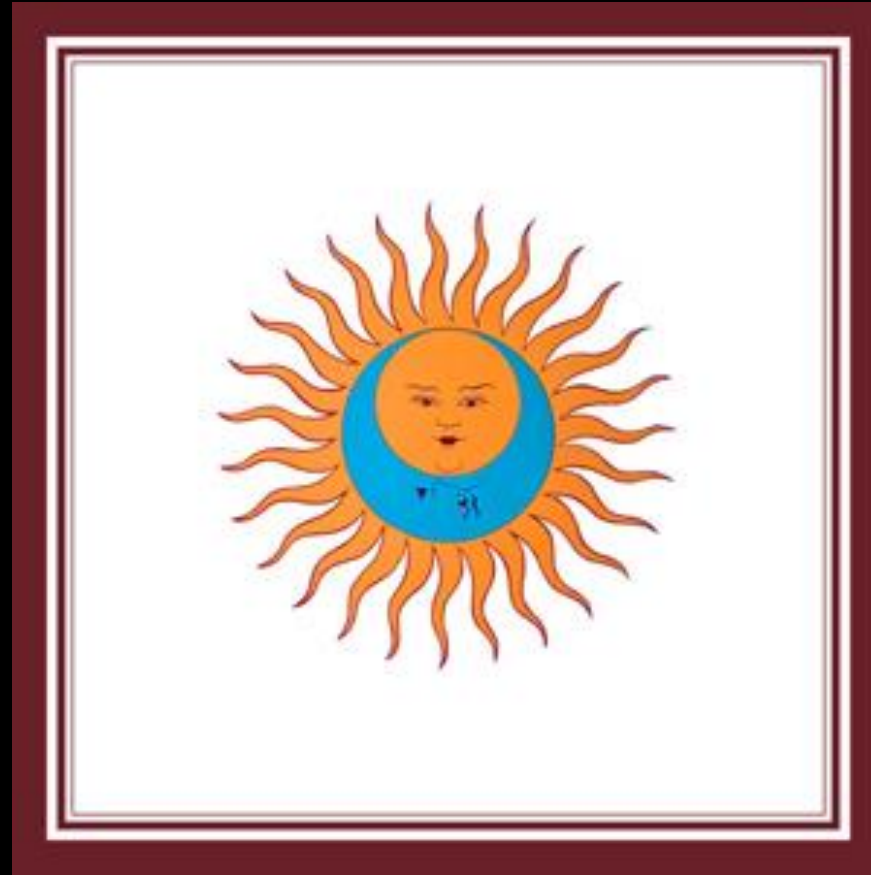


Thinking Like a Magician for Astronomy



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The Vaudeville Progression

1. The What:

2. The Stage:

3. The Show:

4. The Golden Rule:

The Vaudeville Progression

- 1. The What: You can't tackle the "Why" and "How" until you address the "What"**
- 2. The Stage:**
- 3. The Show:**
- 4. The Golden Rule:**

Example: Galaxy Evolution

**Why do
Galaxies
Evolve?**

**How do
Galaxies
Evolve?**

Example: Galaxy Evolution

What is a Galaxy?

**Why do
Galaxies
Evolve?**

**How do
Galaxies
Evolve?**

Example: Galaxy Evolution

What is a Galaxy?

Why do
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How do
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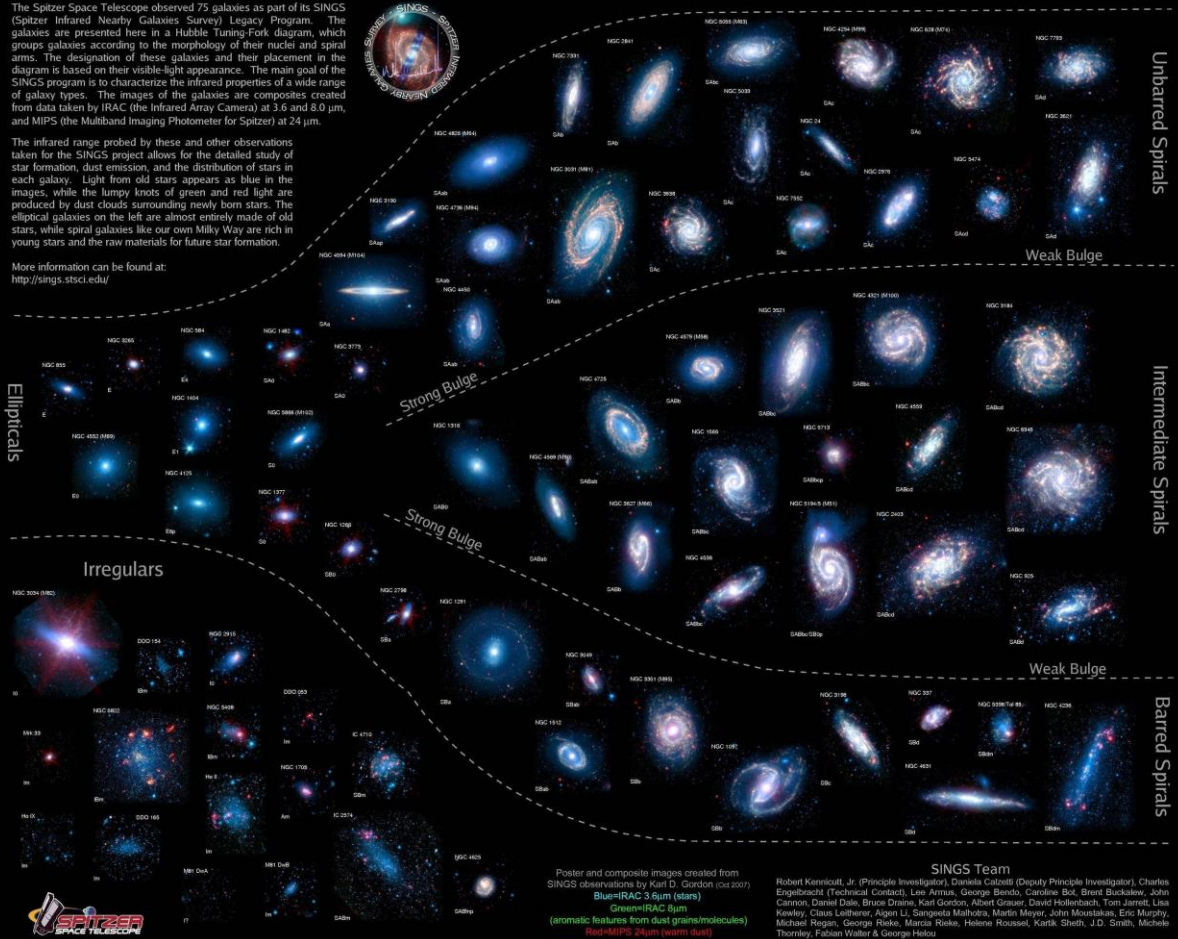
What are you trying to show me about
Galaxy Evolution?

The Spitzer Infrared Nearby Galaxies Survey (SINGS) Hubble Tuning-Fork

The Spitzer Space Telescope observed 75 galaxies as part of its SINGS (Spitzer Infrared Nearby Galaxies Survey) Legacy Program. The galaxies are presented here in a Hubble Tuning-Fork diagram, which groups galaxies according to the morphology of their nuclei and spiral arms. The designation of these galaxies and their placement in the diagram is based on their visible-light appearance. The main goal of the SINGS program is to characterize the infrared properties of a wide range of galaxy types. The images of the galaxies are composites created from data taken by IRAC (the Infrared Array Camera) at 3.6 and 8.0 μm , and MIPS (the Multiband Imaging Photometer for Spitzer) at 24 μm .

The infrared range probed by these and other observations taken for the SINGS project allows for the detailed study of star formation, dust emission, and the distribution of stars in each galaxy. Light from old stars appears as blue in the images, while the lumpy knots of green and red light are produced by dust clouds surrounding newly born stars. The elliptical galaxies on the left are almost entirely made of old stars, while spiral galaxies like our own Milky Way are rich in young stars and the raw materials for future star formation.

More information can be found at: <http://sings.stsci.edu/>



Poster and composite images created from SINGS observations by Karl D. Gordon (Oct 2007)
 Blue=IRAC 3.6 μm (stars)
 Green=IRAC 8 μm
 (aromatic features from dust grains/molecules)
 Red=MIPS 24 μm (warm dust)

SINGS Team
 Robert Kennicutt, Jr. (Principle Investigator), Daniela Calzetti (Deputy Principle Investigator), Charles Engelbracht (Technical Contact), Lee Armus, George Bendo, Caroline Bot, Brent Buckalew, John Cannon, Daniel Dale, Bruce Draine, Karl Gordon, Robert Grais, David Hollenbach, Tom Jarrett, Lisa Kewley, Clint Leitherer, Ajay L. Sengupta Mallottra, Martin Meyer, John Moustakas, Eric Murphy, Michael Regan, George Rieke, Marcia Rieke, Helene Roussel, Kartik Sheth, J.D. Smith, Michele Thornley, Fabian Walter & George Helou

What are you trying to show me about Galaxy Evolution?



**What are you trying to show me about
Galaxy Evolution?**

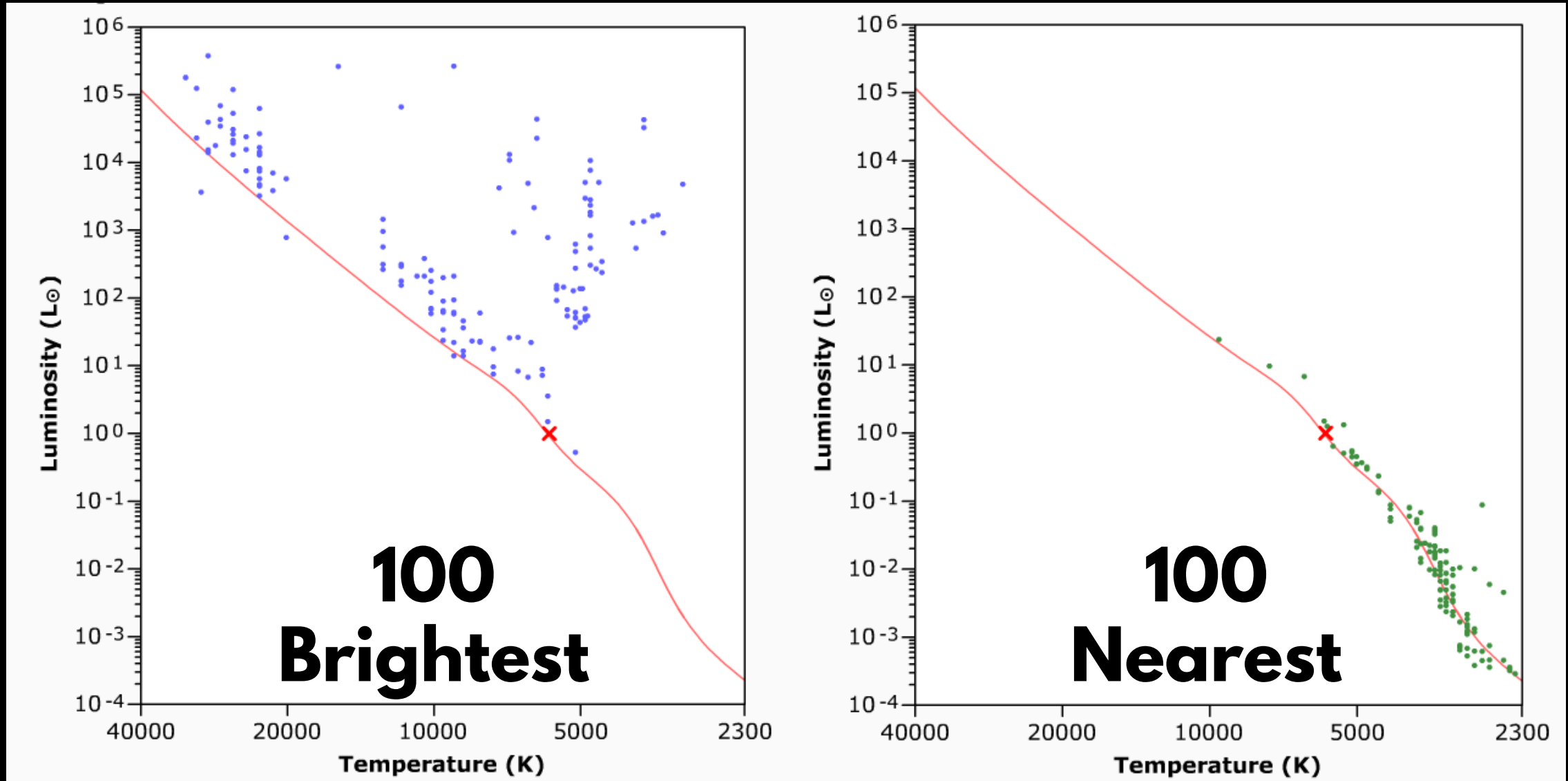
The Vaudeville Progression

- 1. The What: You can't tackle the "Why" and "How" until you address the "What"**
- 2. The Stage: Set the stage to ground the audience**
- 3. The Show:**
- 4. The Golden Rule:**

The Vaudeville Progression

- 1. The What: You can't tackle the "Why" and "How" until you address the "What"**
- 2. The Stage: Set the stage to ground the audience**
- 3. The Show: Two Hand Rule**
- 4. The Golden Rule:**

Example: Luminosity of Stars



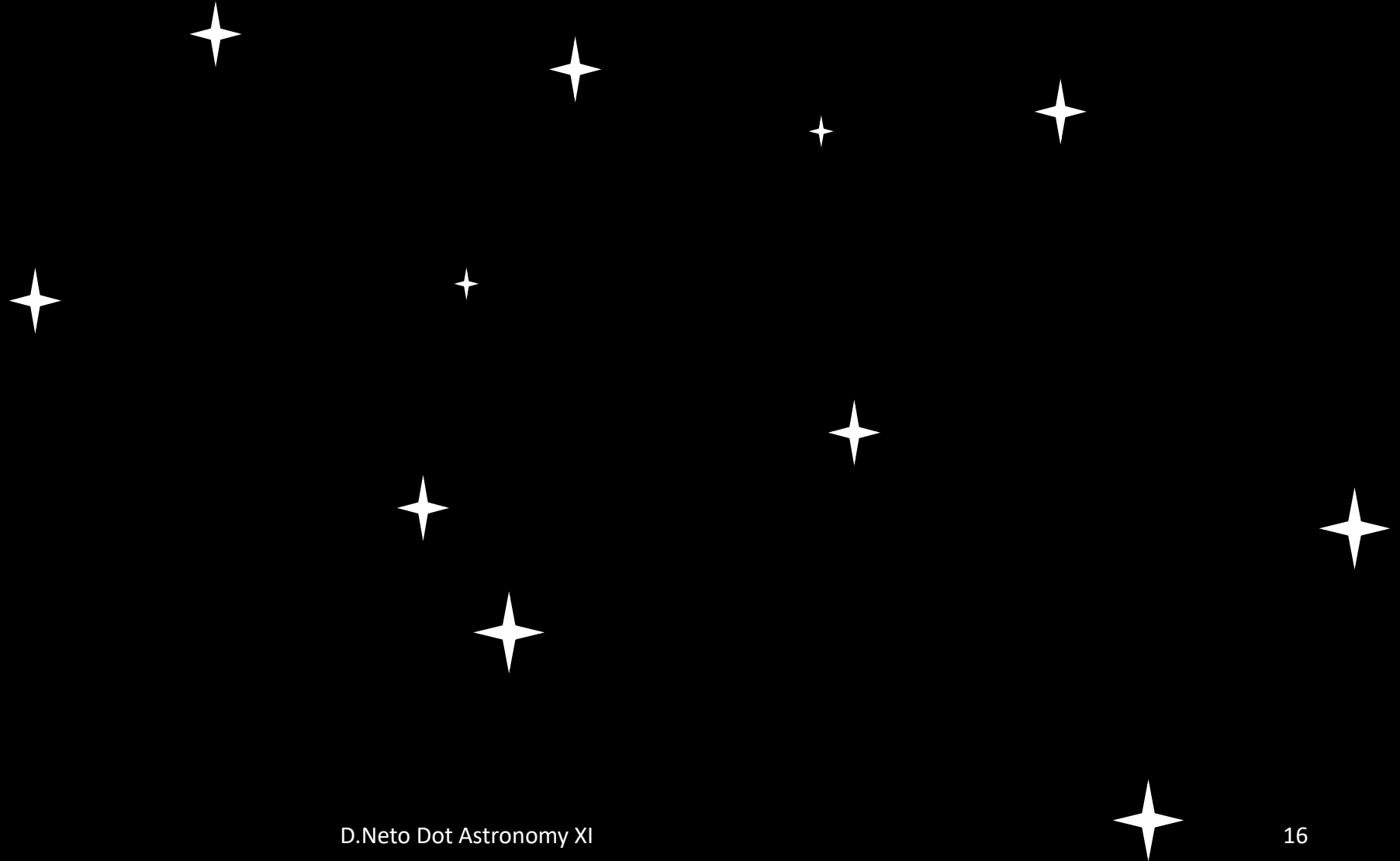
Example: Luminosity of Stars



Example: Luminosity of Stars



Example: Luminosity of Stars



100 ✨
Brightest

Example: Luminosity of Stars



**100
Nearest**

The Vaudeville Progression

- 1. The What: You can't tackle the "Why" and "How" until you address the "What"**
- 2. The Stage: Set the stage to ground the audience**
- 3. The Show: Two Hand Rule**
- 4. The Golden Rule: Tell the audience what you are going to do. Then do it and tell them it has been done.**

Takeaway

Thank you!