Howard Astronomical League

November 21, 2013

Year in Space calendars

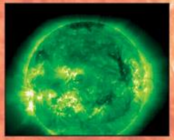
Year in Space calendars

Thermonuclear Neighbor

Violent Sun

Quite literally, we owe our lives to the Sun. Thermonuclear reactions occurring deep in the Sun's core, where hydrogen atoms are fused into helium, release enormous amounts of energy. After a hundred thousand years or so, that energy radiates from the surface of the Sun, providing Earth with a climate suitable for life. The Sun's dynamic and variable system of twisting magnetic fields causes solar events of almost unimaginable power—like the prominence eruption seen here—often with potentially dire consequences for life on Earth. Now halfway through its 10 billion year life, the Sun is being closely monitored around the clock by a suite of spacecraft that are helping us understand our nearest stellar neighbor.

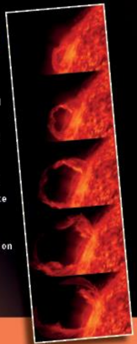
Fast Facts



THE SUN

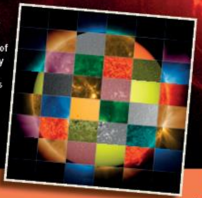
Distance from Earth: 150 million km (93 million mi)
Diameter: 1.4 million km (868,000 mi) or 109 times the diameter of Earth
Volume: 1.3 million Earths could fit inside the Sun
Mass: Equal to 333,000 Earths
Rotation Rate: 25 days (at its equator)
Core Temp: 15 million° C (27 million° F)
Surface Temp: 5,500° C (9,900° F)
Composition: 73% hydrogen, 25% helium, 2% heavier elements

CAUGHT IN THE ACT



In April 2010, just a few days after it began operating in space, the Solar Dynamics Observatory (SDO) captured real-time high-definition video of an enormous prominence on the Sun. At the scale of these images, Earth would appear about twice the size of the period at the end of this sentence. The eruptive event took place over the course of several hours and subsequently triggered a coronal mass ejection that was measured on Earth a few days later.

ALL EYES ON SOL



The Sun emits radiation in many wavelengths, each of which reveals different characteristics of our star. SDO can simultaneously monitor a wide range of wavelengths, represented in this montage as different colors.

HOLLY GILBERT

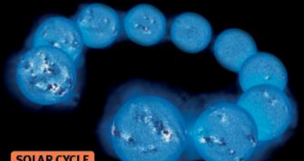
Science, math, and music have always been passions for Holly Gilbert, but physics won out as a career choice. Dr. Gilbert is Chief of the Solar Physics Laboratory in the Heliophysics Science Division at NASA's Goddard Space Flight Center. Her extensive experience studying the solar atmosphere focuses on the dynamic phenomena associated with coronal mass ejections and solar prominences. Her research is driven by the desire to gain a greater understanding of solar storms and the forces behind space weather.

FEELING THE IMPACT

Earth's magnetosphere protects us from charged particles ejected from the Sun during solar storms, but some of these particles can pass into Earth's magnetic field and cause geomagnetic storms. Power surges, cell phone blackouts, interruptions in GPS service, and impaired aircraft radio communication can result. These same charged particles are also responsible for stunning and colorful auroral displays.

SUN SHOWER

Coronal loops, located in the lower corona and transition region of the Sun, are areas where superheated plasma ejected from the Sun travels along the curved magnetic fields, temporarily revealing the location of these invisible fields before raining back down to the surface of the Sun.



SOLAR CYCLE

The Sun goes through an 11-year cycle of sunspot activity, as seen in this montage taken over the course of a decade. Sunspots—black spots on the Sun's surface—are sites of strong magnetic fields and are often cooler than the surrounding surface. Because these areas are often associated with solar flares, the sunspot cycle is a useful predictor of changes in the Sun's activity.

April 2014

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

May 2014

June 2014

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

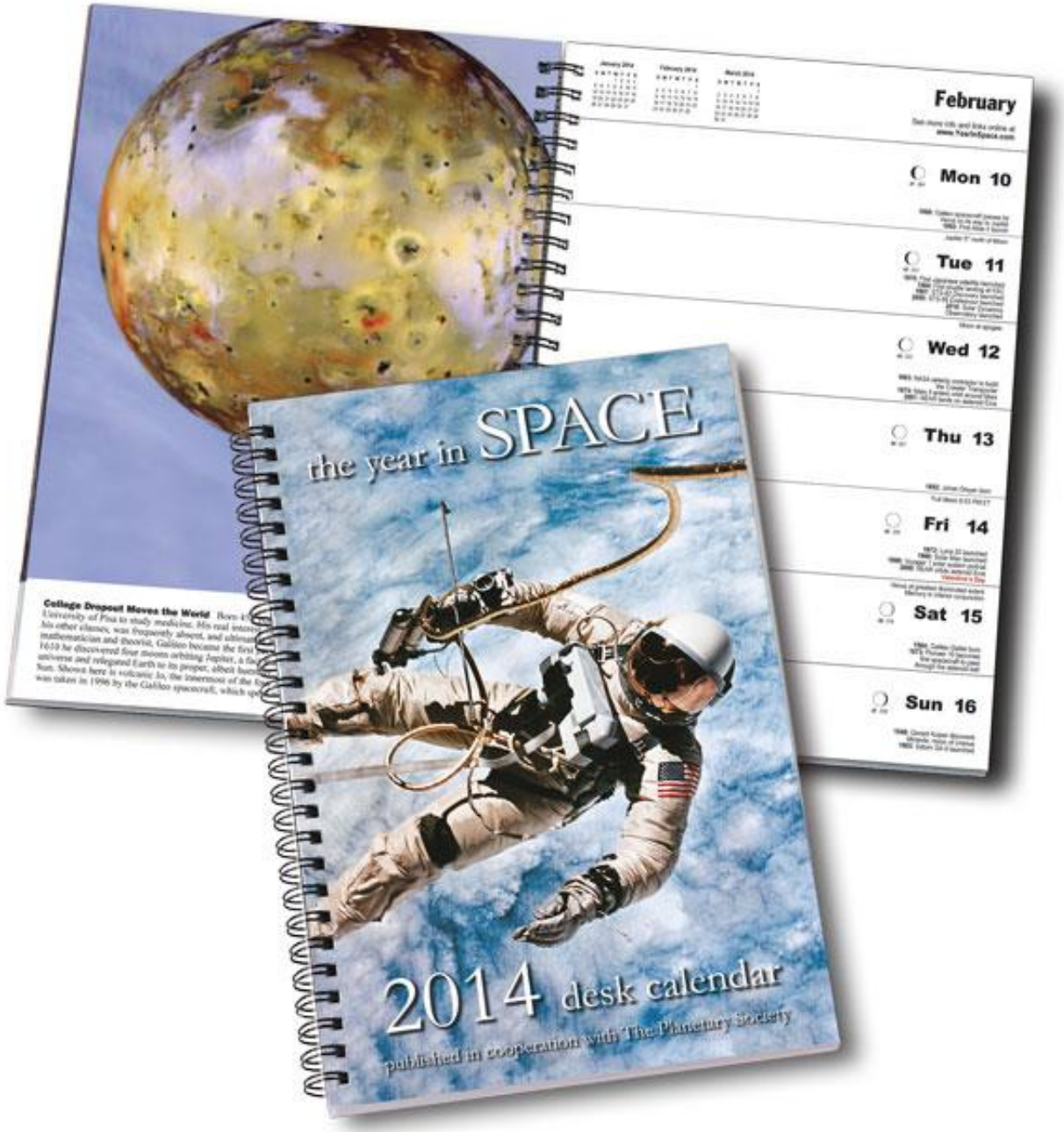
May Sky Guide

- **Mercury** is best seen before dawn on the 25th, low in the east.
- **Venus** is still bright and higher in the east before dawn, joined by the waning crescent Moon on the 25th.
- **Mars** rises an hour before sunset and is visible most of the night. It is near the Moon on the 10th and 11th.
- **Jupiter** is prominent in the west at sunset. A young crescent Moon passes by on the 3rd and 4th.
- **Saturn** reaches opposition on the 10th, rising at sunset and visible all night. The Full Moon is nearby on the 13th & 14th.

Every day, the Solar Dynamics Observatory sends back 1.5 terabytes of data – the equivalent of downloading a half-million MP3 songs.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 1949: Gerard Kuiper discovers Nereid, moon of Neptune 1996: Comet Hyakutake makes closest approach to Sun	2 Space Day	3 2003: ISS Expedition Six crew returns to Earth after 161 days in orbit
4 Jupiter 5° north of Moon 1967: Lunar Orbiter IV launched 1989: STS-30 Atlantis launched, releases Magellan spacecraft 2002: Aqua satellite launched	5 Eta Aquarid meteor shower 1961: Freedom 7 suborbital flight; Alan Shepard is first American in space Cinco de Mayo	6 First Qtr Moon 11:15 PM ET Moon at apogee Eta Aquarid meteor shower 1968: Neil Armstrong ejects safely from Lunar Landing Research Vehicle before it crashes 1975: NASA announces that Canada will build the shuttle robot arm	7 1992: STS-49 *Endeavour* launched	8	9 2003: Hayabusa launched, first mission to retrieve a sample from an asteroid	10 Saturn at opposition 1967: M2-F2 lifting body crash-lands; footage later becomes opening scene of TV series "The Six Million Dollar Man" Astronomy Day (Spring)
11 Mars 3° north of Moon 1974: SMS-1 launched, first geostationary weather satellite 2009: STS-125 Atlantis launched, final Hubble servicing mission Mother's Day	12 1930: Adler Planetarium opens, first planetarium in Western Hemisphere	13 Mercury 8° north of Aldebaran 1964: Apollo A-001 launched (Little Joe II test flight)	14 Full Moon 3:16 PM ET Saturn 0.6° north of Moon 1973: Skylab launched 2009: Herschel and Planck space observatories launched 2010: STS-132 Atlantis launched	15 Venus 1.3° south of Uranus 1958: Sputnik 3 launched 1963: *Faith 7* launched, last Mercury program flight 1997: STS-84 Atlantis launched	16 2011: STS-134 *Endeavour* launched	17 1836: Norman Lockyer born
18 Moon at perigee 1969: Apollo 10 launched 1984: Viking 1 lander given to National Air & Space Museum 1996: First test flight of DC-XA rocket 2009: 23rd and final Hubble servicing EVA	19 1965: Apollo A-003 launched 1996: STS-77 *Endeavour* launched 2000: STS-101 Atlantis launched Victoria Day (Canada)	20 1978: Pioneer-Venus 1 launched 1995: Spektr module launched to Mir 2010: IKAROS spacecraft launched; first successful solar-sail propulsion	21 Last Qtr Moon 8:59 AM ET Mars appears stationary	22 Neptune 5° south of Moon 1969: Apollo 10 lunar module descends to within 50,000 feet of the lunar surface 2012: Dragon C2+ spacecraft launched, first commercial mission to dock with ISS	23 1984: NASA selects tenth astronaut group	24 Uranus 1.9° south of Moon 1962: Aurora 7 launched; Scott Carpenter is first American to eat food in space
25 Mercury at greatest elongation (23° E) Venus 2° south of Moon 1961: JFK "Moon Landing" speech 1965: Saturn SA-8 launched 1966: Rollout of first Saturn V 1973: Skylab 2 begins 28-day mission 2008: Phoenix lander lands on Mars	26 2009: Second three-member crew of ISS Expedition 19 launched Memorial Day	27	28 New Moon 2:40 PM ET 1959: First primates in space, monkeys Able and Baker make suborbital flight 1964: SA-6 launched, second Saturn I Block 2	29 1919: Einstein's General Theory of Relativity tested during total solar eclipse Ascension Day	30 Mercury 6° north of Moon 1966: Surveyor 1 launched 1971: Mariner 9 probe launched	31 1975: European Space Agency formed 1990: Kristall module launched to Mir 2008: STS-124 *Discovery* launched

The Planetary Society Random Space Fact: The radiation from one typical solar flare can have the energy equivalent of ten million volcanic eruptions. More at @RandomSpaceFact on Twitter


the year in SPACE
2014 desk calendar
published in cooperation with The Planetary Society
February
Mon 10
Tue 11
Wed 12
Thu 13
Fri 14
Sat 15
Sun 16

Year in Space calendars

Yearinspace.com

HAL Social Media

HAL Social Media

Website:
http://www.howardastro.org

Twitter:
@HalTweet
https://twitter.com/HalTweet

Facebook:
https://www.facebook.com/groups/howardastro/

Astronomical League Observing Club Awards

Steve Jaworiwsky Asteroid Club

Upcoming club activities

HAL Elections!

HAL elects a new Board of Directors every January.

Contact HALElection@howardastro.org if you're interested in running.

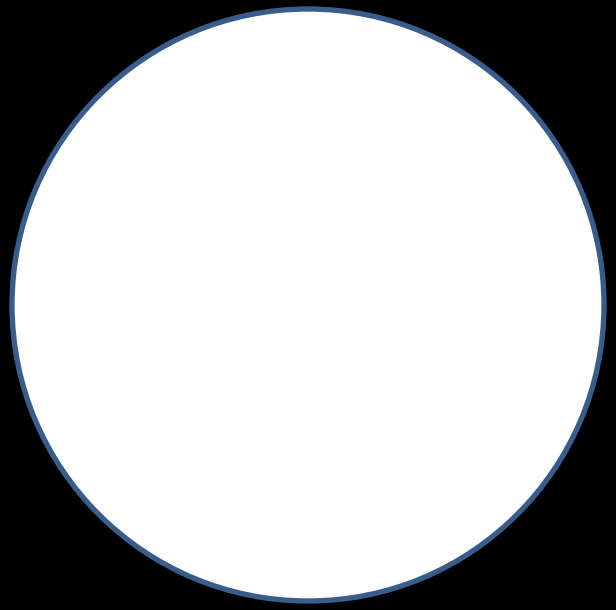
Star Parties and public outreach!

Members only and Public star parties:
Wait until next year!

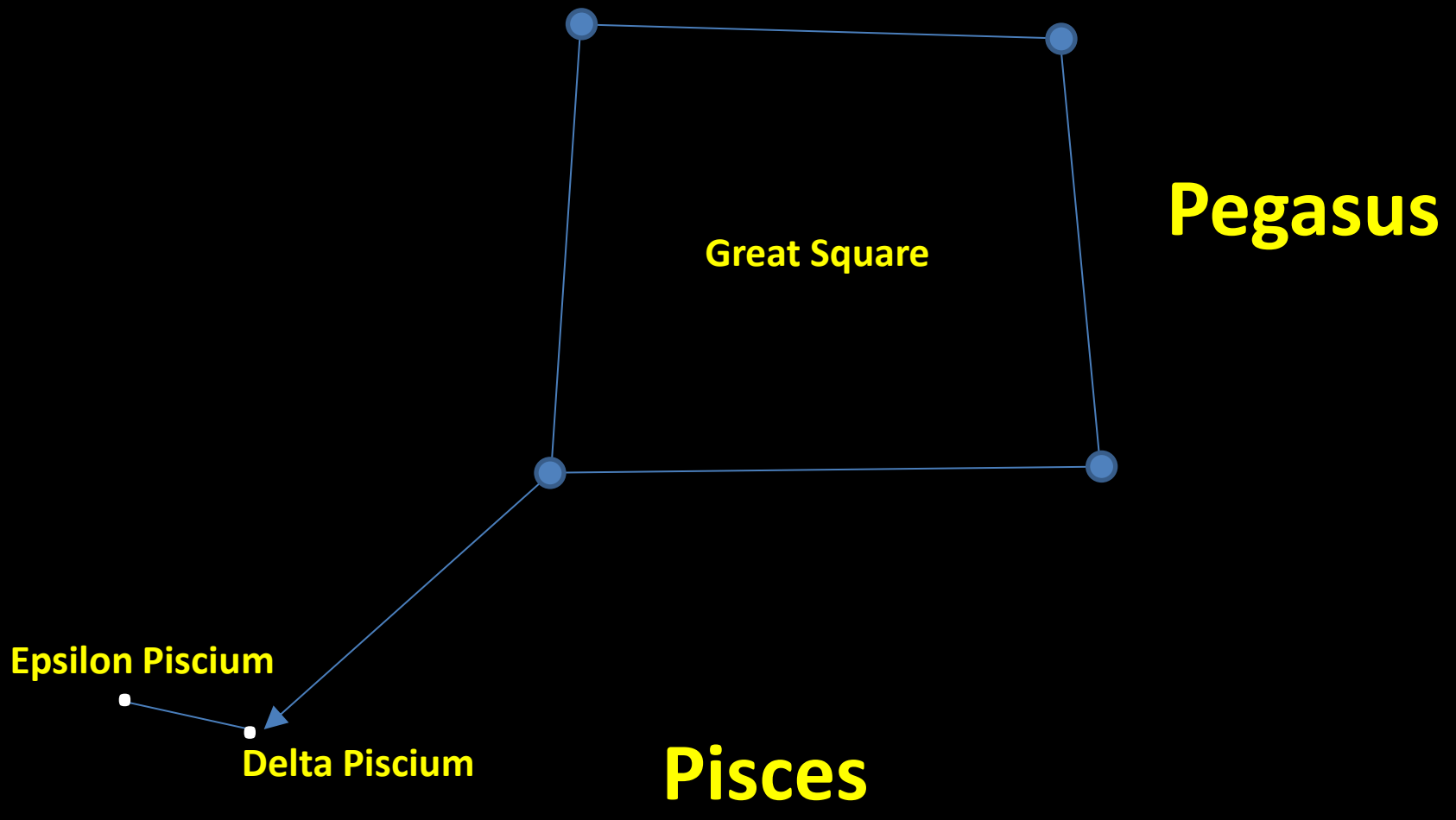
RNC Family Night
December 6th, 6-8 PM

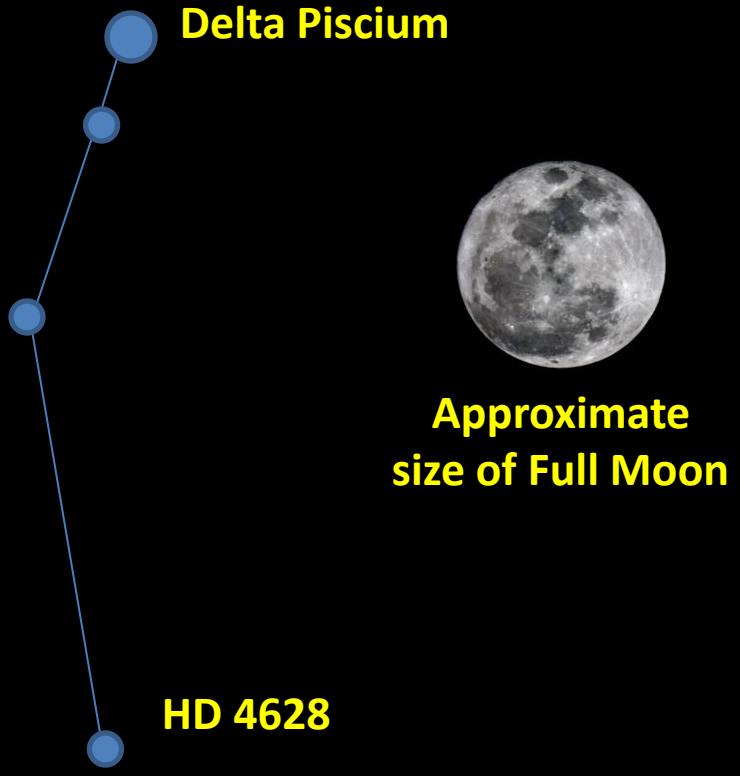
Van Maanen's Star

Earth



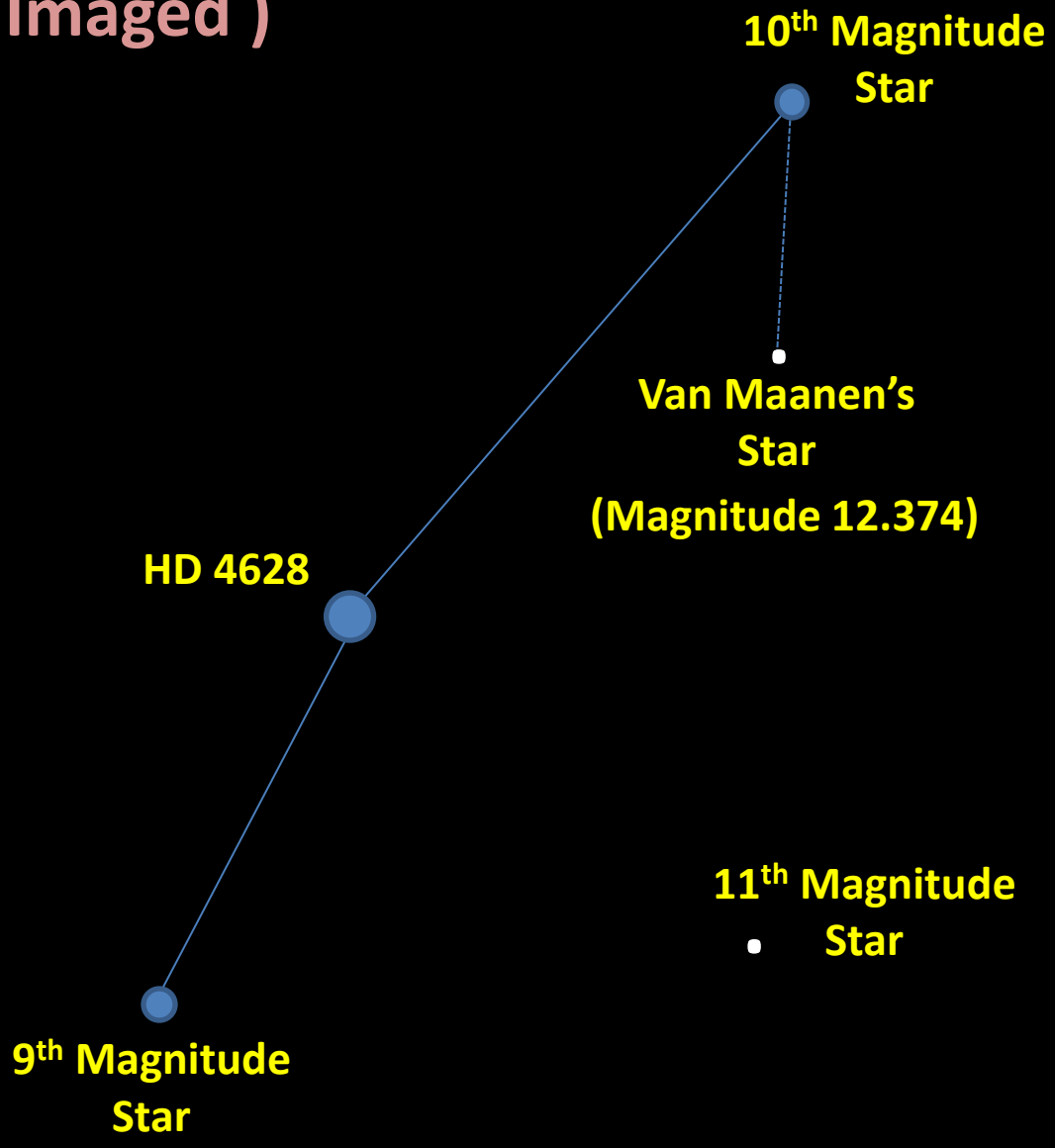
Van Maanen's Star


Great Square
Pegasus
Epsilon Piscium
Delta Piscium
Pisces



(Mirror Imaged)

(Mirror Imaged)

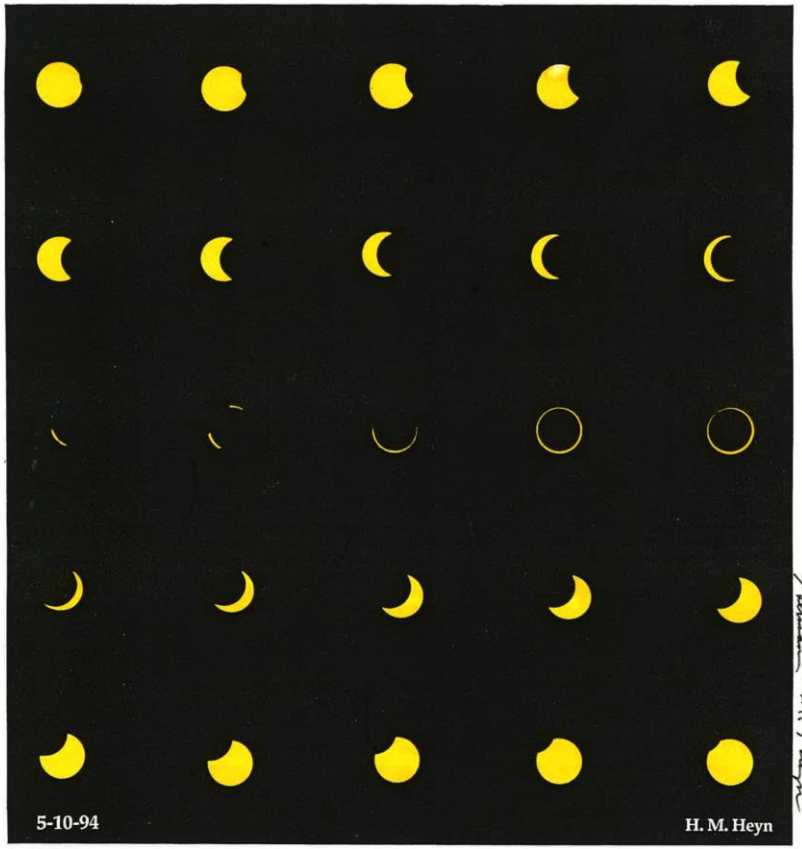


Member's astrophotos and sketches

Gene Handler

Herman Heyn

SOLAR ECLIPSE



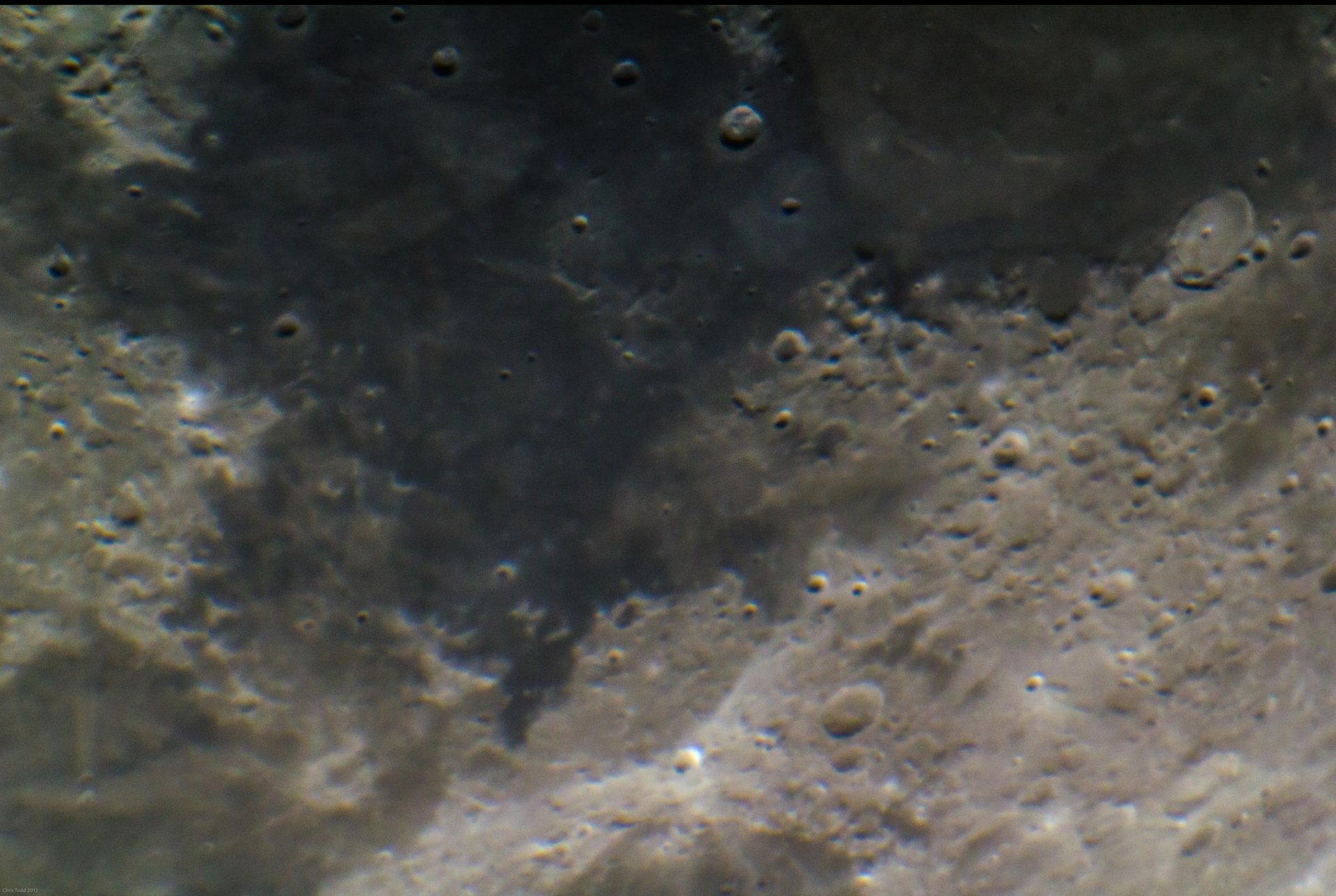
THE GREAT SOLAR ECLIPSE OF MAY 10, 1994 was the last central solar eclipse for the continental United States until 2012 A.D. "Central" means that the Moon passes directly in front of the Sun and hides it either totally or annularly. Other solar eclipses are partial. The May 10th eclipse was an annular or "ring" eclipse, its 143 mile wide path of annularity stretching from southeast of the Hawaiian Islands to Morocco. It crossed the United States diagonally from Arizona to Maine. An annular eclipse occurs when the Moon is too far from Earth to fully hide the Sun's disc. On May 10th the Moon was approximately 250,400 miles from Earth. During an annular eclipse, the Sun's corona, which becomes visible during a total eclipse, remains invisible because of the brilliant ring or annulus of sunlight surrounding the dark body of the Moon.

The remarkable eclipse photograph above was taken by Herman M. Heyn of Baltimore, Maryland, from a location near the front entrance of the Cleveland (Ohio) Museum of Natural History. The first image (top left) was taken at 11:37 A.M., the central image at 1:17 P.M., and the final image (lower right) at 2:47 P.M. EDT. This photograph is not a composite but consists of 25 images on a single frame of Kodak Pro 400 MC 2 1/4" x 2 1/4 " color print film. The camera was a Mamiya C220 twin-lens reflex outfitted with twin 250mm telephoto lenses and solar filters. A section of graph paper with 25 squares cut out was taped to the camera's ground glass viewfinder. As the eclipse unfolded, the Sun was photographed consecutively through each of the 25 cutouts at approximately ten minute intervals (images 11-15 were more closely spaced). The sudden arrival of clouds at the onset of annularity interfered with images 11-13, which had to be taken through holes between the clouds. The eclipse of 2012 will also be annular and is to be visible from China, Japan, the northern Pacific Ocean, and western U.S.A.

Herman M. Heyn, 721 E. 36th Street, Baltimore, MD 21218 (tel: 410-889-0460)

Victor Sanchez

Chris Todd

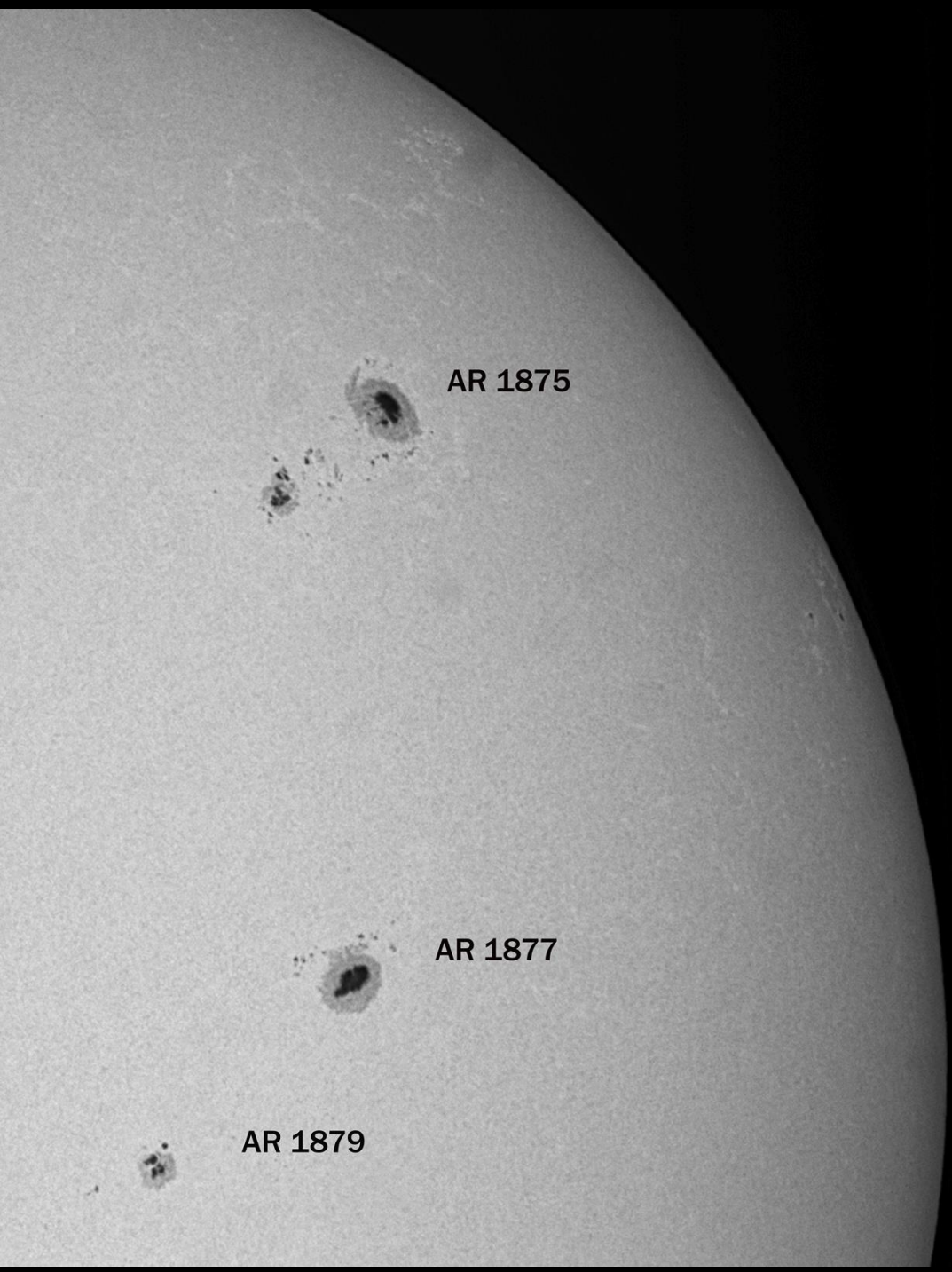


Mike Krauss

Richard Orr

Richard Orr

Saturday October 26, 2013
An X1-Flare was released at approximately 08;30 UT from AR 1877



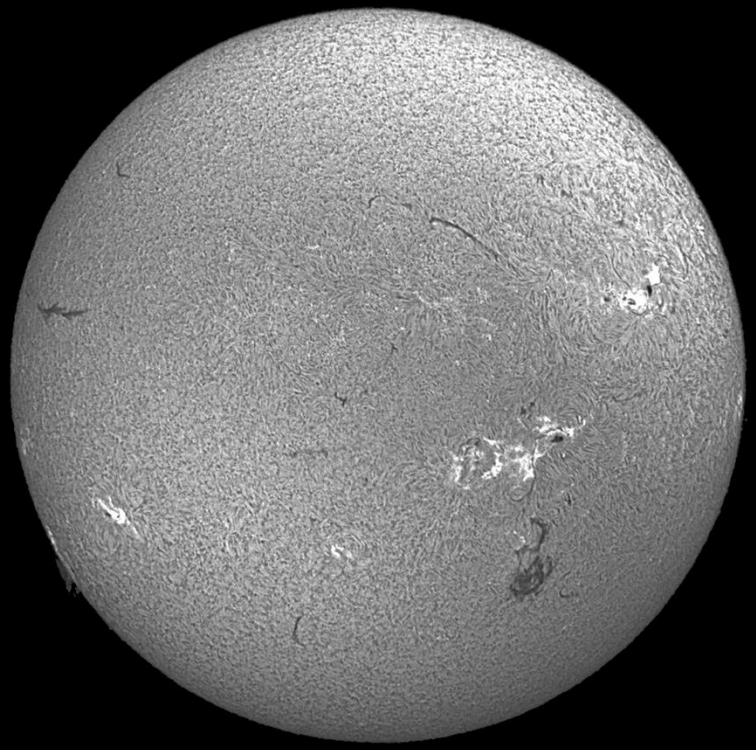


Image by: Phil Whitebloom

David Stein


Ison
Canary Islands 2 Wide Field
Nov 12th, 2013 06:35:00 UTC
Taken by David Stein
SLOOH.COM

Richard Orr

Comet /2013 R1 (Lovejoy)

Drawing @ 4:00 AM EST
13-November-2013
155 mm Refractor w/diagonal
31 mm Nagler Eyepiece
Magnification = 35x
F.O.V. = 2.2 degrees

Constillation: Leo
Magnitude: 5.3
Distance: 64 million miles

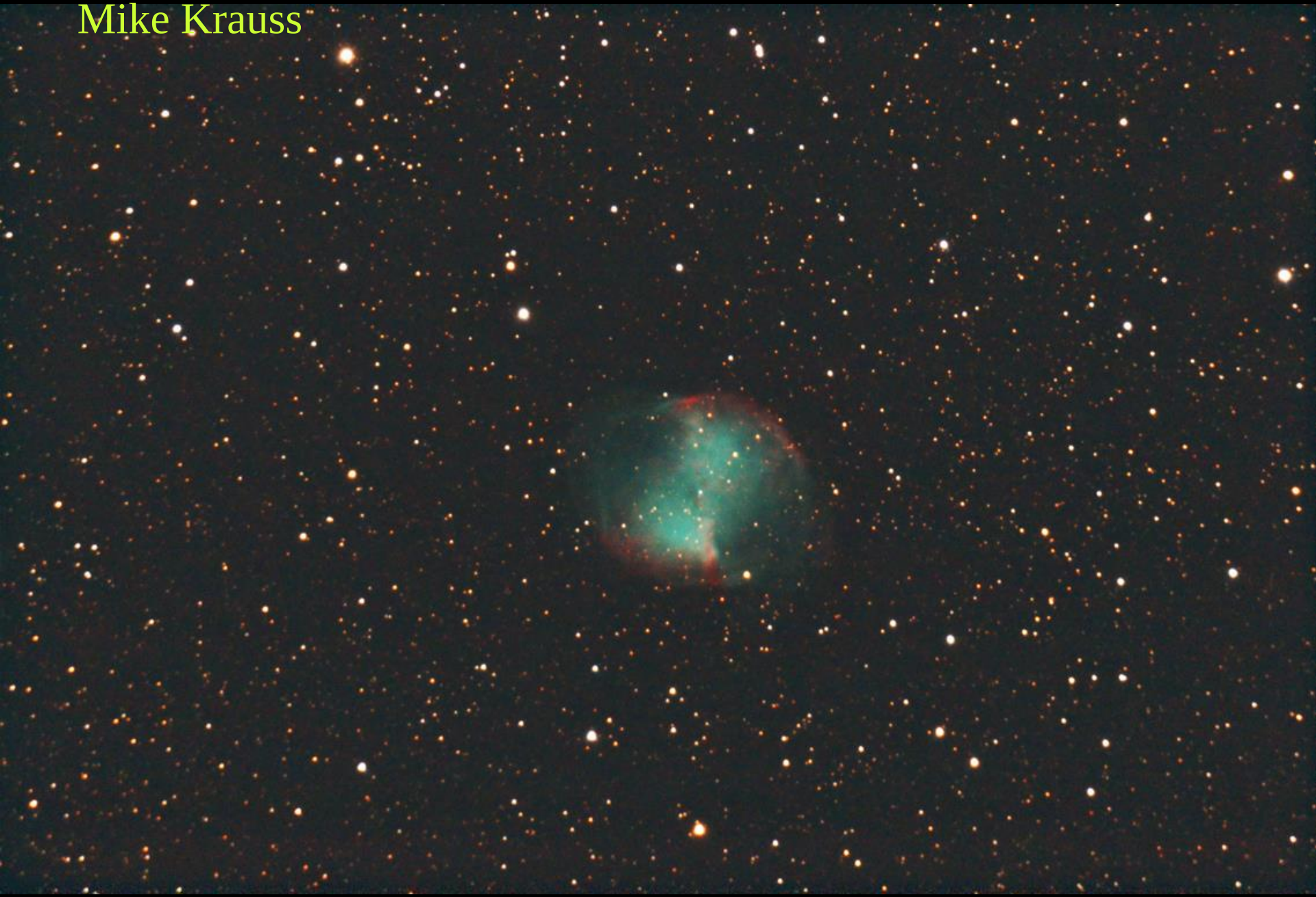
NGC 6946
November 8, 2013
Carr's Mill Park, Howard Co, MD

8-inch, F/5 Newtonian
45 x 4 minutes (3 hours)
ISO 400

Canon Digital Rebel
Autoguided/Coma Corrector
Wayne Baggett

Chris Miskiewicz

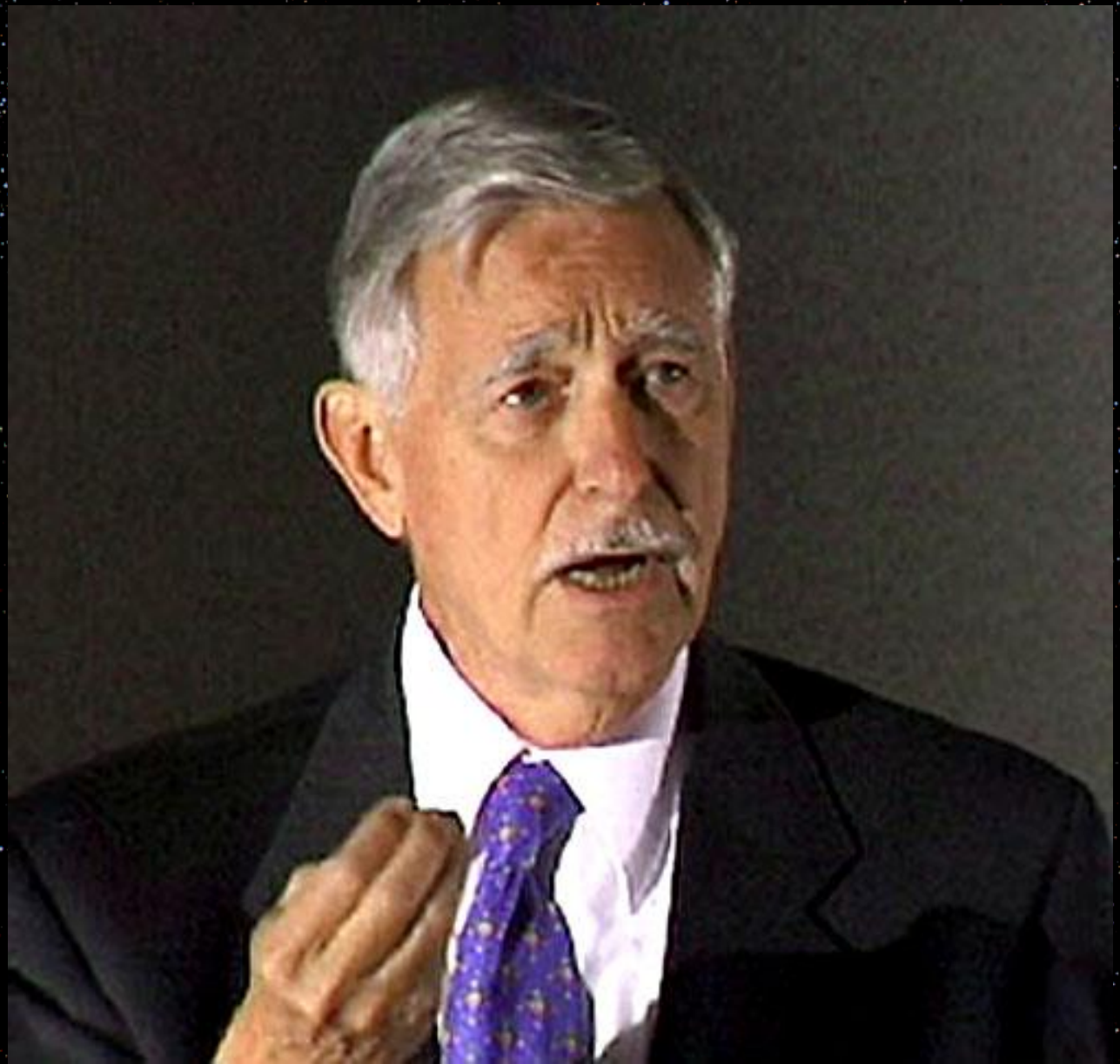
Mike Krauss


Mike Krauss

Paul Montanaro

Halton Arp's Peculiar Galaxies

Halton Arp's Peculiar Galaxies



ATLAS OF PECULIAR GALAXIES

HALTON ARP

MOUNT WILSON AND PALOMAR OBSERVATORIES

CARNEGIE INSTITUTION OF WASHINGTON

CALIFORNIA INSTITUTE OF TECHNOLOGY

Published by the

California Institute of Technology

Pasadena, California 91109

1966

Table of Contents

Halton Arp's Peculiar Galaxies

What is a peculiar galaxy?

That depends on your definition of what a "normal" galaxy is.

That requires a history lesson. "You stand on the shoulders of giants."

Halton Arp's Peculiar Galaxies

Edwin Hubble's Normal Galaxies

Galaxies are "Island Universes" made up of stars like the Milky Way, but galaxies are not part of the Milky Way.

Hubble used the Cepheid variables discovered by Henrietta Swan-Leavitt to show that galaxies like M31 could not be a part of the Milky Way.

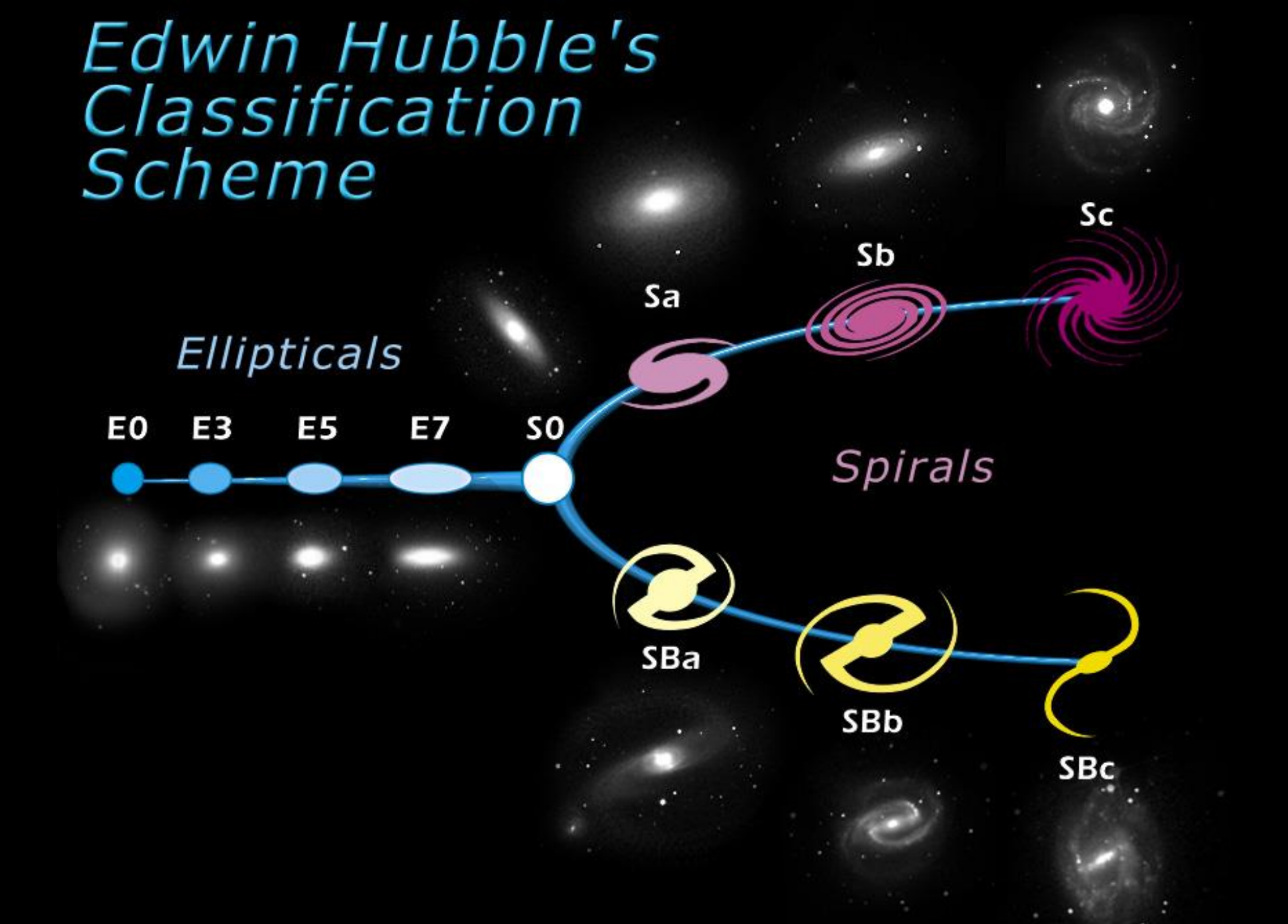
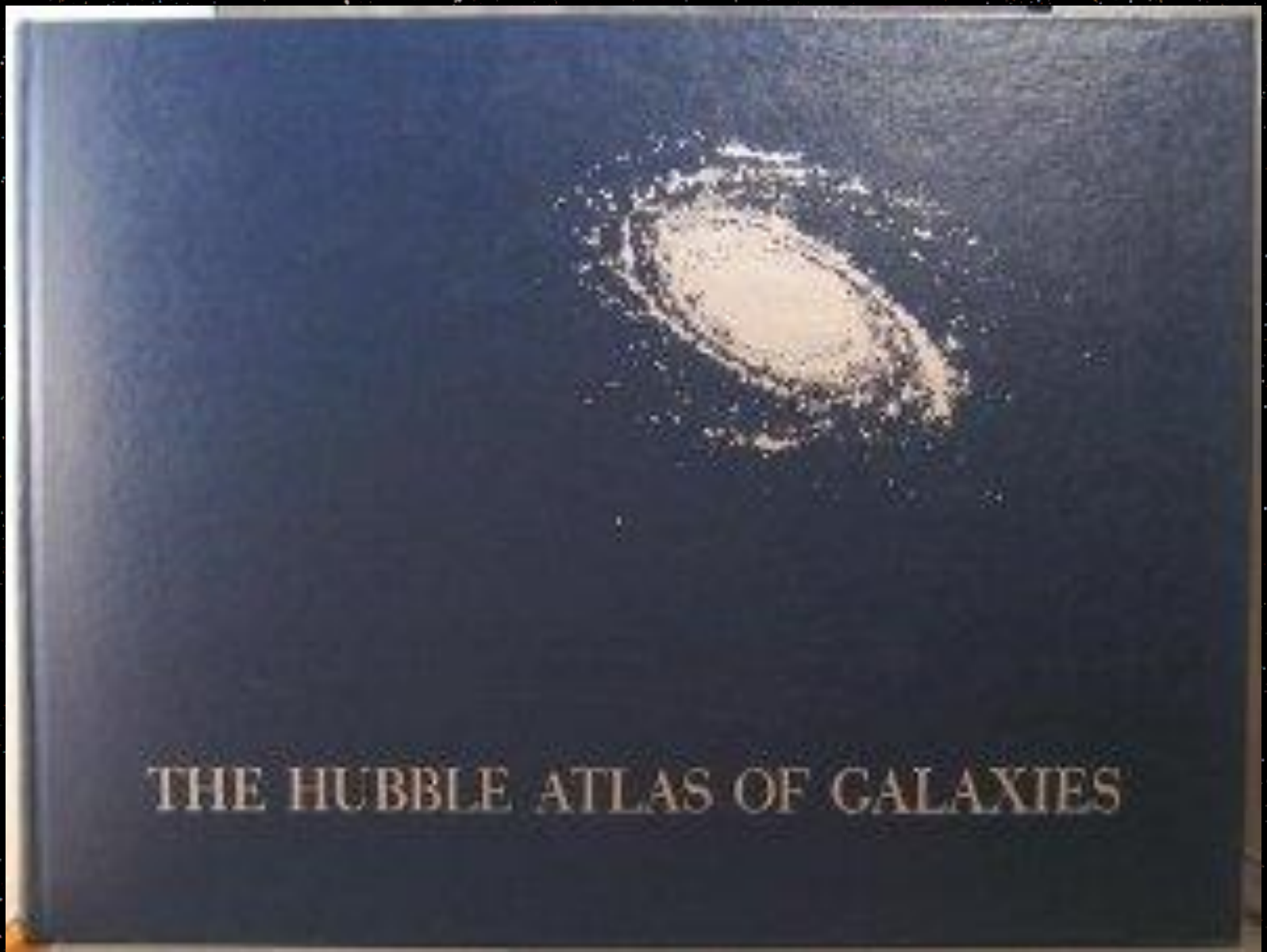


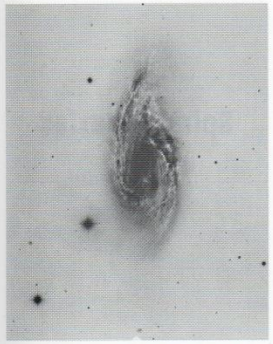
Image credit: http://skyserver.sdss.org/dr1/en/proj/advanced/galaxies/tuningfork.asp

The Hubble Atlas of Galaxies

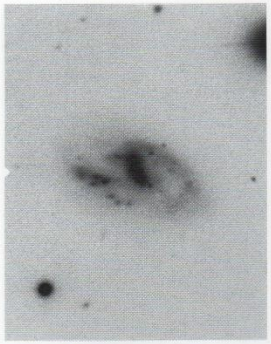


Hubble's tuning fork

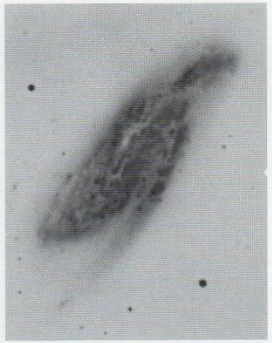
Example galaxies from Hubble's Atlas



16 Messier 66, NGC 3627 (S) p. 275



17 UGC 3972, (B) p. 124

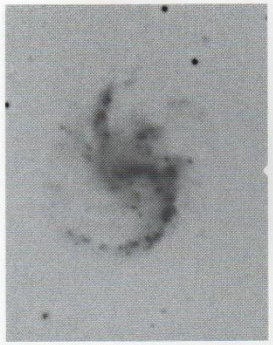


18 NGC 4088 (N) p. 226

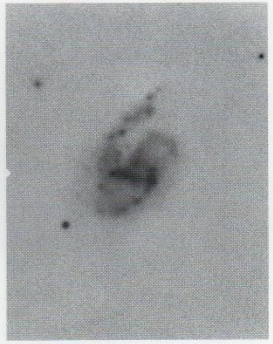
Spiral Galaxies

Three-armed

Arps 19–21



19 NGC 145 (H) p. 181



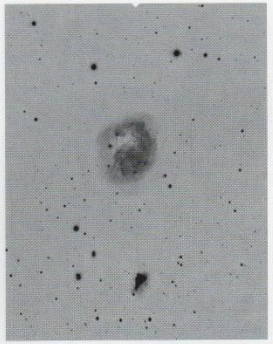
20 UGC 3014 (I) p. 196

21 MCG+5-26-47 (S) p. 276

Spiral Galaxies

One-armed

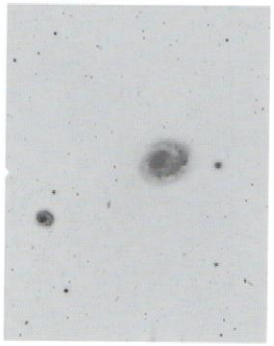
Arps 22–24



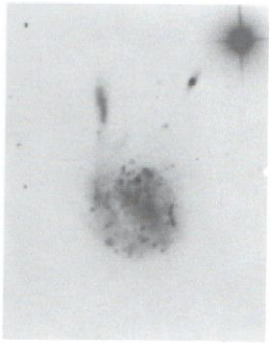
22 NGC 4027 and companion (X) p. 340

Spiral Galaxies

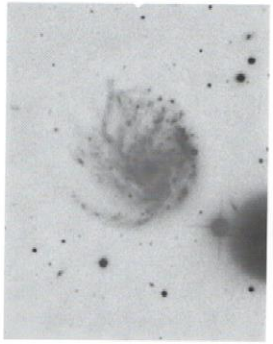
One heavy arm
Arps 25–30



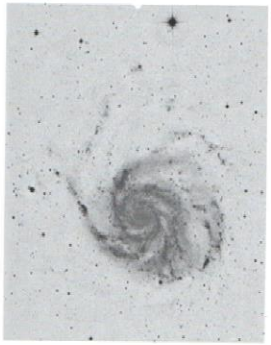
23 NGC 4618 and 4625 (N) p. 226



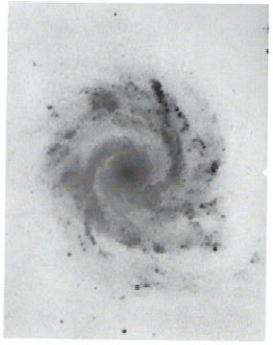
24 NGC 3445 and companions (N) p. 227



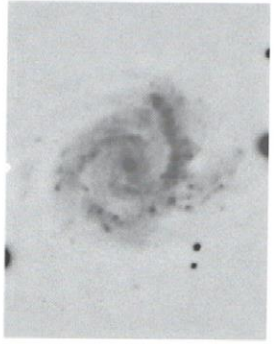
25 NGC 2276 (B) p. 125



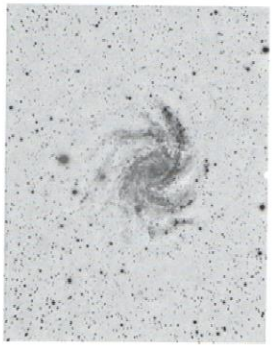
26 Messier 101, NGC 5457 (O) p. 238



27 NGC 3631 (N) p. 227

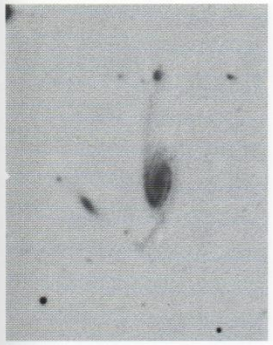


28 NGC 7678 (E) p. 142

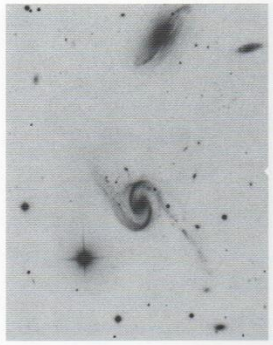


29 NGC 6946 (C) p. 132

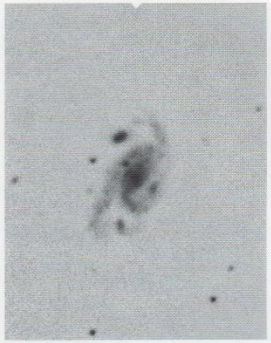
30 NGC 6365 (P) p. 246



64 UGC 9503 and companion (U) p. 317

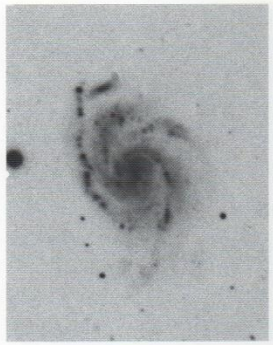


65 NGC 91 and 93 (E) p. 143

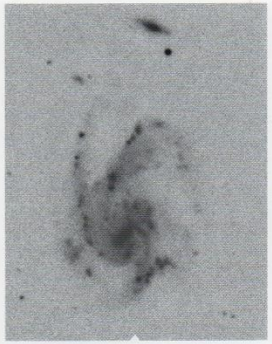


66 UGC 10396 (P) p. 247

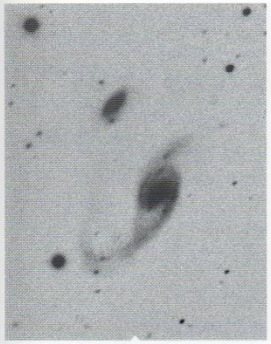
67 UGC 892 (H) p. 183



68 NGC 7757 (G) p. 169

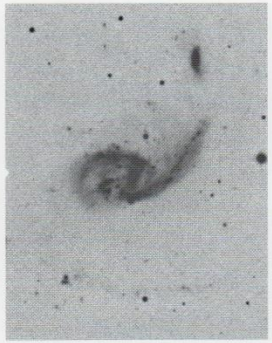


69 NGC 5579 and companion (T) p. 296

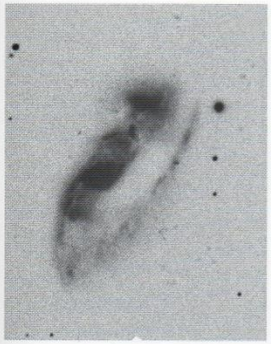


70 UGC 934 (F) p. 154

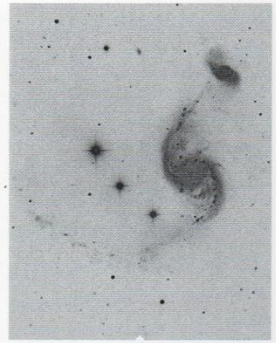
71 NGC 6045 and 6045B (U) p. 314



72 NGC 5994 and 5996 (U) p. 317

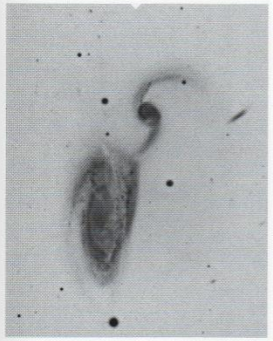


81 NGC 6621 and 6622 (C) p. 134

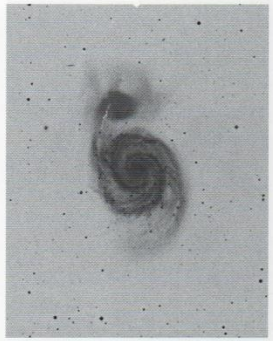


82 NGC 2535 and 2536 (Q) p. 254

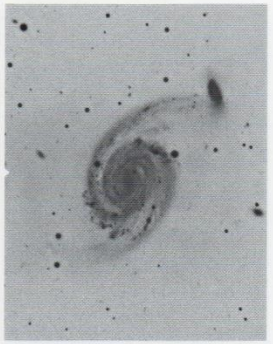
83 NGC 3799 and 3800 (S) p. 276



84 NGC 5394 and 5395 (T) p. 299

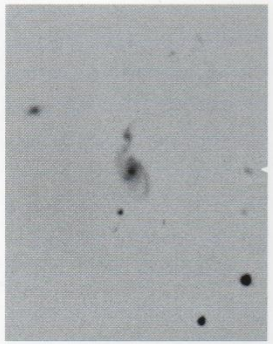


85 Messier 51, NGC 5194 and 5195 (O) p. 240

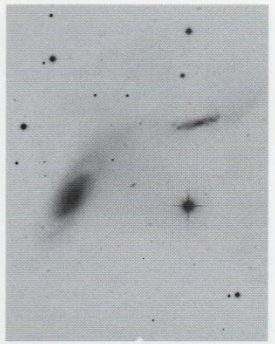


86 NGC 7752 and 7753 (E) p. 144

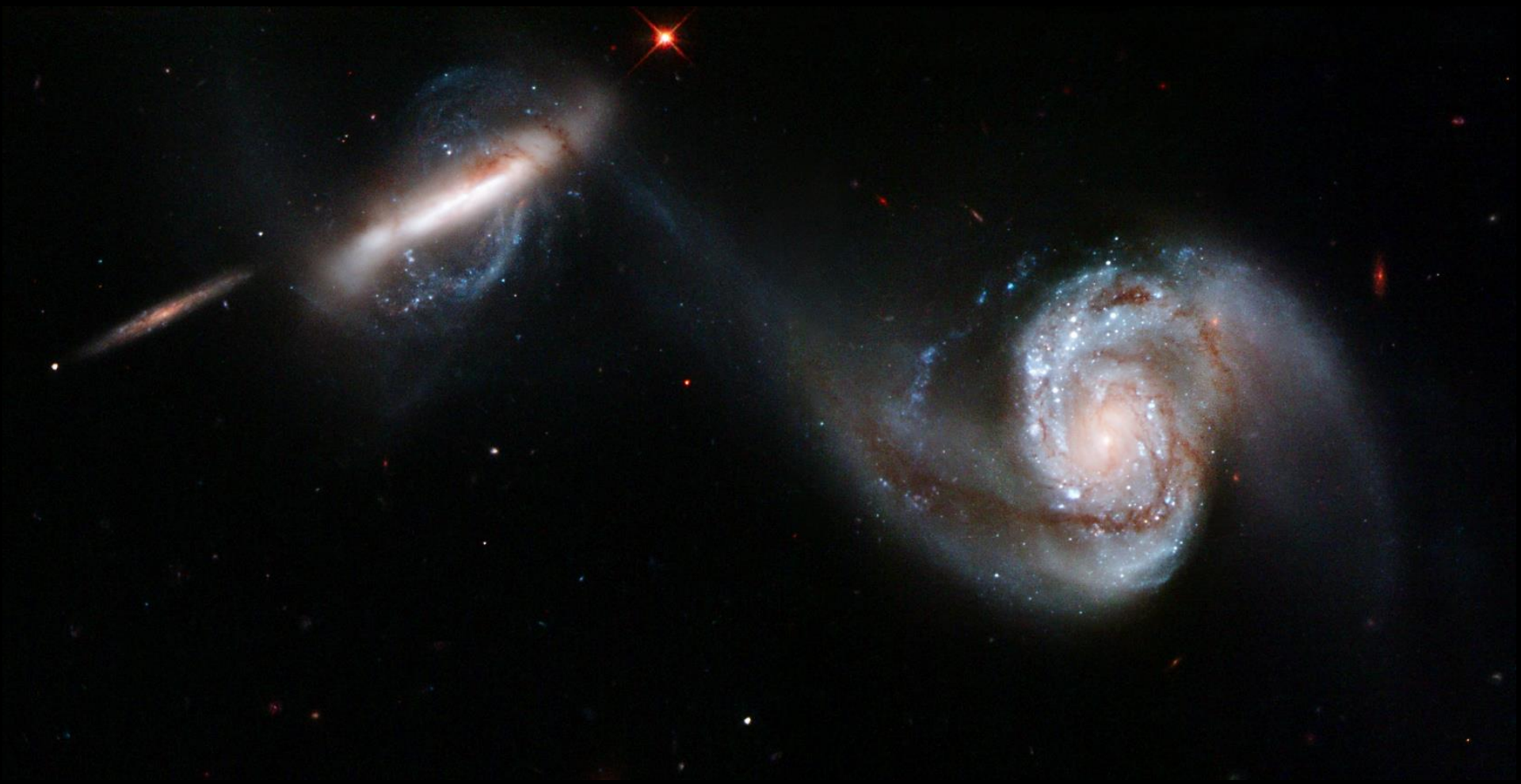
87 NGC 3808A and 3808B (S) p. 277



88 PGC 4728 (F) p. 153

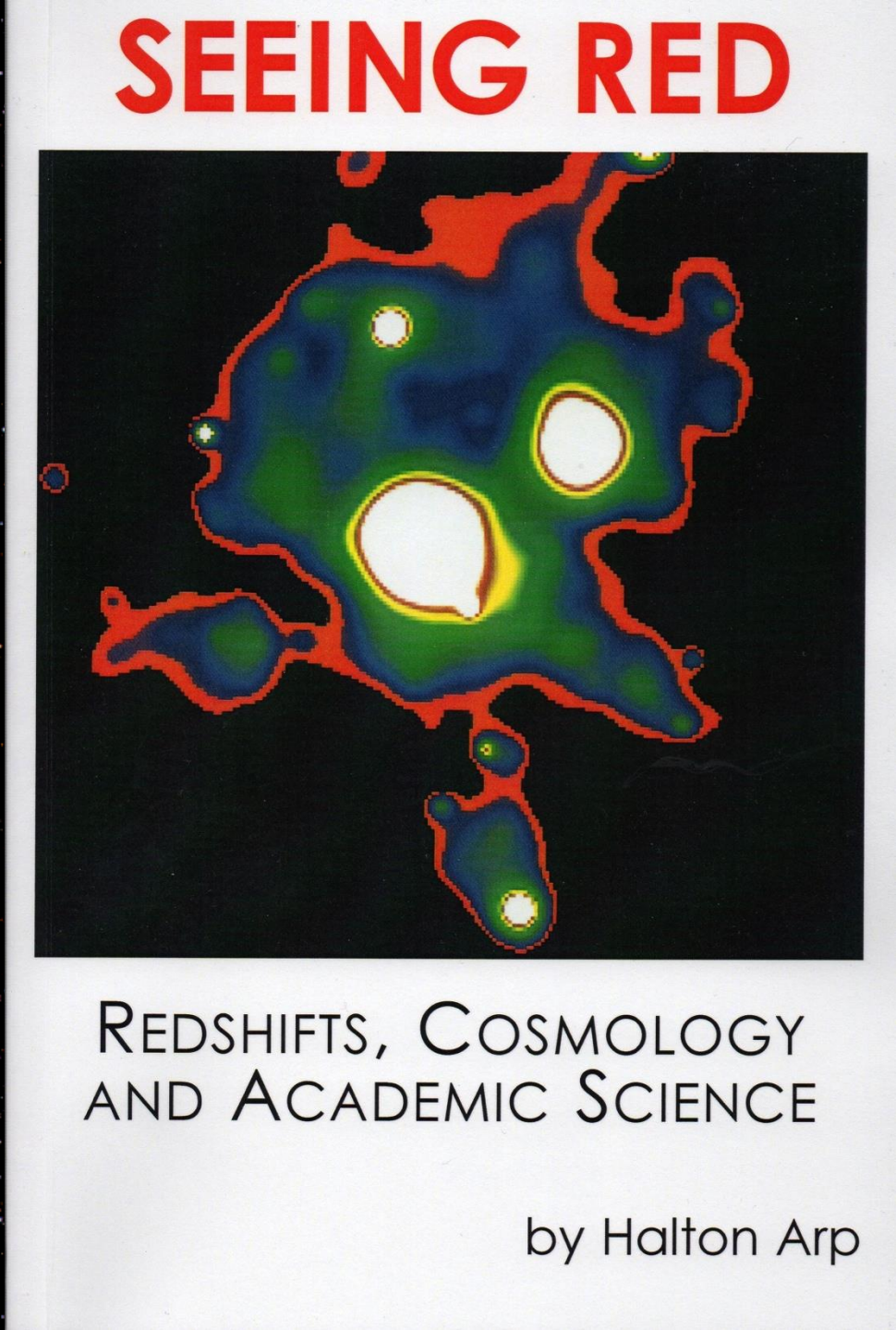


89 NGC 2648 and companion (R) p. 263



Arp's Intrinsic Red Shift

Are red shifts solely due to recessional velocities?

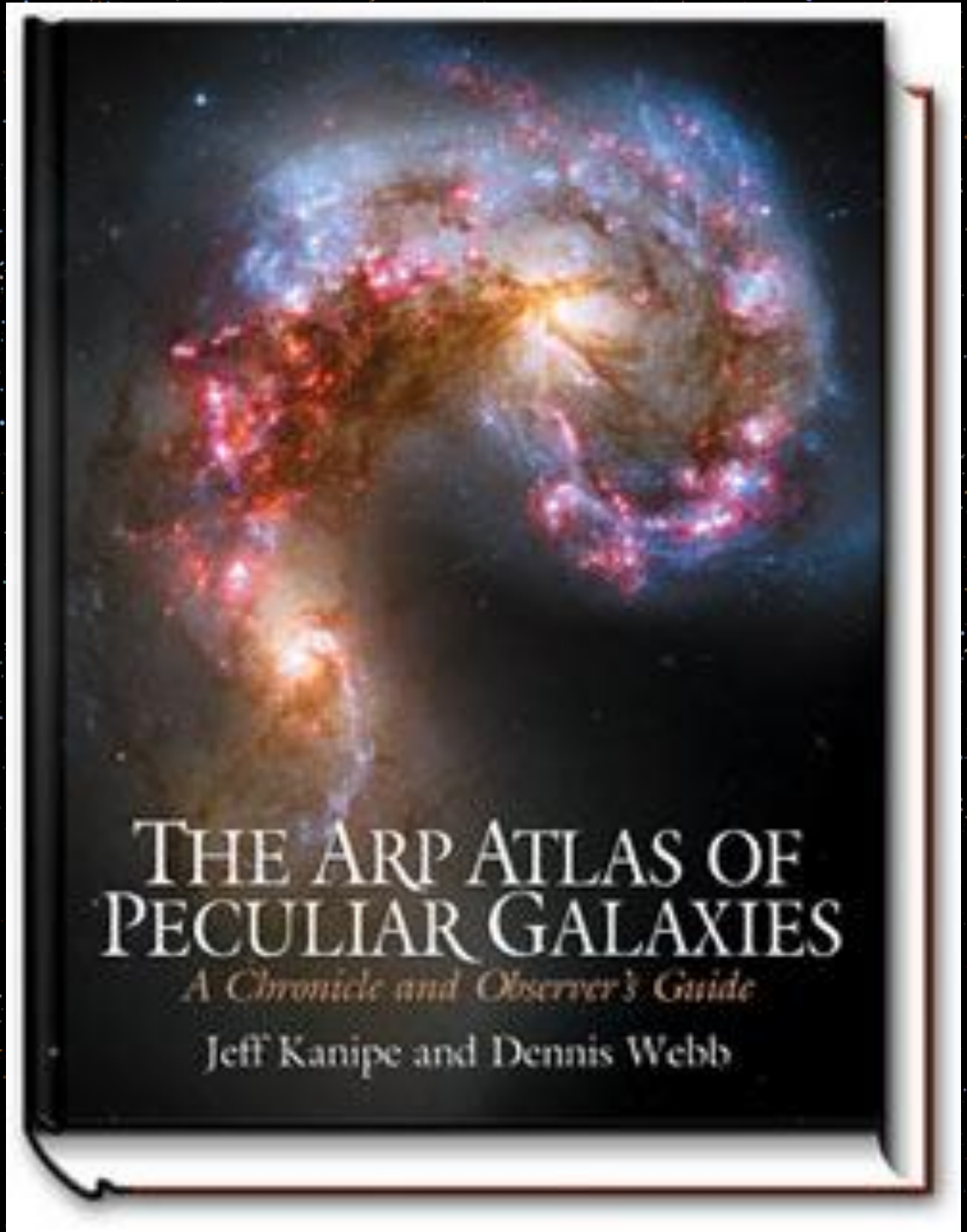


Arp's Peculiar Galaxies Observing club

Four variations:
Visual or Imaging
Northern or Southern

Observe or photograph 100 Arp objects

Most objects 12th to 18th mag, but there are >100 brighter than mag 13.5


THE ARP ATLAS OF PECULIAR GALAXIES
A Chronicle and Observer's Guide
Jeff Kanipe and Dennis Webb

Arp Atlas, Webb & Kanipe

Introduction – 8pp
Improved version of the original
Atlas of Peculiar Galaxies – 44pp
Biographical section – 43pp

Observing guide – 250+ pages:
Amateur drawings or photographs,
descriptions, charts, tables, diagrams

Remote Imaging:

Paying for high quality astrophotography data

Or, how to get a great astrophotograph without:

1) Freezing your butt off or losing sleep
2) Spending $20,000 on equipment
3) Hauling your gear thousands of miles to dark sites
4) Dealing with the frustration of equipment not working

Providers:

Slooh.com

iTelescope.net
(formerly Global Rent A Scope)

David Stein, via slooh.com

Chris Todd

This image did *NOT* cost me:

Takahashi FSQ-106:	~$5,000
SBIG STL-11000M:	~$9,000
Astrodon filters:	~$1,800
Paramount GT-1100S	~$8,000?
Autoguider, software, etc:	~$5,000?

~$30,000 total, not counting location, dome, etc.

iTelescope.net

Live Demo

Thank You!

Next month's meeting is on Thursday,
December 19th, 2013
7:30 PM

Meeting theme:

Member's Potluck!

Sign up on the forum to bring a dish,
and come to the meeting hungry!