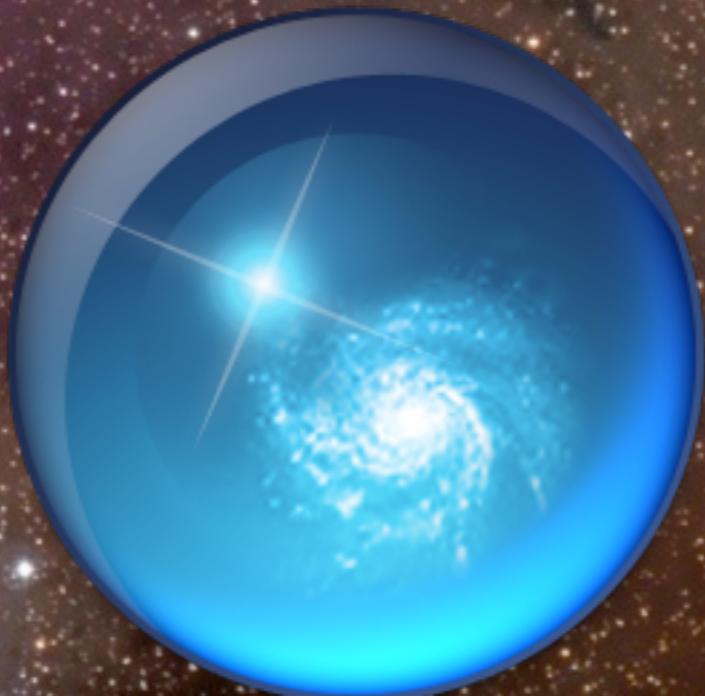


WorldWide Telescope

Microsoft
Research



(Secrets of the)
WorldWide Telescope

Alyssa A. Goodman

*Professor of Astronomy
Harvard University*



3500 years of Observing

Stonehenge, 1500 BC



Ptolemy in Alexandria, 100 AD



Observatory Tower,
Lincolnshire, UK, c. 1300



Galileo, 1600



The “Scientific Revolution”

Reber’s Radio
Telescope, 1937



NASA/Explorer 7
(Space-based
Observing)
1959

“The Internet”

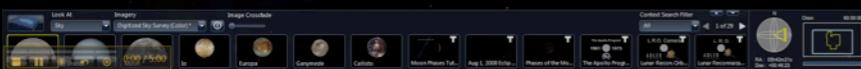
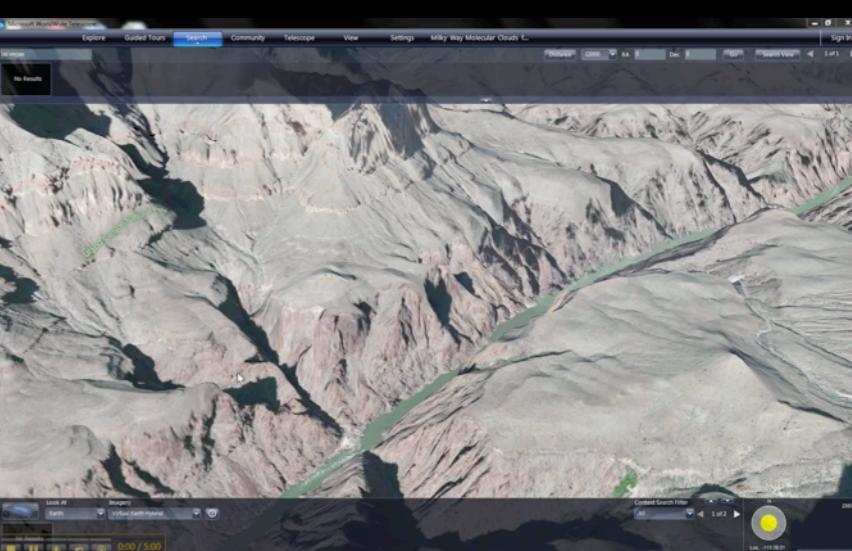
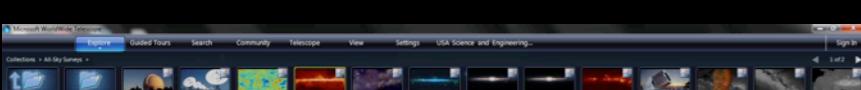
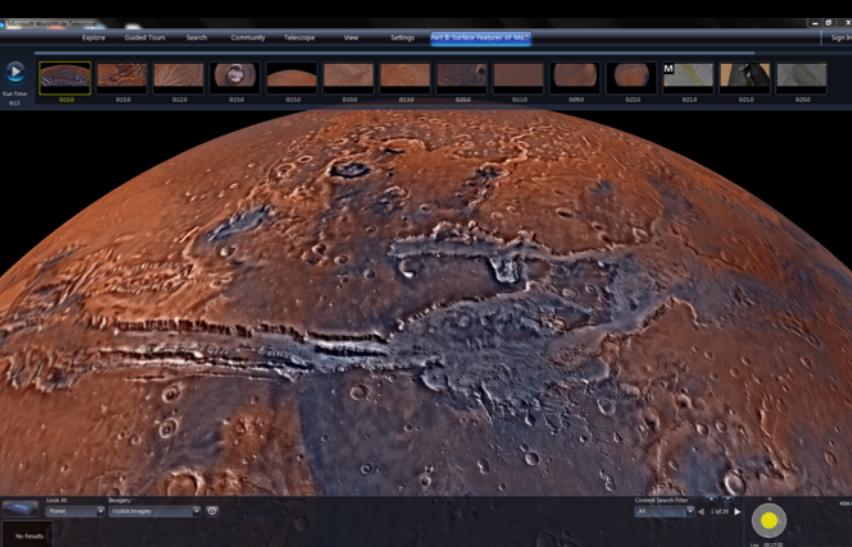
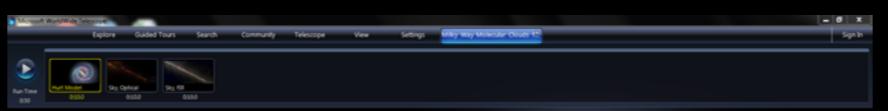
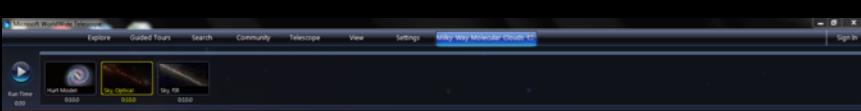
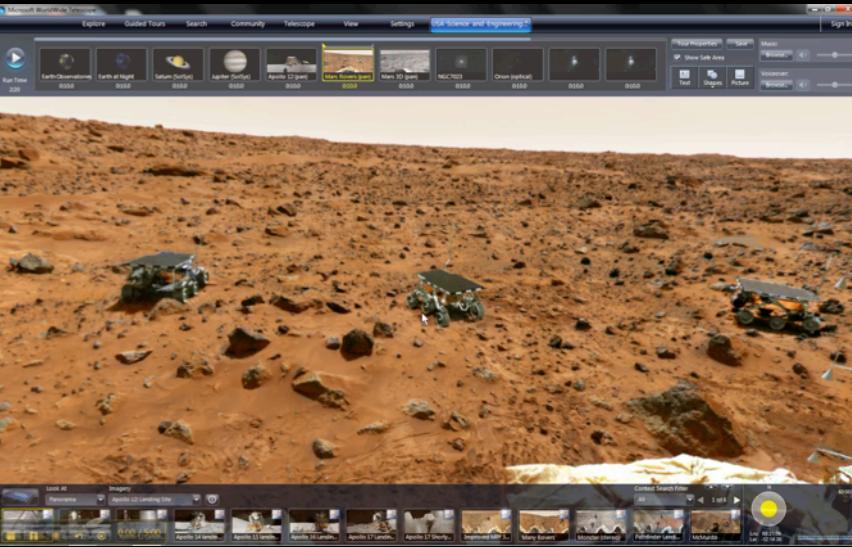


Long-distance
remote-control/
“robotic”
telescopes
1990s



“Virtual
Observatories”
21st century

2013



Experience WWT at worldwidetelescope.org



Microsoft® Research WorldWide Telescope

Experience WWT at worldwidetelescope.org

The screenshot shows the Microsoft Research WorldWide Telescope interface. At the top, there's a navigation bar with tabs: Explore (which is selected), Guided Tours, Search, View, and Settings. Below the navigation bar, there's a collection of images labeled "All-Sky Surveys". A callout box points to the "Explore" tab with the text: "Seamlessly explore imagery from the best ground and space-based telescopes in the world". Another callout box points to the "All-Sky Surveys" section with the text: "Expert led tours of the Universe". A third callout box points to the "View" tab with the text: "Control time to study how the night sky changes". On the right side, there's a "View" button with arrows indicating it's a slider, and the text "1 of 3". In the center, there's a "Finder Scope" window showing "NGC224" (Classification: Spiral Galaxy in Andromeda) with coordinates: RA: 00h42m42s, Dec: 41° 16' 00", Alt: 70° 06' 26", Az: 275° 42' 17", Set: 00:35. A callout box points to this window with the text: "Much more than ‘just’ the sky at night! 3D features can take you to other planets, stars & galaxies." To the right of the Finder Scope, there's a "Context bar" showing "Andromeda" and "01:58:26". A callout box points to the Context bar with the text: "Context bar shows items of interest in current field of view". Below the Finder Scope, there's a "Context globe" showing the current field of view. A callout box points to the Context globe with the text: "Context globe shows where you're looking.". At the bottom, there's a toolbar with buttons for "Look At" (set to "Sky"), "Imagery" (set to "Digitized Sky Survey"), "Image Credits" (which links to a detailed description of the data source), "Info", "Image Crossfade", "Three Faces of the Sun", "Research", "Show Object" (set to "NGC221"), "Close", and "1 of 3" (with arrows indicating it's a slider). The bottom right corner shows "RA : 00h42m40s" and "Dec : 41:13:35".

Seamlessly explore imagery from the best ground and space-based telescopes in the world

Expert led tours of the Universe

Control time to study how the night sky changes

Much more than “just” the sky at night! 3D features can take you to other planets, stars & galaxies.

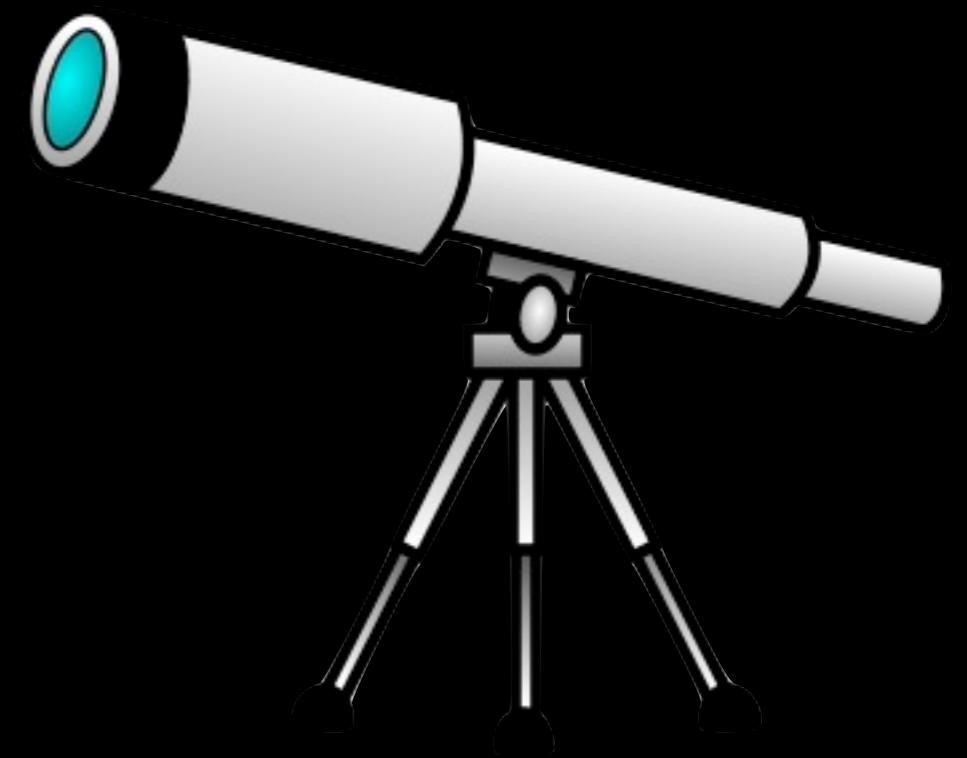
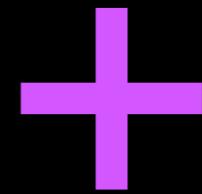
Finder Scope
NGC224
Classification: Spiral Galaxy in Andromeda
RA: 00h42m42s Magnitude:
Dec: 41 : 16 : 00 Distance:
Alt: 70 : 06 : 26 Rise:
Az: 275 : 42 : 17 Transit:
Set: 00:35

Finder Scope links to Wikipedia, publications, and data, so you can learn more

Context bar shows items of interest in current field of view

Context globe shows where you're looking.

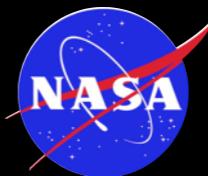
(Secrets of the) WorldWide Telescope



Secrets of WorldWide Telescope

Collaboration

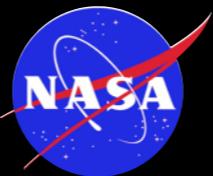
Microsoft
Research



“Standards”

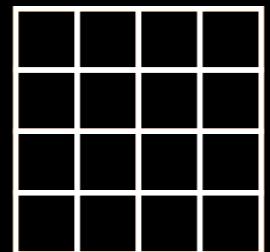


Data



theastrodata.org

“Tricks”



“Interoperability”



Collaboration



Curtis Wong
Microsoft Research

Story mode

Stellar Evolution SKY SERVER

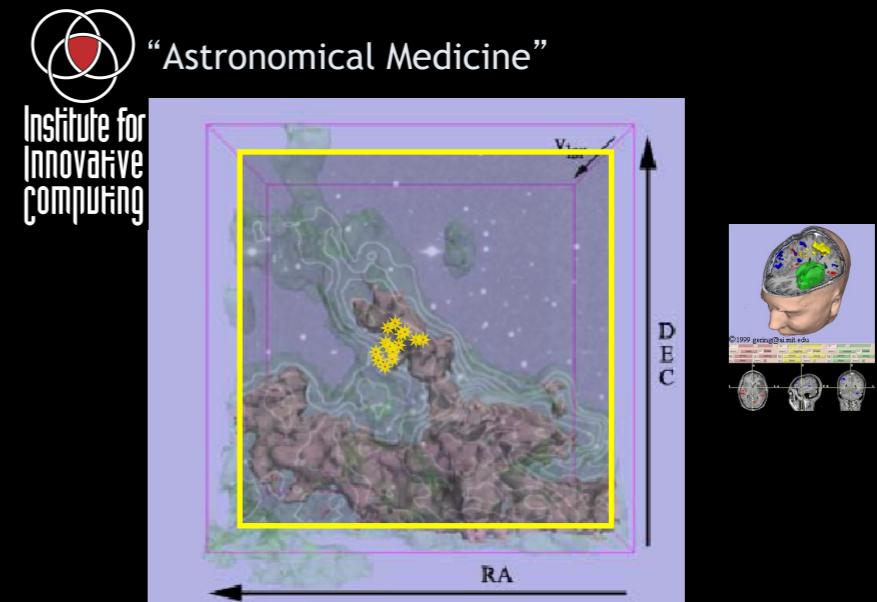
Story mentions gravitational condensation of protostars from hydrogen and galactic dust And links to related content appears below

Clicking on the related link below takes you to the object in context of the sky

Nebula

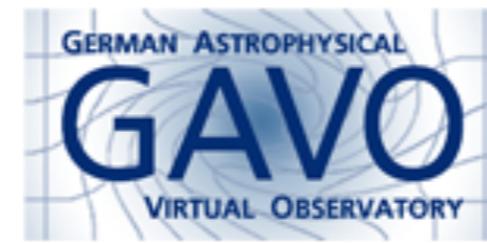
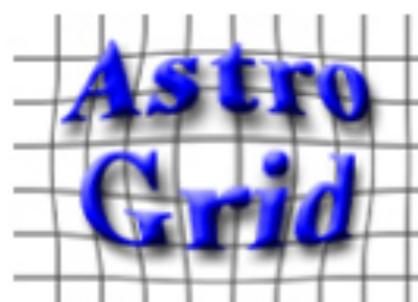
A screenshot of a web-based astronomical application. At the top, it says "Story mode" and "Stellar Evolution SKY SERVER". Below that is a text box: "Story mentions gravitational condensation of protostars from hydrogen and galactic dust And links to related content appears below". Another text box below says: "Clicking on the related link below takes you to the object in context of the sky". To the right is a star field image with a yellow arrow pointing to a nebula labeled "Nebula". At the bottom is a navigation bar with several small thumbnail images and a play button icon.

Alyssa Goodman
Harvard University



A joint venture of FAS-Astronomy & HMS/BWH-Surgical Planning Lab.
Work shown here is from the 2005 Junior Thesis of Michelle Borkin, Harvard College.

"Standards"



[Explore](#)[Guided Tours](#)[Search](#)[Community](#)[Telescope](#)[View](#)[Settings](#)

Collections >



My Collections



Constellations



Solar System (Sky)



All-Sky Surveys



Spitzer Studies



Chandra Studies



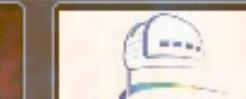
Hubble Studies



Astrophotography



Radio Studies



NOAO Studies



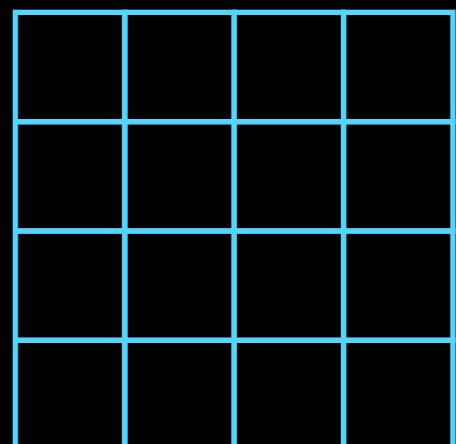
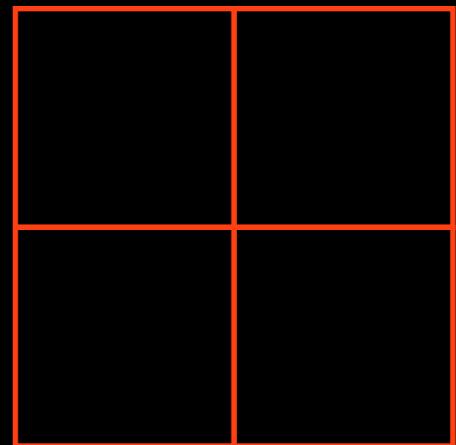
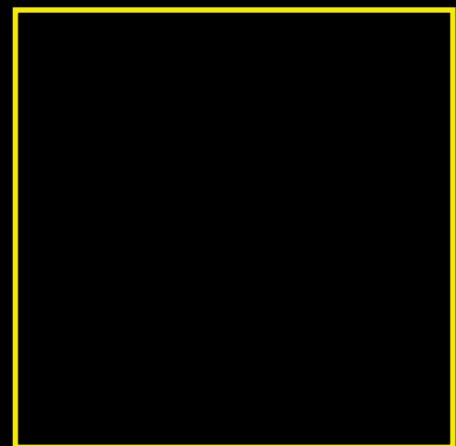
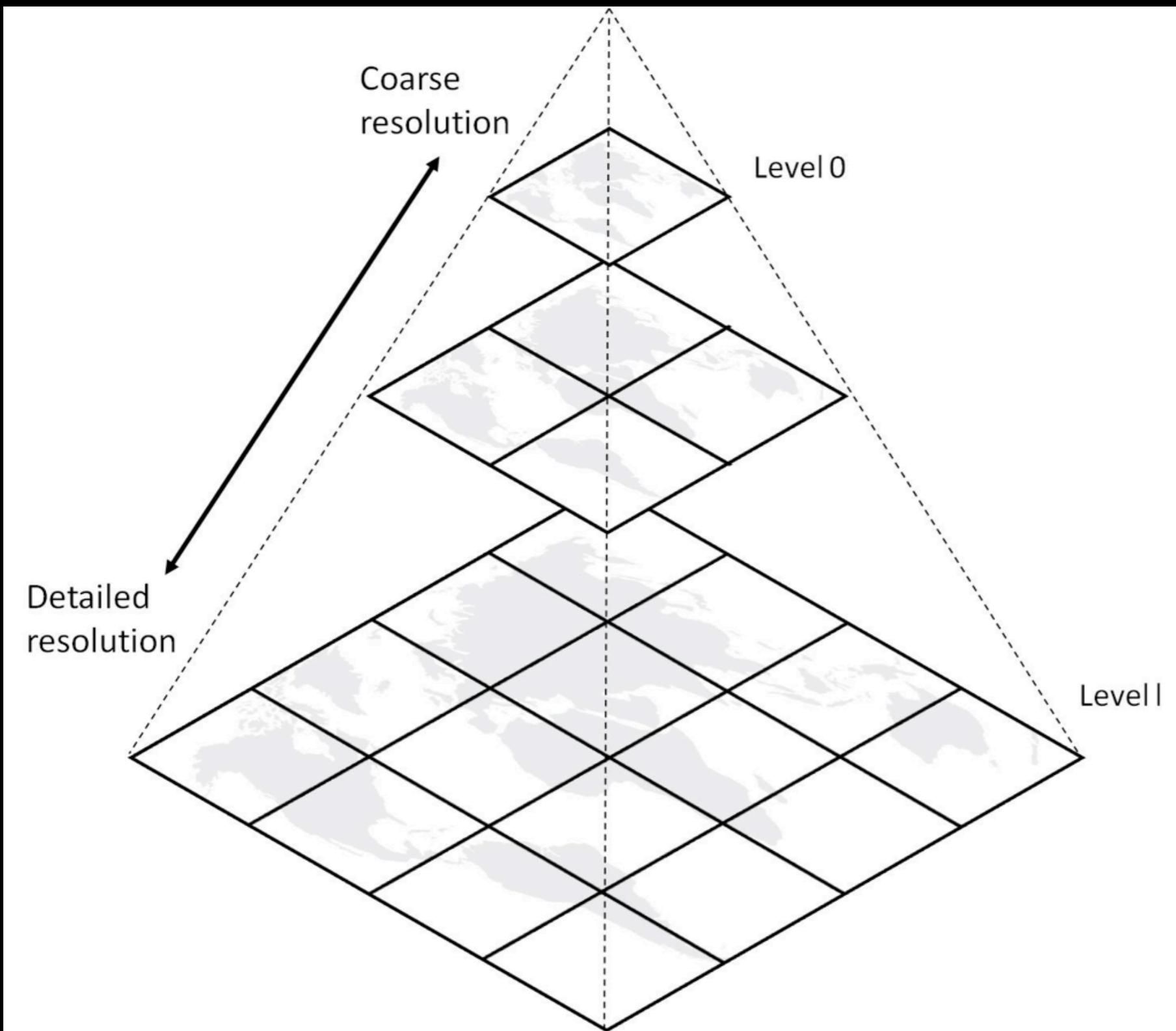
Gemini



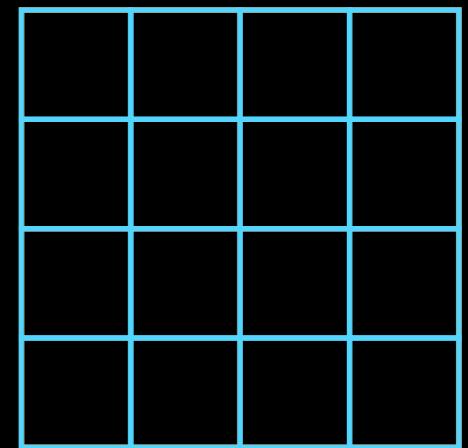
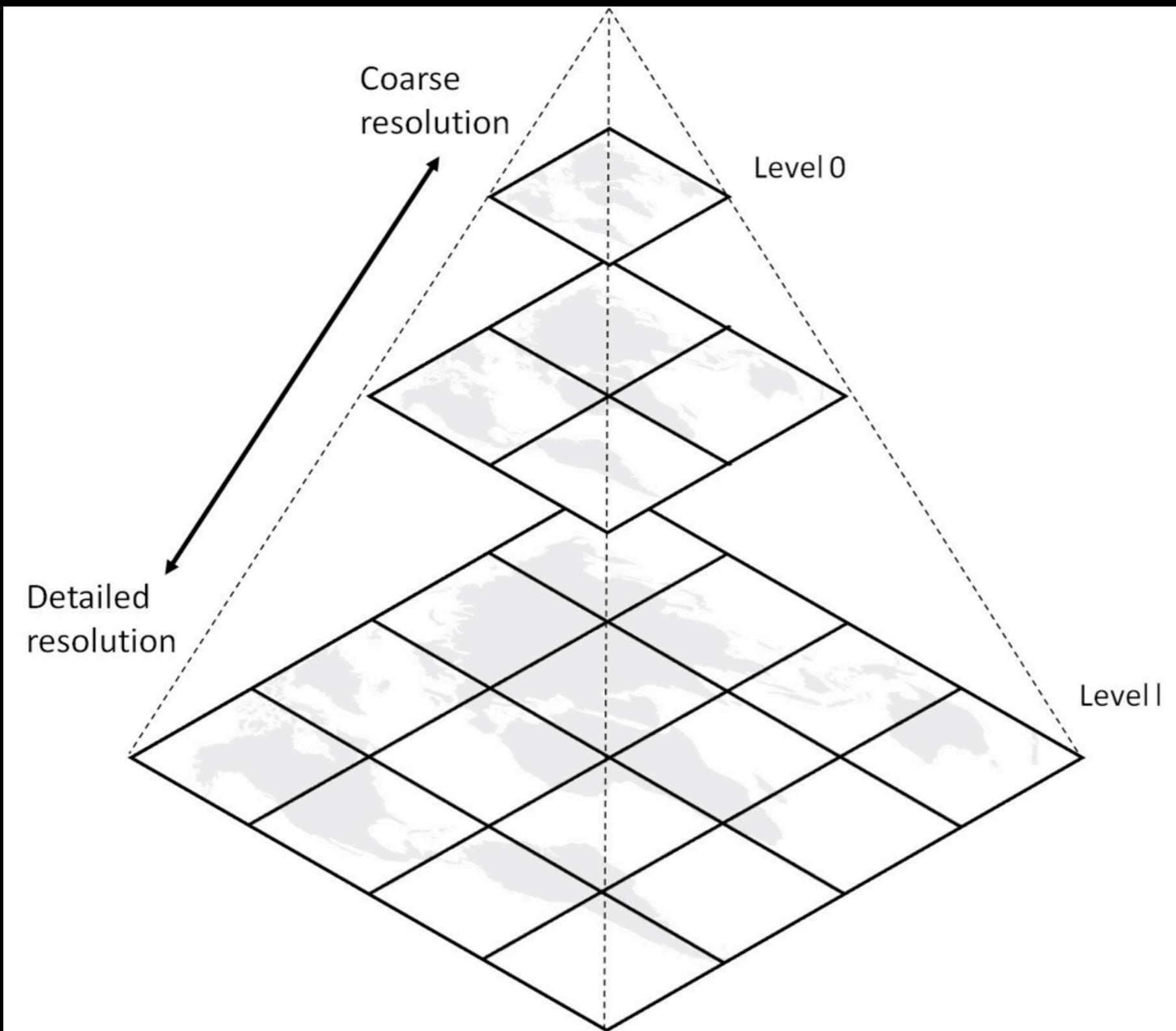
Data



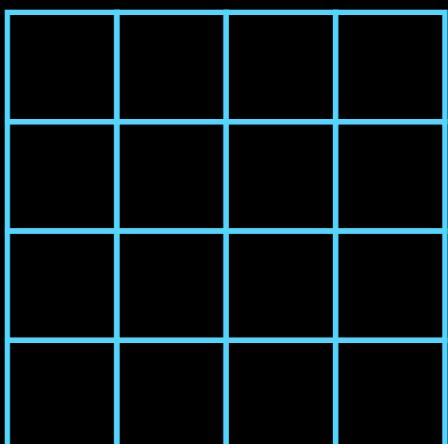
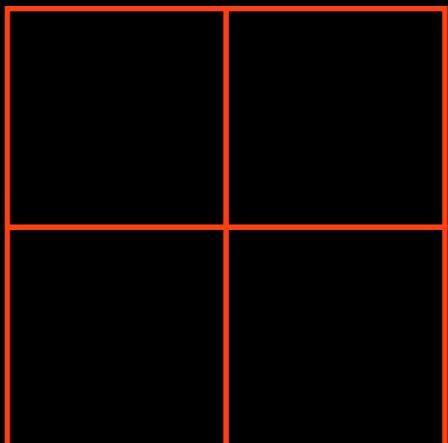
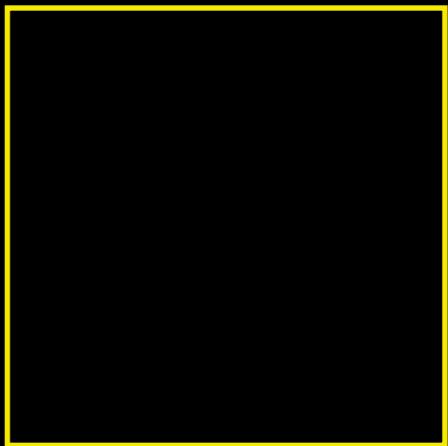
“Tricks”...for example...



“Tricks”...for example...

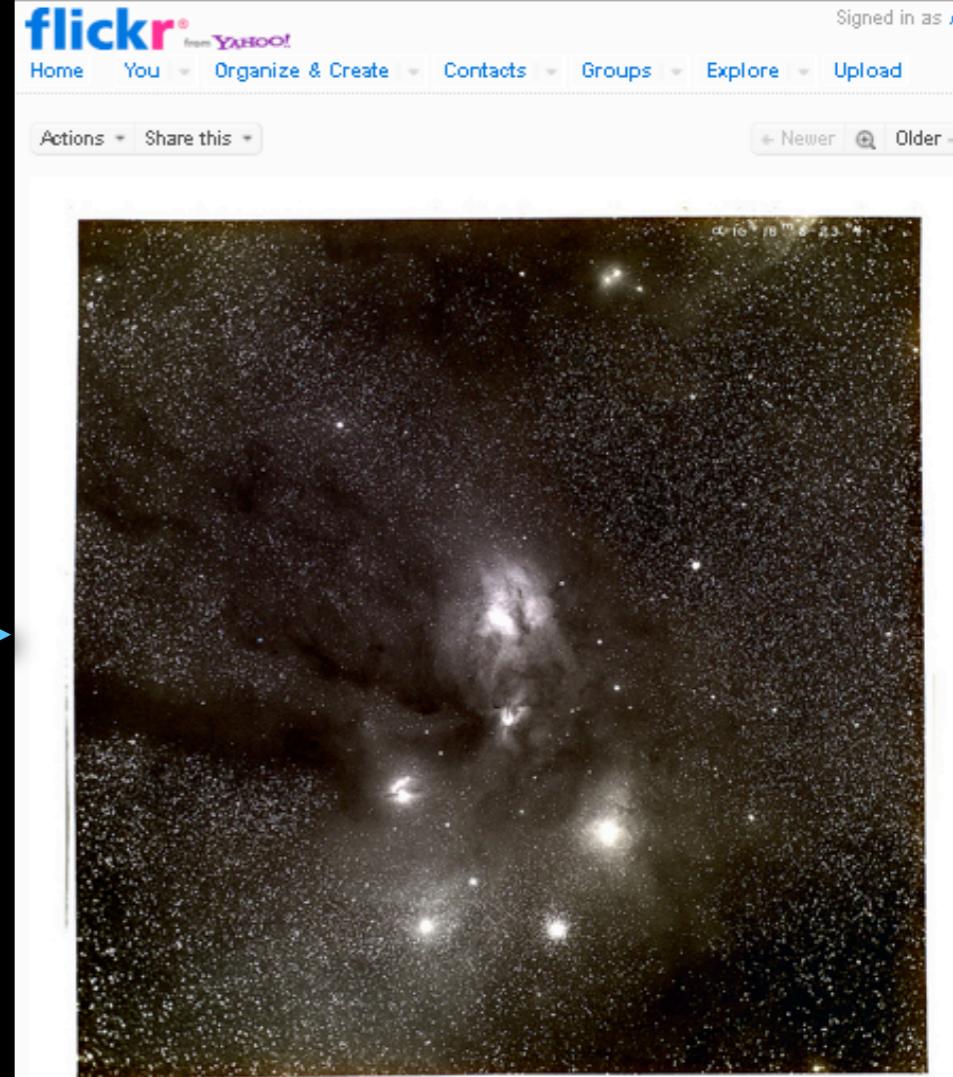
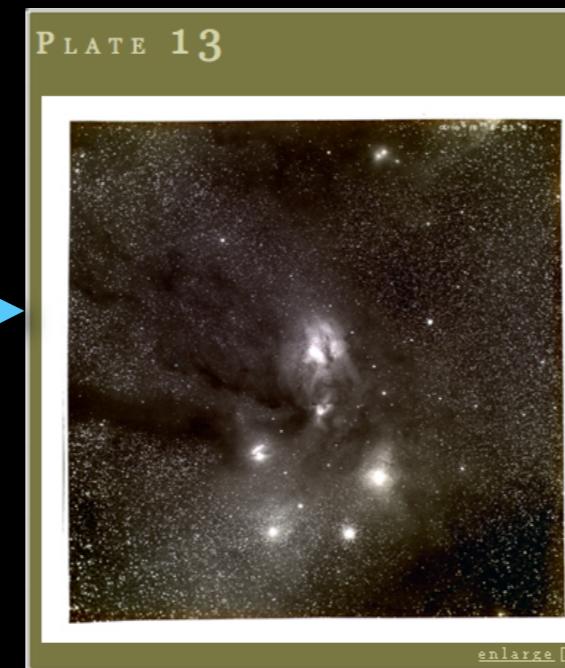
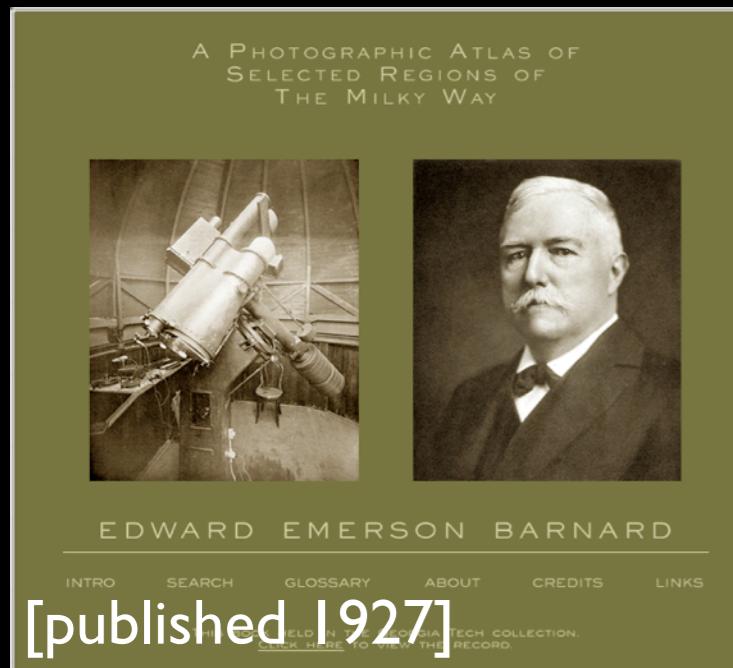


“Tricks” ...for example...



“Interoperability” ...for example...

astrometry.net + flickr + WWT



Explore Guided Tours Search View Settings

Collections > Open Collections > barnardoph >

barnardoph

1 of 1

1 of 3

N Ophiuchus 09:41:29

Look At Imagery Info Image Crossfade

Sky Digitized Sky Survey (Color)

Ophiuchus IC4634 IC4603 IC4604 M19 NGC6235 NGC6273 NGC6284

RA : 16h25m41s

View in World Wide Telescope

barnardoph

E.E. Barnard's image of Ophiuchus
www.library.gatech.edu/bpdi/bpdi.php

Comments and faves astrometry.net

astrometry.net (8 days ago | reply | delete)
Hello, this is the blind astrometry solver. Your results are:
(RA, Dec) center:(240.421365140, -23.8749819397) degrees
(RA, Dec) center (H:M:S, D:M:S):(16:25:41.128, -23:40:29.935)
Orientation:178.34 deg E of N
Pixel scale:52.94 arcsec/pixel
Parity:Reverse ("Left-handed")
Field size :9.41 x 9.41 degrees
Your field contains:
The star Antares (α Sco)
The star Graffias (β1 Sco)
The star Al Niyat (σ Sco)
The star τ Sco
The star ω1 Sco
The star ν Sco
The star ω2 Sco
The star ω Oph
The star 13 Sco
The star ο Sco
IC 4592
IC 4801
NGC 6121 / M 4
IC 4803
IC 4804 / rho Oph nebula
IC 4805



Secrets of WorldWide Telescope

Collaboration

Microsoft
Research



“Standards”

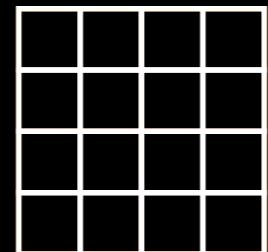


Data



theastrodata.org

“Tricks”



“Interoperability”



WWT Ambassadors



The screenshot shows a group of four students in a classroom setting, focused on a computer monitor displaying a 3D astronomical visualization. The website's header includes links for Login, Register, Search, and various sections like HOME, ABOUT, LEARN WWT, FIND TOURS, EDUCATORS, AMBASSADORS, COMMUNITY, GET WWT, and SUPPORT.

Upcoming Events

- AAAS Family Science Days Feb. 16 - Feb. 17
- Belmont 6th Grade Star Party Feb. 28
- Cambridge Science Festival Carnival Apr. 13
- Clarke Middle School, Lexington, MA Apr. 22 - May. 31

About WWTA

The WorldWide Telescope computer program (WWT) from Microsoft Research is a stunningly beautiful and freely available tool offering immersive views of the sky and multimedia links to interactive descriptions and explanations of millions of celestial objects. WorldWide Telescope Ambassadors (WWTA) use WWT to educate the public about Astronomy and Science. WWTA is run by a team of astronomers and educators at Harvard University, in collaboration with the WWT team at Microsoft Research.

[Read more](#)

Download Tour

Experience Tour Online

Watch as Video

“Tours”



WWTVizLabs



WWT in Research

COMPLETE

POWERED BY THE **Dataverse Network™** PROJECT



vimeo Glue Demo: World Wide Telescope

glue multidimensional data exploration

Viz-e-lab

+Coming Attraction... WWT in **edX**

Galileo Galilei

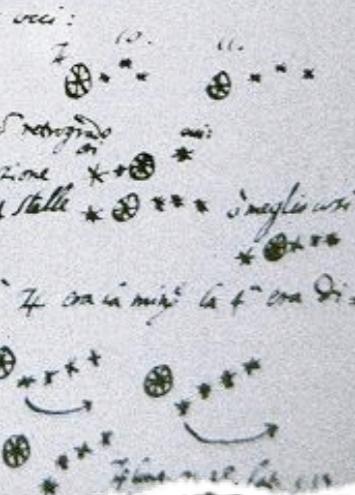
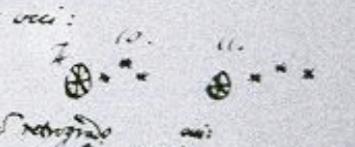
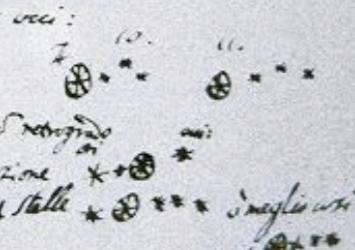
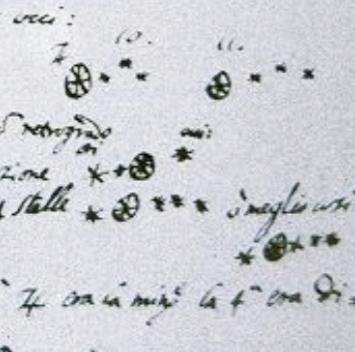
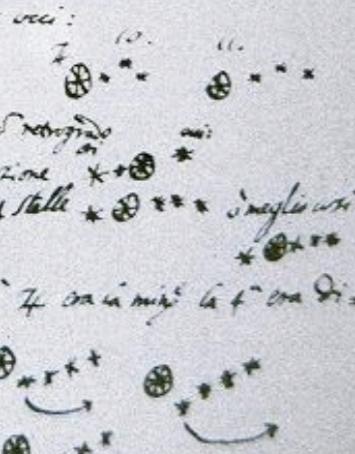
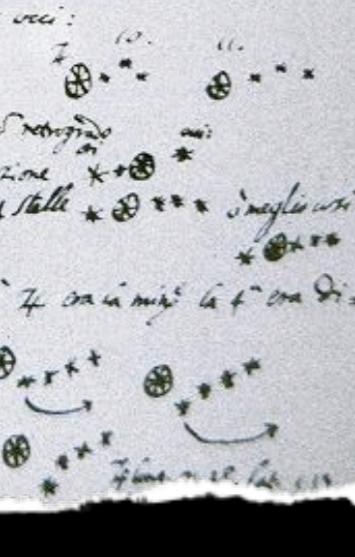
(1564-1642)

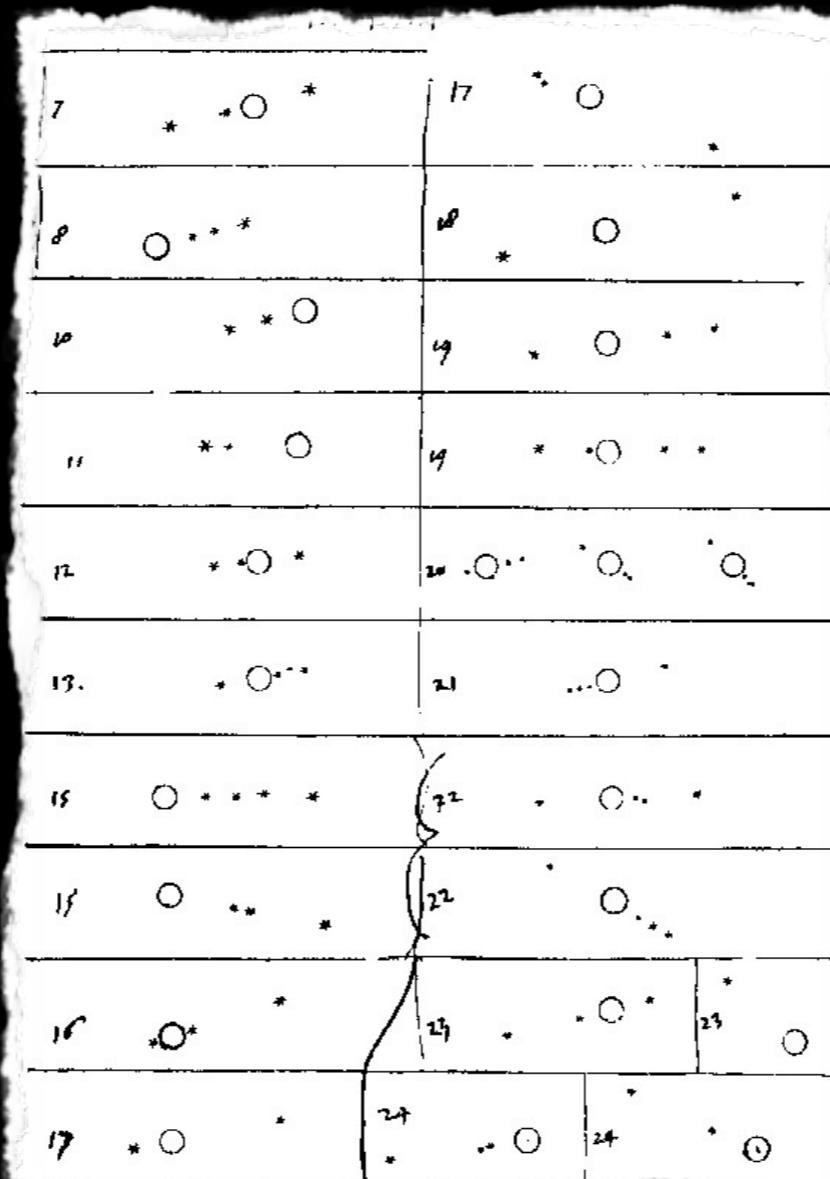
Sopra il Principio.

Galileo Galilei. Familius Servus della Ser. V. inaugilaro avilusq; et lo ogni spirto di buone no seleni satisfaciencia che nere della eterna Tr. Matematicis nello studio di Padova,

Qui si sono determinate di presentare al Sopra il Principio l'Utile et il piacere di finimenti inseminabile q; ogni regola et invenia marittima o terrestre finora divenuta per le nuove artificie ne l'ogni puro et seleni a disposizione di q; q; L'Utile conato delle più n. delle speculazioni di prospettiva na l'uantaggio di insprie Leggi et Tele dell'inservit p' de hore et p' di stelle prima ch' egli suopra noi et distinguenda il numero et la qualita dei vasselli giudicare li sue forte palli e persicella caccia et combattimento o alla fuga, o pure una nella campagna aperta uide et partularmente distinguere ogni suo moto et propositamento.

Adi 7. di gennaio

Gione si uide uti  occi:
Adi 8 uoti 
Adi 9  era dux direto et no retrogrado
Adi 10 si uide in tale ueritazione 
Il 13. si uide minime a Gione 4 stelle  magliuisti
Adi 14 e angelo 
Il 15  la prossima 4 oramig' fa et ora di
stante della 3^a l'oppio tira
Le stelle delle 3 aut' ore si son
maggior del diametro di 7 et er
vano in linea retta.



SIDERIUS NUNCIUS

On the third, at the seventh hour, the stars were arranged in this sequence. The eastern one was 1 minute, 30 seconds from Jupiter; the closest western one 2 minutes; and the other western one wa

ast



* West

0 minutes removed from this one. They were absolutely on the same straight line and of equal magnitude.

On the fourth, at the second hour, there were four stars around Jupiter, two to the east and two to the west, and arranged precisely

East



West

on a straight line, as in the adjoining figure. The easternmost was distant 3 minutes from the next one, while this one was 40 seconds from Jupiter; Jupiter was 4 minutes from the nearest western one and this one 6 minutes from the westernmost one. Their magnitudes were nearly equal; the one closest to Jupiter appeared a little smaller than the rest. But at the seventh hour the eastern stars were only 0 seconds apart. Jupiter was 2 minutes from the nearer eastern

East



West

one, while he was 4 minutes from the next western one, and this one was 3 minutes from the westernmost one. They were all equal and extended on the same straight line along the ecliptic.

On the fifth, the sky was cloudy.

On the sixth, only two stars appeared flanking Jupiter, as is seen

East



West

in the adjoining figure. The eastern one was 2 minutes and the western one 3 minutes from Jupiter. They were on the same straight line with Jupiter and equal in magnitude.

On the seventh, two stars stood near Jupiter both to the east

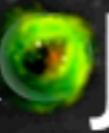


Watch as Video

Notes for & re-productions of Siderius Nuncius



THE MILKY WAY PROJECT



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WELCOME

The Milky Way Project aims to sort and measure our galaxy, the Milky Way. Initially we're asking you to help us find and draw bubbles in beautiful infrared data from the Spitzer Space Telescope.

Understanding the cold, dusty material that we see in these images, helps scientists to learn how stars form and how our galaxy changes and evolves with time.

[Click here](#) to see the full tutorial or browse the site to find out more about the science behind the Milky Way Project.

YOU CAN NOW SEE HOW CLOSE WE ARE TO 1,000,000 DRAWINGS AT [HTTP://WWW.MILKYWAYPROJECT.ORG/G...](http://WWW.MILKYWAYPROJECT.ORG/G...) 12 DAYS AGO

194,943 IMAGES SERVED · 252,562 BUBBLES DRAWN · 24,234 POSSIBLE STAR CLUSTERS · 8,978 CANDIATE GALAXIES · 597,054 OTHER OBJECTS

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