# Credits

If you recall in the preface, I mentioned that I'd be back with the credits. Here I'll list all the places where I accumulated video clips, pictures, text, and information across books, websites, papers, and broadcast media. All the stuff I used to put together "How far away is it".

But even more important, I'd like to spend a few minutes talking about the key books and websites that guided the development of the video book. These will be the places where you can do additional research into areas of astronomy touched on in this video book. After the credit role, I'll give you my final thoughts.

> **[Music:** *Simon Wilkinson – "Exodus" – We use this background music for my discussion of the credits. We'll switch to Beetoven's 9th for the credit role.***]**

## Hubble


The two primary websites I used for the Hubble images, data, and video clips are hubblesite.org and spacetelescope.org. The Hubble telescope is a joint NASA and European Space Agency (ESA) project.


HubbleSite is the NASA website and SpaceTelescope is the ESA website. You can search for any object at either site by the name I included on the picture in the video book.

I only used a fraction of what is available here. There are thousands of spectacular photographs and each one comes with a wealth of information about the objects seen, methods used, and implications for our knowledge of the Universe. If you are at all interested in learning more about the Hubble Space Telescope's discoveries, these sites are the place to start.

## Spitzer and Chandra


I used the Caltech-Spitzer website for the Spitzer Space Telescope infrared images and the Harvard-Chandra website for all the Chandra X-Ray Space Observatory images.


These are wonderful sites for additional research on how new knowledge is being created through discoveries in the extended electromagnetic spectrum.

## JPL-Caltech and Goddard


The JPL-Caltech website has a wealth of information about the solar system. Our segment on the Solar System is populated with pictures from this site.

The Goddard Space Flight Center runs a large number of our orbiting space satellites including the Sentinels of the Solar System. You can see the full video here. In addition, Goddard operates the new Fermi Gamma-Ray Space Telescope.


If your research takes you closer to home than these two websites are the place to start.

## European Space Agency


The ESA science website and the European Space Organization's Very Large Telescope websites are invaluable sources of information and deep space images. I used these sites for a number of fantastic photographs, primarily in the Milky Way segment.


## Hubble Archive


Also, take a look at the Hubble Archive. It has the instructions for going straight to Hubble's raw images database. You can see just what the astronomer sees before the astrophotography techniques are applied. This is where I picked up the Planetary Nebula NGC 2818 photos.

## Next Generation

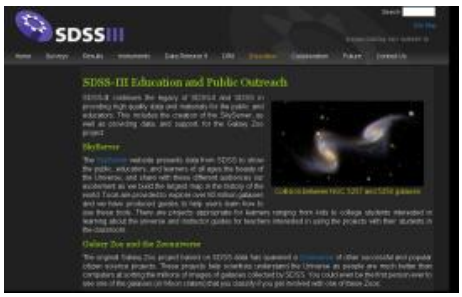
http://www.stsci.edu/jwst/

These next generation space telescopes have their websites up and running now. The next generation discoveries will be published here.

http://www.herschel.caltech.edu

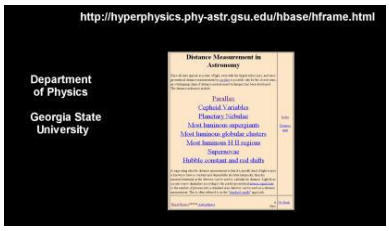
## Sloan Digital Sky Survey - http://www.sdss3.org/edu

The Sloan Digital Sky Survey provides tools to explore over 80 million galaxies with guides to help users learn how to use these tools. There are projects appropriate for learners ranging from kids to college students interested in learning about the universe and instructor guides for teachers interested in using the projects with their students in the classroom.




Your participation in these projects actually helps scientists understand the Universe as people are much better than computers at sorting the millions of images of galaxies collected by SDSS. You could even be the first person ever to see one of these galaxies.

## Georgia State University -http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html




For information on the cosmic distance ladder and Physics in general, there's no better place than Georgia State University's website.

## Atlas of the Universe - http://www.atlasoftheuniverse.com/


The Atlas of the Universe was my top source for galaxy clusters and superclusters in the Virgo Supercluster and Local Superclusters segments.

**David Darling's Encyclopedia - http://www.daviddarling.info/encyclopedia.com/**

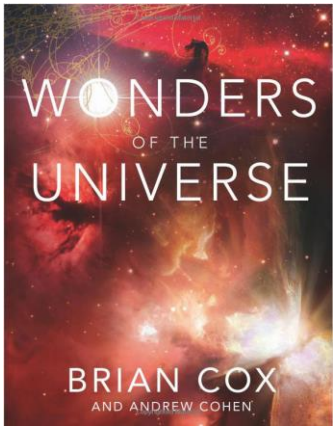
Astronomer David Darling's Encyclopedia of Science is also an excellent source of information.


**Astrophotographers**

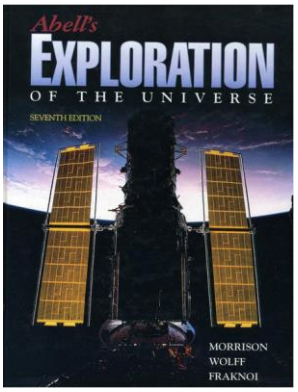
Then there are the wonderful astrophotographers: I used Rogelio Benal Andreo's award winning photographs; Anthony Ayiomamitis' fantastic astrophotography; Robert Gendler's wonderful work; and pictures from Tony Darnell's excellent website.

**Books**

I used two books extensively.

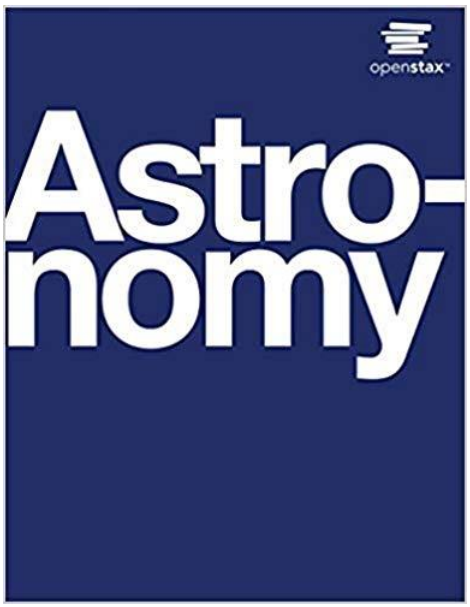



The first was Brian Cox and Andrew Cohen's book "Wonders of the Universe". It pointed me at all the interesting areas to focus on. I don't think I overlooked a single item in the book that was connected to the cosmic distance ladder. The book itself goes into a wide variety of astronomical subjects. I highly recommend reading this book and or seeing the BBC Series "Wonders of the Universe" narrated by Brian Cox himself. It is an excellent update for anyone who has seen the older "Cosmos" series done by Carl Sagan.




The second book was George Abell's second edition of "Exploration of the Universe" published in 1969. This was my lower division astronomy text book. I'm glad I saved it all these years. I used this book for all the foundational information about parallax, the solar system, stars, nebula, galaxies, etc. You may recognize the name Abell. George Abell was the astronomer who cataloged all the star clusters we examined in our sections on the Virgo Supercluster and the Local Superclusters. His work on this book was so good, that others have taken up the task to keep it alive. Today you can get the 9th edition. If you want to get serious about astronomy, this is the book for you.

I want to call your attention to a new free online textbook called 'Astronomy" that anyone interested in astronomy can use. It is supported by OpenStax, a Rice University 501(C)(3) nonprofit charity. The book builds student understanding through the use of relevant analogies, clear and non-technical explanations, and rich illustrations. Take a look at Synchrotron radiation on page 972.

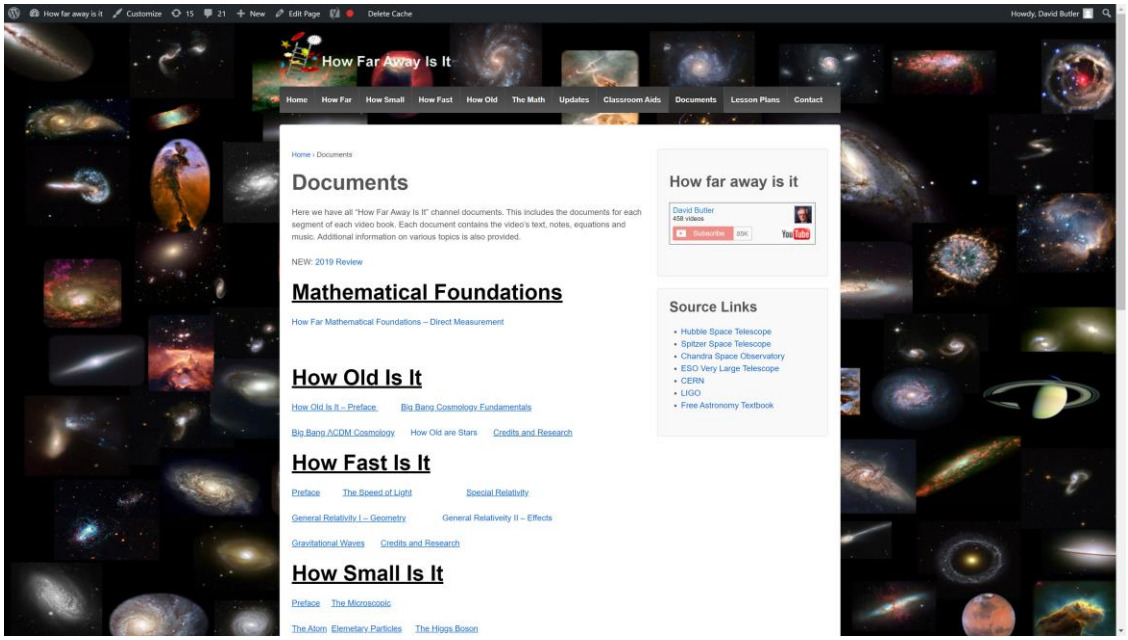



https://openstax.org/details/astronomy

Also, thanks to Jonathan Onstead, there is a 'How Far Away Is It' wiki available for anyone who wants to engage in conversations about this or any channel video.


https://howfarawayisit.fandom.com/wiki/Encyclopedia_Howfarawayica

And don't forget. Every video has a document on the howfarawayisit.com website containing all the text. Download and translate as needed. Thanks for watching.




http://howfarawayisit.com/documents/

We'll end with a list of the Hubble photos used, websites, video clips, books, papers, and music that were all a part of this video book "How Far Away Is It". Now here are the rest of the credits. Feel free to send comments to howfarawayisit@gmail.com

Thank you for watching.

> **[Music:** *Beethoven – "Symphony No.9, 'Choral' _ IV" – Here we conclude with Beetoven's "Ode to Joy" climax.***]**

## Hubble Photographs - http://hubblesite.org/

Andromeda Galaxy - M31
Galaxy NGC 300
Stephan's Quintet
Galaxy NGC 4163
Galaxy NGC 4214
Active Galaxy Centaurus A"
Starburst Galaxy NGC 1569
NGC 2976
Grand Design Spiral Galaxy M81
Starburst Galaxy M82
Circinus Galaxy
NGC 253
NGC 3077
Star Birth in Galaxy M83
Pinwheel Galaxy M101
Sombrero Galaxy M104
Barred Spiral Galaxy NGC 1512
Eagle Nebula
Stellar Spire in the Eagle Nebula
Whirlpool Galaxy M51
Spiral Galaxy M74
NGC 5866
I Zwicky 18
Spiral Galaxy NGC 2841
Virgo Cluster Galaxy NGC 4660
Galaxy NGC 3079
Gaseous Bubble in Galaxy NGC 3079
Spiral Galaxy NGC 3949
Starburst Galaxy NGC 3310
Virgo Cluster M87
NGC 4013
NGC 4710
Dusty Spiral Galaxy NGC 4414
Galaxy NGC 1427A

Hanny's Voorwerp, IC 2497
Spiral Galaxy NGC 3982
Barred Spiral Galaxy NGC 1300
Black Hole-Powered NGC 7742
NGC 5584
The Dusty Galaxy NGC 1316
Spiral Galaxy NGC 4319
NGC 3021
NGC 1309
Spiral Galaxy NGC 4622
Polar Ring Galaxy NGC 4650A
Galaxy ESO 510-G13
Galaxy NGC 6782
Galaxy Cluster MACS J0025
NGC 1275
Black Hole ESO 243
Colliding NGC 1410 NGC 1409
The Mice NGC 4676
Spiral Galaxy NGC 4911
Arp 273
Tadpole Galaxy
Interacting Galaxies Arp 147
Abell S0740
VV 340
Hoag's Object Galaxy
2MASX J00482185
COSMOS 3127341
Galaxy Cluster Abell 520
Pandora's Cluster, Abell 2744
COSMOS 1705033
Galaxy Cluster MACS 1206
COSMOS 1161898
COSMOS 2607238
Dust Pillars in the Carina Nebula
Gravitational Lens 0013+2249
Gravitational Lens 0038+4133
Gravitational Lens 0211+1139
Interacting Galaxy 2MASX J091...
Interacting Galaxy Arp 256
Interacting Galaxy ESO 77-14
Interacting Galaxy NGC 454
Interacting Galaxy NGC 6240"
Interacting Galaxy NGC 6786
Dog Star, Sirius and Companion
Star Fomalhaut (HD 216956)
Helix Nebula
Dumbbell Nebula
HH 2
HH 34
HH 47
Orion Nebula
Horsehead Nebula
Orion Constellation
Retina Nebula
S106
Dying Star HD 44179
Cone Nebula
Cygnus Loop Supernova Remnant
Ant Nebula
NGC 6369
NGC 2440
NGC 2371
Kohoutek 4-55
Boomerang Nebula
Crab Nebula
Planetary Nebula SuWt 2
IC 4593
SN 1006
SN 1006 Supernova Remnant
Carina Nebula
Jet in Carina Nebula
Butterfly Nebula NGC 6302
NGC 5315
Trifid Nebula
NOAO Image of Trifid Nebula
Bok globules in NGC 281
Cassiopeia A
NGC 2818
NGC 6791
47 Tucanae
Necklace Nebula
Omega Centauri
Omega Nebula
NGC 3603
Star V838
NGC 3324
Galactic Center Region
Small Magellanic Cloud
Double Bubble
LH 95 in the Large Magellanic Cloud
Supernova Remnant N 63A
Menagerie
Tarantula Nebula - Hodge 301
30 Doradus
Supernova Remnant 0509
Star Cluster NGC 2074
NGC 602, N90
NGC 346
Galaxy Triplet Arp 274
M 66
Dwingeloo 1
Neptune
Venus Cloud Tops
BoRG 58
ESO 576-69
Zw II 28
SDSS J1004+4112
Giant Lensed Galaxy Arc
SN 2002dd
Cygnus Loop Nebula
Packman NGC 281
Pistol Star
Arches Cluster
Quintuplet Cluster
Eta Carinae 1843 Event
Lagoon Nebula
Ultra Deep Field
Galaxy HUDF-JD2
Bubble Nebula NGC 7635
Eskimo Nebula (NGC 2392)
Glowing Eye of Planetary Nebula NGC 6751
NGC 3314
Globular Cluster M80 NGC 6093
Egg Nebula M16
Spiral Galaxy NGC 3370
Cepheid Variables in IC 4182
IRAS 22491-1808
NGC 5189

Spiral Galaxy NGC 4639 w/ Cepheids
NGC 5307
He 2-47
NGC 6543, Cat's Eye Nebula
Rotten Egg Nebula
Planetary Nebula MyCn18
Ring Nebula (M57)
Bow Shock near Young Star LL Ori
Veil Nebula
NGC 1068 Black Hole SN
NGC 4921 in Coma Cluster
NGC 4522
M 66
NGC 7023 Iris Nebula
Abell 370
NGC 7049
Pismis 24 and NGC 6357
Tycho Supernova, SN157
Kepler's Supernova Remnant
NGC 4755 or the Jewel Box
Apr 142

## Hubble Archive - http://hla.stsci.edu/

IC 1011 Abell2029
Carina Nebula
ANGST (ACS nearby Galaxy Survey)
COMA (ACS Treasury Survey of Coma Cluster of Galaxies)
COSMOS (Cosmic Evolution Survey)
GOODS (Great Observatories Origins Deep Survey)
Hubble Heritage
UDF (Ultra Deep Field)
APPP (Archive Pure Parallels Program
SGAL (Spiral Galaxies)
Andromeda (Deep Optical Photometry of Six Fields in the Andromeda Galaxy)
Carina (An ACS H-alpha Survey of the Carina Nebula)
CANDELS (Cosmic Assembly Near-IR Deep Extragalactic Legacy Survey
CLASH (Cluster Lensing and Supernova survey with Hubble)
PHAT (The Panchromatic Hubble Andromeda Treasury)
HIPPIES (Hubble Infrared Pure Parallel Imaging Extragalactic Survey)
HUD09 (Hubble Ultra Deep field 2009)
Cepheid Variable Star V1
Light Curve of Cepheid Variable Star V1
Star Field in M31 with V1 included
Hubble's 1923 photo of V1

## JPL - CalTech - www.jpl.nasa.gov/spaceimages

Venus
Mercury"
Jupiter and Three Galilean Satellites
Saturn's Tumbling Moon
Hyperion
Saturn by Voyager 1
Europa
Io In Front of Jupiter
Shoemaker
Saturn's Northern Storm
Shoemaker-Levy 9 Impact
Jupiter
Clumps in Saturn's Rings
Titan's luminous crescent
Quartet of Saturn's moons
Lunar Far side
Ganymede
Itokawa
Comet Halley
Comet Siding Spring
Makemake
Caliban
Ariel
Uranus
Uranus and Ariel
Solar System PDF
Jupiter Ring System
Europa Voyager 2 Closest Approach
Mariner 10's Venus
Pluto and Its Moons
Galileo Journal Translation
Io
Oberon
Voyagers at the Termination Shock
Leonids Meteor Shower
Far Side of the Moon
Voyager 2 Looks at Saturn's Rings
COBE's View of the Milky Way
Heliosheath
HD 278942
Cygnus Loop Nebula
Packman NGC 281
RCW 86
Orion Molecular Cloud
Dark River to Antares
Earth from Mars
Earthrise - Apollo 8
Ozone Layer Hole over Antarctica
Sunlight over Earth
Galileo Images the Moon
The Earth and Moon
Solar flare - time laps
Mars and Elysium
Mars and Syrtis Major
Mars and Acidalia
An Ancient Jovian Storm
Jupiter's Great Red Spot
Miranda as seen by Voyager 2
Star HD 189733
Mira

## Chandra X-Ray Space Observatory - http://chandra.harvard.edu/

Star CH Cyg
SN 1006
Abell 2029 - CI 1011
El Gordo
Perseus Cluster
RCW 103 - SN
NGC 4649 Black Hole
NGC 4696 Black Hole
Cosmos Field
NGC 6240
M81
Abell 520
MACS J0025.4-1222
Abell 2744
Centaurus A, NGC 5128
NGC 4649
NGC1068
Sextans A
NGC 1275
Galactic Center
SN 1006
Tycho's SNR
SNR 0509-67.5
RCW 86

## Spitzer Space Telescope JPL/CalTech - http://www.spitzer.caltech.edu/

Lagoon nebula
SN 1006
Galaxy HUDF-JD2 - Near Infrared
Galaxy HUDF-JD2 - Infrared
Sombrero Galaxy
Cosmos Field
XSC Equitorial Projection
Local Volume - Meet the Neighbors
SN 1604
Galactic Center
NGC 281
Fomalhaut
HD 189733b
Milky Way
RCW 86
Rho Ophiuchi

## ESO European Southern Observatory - http://www.eso.org/public

Cone nebula
SN 1987A
HIP 13044
Cat's Paw Nebula (NGC 6334)
NGC 6729
J102915 - oldest star
M 78 in Orion
R Coronae Australis
Orion Nebula - infrared
NGC 2467
Milky Way
HE 1523-0901
Betelgeuse
HUDF-JD2
NGC 3369
El Gordo
Cosmos Field
Abell 2744
SN 1604
SN 1987A
NGC 3603

## NASA Goddard Spaceflight Center - http://svs.gsfc.nasa.gov/

Heliosphere Bubbles
Hinode - Sunspots
RHESSI - Solar flares
TRACE - Coronal rain
TIMED - Earth Atmosphere
SOHO - Filament304
STEREO - Coronal mass ejection (CME)
VOYAGER - Stagnation region
Heliosphere to Alpha Centauri
NASA/Goddard Space Flight Center Scientific Visualization Studio
Earth from Apollo 17
NASA Cosmic Distance Scale
Transit of Venus
Incandescent Sun
SDO: Year One

## Anthony Ayiomamitis - http://www.perseus.gr/

Vega
Capella
Altair
Antares
Mirach
Deneb
Castor
Polaris
Delta Cephei
Arcturus
T Lyr - Carbon Star in Lyrae
AW Cyg - Carbon Star in Cygnus
Mu Ceph - Carbon Star in Cepheus
Barnard's Star in Oph - Motion Star
61 Cygni AB - Motion Star
Lalande 21185 in UMa - Motion Star
Wolf 359 in Leo - Motion Star
Sigma Draconis - Motion Star
Hypervelocity Star HVS 4
Hypervelocity Star HVS 2

David Darling Encyclopedia of Science
www.daviddarling.info/encyclopedia.com/
Proxima Centauri
Pollux
Spica (credit: Albert Manzanares)
Alpha Centauri

SolStation.com
Milky Way

Donald J. Lindler
Sigma Space Corporation
Earth - Moon from Deep Impact

Michael Fowler UVa Physics Department
How High the Moon

Serge Brunier
Milky Way from atop the Andes

Wally Pacholka
Milky Way from Devil's Tower Wyoming

Space.com
Milky Way over Chilean desert

Deep Space Colors
Rogelio Bernal Andreo
Rho Ophiuchi
Witch Head Nebula

The Universe in Color
www.robgendlerastropics.com/
Robert Gendler
Rosetta Nebula

Lowell Observatory
Irregular Galaxy Sextans A

Virgo consortium
Millennium Simulation

Sloan Digital Sky Survey / Sky Server
cas.sdss.org/dr3/en/tools/places/page5.asp
Peculiar Galaxy NGC 7603

Andrew Colvin
Earth's place in the Universe diagrams

Australia Telescope
outreach.atnf.csiro.au/education/senior/astrophysics/spectra_info.html

Randy Halverson
www.dakotalapse.com/
Milky Way timelaps

Richard Crisp
M33 the Triangulum Galaxy
Heart and Soul Nebulae

Local Volume Legacy Survey

Atlas of the Universe
www.atlasoftheuniverse.com/superc.html
Hercules Supercluster
Perseus-Pisces Supercluster
Hydra-Centaurus Supercluster
Centaurus Supercluster
Coma Supercluster
Horologium Supercluster

David's Astronomy Site
www.richweb.f9.co.uk/astro/index.htm
LL Lyrae

Ken Lunn
usuaris.tinet.org/klunn/solar-system.html#h-sphere
The Solar System

Montana State University
www.physics.montana.edu/faculty/cornish/lagrange.html
Lagrange Points

World Year of Physics 2005
www.physics2005.org/projects/eratosthenes/
Eratosthenes measures the Earth

University of California, Irvine
Physical star sizes

Georgia State University
Department of Physics and Astronomy

## Video Clips

Hubble Night Sky - March 2012 Hubblesite.org/explore_astronomy/tonights_sky

Virgo Cluster M87 Hubblesite.org/newscenter/archive/releases/2008/30/video/a

M101 Hubblesite.org/newscenter/archive/releases/2006/10/video/a

M83 Hubblesite.org/newscenter/archive/releases/2009/29/video/a

M82 Hubblesite.org/newscenter/archive/releases/2006/14/video/a

M81 Hubblesite.org/newscenter/archive/releases/2008/02/video/a

Stephan's Quintet Hubblesite.org/newscenter/archive/releases/2001/22/video/c

Eagle Nebula Hubblesite.org/newscenter/archive/releases/2005/12/video/b

Whirlpool Galaxy Hubblesite.org/newscenter/archive/releases/2005/12/video/c

CLASH MACS 1206 Hubblesite.org/newscenter/archive/releases/2011/25/video/a

Stages in Galaxy Collisions Hubblesite.org/newscenter/archive/releases/2008/16/video/d

Dozens of Colliding Galaxies  Hubblesite.org/newscenter/archive/releases/2008/16/video/c

Milky Way's Future  Hubblesite.org/newscenter/archive/releases/2008/16/video/a

NGC 1275 Filaments  Hubblesite.org/newscenter/archive/releases/2008/28/video/b

NGC 1275  Hubblesite.org/newscenter/archive/releases/2008/28/video/a

Arp 273  Hubblesite.org/newscenter/archive/releases/2011/11/video/c

Helix Nebula  Hubblesite.org/newscenter/archive/releases/2003/11/video/c

Butterfly Nebula  Hubblesite.org/newscenter/archive/releases/2009/25/video/h

Galaxy Triplet Arp 274  Hubblesite.org/newscenter/archive/releases/2009/14/video/b

Hubble_ Zoom MACS 1206  Hubblesite.org/newscenter/archive/releases/2011/25/video/a

Omega Centauri  Hubblesite.org/newscenter/archive/releases/2010/28/video/b

Carina Nebula  Hubblesite.org/newscenter/archive/releases/2010/29/video/a

Ant Nebula Menzel 3  Hubblesite.org/newscenter/archive/releases/2001/05/video/a

Horsehead Nebula  Hubblesite.org/newscenter/archive/releases/2001/12/video/a

Cassiopeia A  Hubblesite.org/newscenter/archive/releases/2006/30/video/a

Dumbbell Nebula  Hubblesite.org/newscenter/archive/releases/2003/06/video/a

Orion Nebula  Hubblesite.org/newscenter/archive/releases/2006/01/video/c

IC 4593  Hubblesite.org/newscenter/archive/releases/2007/33/video/a

Bok globules in NGC 281  Hubblesite.org/newscenter/archive/releases/2006/13/video/a

Supernova Remnant N 63A  Hubblesite.org/newscenter/archive/releases/2005/15/video/a

NGC 346  Hubblesite.org/newscenter/archive/releases/2005/04/video/a

Star V838 Monocerotis  Hubblesite.org/newscenter/archive/releases/2004/10/video/a

Trifid Nebula  Hubblesite.org/newscenter/archive/releases/1999/42/video/a

WFC3 30 Doradus  Hubblesite.org/newscenter/archive/releases/2009/32/video/b

Carina Nebula  Hubblesite.org/newscenter/archive/releases/2010/13/video/d

Dark Pillars of Carina  Hubblesite.org/newscenter/archive/releases/2010/29/video/a

Herbig-Haro object HH 1  Hubblesite.org/newscenter/archive/releases/2011/20/video/m

Herbig-Haro object HH 2  Hubblesite.org/newscenter/archive/releases/2011/20/video/j

Herbig-Haro object HH 34  Hubblesite.org/newscenter/archive/releases/2011/20/video/f

Herbig-Haro object HH 47  Hubblesite.org/newscenter/archive/releases/2011/20/video/b

S106  Hubblesite.org/newscenter/archive/releases/2011/38/video/b

NGC 6791  Hubblesite.org/newscenter/archive/releases/2008/25/video/a

NGC 3324  Hubblesite.org/newscenter/archive/releases/2008/34/video/b

Cepheid variable  M1 V1  Hubblesite.org/newscenter/archive/releases/2011/15/video/a

Ring Nebula Hubblesite.org/newscenter/archive/releases/2013/13/video/b/

NGC 5189 Hubblesite.org/newscenter/archive/releases/2012/49/video/b/

Arp 142 Hubblesite.org/newscenter/archive/releases/2013/23/video/a/

R Coronae Australis  www.ESO.org/public/videos/eso1027b/

GJ 1214 zoom  www.ESO.org/public/videos/eso0950c/

NGC 6729  www.ESO.org/public/videos/eso1109a

J102915 - oldest star  www.ESO.org/public/videos/eso1132a

SN 1987A  www.ESO.org/public/videos/eso1032b

HIP 13044  www.ESO.org/public/videos/eso1045f

Zoom in on Betelgeuse  www.ESO.org/public/videos/eso0927a

Zooming in on NGC 3603  www.ESO.org/public/videos/eso1005a

Cat's Paw Nebula (NGC 6334)  www.ESO.org/public/videos/eso1003a

Carl Sagan - Pale Blue Dot  www.YouTube.com/watch?v=p86BPM1GV8M

City Lights from International Space Station
NASA Astronaut Don Pettit  (2002-2008)  www.YouTube.com/watch?v=U7WuSP663uU

The View from Space - Countries and Coastlines
International Space Station  www.YouTube.com/watch?v=EPyl1LgNtoQ

Plains Milky Way – Dekotalaps  www.YouTube.com/watch?v=KySThq5CxLI

A timelapse view of the milky way from Chile  www.YouTube.com/watch?v=JEHm-XUHwNw

Millennium_flythru  www.YouTube.com/watch?v=M1vPSwRzAZI

Millennium_sim  www.YouTube.com/watch?v=spkqkg9IADo

IC 1011 - How the Universe Works  www.YouTube.com/watch?v=3GJAZWB8HFE

Superclusters of Galaxies. The Great Sloan Wall [cosmic web]
www.YouTube.com/watch?NR=1&feature=endscreen&v=xu2-9omdXNc

Hubblecast 31_ NGC 2623 www.YouTube.com/watch?v=6d2PgcB4XZE

Hubblecast 34_ M 66 www.YouTube.com/watch?v=0Q7XzhQbj3I

Hubblecast 26_ NGC 4921 www.YouTube.com/watch?v=Cnvgq3ifOWs

The Hubble Ultra Deep Field in 3D www.YouTube.com/watch?v=oAVjF_7ensg

BBC's Seeing Andromeda - Wonders of the Universe_ Messengers
www.YouTube.com/watch?v=KkjuIoCorTE

Sentinels of the Heliosphere www.YouTube.com/watch?v=AqRQ_93kFKs

Plains Milky Way www.YouTube.com/watch?v=KySThq5CxLI

Milky Way from Chile www.YouTube.com/watch?v=JEHm-XUHwNw

Trojan Asteroid Shares Orbit with Earth
www.NASA.gov/mission_pages/WISE/news/wise20110727vid_prt.htm

Dawn at Vestra
www.JPL.NASA.gov/video/index.cfm?all_videos&id=1009#fragment-5

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"Distance Measurement in Astronomy" Department of Physics and Astronomy, Georgia State University hyperphysics.phy-astr.gsu.edu/hbase/astro/distance.html#c1

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## Music

Johann Sebastian Bach
- Cantata No.147 - Jesu, Joy of Man's Desiring
- Air 'on the G String'
- Zion hort die Wachter

Samuel Barber - Adagio for Strings

Ludwig van Beethoven
- Symphony No.9 in D minor Op.125, 'Choral' _ III
  - Adagio molto e cantabile
  - Final Movement
  - Piano Sonata No 14 in C sharp minor - Moonlight

Georges Bizet - Entracte to Act III

Ridolfo Luigi Boccherini - Minuet

Alexander Borodin - Nocturne

James Horner - Braveheart Movie Music
- End Credits
- Main Title

Carl Maria von Weber - Der Freischütz Ouvertüre

Achille-Claude Debussy - Clair De Lune

Clément Philibert Léo Delibes - Flower Duet

Antonín Leopold Dvořák - String Serenade

Edward William Elgar - Enigma Variations Op.36

Gabriel Urbain Fauré - Pavane Op.50

Franz Liszt - Hungarian Rhapsody No. 2

Ramin Djawadi - HBO Series - Game of Thrones - Main Title

Edvard Grieg - Peer Gynt Incidental Music Op.23 - Morning

Louis Armstrong - What A Wonderful World

Pietro Antonio Stefano Mascagni - Intermezzo

Jules Émile Frédéric Massenet - Meditation

Felix Mendelssohn - Violin Concerto in E Minor Op.64

Wolfgang Amadeus Mozart
- Clairinet Concerto in A
- Concerto No_ 10 for 2 pianos & orchestra
- Flute and Harp Concerto in C, K.299 - Andantino
- Piano Concerto No.21 in C 'Elvira Madigan'
- Piano Concerto No_ 20 in D minor
- Sinfonia concertante for violin, viola & orchestra
- The Magic Flute

Johann Pachelbel - Canon in D

Sergei Vasilievich Rachmaninoff
- Piano Concerto No 2 in C minor
- Rhapsody on a Theme of Paganini - Variation 18

Joaquin Rodrigo - Concierto de Aranjuez

Charles-Camille Saint-Saëns - The Carnival of the Animals - The Swan

Alfred Eric Leslie Satie - Gymnopédie No.1

Pyotr Ilyich Tchaikovsky - Capriccio Italien

Twinkle Twinkle Little Star

Vangelis
- Conquest of Paradise
- Heaven and Hell 3rd Movement

Antonio Vivaldi -The Four Seasons - Winter Concerto in F Minor

Richard Wagner - Rienzi Overture

Simon Wilkinson - Exodus www.thebluemask.com

# Second Edition Updates

## Hubble Photographs - http://hubblesite.org/

WR 124
Summer Triangle
Calabash Nebula
Boomerang Nebula
NGC 6326

AG Carinae
IRAS 18059-3211
NGC 6153
Spider Nebula
V1331 Cyg

Deneb
Twin Jet Nebula
NGC 6572
PK 329-02.2

## Planets and Moons

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https://www.nasa.gov/feature/jpl/large-asteroid-to-safely-pass-earth-on-sept-1 Asteroids

NASA Bennu's Journey
https://www.nasa.gov/osiris-rex
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https://www.nasa.gov/mission_pages/hubble/news/asteroid-collision.html P/2010 A2
https://www.nasa.gov/audience/forstudents/k-4/dictionary/Asteroid.html Vesta
https://spacemath.gsfc.nasa.gov/weekly/6Page141.pdf math for asteroid belt density
https://www.nasa.gov/feature/pluto-s-big-moon-charon-reveals-a-colorful-and-violent-history Charon

Astrum YouTube channel with great videos on the planets
https://www.youtube.com/user/astrumspace

## Comets and Heliosphere

https://www.nasa.gov/feature/goddard/2017/nasa-s-cassini-voyager-missions-suggest-new-picture-of-sun-s-interaction-with-galaxy

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Earth from ISS
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The Statue of Liberty Nebula – 9,000 ly
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IC 10 – 2.2 mly
https://scitechdaily.com/hubble-image-of-the-week-irregular-galaxy-ic-10/

Sextans A – 4.3 mly
https://subarutelescope.org/old/Pressrelease/2004/02/23/index.html

Sculptor Dwarf – 290,000 ly
https://www.spacetelescope.org/news/heic1719/

Fornax Dwarf - 460,600 ly
https://www.eso.org/public/usa/images/eso1007a/
https://www.eso.org/public/videos/eso1428a/
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## Local Volume

NGC 1512 – 30mly
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Whirlpool Galaxy M51 – 31 mly
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https://sites.ualberta.ca/~pogosyan/teaching/ASTRO_122/lect24/lecture24.html

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Fabric of the Cosmos
http://www.virgo.dur.ac.uk/2005/06/02/Millennium/

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https://commons.wikimedia.org/w/index.php?curid=35204698#/media/File:UY_Scuti_zoomed_in,_Rutherford_Observatory,_07_September_2014.jpeg

Dumbbell Nebula, M27, NGC 6853 – 1,200 ly
https://imgur.com/gallery/I1tpMHk

US 708 – sdO (61,970 light years)
http://www.sci-news.com/astronomy/science-us708-hypervelocity-star-supernova-galactic-speed-record-02571.html

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Frantz Martinache
https://pumas.jpl.nasa.gov/files/09_21_05_2.pdf
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https://www.eso.org/public/news/eso1622/
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https://skullsinthestars.com/2010/06/12/you-could-learn-a-lot-from-a-ducky-the-van-cittert-zernike-theorem/
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GAIA star motion
https://www.youtube.com/watch?v=faWDssUUTcQ

NASA UHD video from ISS
https://www.youtube.com/watch?v=fVMgnmi2D1w

Lightning Storm
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Epic Lightning Storm
https://www.youtube.com/watch?v=ntjmIf0B1M8

## Ending

Well that's a wrap except for one last thing.

If you recall in the Preface, I mentioned that I was creating this video book to update those I care about on what we have learned about the Universe while I wasn't looking.

But on reflection, when I review all we've learned and all that we have yet to discover, my thoughts turn to my grandchildren and I'm reminded of the Louis Armstrong lyrics:

> I see my grandchildren smile
> I watch them grow
> They'll learn much more than I'll ever know
> And I think to myself
> What a Wonderful World