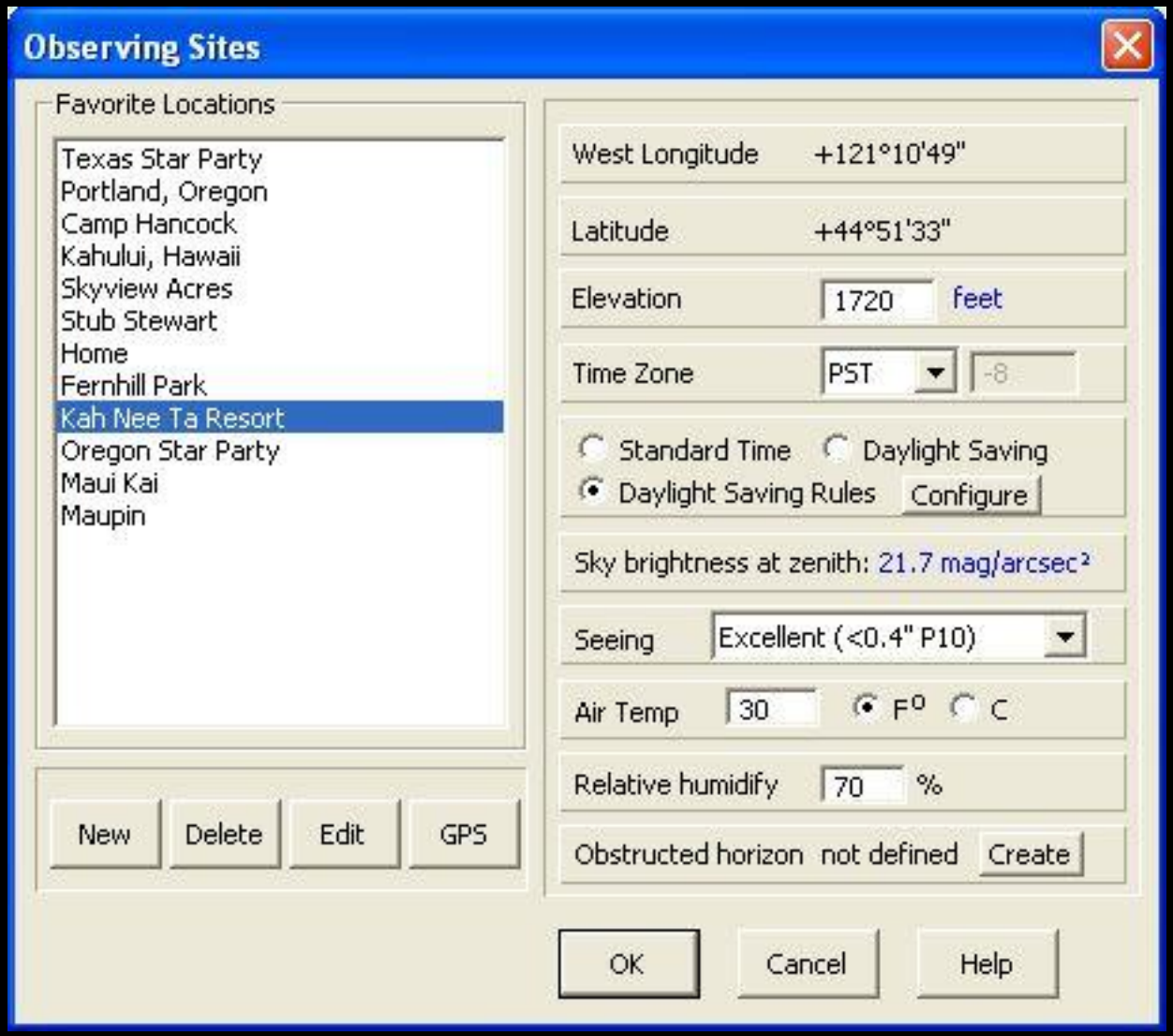
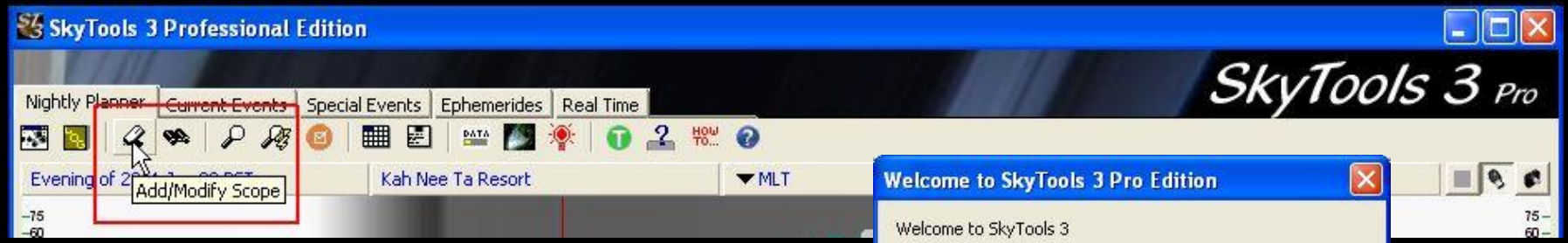
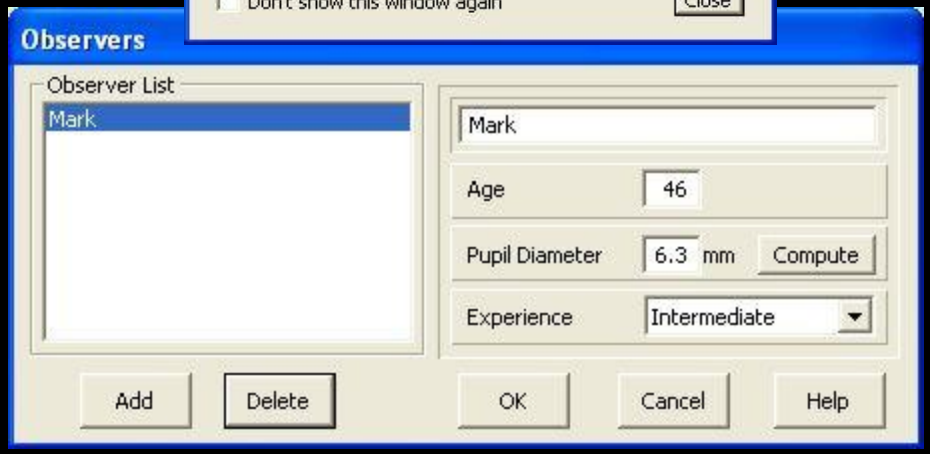
Please make sure you have the Kah Nee Ta Resort entered!!!



Please make sure you have 1 telescope, 2 eyepieces,
& 1 observer entered!!!
If you have the Pro Edition, enter 1 camera too!!!





Introduction to SkyTools 3

Mark A. Martin

February 19, 2011

HUGE THANKS to

Jim Todd & OMSI

Larry Godsey

Sameer Ruiwale

Greg Crinklaw

My Family

The purpose of SkyTools is to help the amateur astronomer plan & execute astronomical observations.

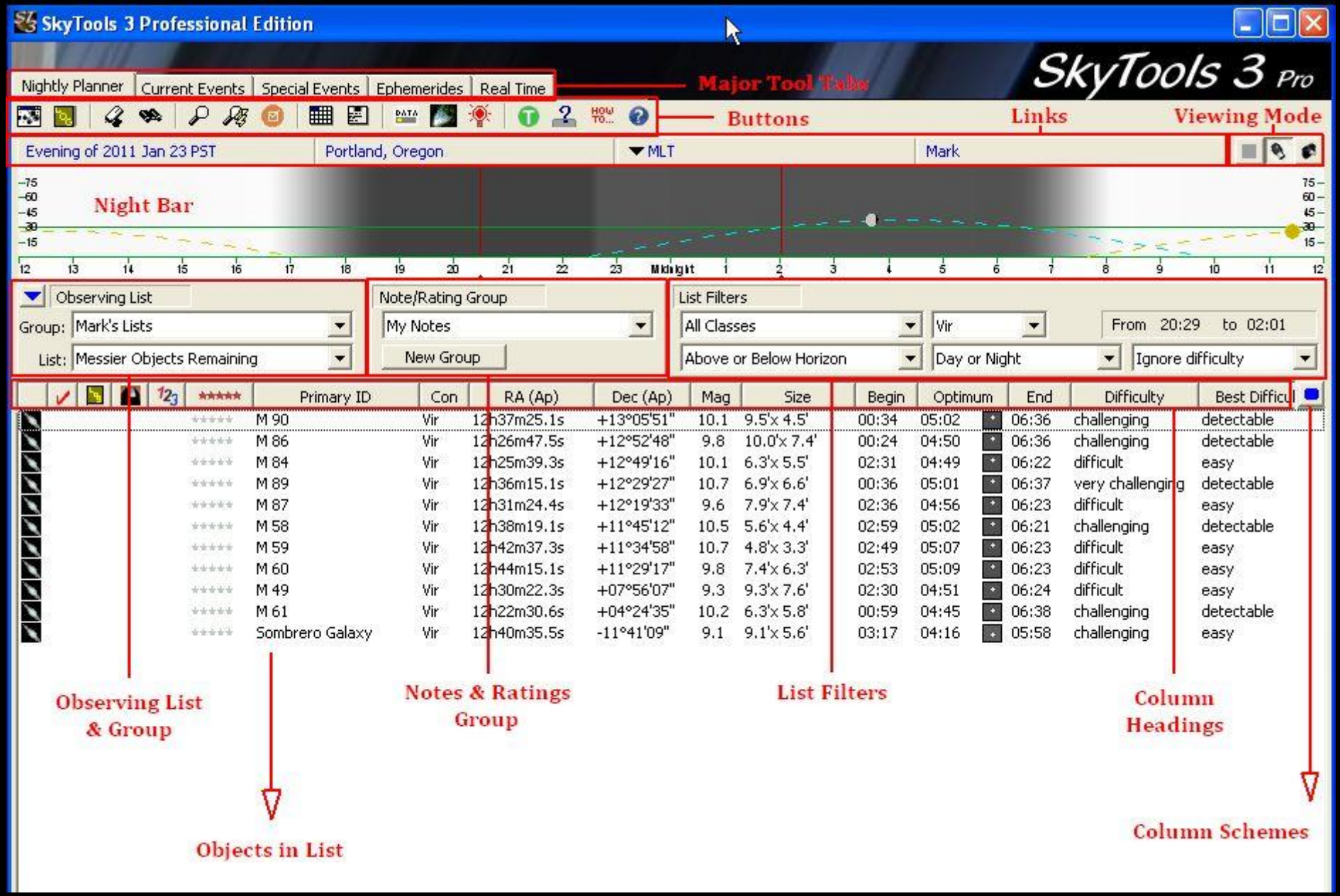
It has Five Main Components

- Nightly Planner – observation planning
- Current Events Tool – events in near future
- Special Events Tool – historical or events in distant future
- Ephemerides Tool
- Real Time Tool – telescope/DSC/mount control

In addition, SkyTools 3 provides several different types of charts.
Some charts simulate views through telescopes or cameras.
One chart allows you to control mounts.

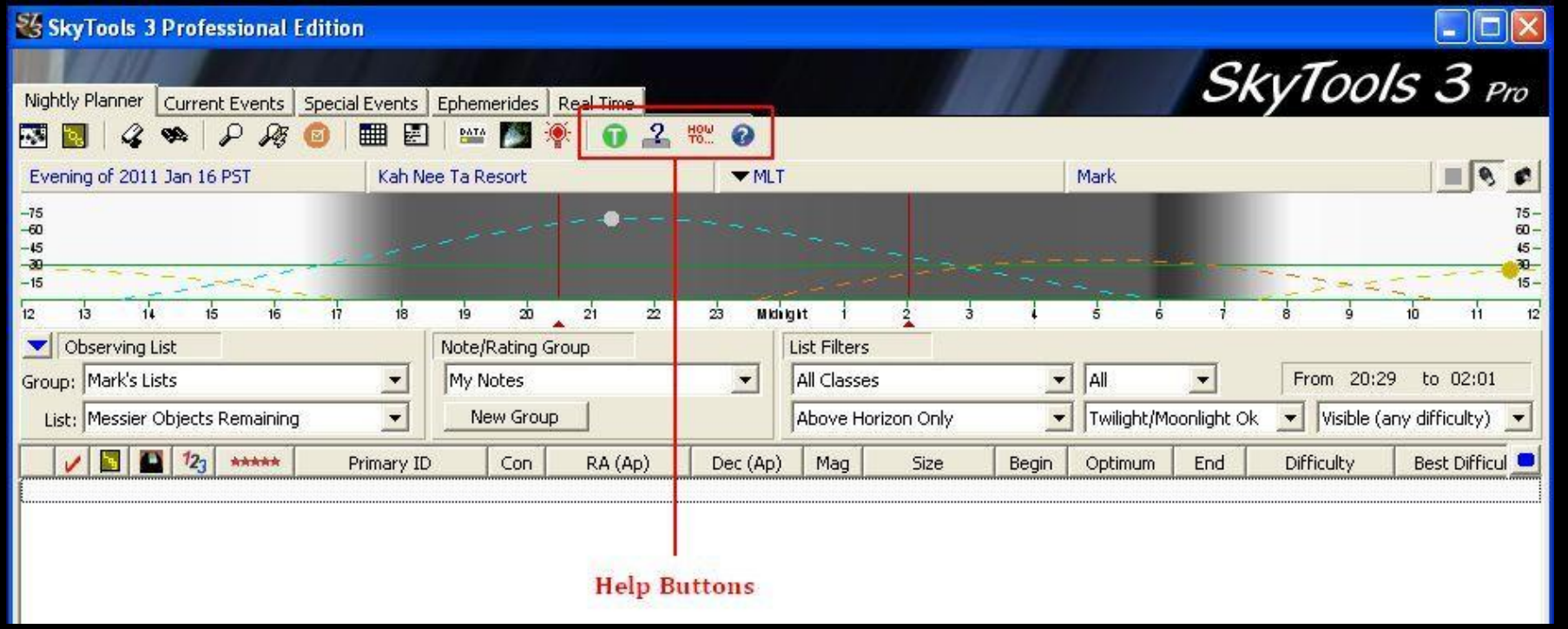
It has nearly complete support for visual observation and good support for most types of amateur imaging.

Program Components in the Nightly Planner



Helpful Resources when Using SkyTools 3

Help Buttons



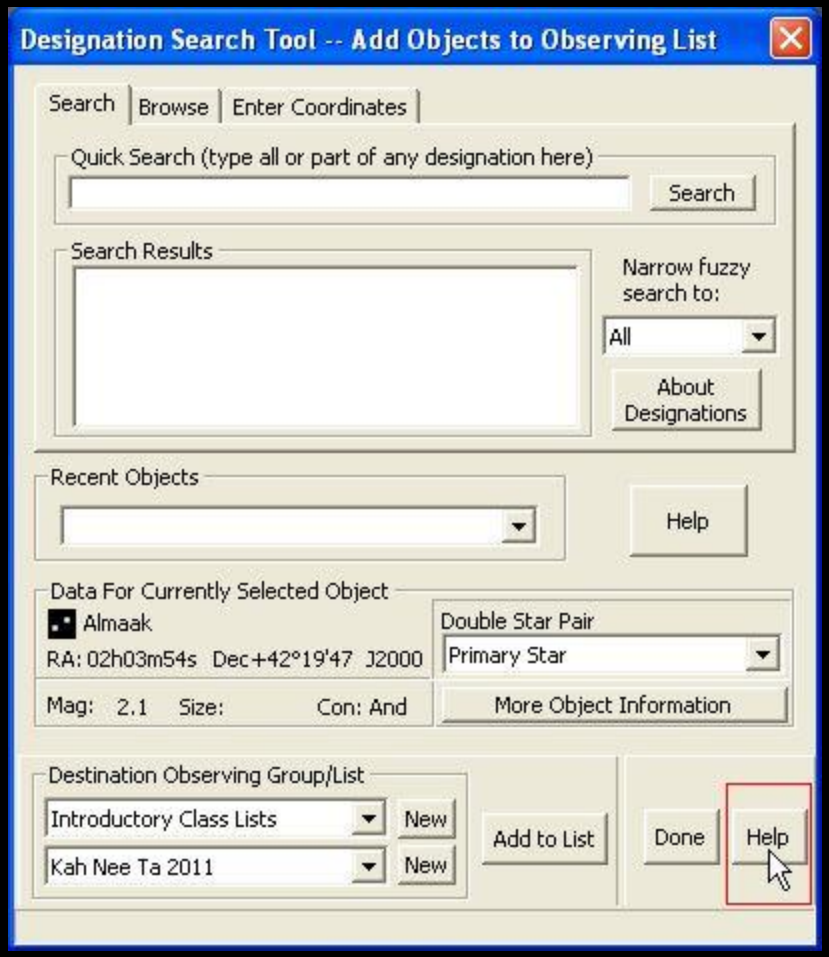
Tutorials, Help for Current Tab, How To's, Help Index

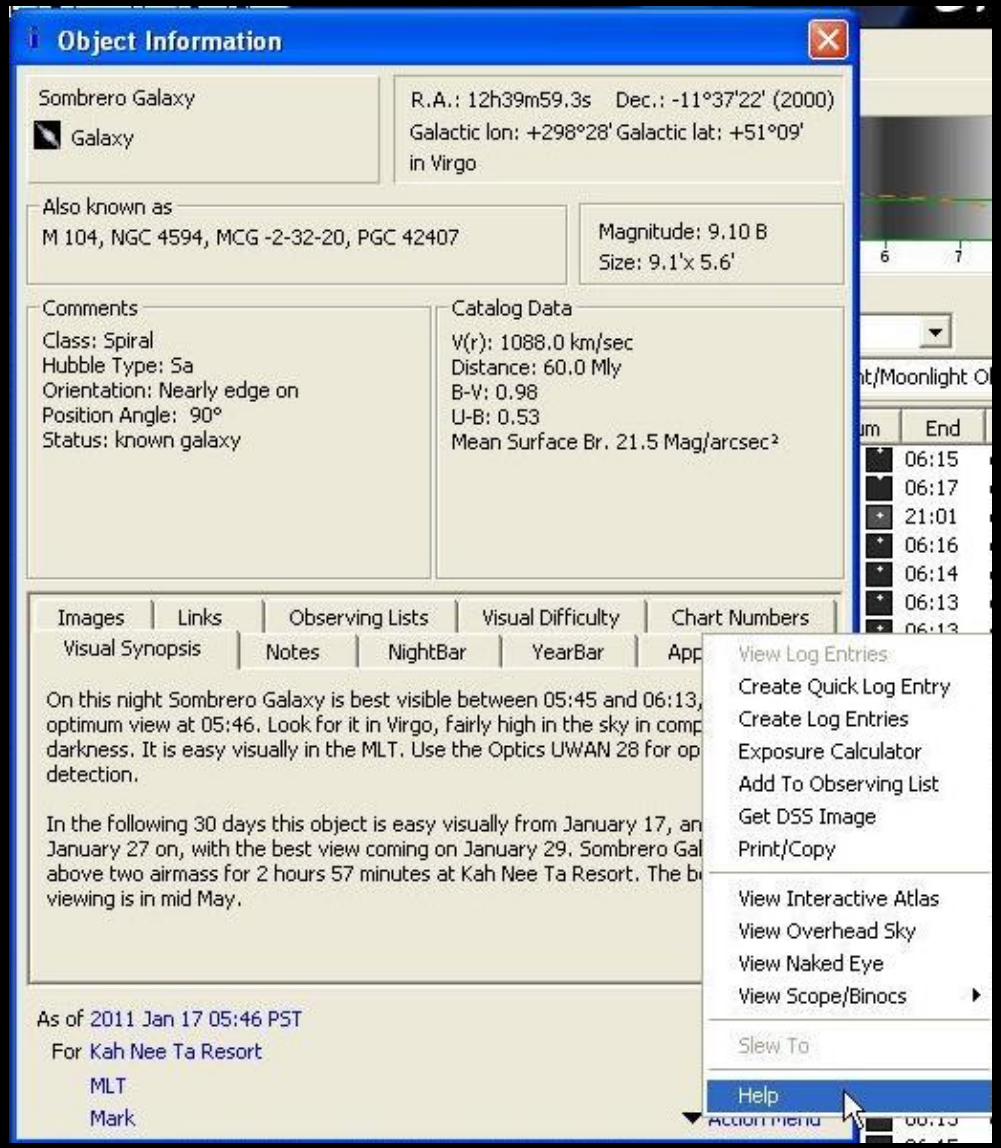
Helpful Resources when Using SkyTools 3

Tool Tips

Helpful Resources when Using SkyTools 3

Dialog Box Help Buttons
& Menu Items





Helpful Resources when Using SkyTools 3

SkyTools Yahoo! Group

http://groups.yahoo.com/group/skytools/

Greg Crinklaw and others answer questions.

SkyTools 3 User Guides

Skyhound Download page

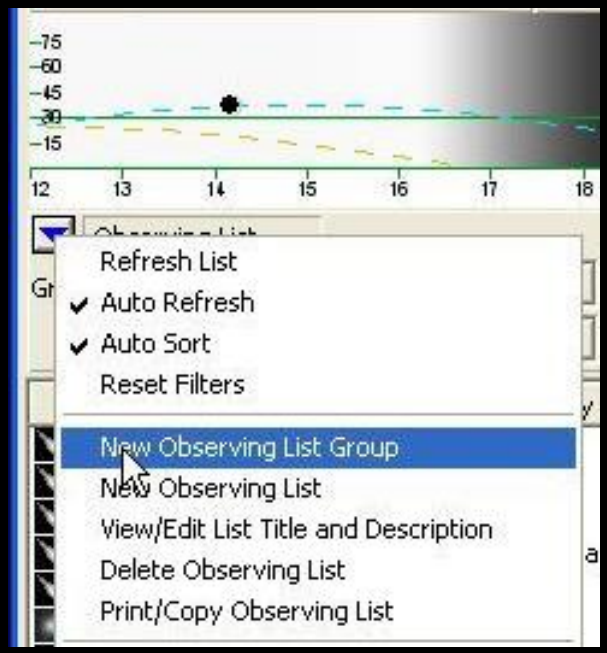
http://www.skyhound.com/downloads.html

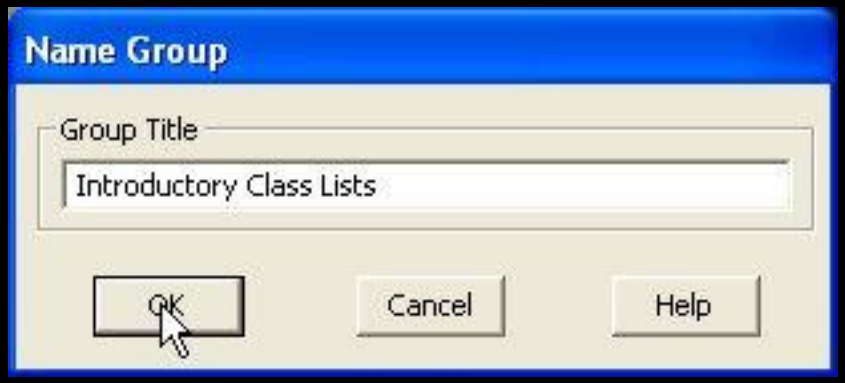
Standard Edition: 566 pages
Professional Edition: 623 pages
Each is about 4 MB in size.

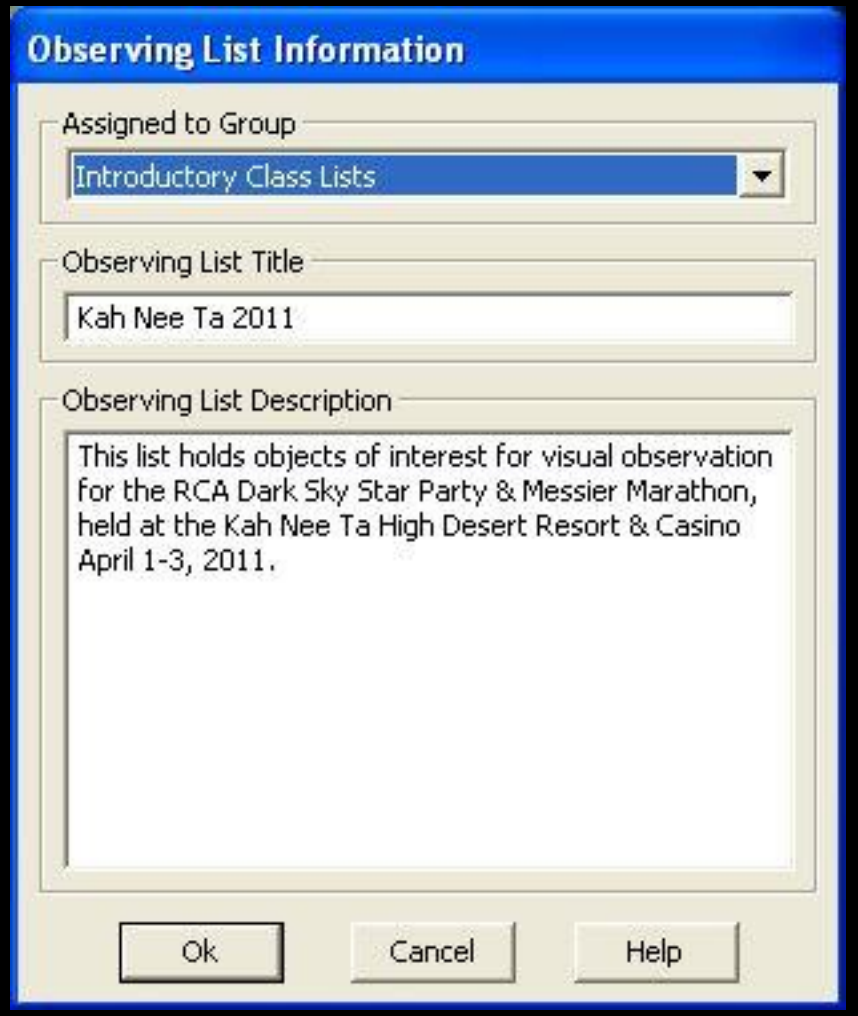
Helping a friend or two or 60 learn the software

Using SkyTools 3 to Prepare for the Kah Nee Ta Star Party

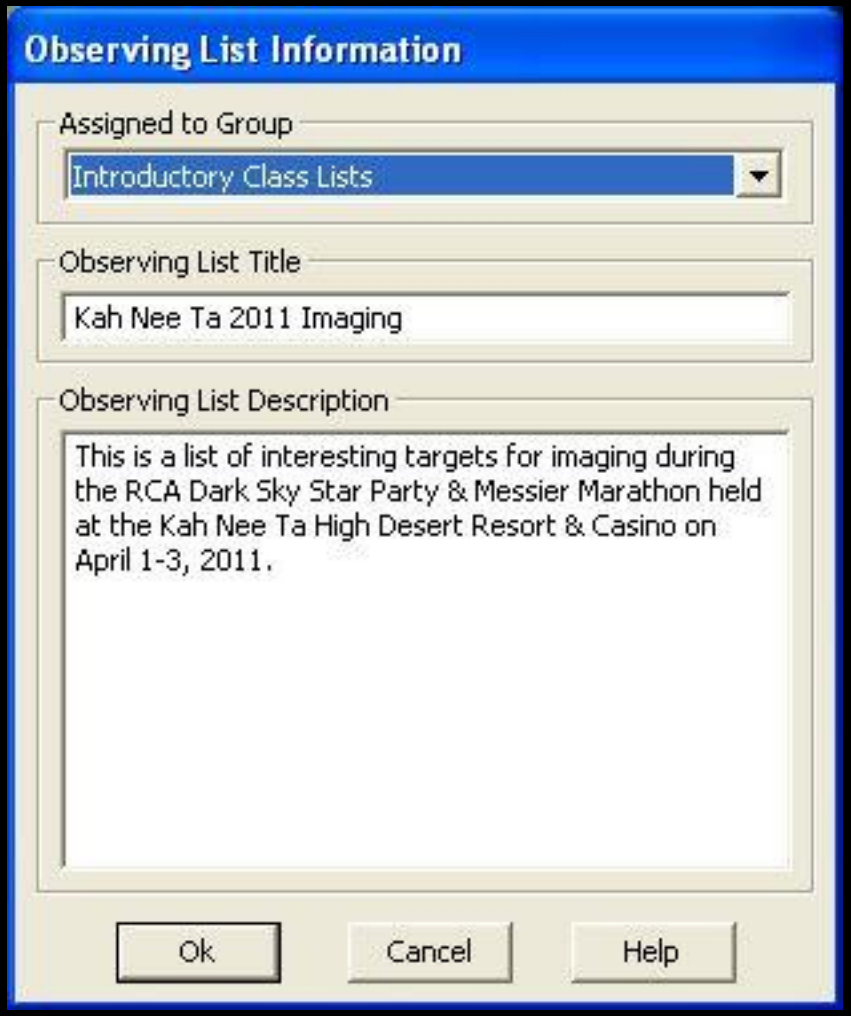
1. Create the “Introductory Class Lists” observing list group
2. Create the empty “Kah Nee Ta 2011” observing list



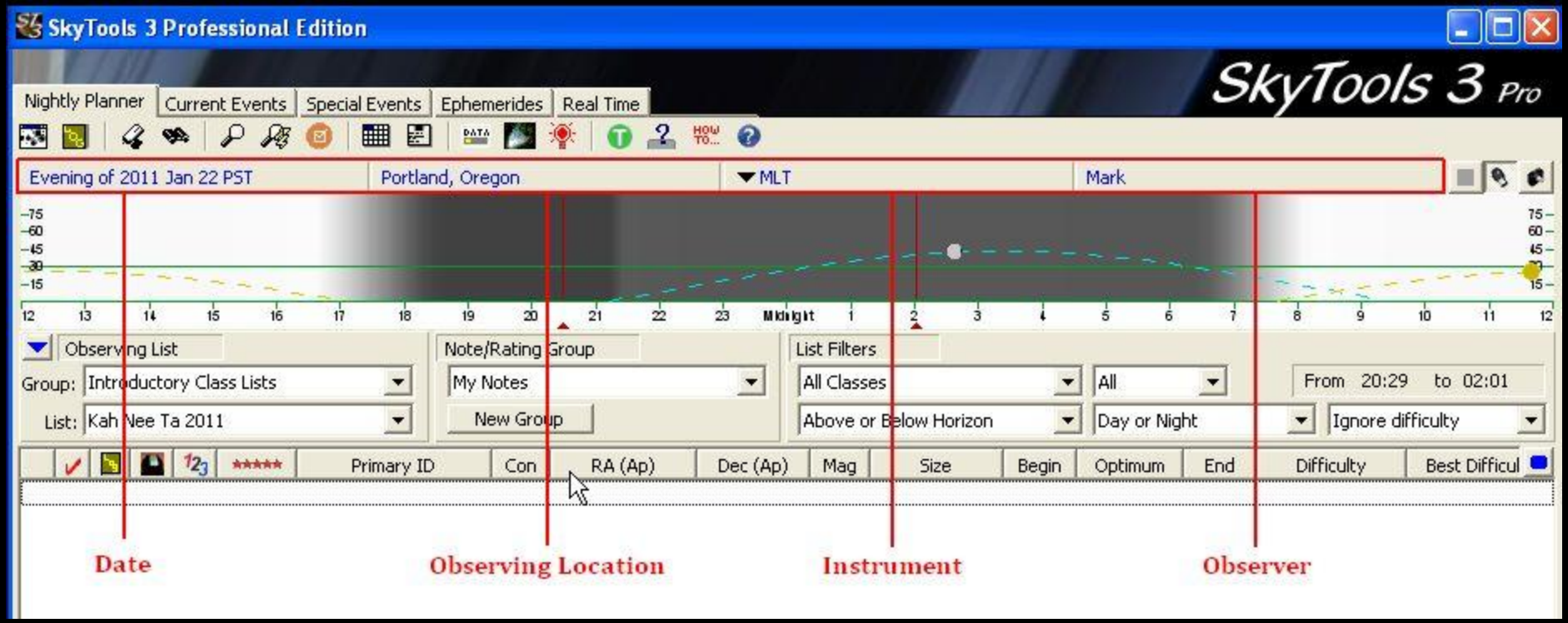




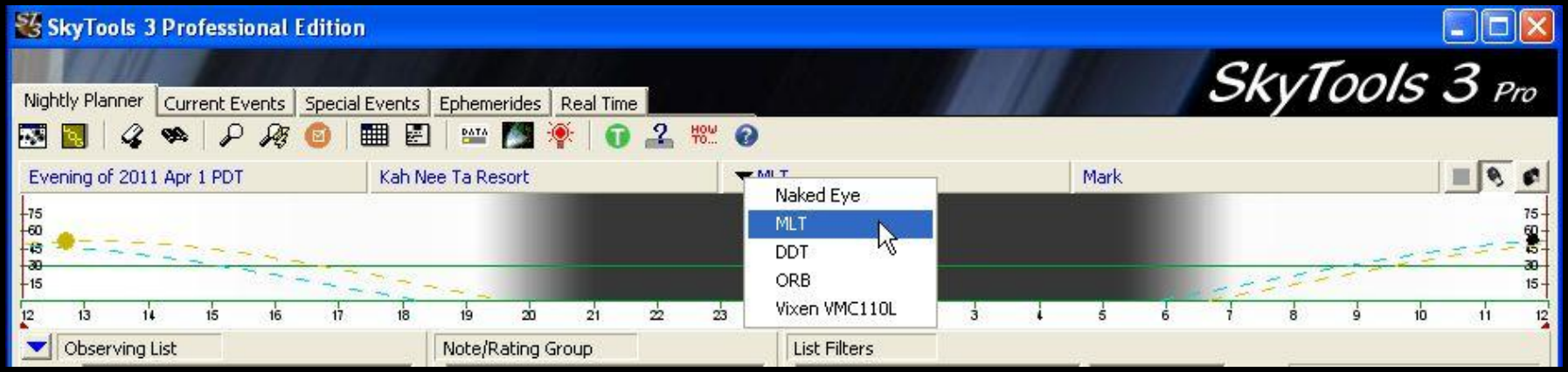
If you have the Professional Edition, create the observing list "Kah Nee Ta 2011 Imaging" in the Introductory Class Lists group.

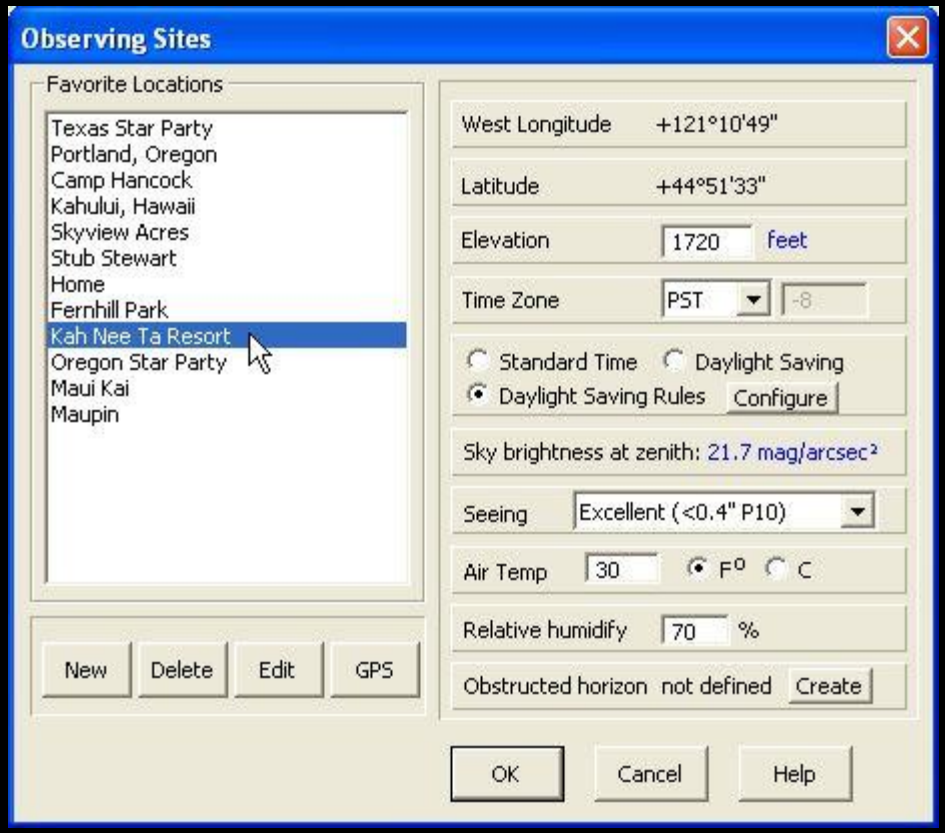


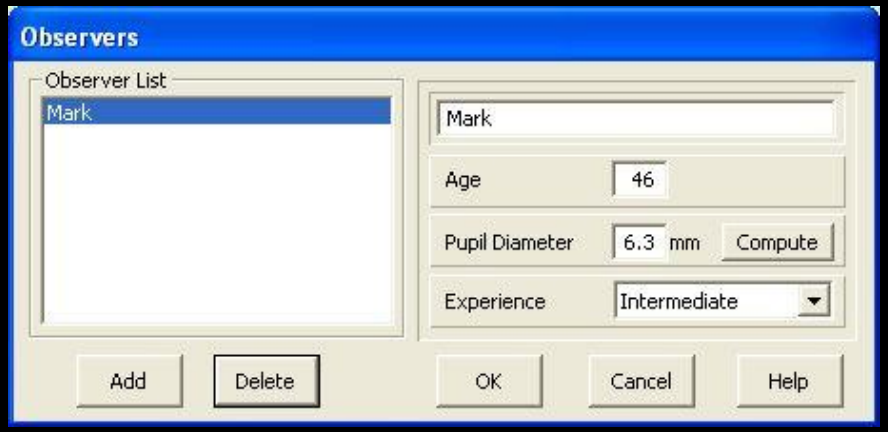
Set Date, Location, Instrument, & Observer



A date stretches from noon on the given date until noon the next day.


SkyTools 3 Professional Edition
SkyTools 3 Pro
Nightly Planner
Current Events
Special Events
Ephemerides
Real Time
Evening of 2011 Apr 1 PDT
Kah Nee Ta Resort
Mark
Naked Eye
MLT
DDT
ORB
Vixen VMC110L
Observing List
Note/Rating Group
List Filters


Observing Sites
Favorite Locations
Texas Star Party
Portland, Oregon
Camp Hancock
Kahului, Hawaii
Skyview Acres
Stub Stewart
Home
Fernhill Park
Kah Nee Ta Resort
Oregon Star Party
Maui Kai
Maupin
West Longitude +121°10'49"
Latitude +44°51'33"
Elevation 1720 feet
Time Zone PST -8
Standard Time
Daylight Saving
Daylight Saving Rules
Configure
Sky brightness at zenith: 21.7 mag/arcsec²
Seeing Excellent (<0.4" P10)
Air Temp 30 F° C
Relative humidify 70 %
Obstructed horizon not defined
Create
New
Delete
Edit
GPS
OK
Cancel
Help


Observers
Observer List
Mark
Mark
Age 46
Pupil Diameter 6.3 mm
Compute
Experience Intermediate
Add
Delete
OK
Cancel
Help

My Equipment

Visual Observation

- ❑ 16” Meade Lightbridge Dobsonian telescope (≈ $1900, MLT)

Imaging

- ❑ 10” Astro-Tech Imaging Newtonian (≈ $600, AT10IN)
- ❑ Canon 40D 10.1 MP DSLR camera (≈ $500 – 1000)
- ❑ SBIG ST-7XME Deluxe astronomical CCD camera ($2495)

At prime focus with the AT10IN telescope, the cameras have the fields of view and resolutions

- ➢ Canon 40D = 75’ x 50’, 3.3”/pixel
- ➢ SBIG ST-7XME Deluxe = 23.3’ x 15.5’, 5.2”/pixel

Piggyback, the Canon 40D camera with a 50 mm f/1.4 lens has a field of view of 25.4° x 16.9°.

MLT Report

Mark
Intermediate, 6.3mm pupils

Kah Nee Ta Resort
Naked Eye Limiting Magnitude: 7.0

Comments/Data

Telescope type: Reflector
Aperture: 16.0 inches
Focal length: 72.0 inches
Focal ratio: 4.5
Mounting: Alt/Azimuth
Optical condition: a little dirty

Dawes resolution limit: 0.3"
Typical practical visual magnification limit: 880
Recommended eyepiece magnifications: 58, 100, 410 plus 2X Barlow
Typical limiting visual magnitude: 16.4

10 x 60 mm finder scope Field of View: 5.0° Limiting magnitude: 10.

Eyepiece Information

Eyepiece	Magnification	Field of View	Exit Pupil	Limiting Mag
Vixen NPL 25	73	41.0'	5.6	15.2
Plössl 15mm	122	24.6'	3.3	15.6
Optics UWAN 28 2.0x	131	37.7'	3.1	15.6
Vixen NPL 25 2.0x	146	20.5'	2.8	15.7
Optics SPL 12.5	146	22.6'	2.8	15.7
Scientific 100 Series 9	203	29.5'	2.0	15.8
Plössl 15mm 2.0x	244	12.3'	1.7	15.9

Close | Print/Copy | Help

Astro-Tech AT10IN Report

Mark
Intermediate, 6.3mm pupils

Kah Nee Ta Resort
Naked Eye Limiting Magnitude: 7.0

Comments/Data

Telescope type: Reflector
Aperture: 254.0mm
Focal length: 1016.0mm
Focal ratio: 4.0
Mounting: Equatorial
Optical condition: clean

Dawes resolution limit: 0.5"
Typical practical visual magnification limit: 550
Recommended eyepiece magnifications: 36, 64, 250 plus 2X Barlow
Typical limiting visual magnitude: 15.5

8 x 50 mm finder scope Field of View: 5.0° Limiting magnitude: 10.4

Canon 40D digital camera: 3888 x 2592 pixels (1x1 bins)
SBIG ST-7XME Deluxe CCD camera: 765 x 510 pixels (1x1 bins

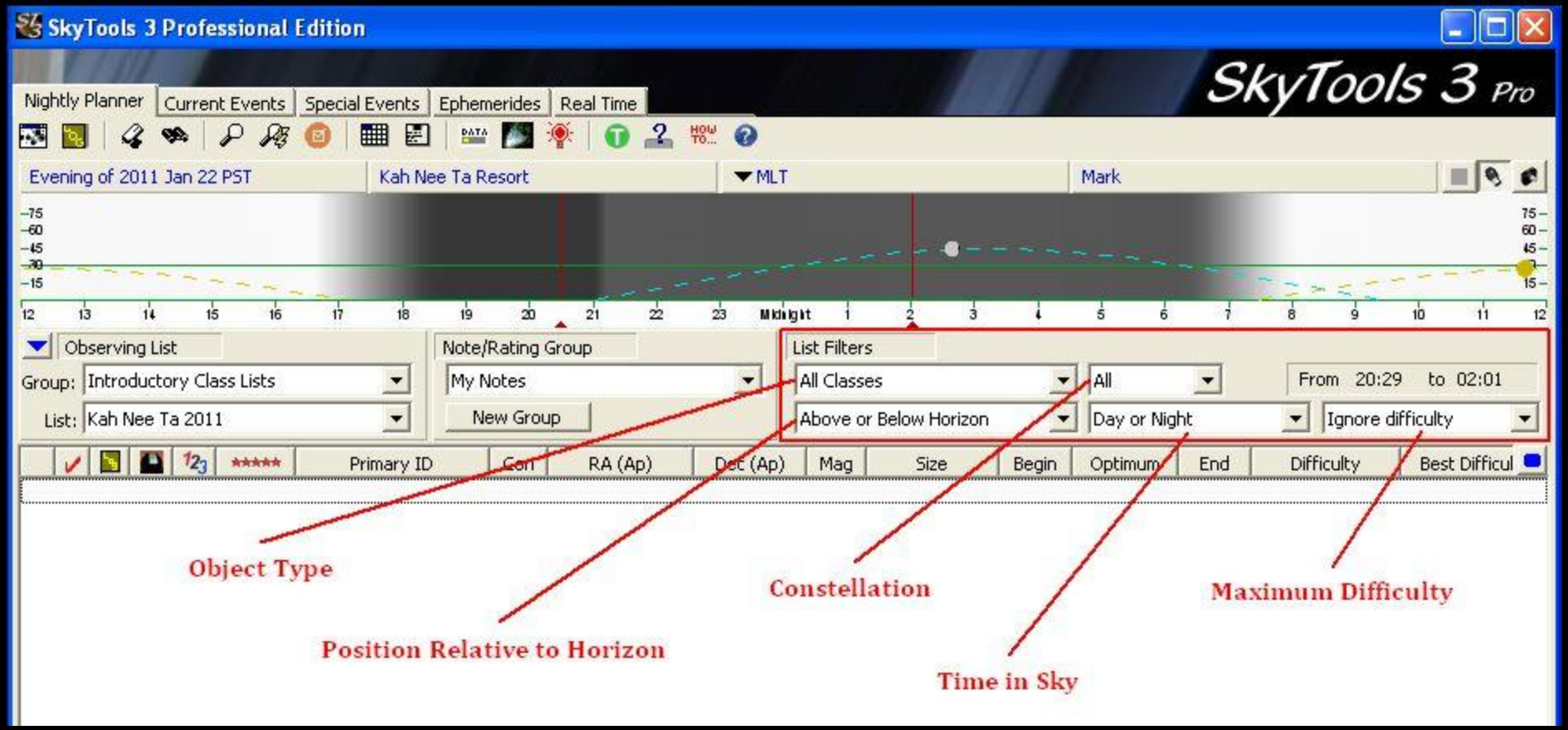
Camera Information

Camera	Focal State	Lens	Field of View	Resolution
SBIG ST-7XME Deluxe	Prime Focus		23.3'x 15.5'	5.2"/pix
Canon 40D	Prime Focus		75.0'x 50.0'	3.3"/pix
Canon 40D	Piggyback	50 mm f/1.4	25.4°x 16.9°	66.5"/pix

Eyepiece Information

Eyepiece	Magnification	Field of View	Exit Pupil	Limiting Mag
MaxView 40	25	103.9'	10.0	13.1
Optics UWAN 28	36	135.6'	7.0	13.8

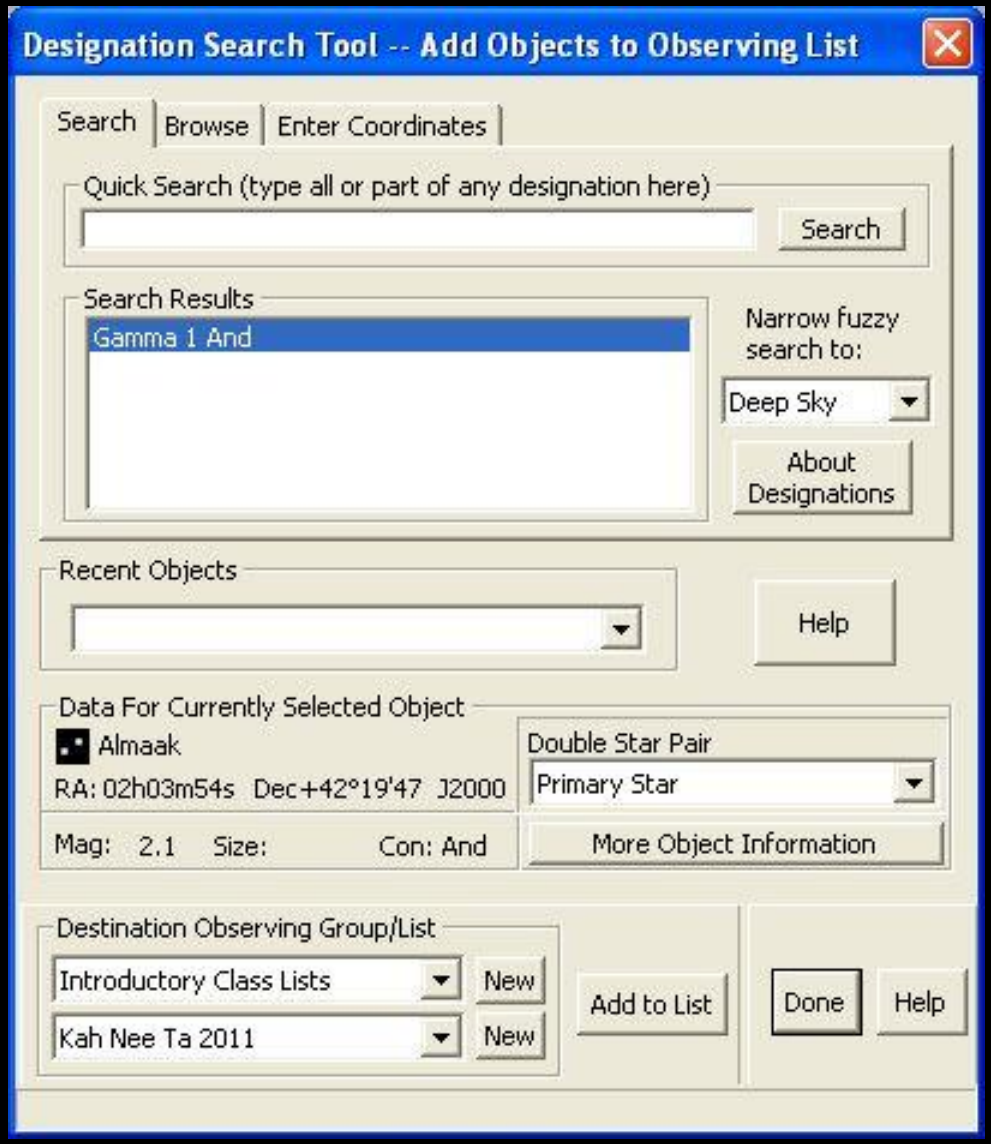
Set Filters to Show All Objects

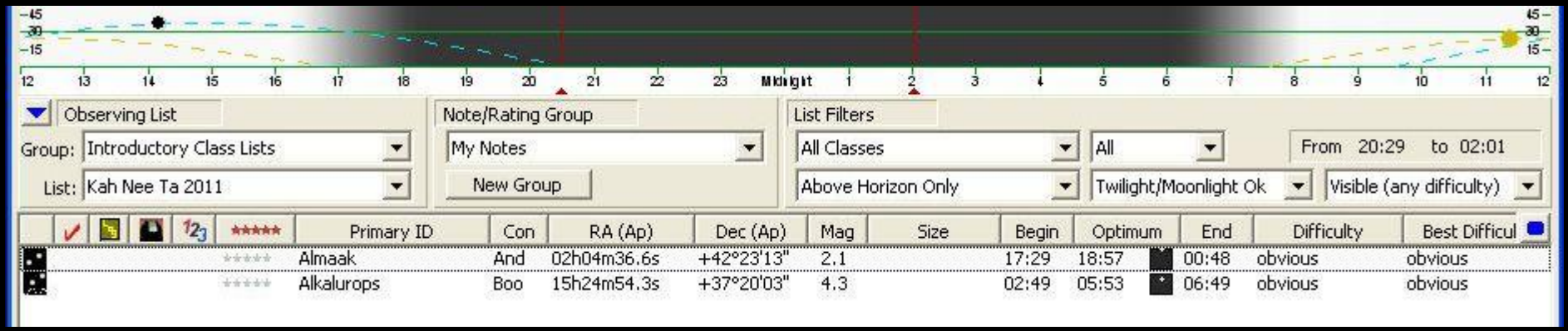


Using a Designation Search to Add an Individual Object to a List

Add γ Andromeda to our list.

Exercise: Add μ Boötis to the Kah Nee Ta 2011 observing List using a Designation Search for “mu boo”.





If you can't find the object in the search results,

1. Consult "About Designations" to check format of name.
2. Search by location (Most reliable method)
   a. Find location – Wikipedia (http://www.wikipedia.org)
      SIMBAD (http://simbad.u-strasbg.fr/simbad/) for Milky Way
      NED (http://nedwww.ipac.caltech.edu/) for outside Milky Way
   b. Open Interactive Atlas to position, look for object nearby, and add if found.

   Alternative: Use Database Power Search Tool to search for objects within radius.

If you still can't find it, might want to add it to the Supplemental Database. (Last resort)

Exercise: Find the galaxy ESO 435-G019 in the SkyTools database.

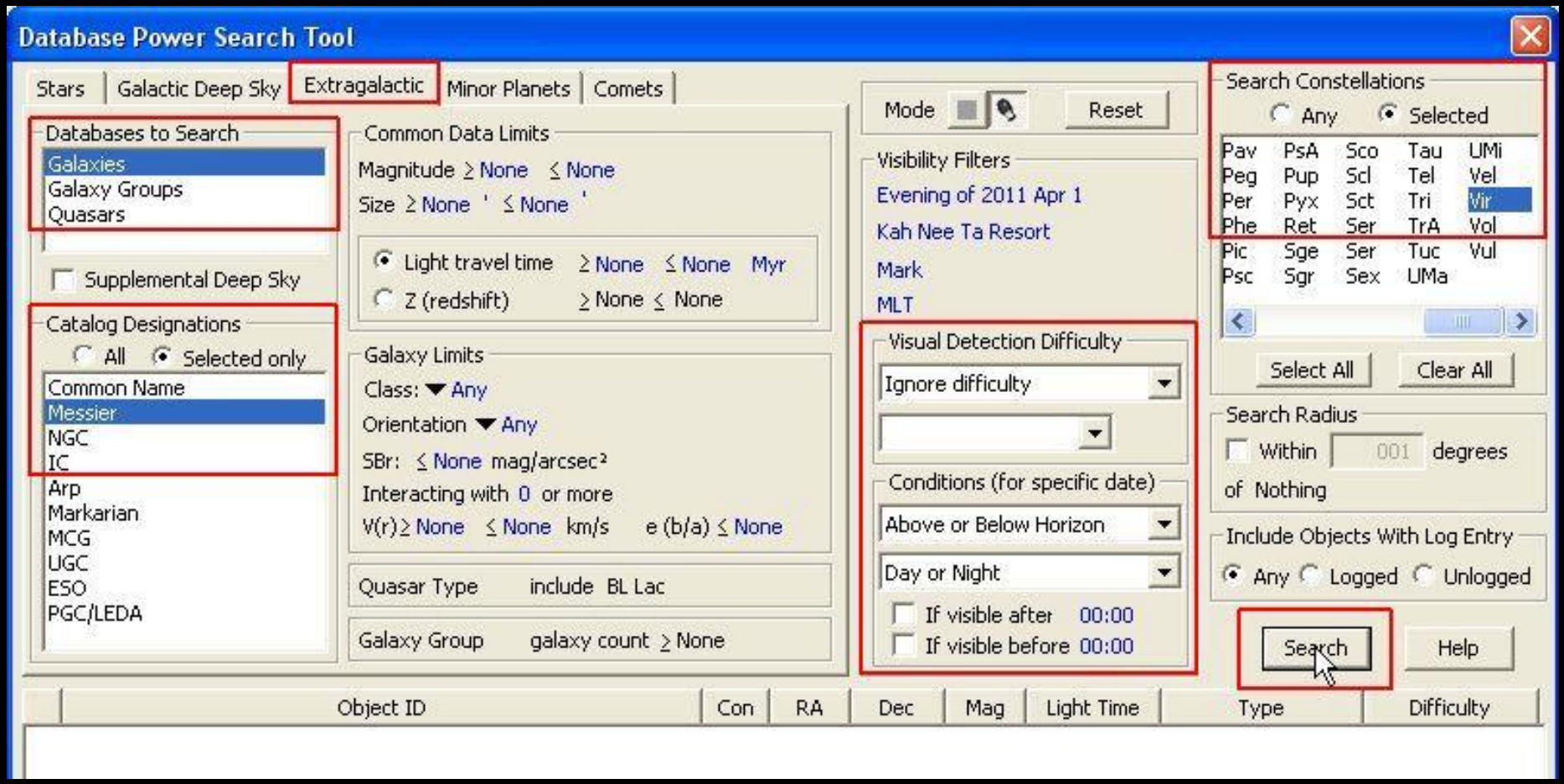
Using a Database Power Search to Add Multiple Objects to a List

<u>Examples</u>:

1. Find all of the Messier galaxies in Coma and Virgo and add them to a list.
2. Find all planetary nebulae with surface brightness above a certain value that will be above 2x airmass and visible in complete darkness on a given night from a given location and add them to a list.
3. Find all of the globular clusters in the NGC within 10° of θ Ophiuchus and add them to a list.

To illustrate, let's find all of the Messier galaxies in Coma and Virgo and add them to our list.

Settings for Finding All Messier Galaxies in Coma & Virgo



Your observing list should contain 20 objects after adding these galaxies.

Exercise: Use the Database Power Search Tool to find all of the planetary nebulae in Corvus (Crv) and Hydra (Hya) with magnitudes less than 12 that will be above the horizon, and visible in complete darkness on the first night of the Kah Nee Ta star party (April 1, 2011). Add these to the Kah Nee Ta 2011 observing list.

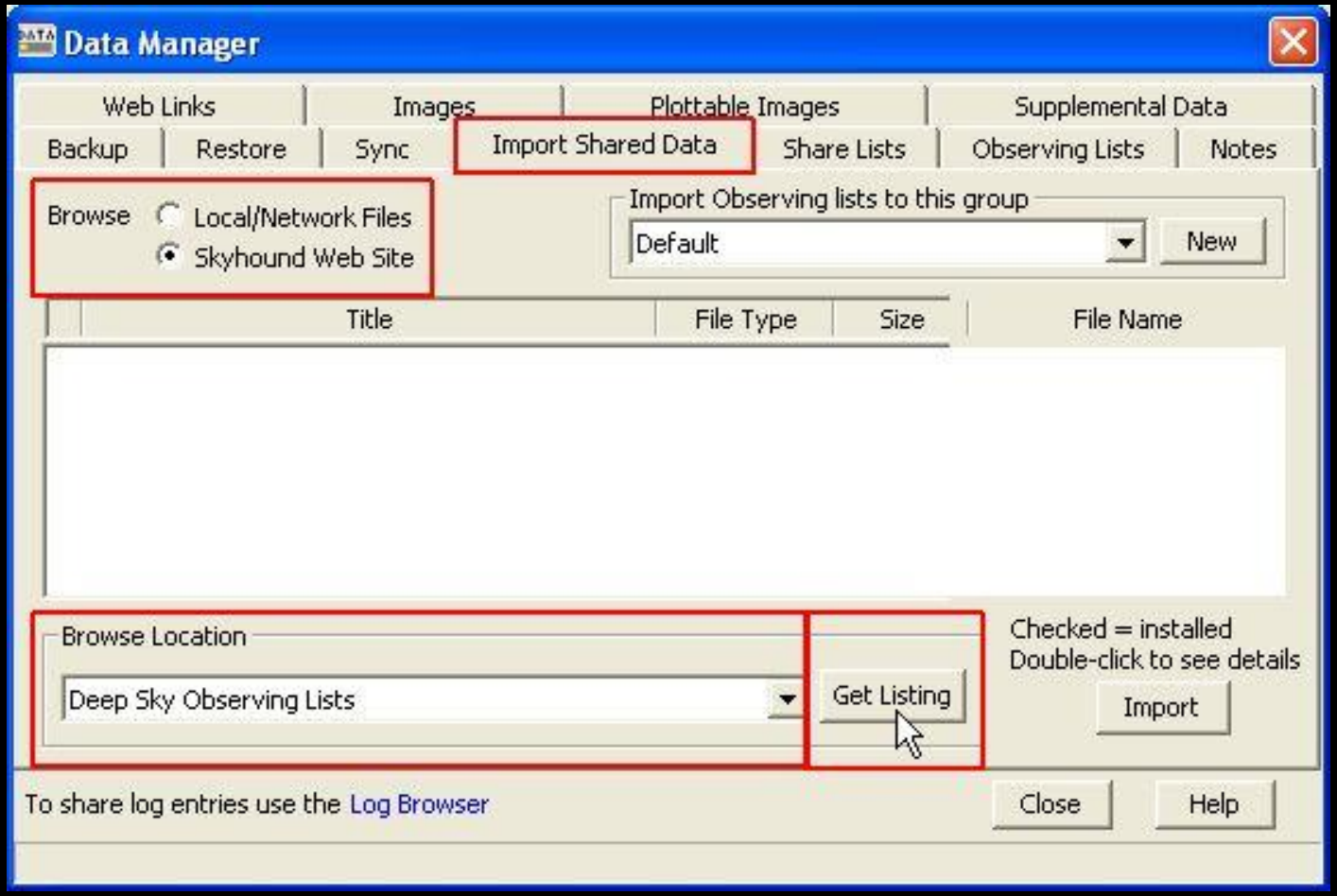
Exercise: Find all of the open clusters with magnitudes less than 8 that are within 10° of Sirius with visual detection difficulties that are Detectable or less difficult and add them to the Kah Nee Ta 2011 observing list.

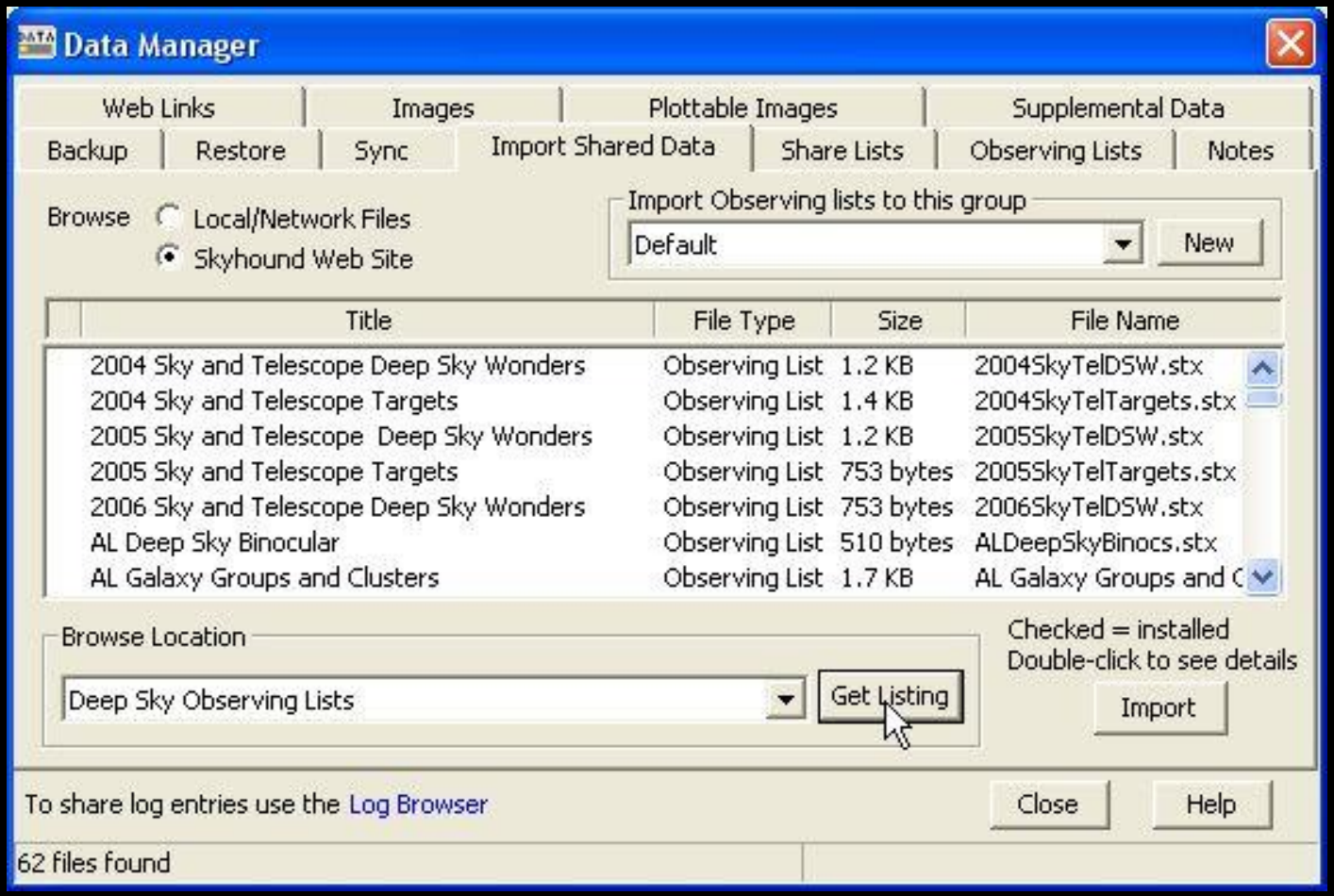
After completing these exercises, your observing list should contain 28 objects.

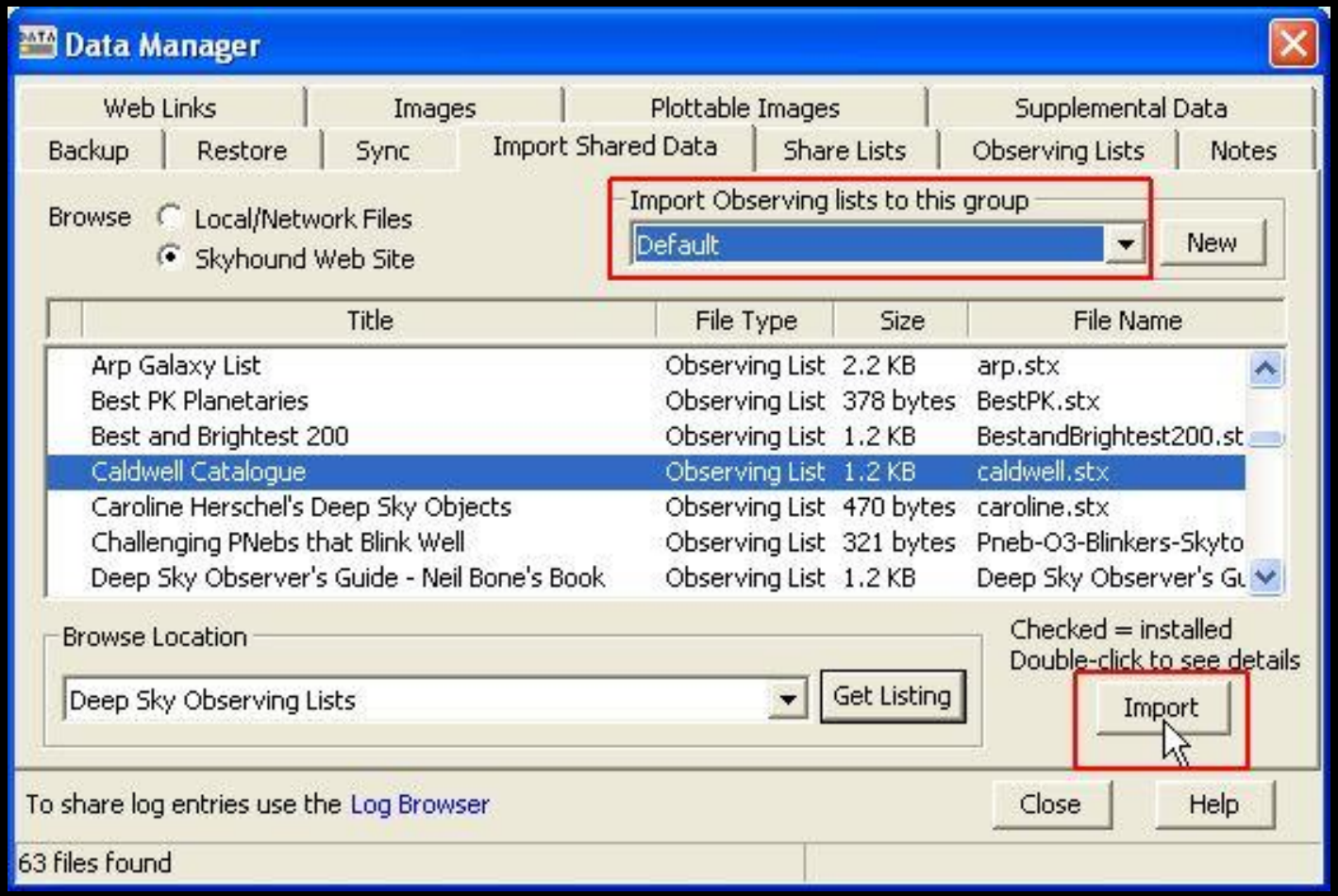
Downloading an Observing List and Copying Objects to Another List

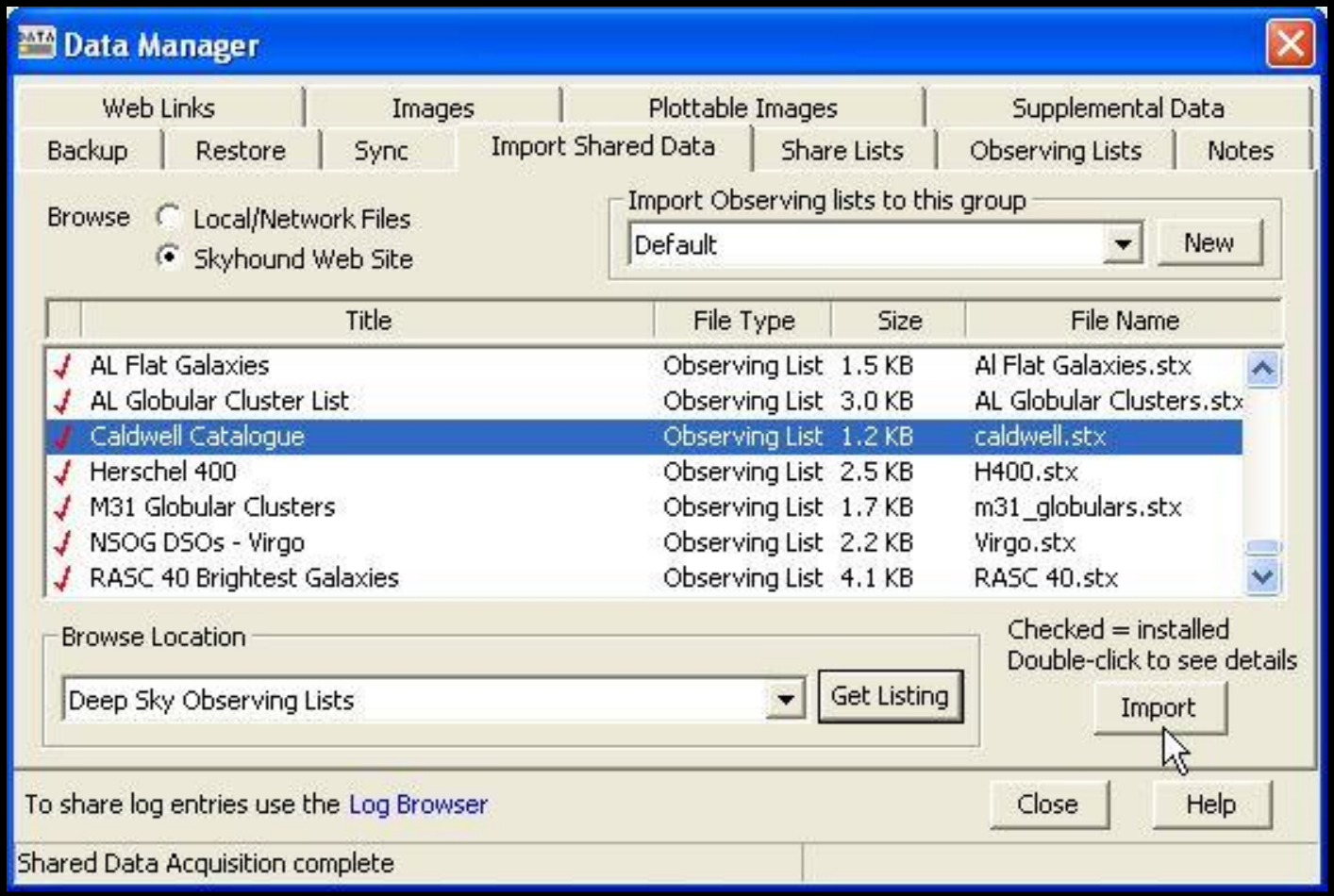
Suppose you're working on your Astronomical League Caldwell List and you'd like to take the opportunity to log a few more objects under the dark skies of the star party. But SkyTools 3 doesn't include a list of the Caldwell objects by default. So we'll try to

download the list from the Internet. The tool for doing this is the Data Manager.

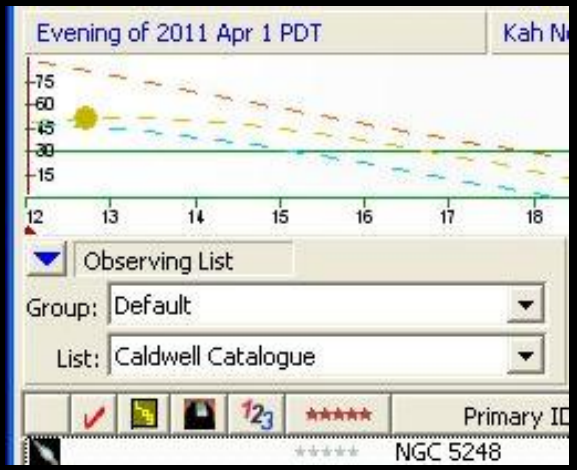

Data Manager
Web Links
Images
Plottable Images
Supplemental Data
Backup
Restore
Sync
Import Shared Data
Share Lists
Observing Lists
Notes
Browse
Local/Network Files
Skyhound Web Site
Import Observing lists to this group
Default
New
Title
File Type
Size
File Name
Browse Location
Deep Sky Observing Lists
Get Listing
Checked = installed
Double-click to see details
Import
To share log entries use the Log Browser
Close
Help


Data Manager
Web Links
Images
Plottable Images
Supplemental Data
Backup
Restore
Sync
Import Shared Data
Share Lists
Observing Lists
Notes
Browse
Local/Network Files
Skyhound Web Site
Import Observing lists to this group
Default
New
Title
File Type
Size
File Name
2004 Sky and Telescope Deep Sky Wonders
Observing List
1.2 KB
2004SkyTelDSW.stx
2004 Sky and Telescope Targets
Observing List
1.4 KB
2004SkyTelTargets.stx
2005 Sky and Telescope Deep Sky Wonders
Observing List
1.2 KB
2005SkyTelDSW.stx
2005 Sky and Telescope Targets
Observing List
753 bytes
2005SkyTelTargets.stx
2006 Sky and Telescope Deep Sky Wonders
Observing List
753 bytes
2006SkyTelDSW.stx
AL Deep Sky Binocular
Observing List
510 bytes
ALDeepSkyBinocs.stx
AL Galaxy Groups and Clusters
Observing List
1.7 KB
AL Galaxy Groups and C
Browse Location
Deep Sky Observing Lists
Get Listing
Checked = installed
Double-click to see details
Import
To share log entries use the Log Browser
Close
Help
62 files found

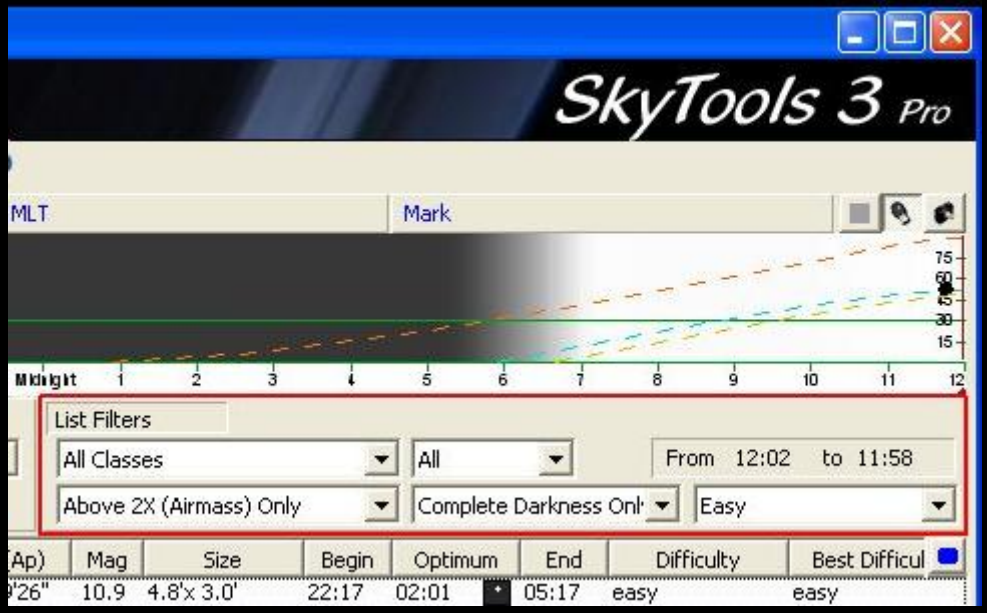

Data Manager
Web Links
Images
Plottable Images
Supplemental Data
Backup
Restore
Sync
Import Shared Data
Share Lists
Observing Lists
Notes
Browse
Local/Network Files
Skyhound Web Site
Import Observing lists to this group
Default
New
Title
File Type
Size
File Name
Arp Galaxy List Observing List 2.2 KB arp.stx
Best PK Planetaries Observing List 378 bytes BestPK.stx
Best and Brightest 200 Observing List 1.2 KB BestandBrightest200.st
Caldwell Catalogue Observing List 1.2 KB caldwell.stx
Caroline Herschel's Deep Sky Objects Observing List 470 bytes caroline.stx
Challenging PNebs that Blink Well Observing List 321 bytes Pneb-O3-Blinkers-Skyto
Deep Sky Observer's Guide - Neil Bone's Book Observing List 1.2 KB Deep Sky Observer's Gu
Browse Location
Deep Sky Observing Lists
Get Listing
Checked = installed
Double-click to see details
Import
To share log entries use the Log Browser
Close
Help
63 files found


Data Manager
Web Links
Images
Plottable Images
Supplemental Data
Backup
Restore
Sync
Import Shared Data
Share Lists
Observing Lists
Notes
Browse
Local/Network Files
Skyhound Web Site
Import Observing lists to this group
Default
New
Title
File Type
Size
File Name
AL Flat Galaxies
Observing List
1.5 KB
Al Flat Galaxies.stx
AL Globular Cluster List
Observing List
3.0 KB
AL Globular Clusters.stx
Caldwell Catalogue
Observing List
1.2 KB
caldwell.stx
Herschel 400
Observing List
2.5 KB
H400.stx
M31 Globular Clusters
Observing List
1.7 KB
m31_globulars.stx
NSOG DSOs - Virgo
Observing List
2.2 KB
Virgo.stx
RASC 40 Brightest Galaxies
Observing List
4.1 KB
RASC 40.stx
Browse Location
Deep Sky Observing Lists
Get Listing
Checked = installed
Double-click to see details
Import
To share log entries use the Log Browser
Close
Help
Shared Data Acquisition complete

Select Caldwell List

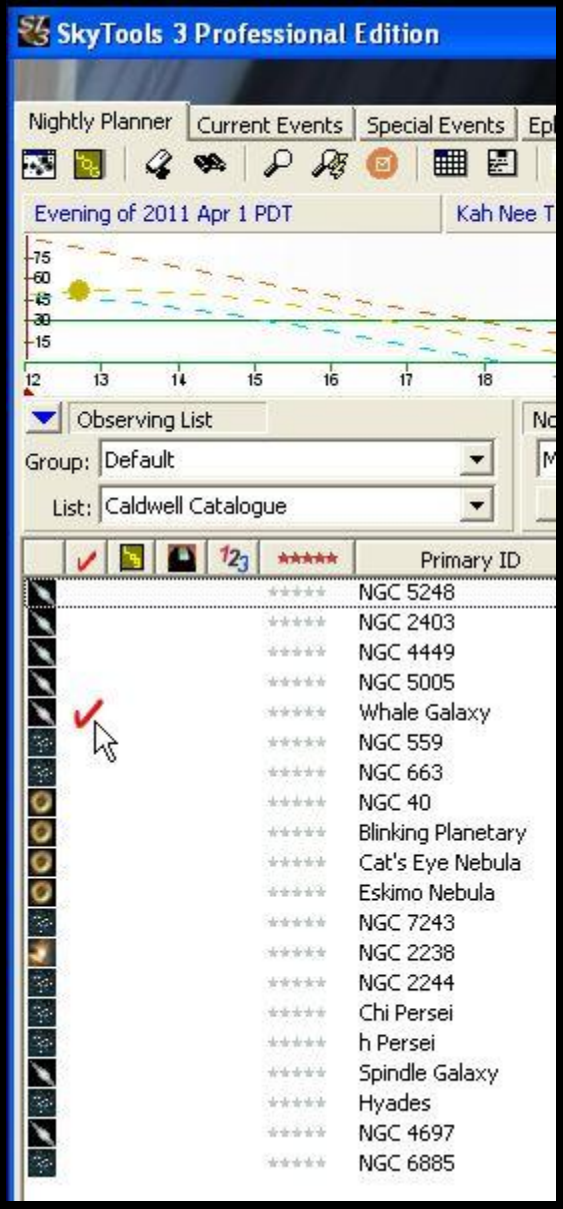


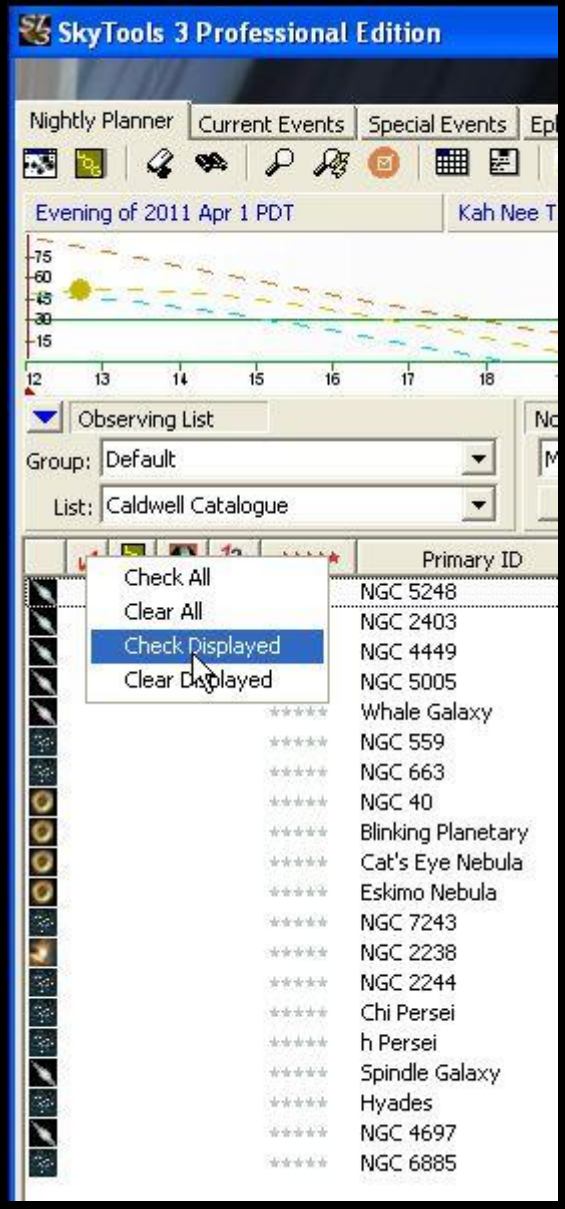
Set Filters to Find Suitable Objects

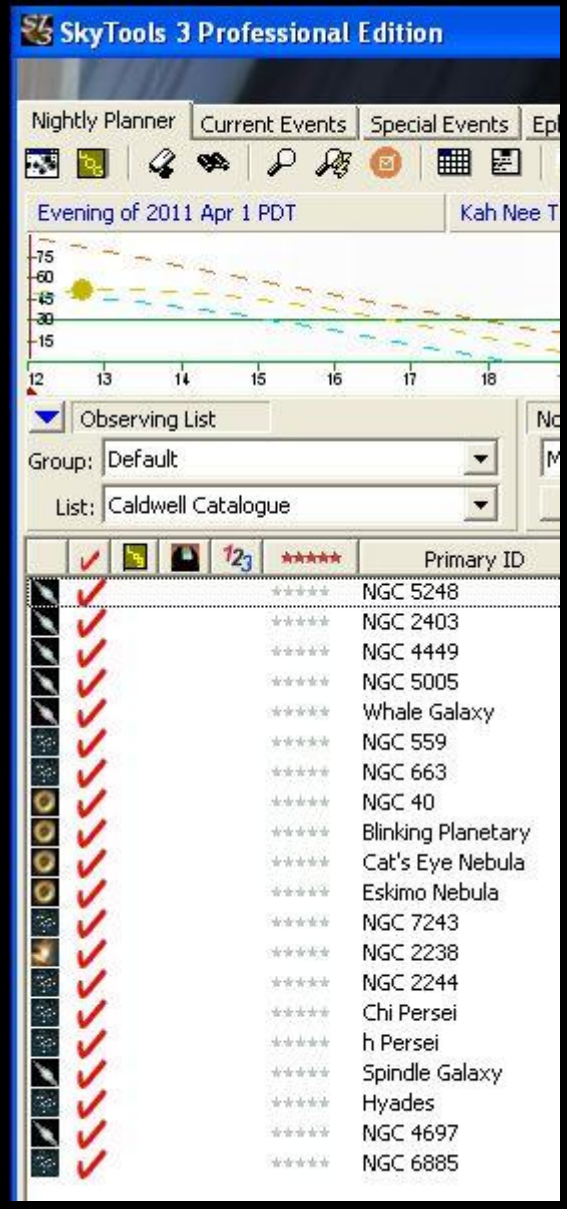


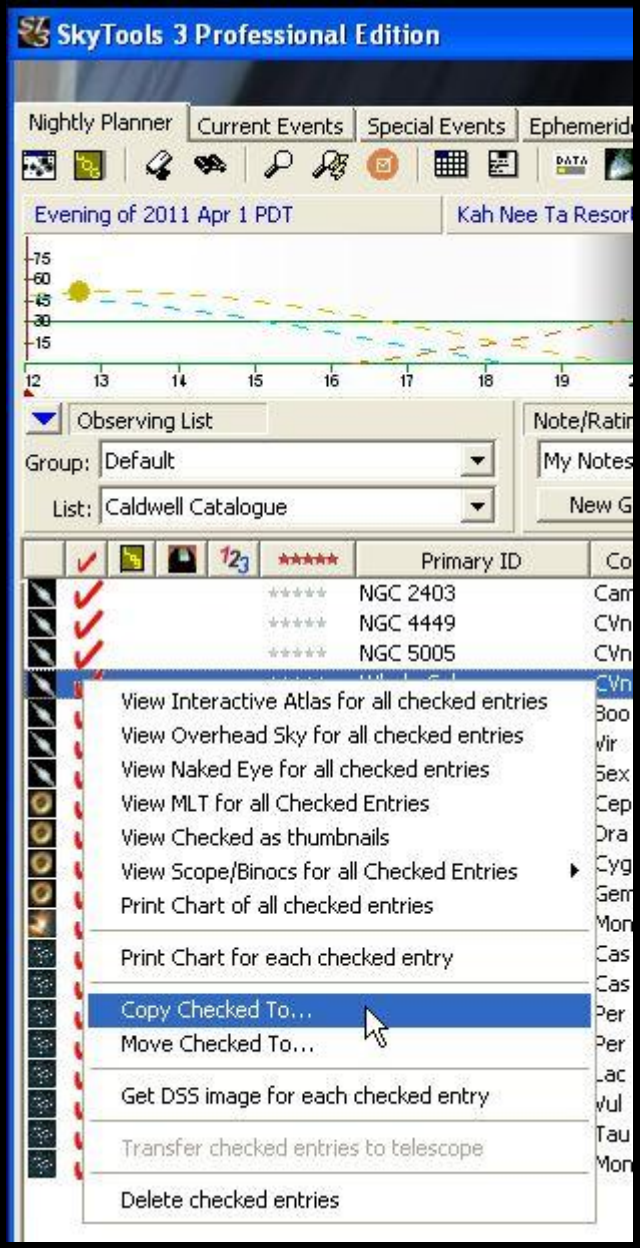
The Filters Extract 20 Objects

Checks Allow Operations on More Than One Object at a Time

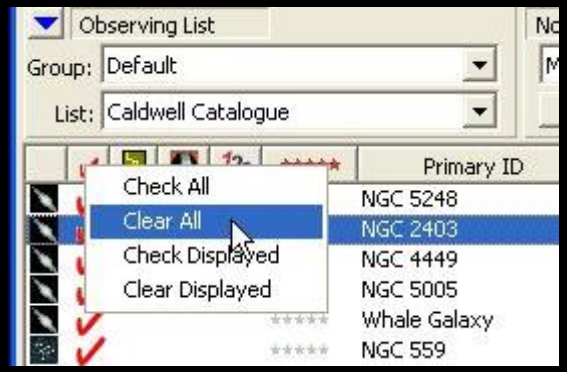








Copy the checked objects to the star party list.
There are now 48 objects on my list.

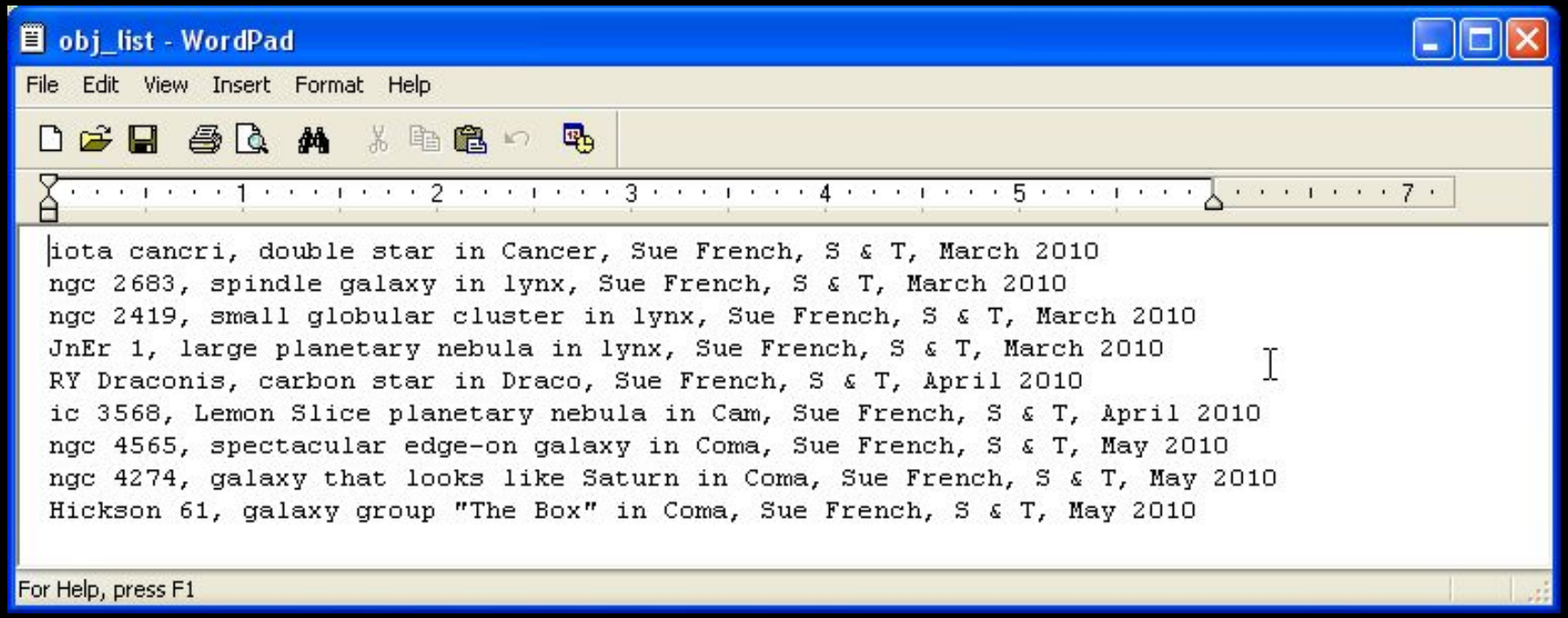


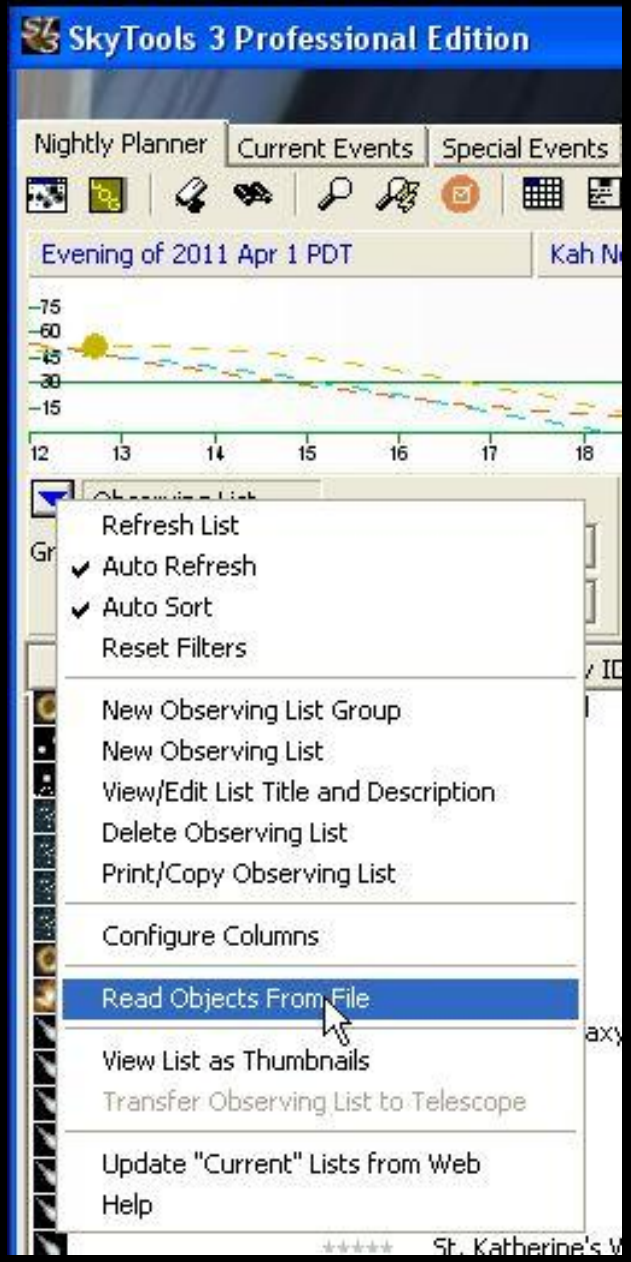
Exercise: Download another observing list from the Skyhound web site and add it to the Default observing list group. Add more objects to the Kah Nee Ta 2011 list until you've added 20 total.

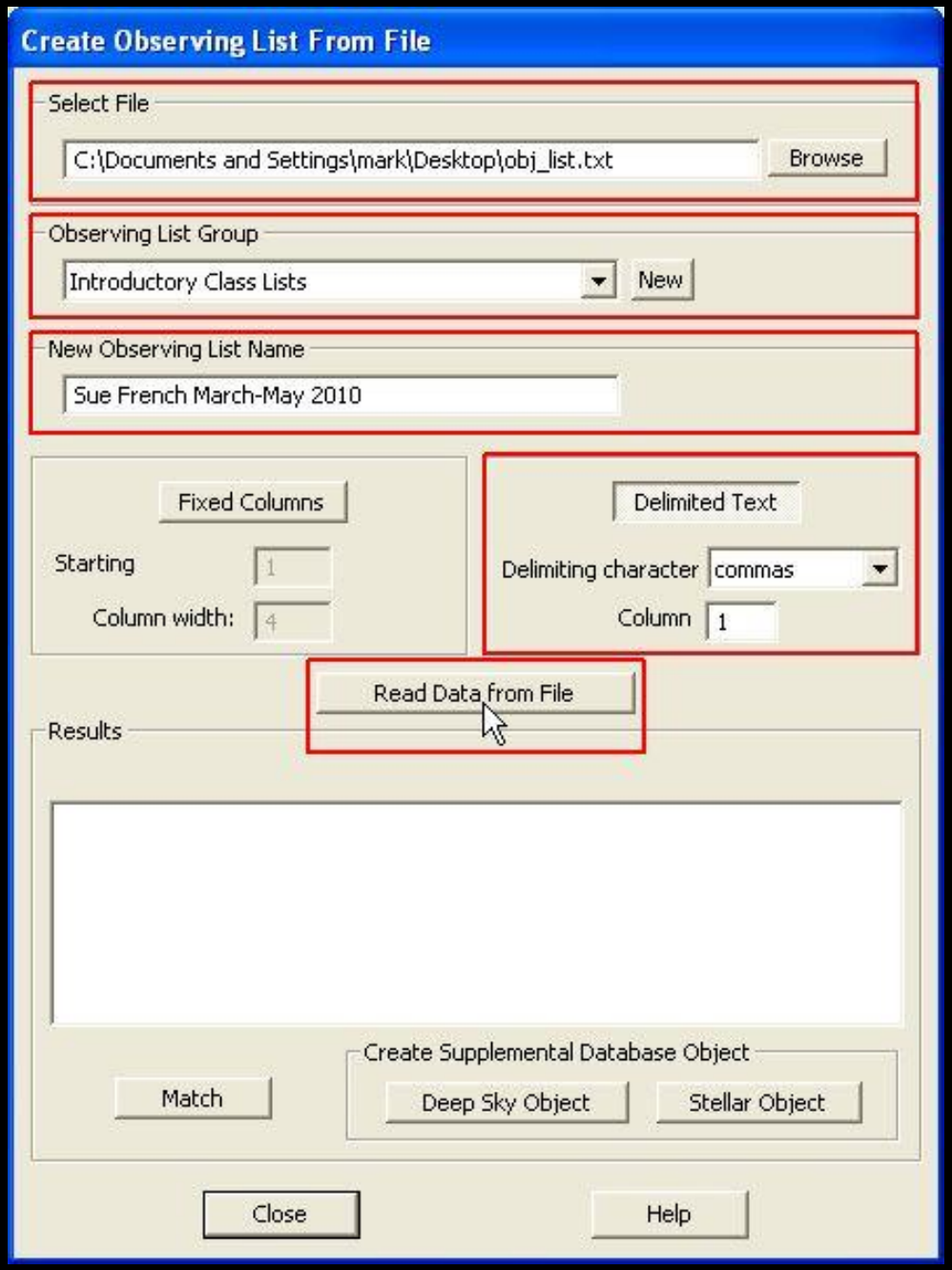
Reading Objects from a File and Adding Them to an Observing List

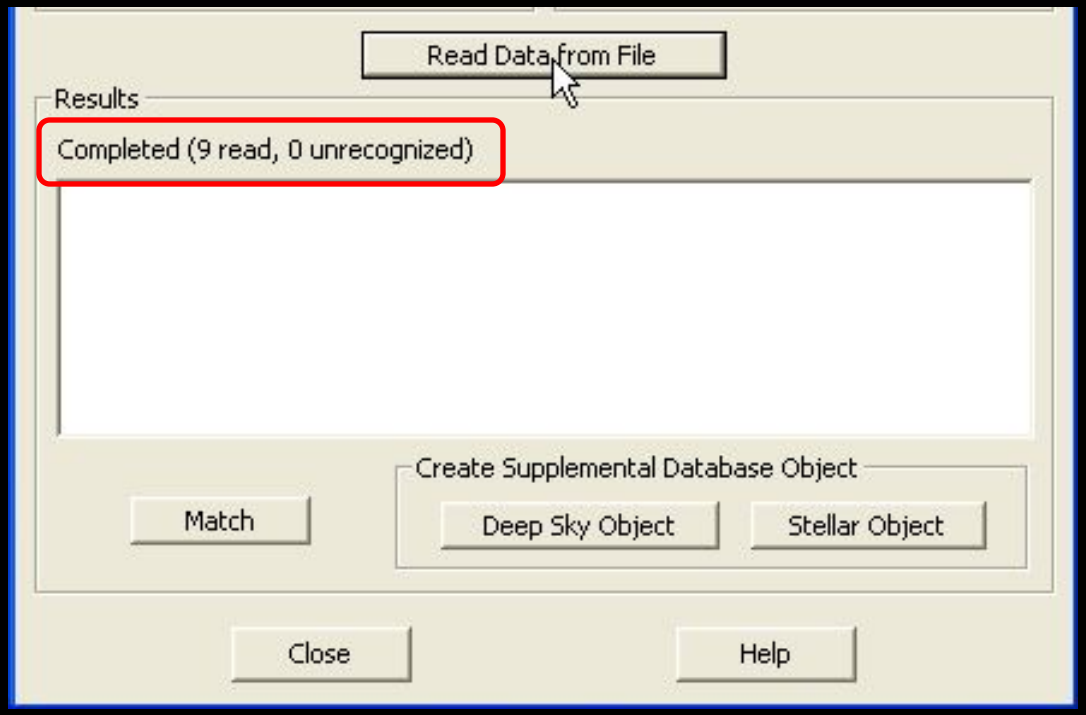
Suppose that you ‘re looking through some old copies of Sky & Telescope during lunch at work and find a few objects you’d like to see during the star party. You could type these objects into a text file with one object per line and email the file to yourself at home. But rather than having to add the objects to your observing list manually, SkyTools can read the objects directly from the file

Download http://mark-a-martin.us/skytools/obj_list.txt




SkyTools 3 Professional Edition
Nightly Planner
Current Events
Special Events
Evening of 2011 Apr 1 PDT
Refresh List
Auto Refresh
Auto Sort
Reset Filters
New Observing List Group
New Observing List
View/Edit List Title and Description
Delete Observing List
Print/Copy Observing List
Configure Columns
Read Objects From File
View List as Thumbnails
Transfer Observing List to Telescope
Update "Current" Lists from Web
Help

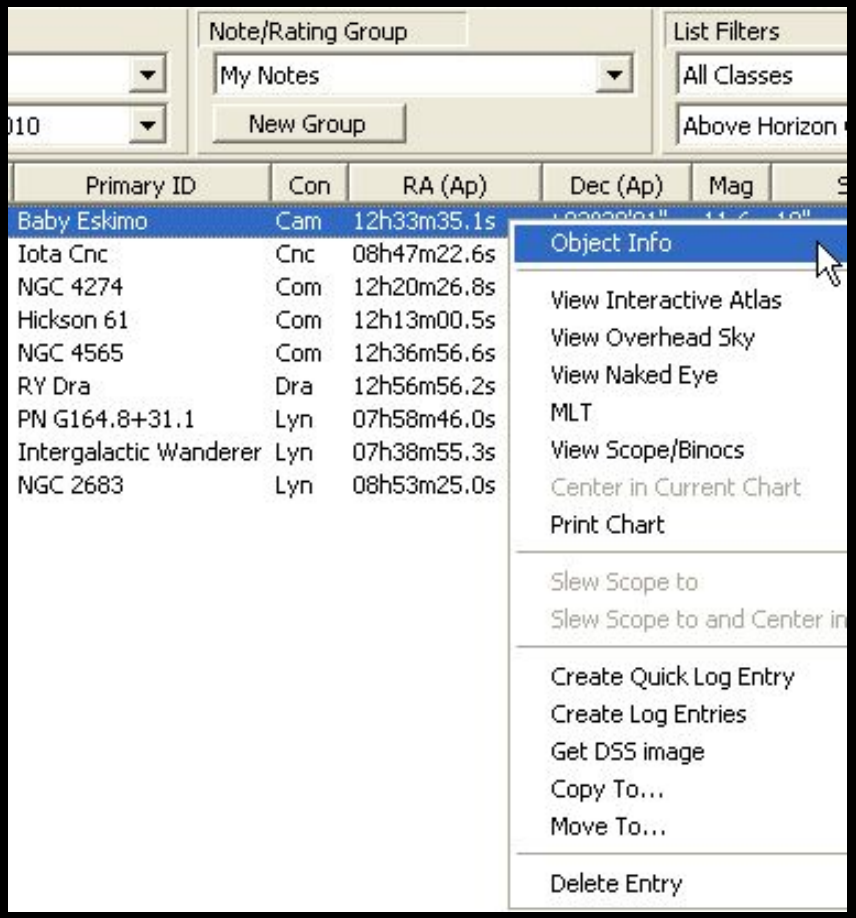

Create Observing List From File
Select File
C:\Documents and Settings\mark\Desktop\obj_list.txt
Browse
Observing List Group
Introductory Class Lists
New
New Observing List Name
Sue French March-May 2010
Fixed Columns
Starting
1
Column width:
4
Delimited Text
Delimiting character
commas
Column
1
Read Data from File
Results
Create Supplemental Database Object
Match
Deep Sky Object
Stellar Object
Close
Help

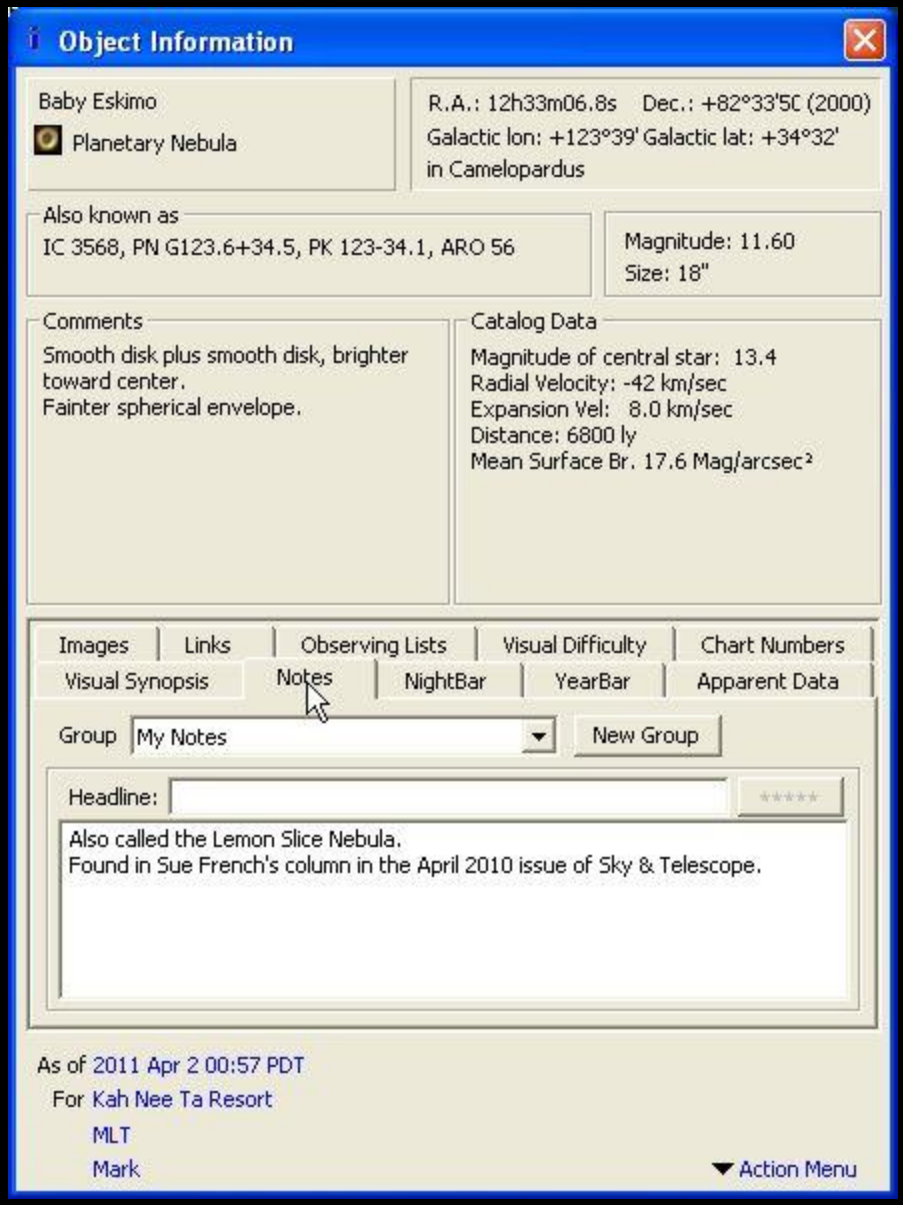


Push the Read Data from File button. All objects were recognized.

The first several columns of the new Observing list

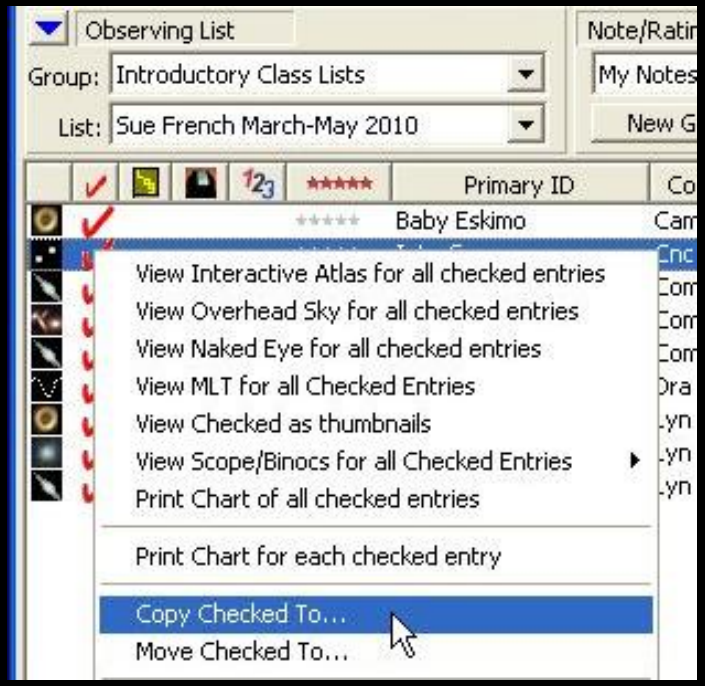
Double-click or use the right-click menu to open the Object Information dialog box.





Enter notes under Notes tab on Object Information dialog box.

<u>Exercise</u>: Explore the other tabs of the Object Information dialog box.



Check all objects and copy them to Kah Nee Ta 2011 list, as before.

Afterwards, clear checks from list, if desired.

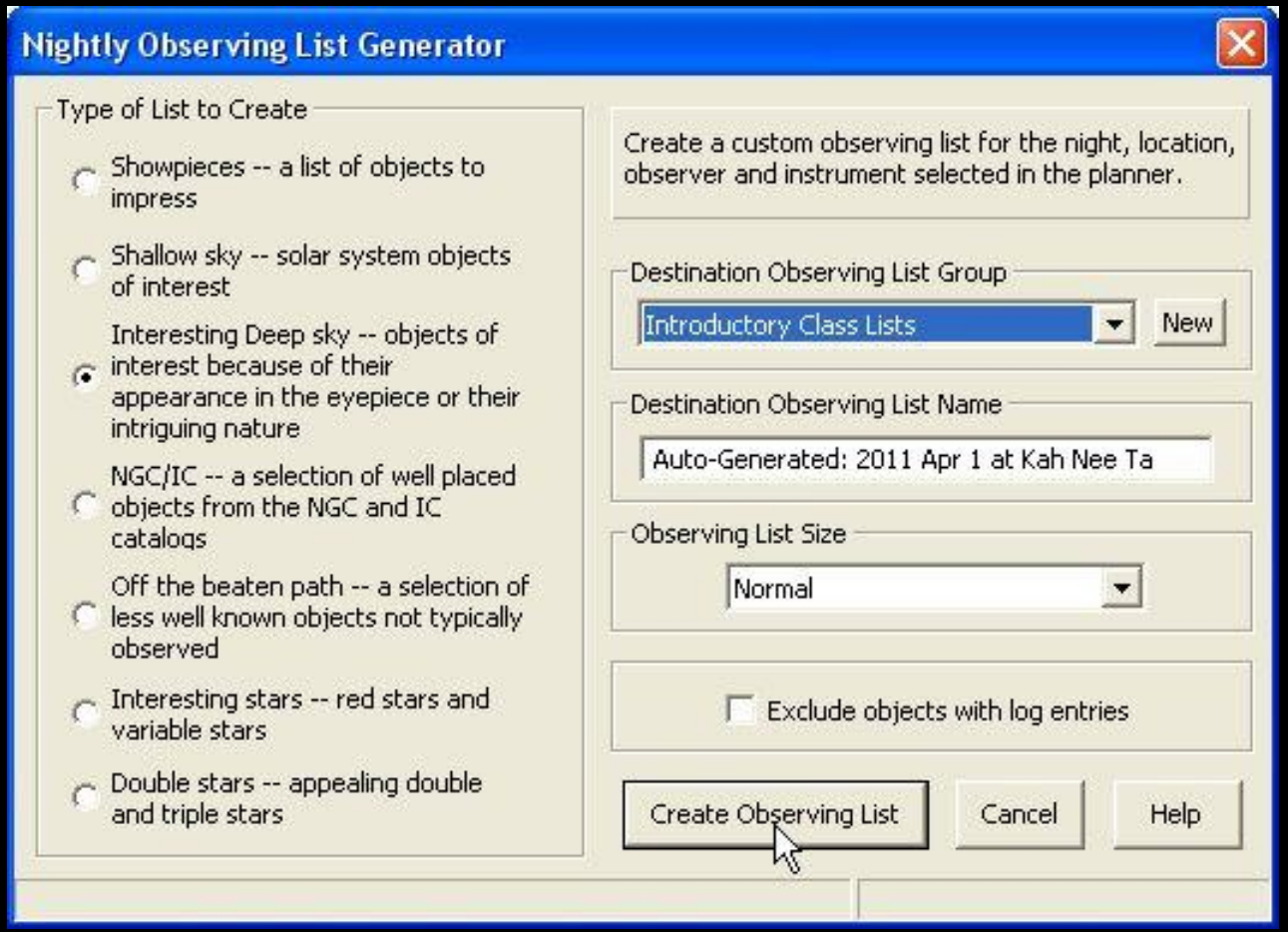
I now have 57 objects in my Kah Nee Ta 2011 observing list.

Automatically Generating an Observing List

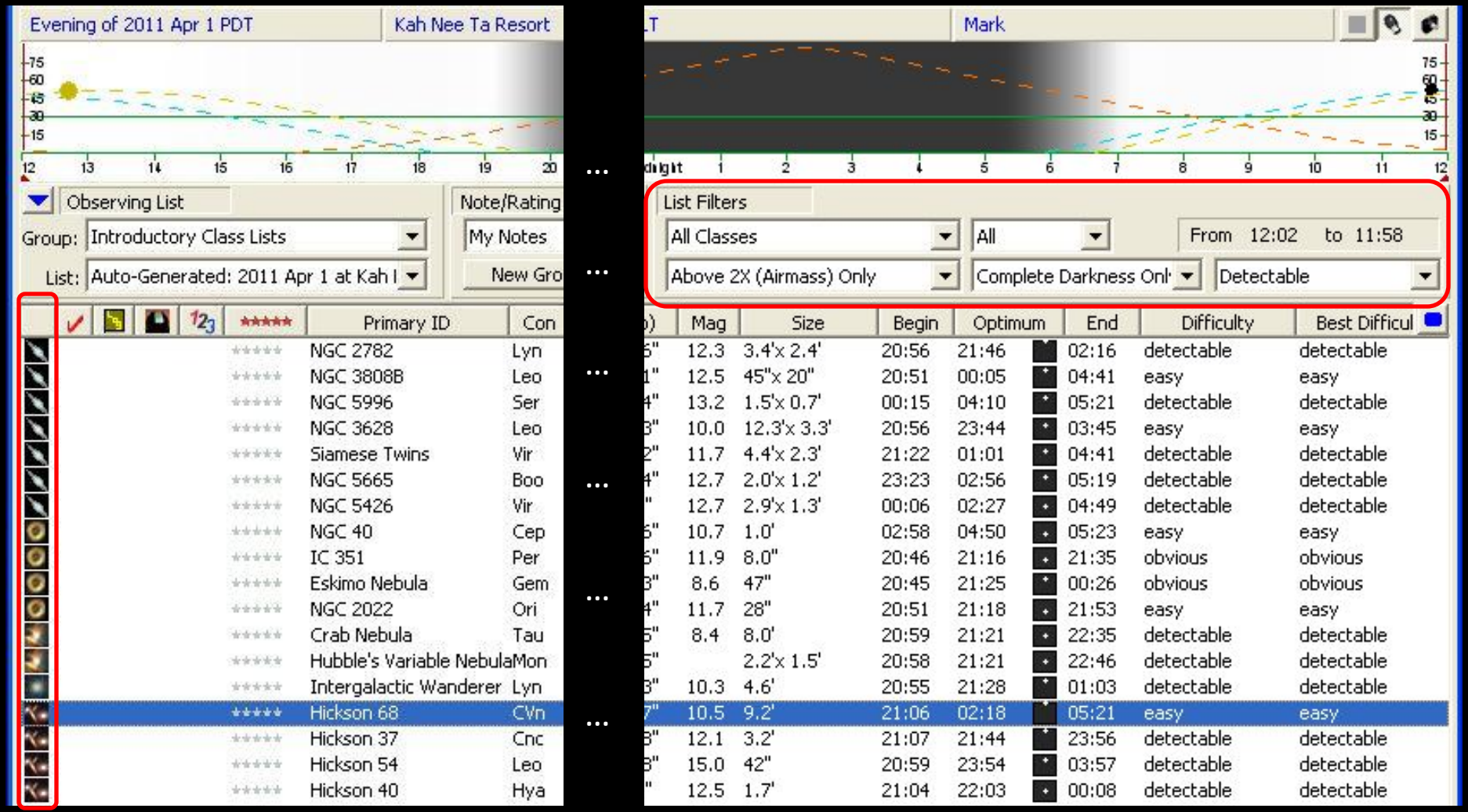
Nightly Observing List Generator button

Nightly Observing List Generator with options set

Your list will differ from mine.



The original automatically-generated list contained 26 objects running the entire gamut of visual detection difficulties. This is the list filtered to increase visibility (18 objects) and sorted by object type. To sort by the value in a column, click on the column heading.



7 galaxies, 4 planetary nebulae, 2 diffuse nebulae, 1 globular cluster, and 4 unknown

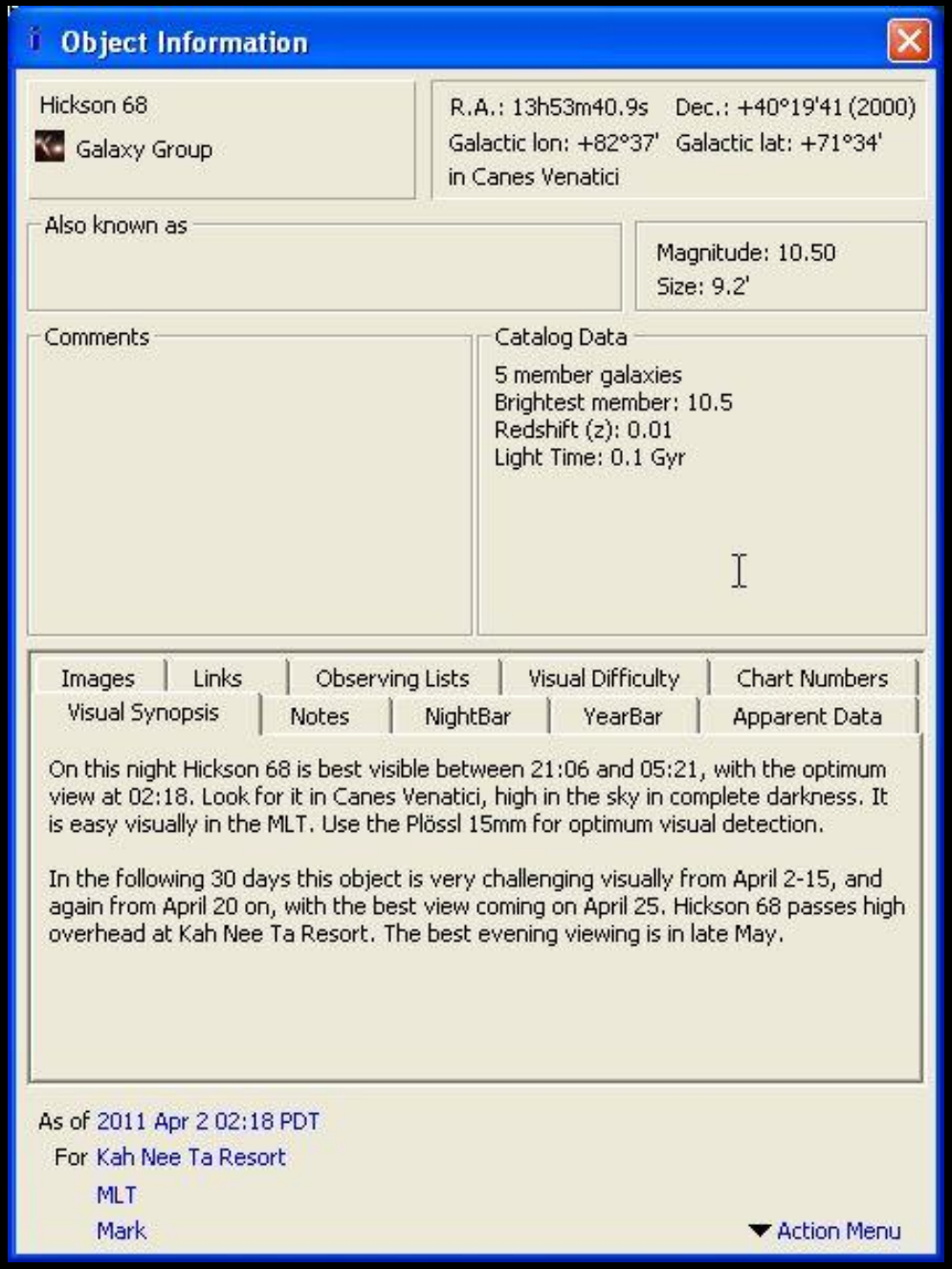
Exploring Hickson 68

If Hickson 68 isn't on your automatically-generated list, add it using a Designation Search for "hickson 68".

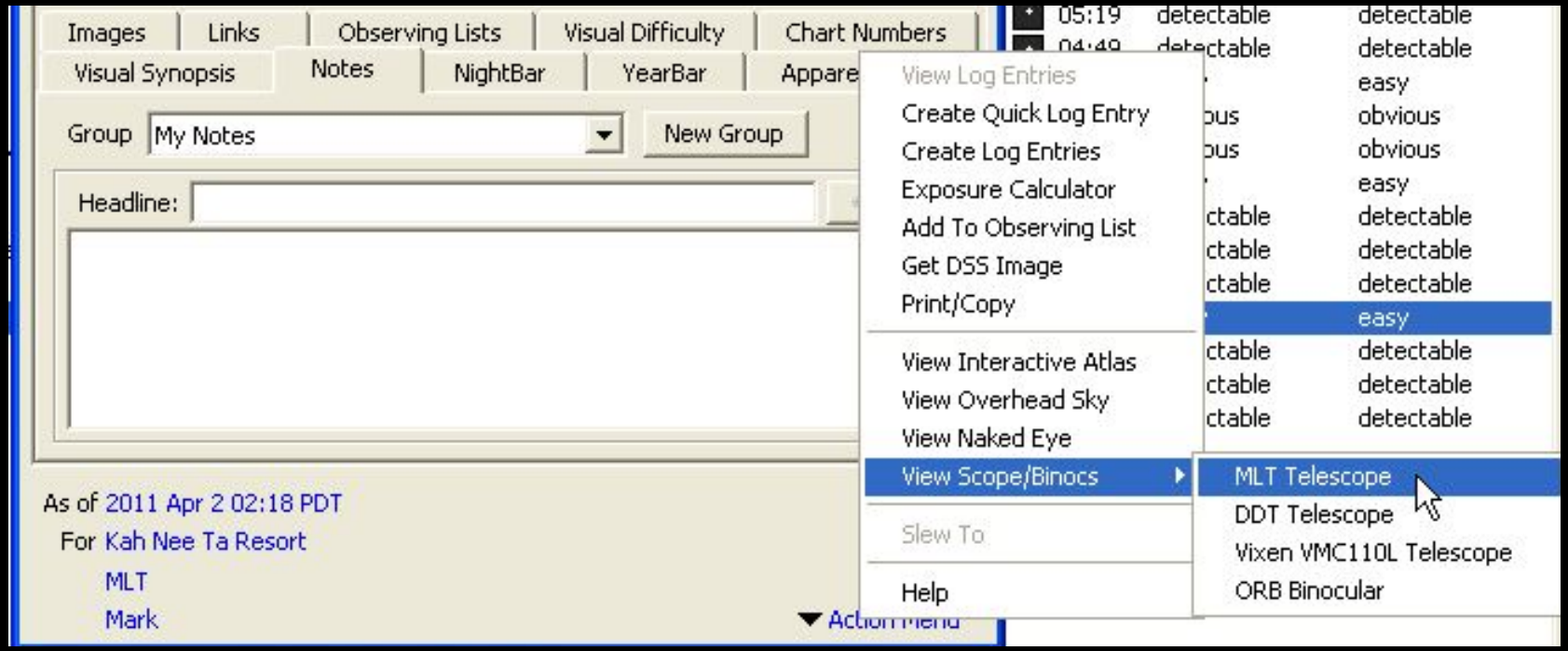
Open the Object Information dialog box for Hickson 68.

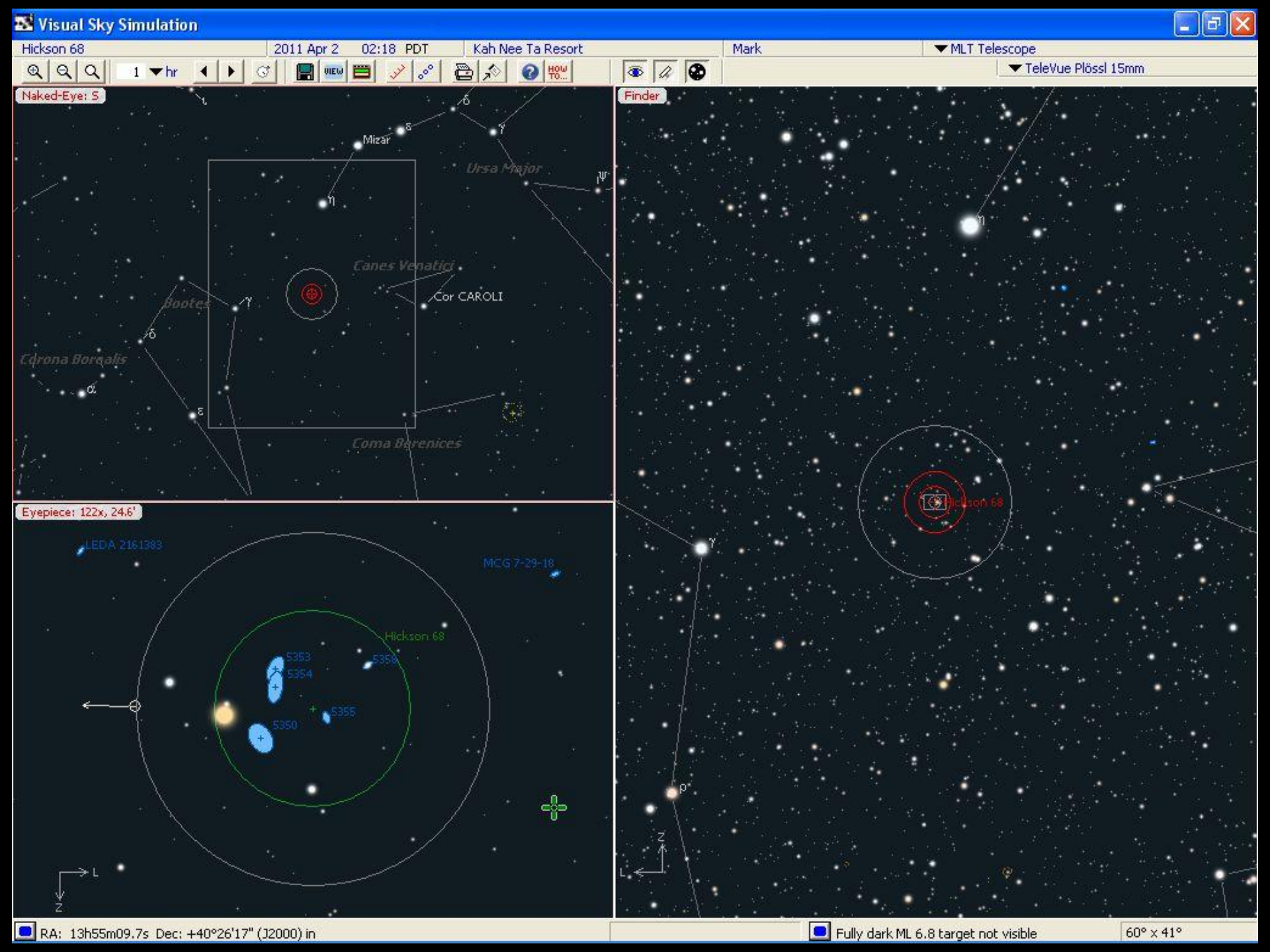
It turns out that Hickson 68 is a galaxy group.

Also check out the Year Bar and the Night Bar.



But what will Hickson 68 look like in your telescope?
It's possible to get an idea of this using a Visual Sky Simulation.
Choose the view associated with your telescope from the Action Menu at the bottom right-hand corner of the Object Information dialog box.




Visual Sky Simulation
Hickson 68
2011 Apr 2 02:18 PDT
Kah Nee Ta Resort
Mark
MLT Telescope
TeleVue Plössl 15mm
Naked-Eye: S
Mizar
Ursa Major
Canes Venatici
Cor CAROLI
Bootes
Corona Borealis
Coma Berenices
Finder
Hickson 68
Eyepiece: 122x, 24.6'
LEDA 2161383
MCG 7-29-18
Hickson 68
5353
5354
5356
5355
5350
RA: 13h55m09.7s Dec: +40°26'17" (J2000) in
Fully dark ML 6.8 target not visible
60° x 41°

Visual Sky Simulation

- Simulates naked eye, finder, and eyepiece views of the object.
- Each view may be individually configured, zoomed, or even toggled off or on.
- Views may also be interchanged.
- Can change the date, location, instrument, observer, or even the object.

View-specific controls operate whichever view is selected. Select a view by clicking on it. The selected view has a faint red highlight around it.

Initial settings:

- ❖ Eyepiece is whichever eyepiece was last used with telescope.
- ❖ Date is the date in the tool from which the chart was opened.
- ❖ Time is the optimal viewing time that SkyTools calculated for the date.

The 3 views of the Visual Sky Simulation comprise the context method of object finding:

If you can make all 3 views match the star fields visible in them using your naked eyes/reflex site, finders, and eyepiece, respectively, then you will have found the object you're looking for.

Button, Key, or Mouse Click	Action
Eye Button	Toggle Naked Eye view off or on
Finder Button	Toggle Finder view off or on
Circular Star Field Button	Toggle Eyepiece view off or on
F9 Key	Show Eyepiece view only
F10 Key	Show Finder view only
F11 Key	Show Naked Eye view only
F12 Key	Show all 3 views
Shift-Click-Drag	Interchange 2 views

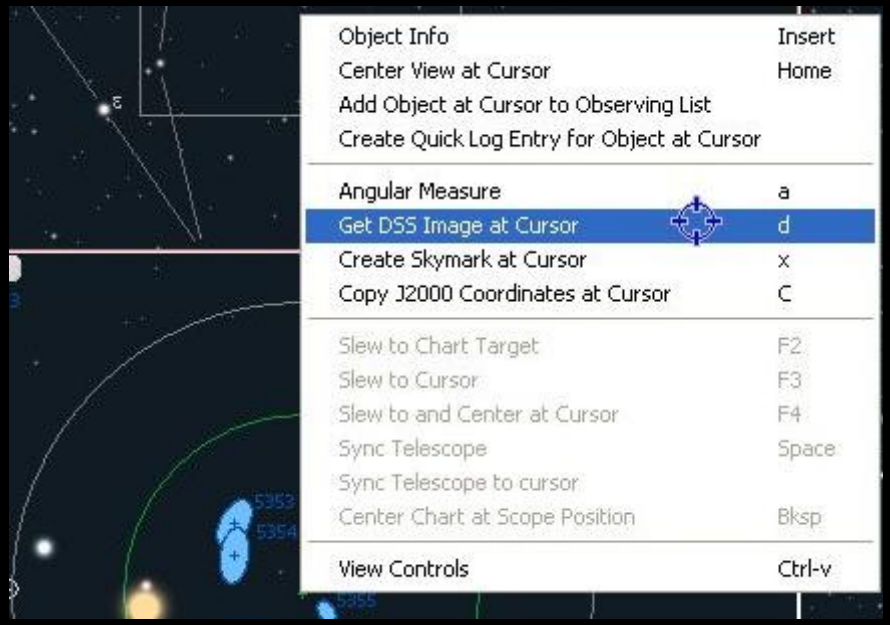
Controls for the views displayed in a Visual Sky Simulation and their arrangement on the chart.

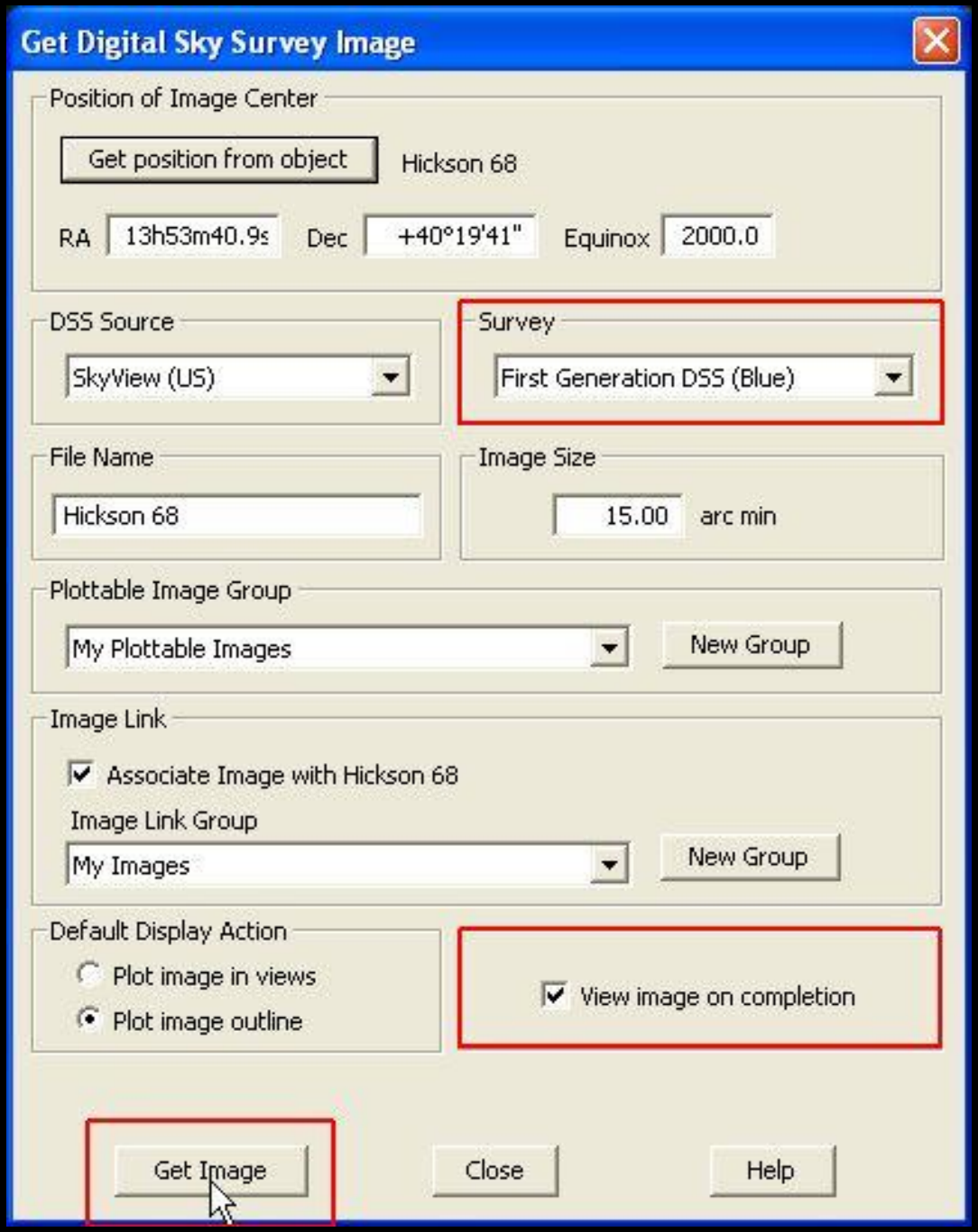
Exercise: Play with the Visual Sky Simulation to get a feeling for how it works.

Deep-Sky Objects in a Visual Sky Simulation

- Represented by GEOMETRIC shapes.
- **Brightness** is not represented.
- The 👁visual detection difficulty👁 is estimated for the object in the selected view. This is displayed in the bottom right-hand side of the window.
- Full ★sky reports★ are available by pushing the blue button next to difficulty.

It's possible to make the view a little more realistic by overlaying a DSO with an image.





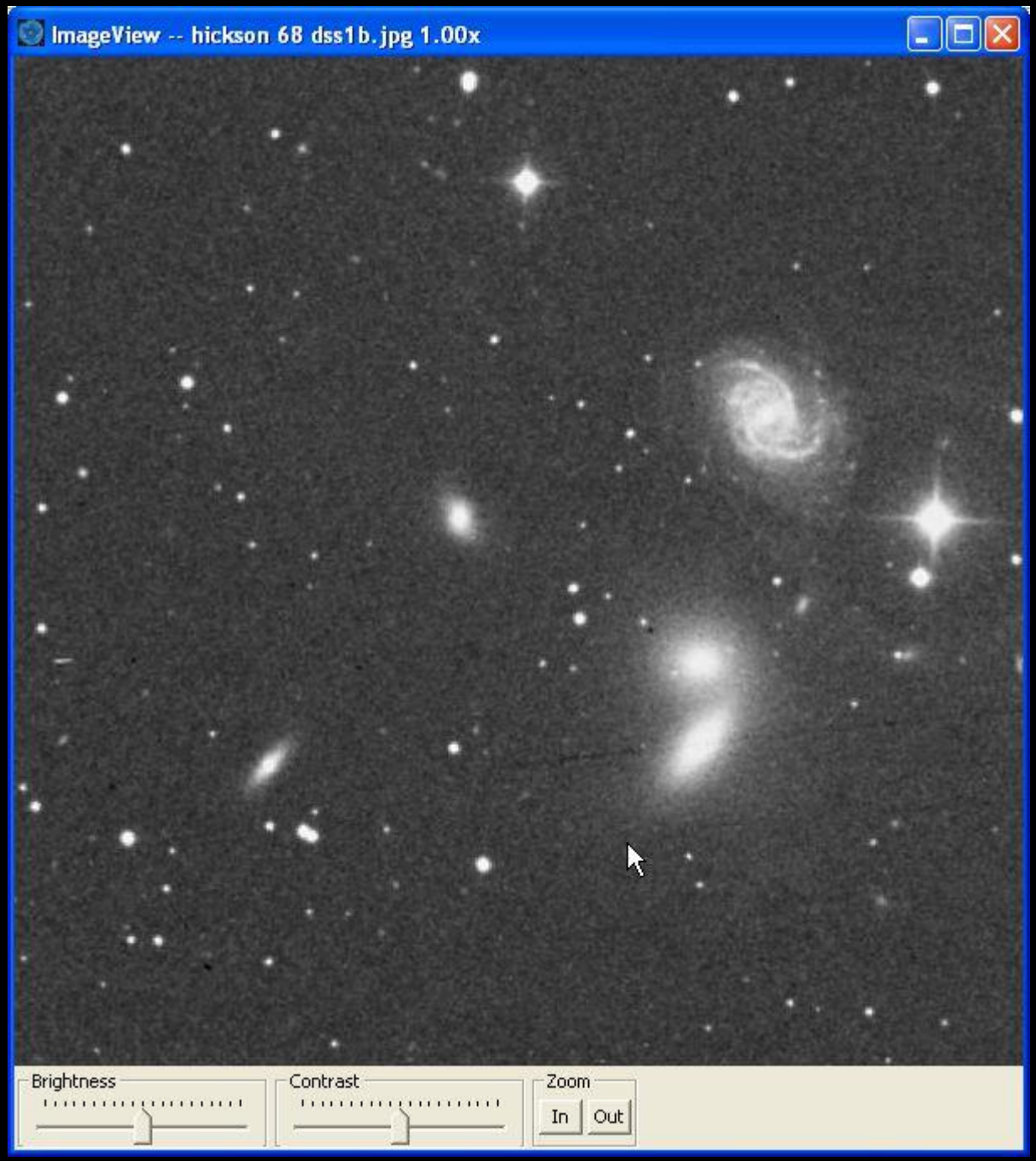
Settings to select type of image and to open the image in ImageView after download.

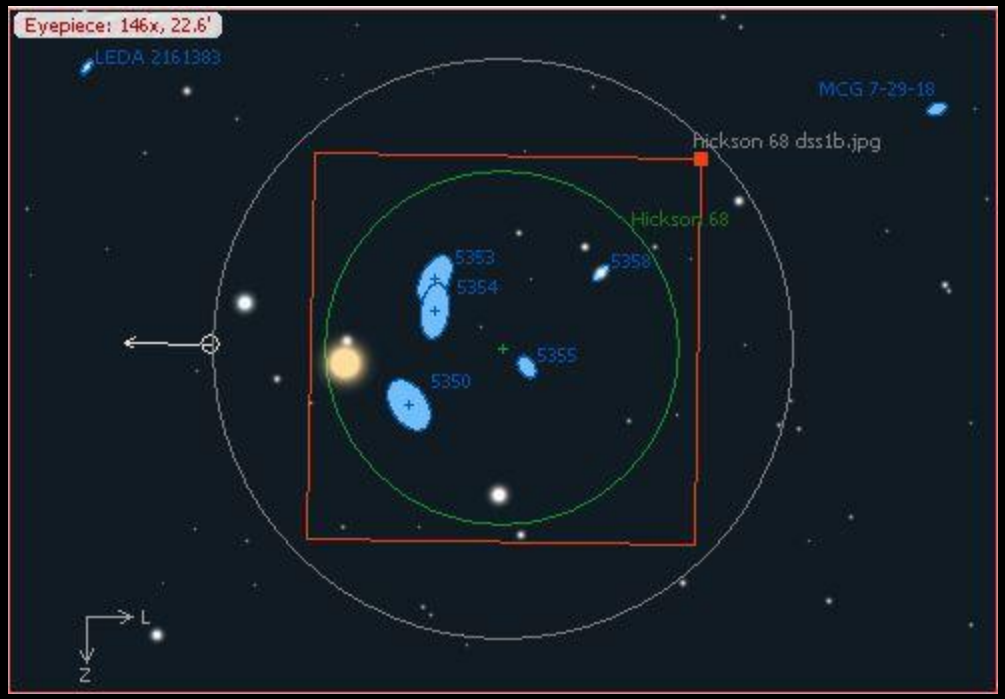
Professional Edition has a greater number of image types to download.

Slide Brightness slider to the left until the brightness of the background is closer to the sky brightness in the Visual Sky Simulation.

Afterwards, close ImageView and the Get Digital Sky Survey Image dialog box.

Images and Image Groups Are managed using the “Images” and “Plottable Images” tabs of the Data Manager.

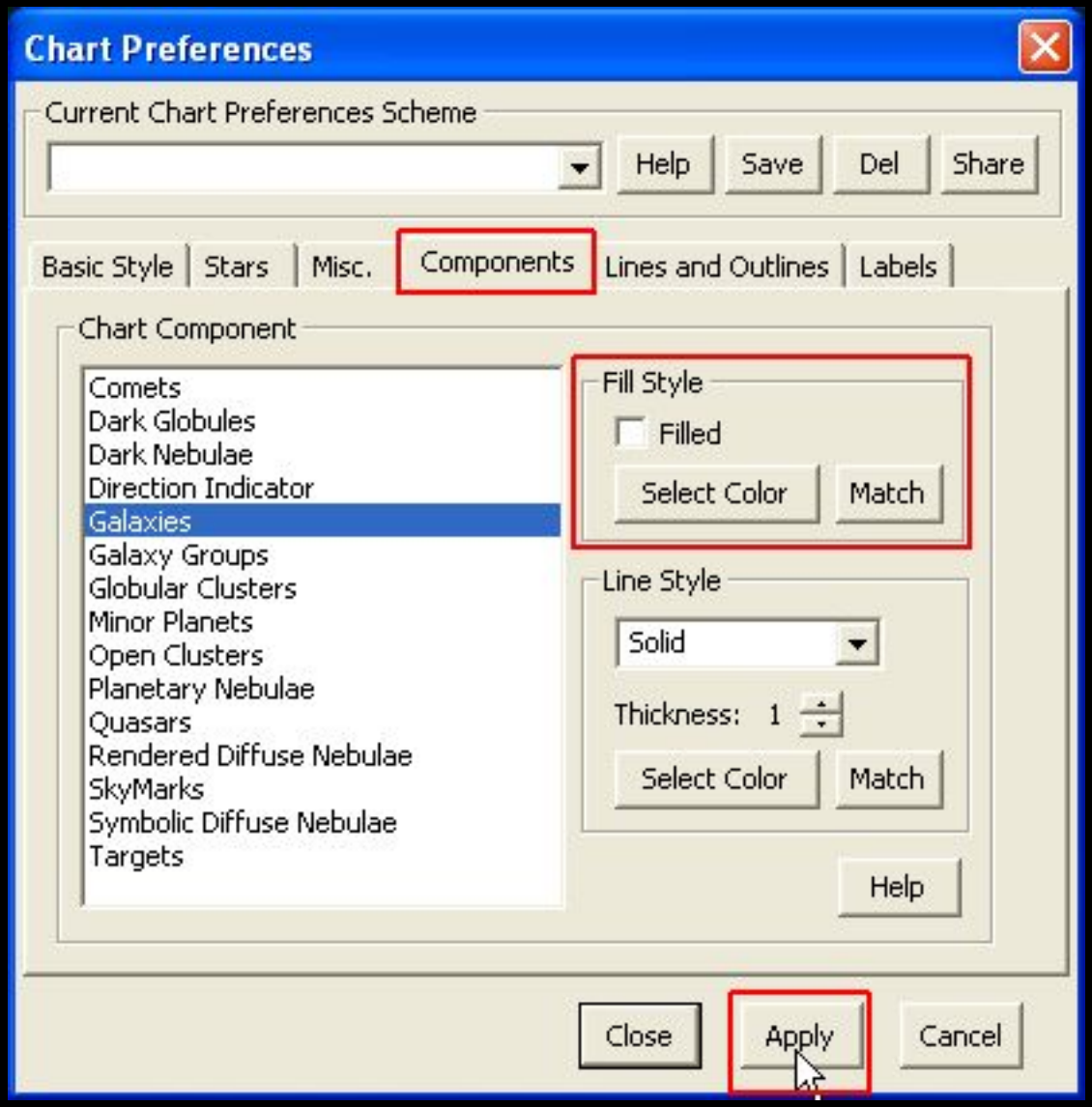




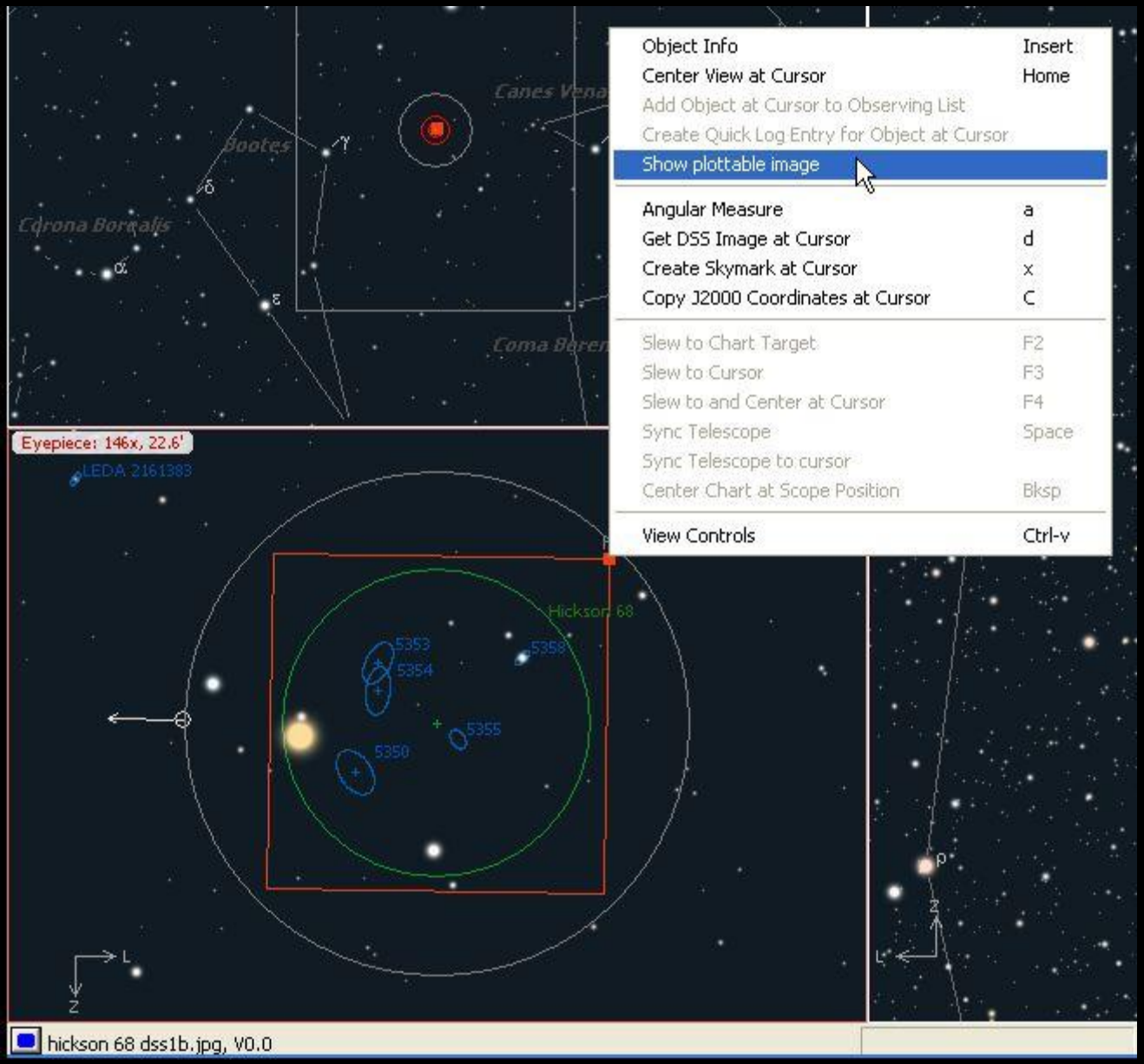
Click on the Eyepiece view to select it. You should now see the orange square above. It marks the image boundaries in the view.

If the orange square is not visible,

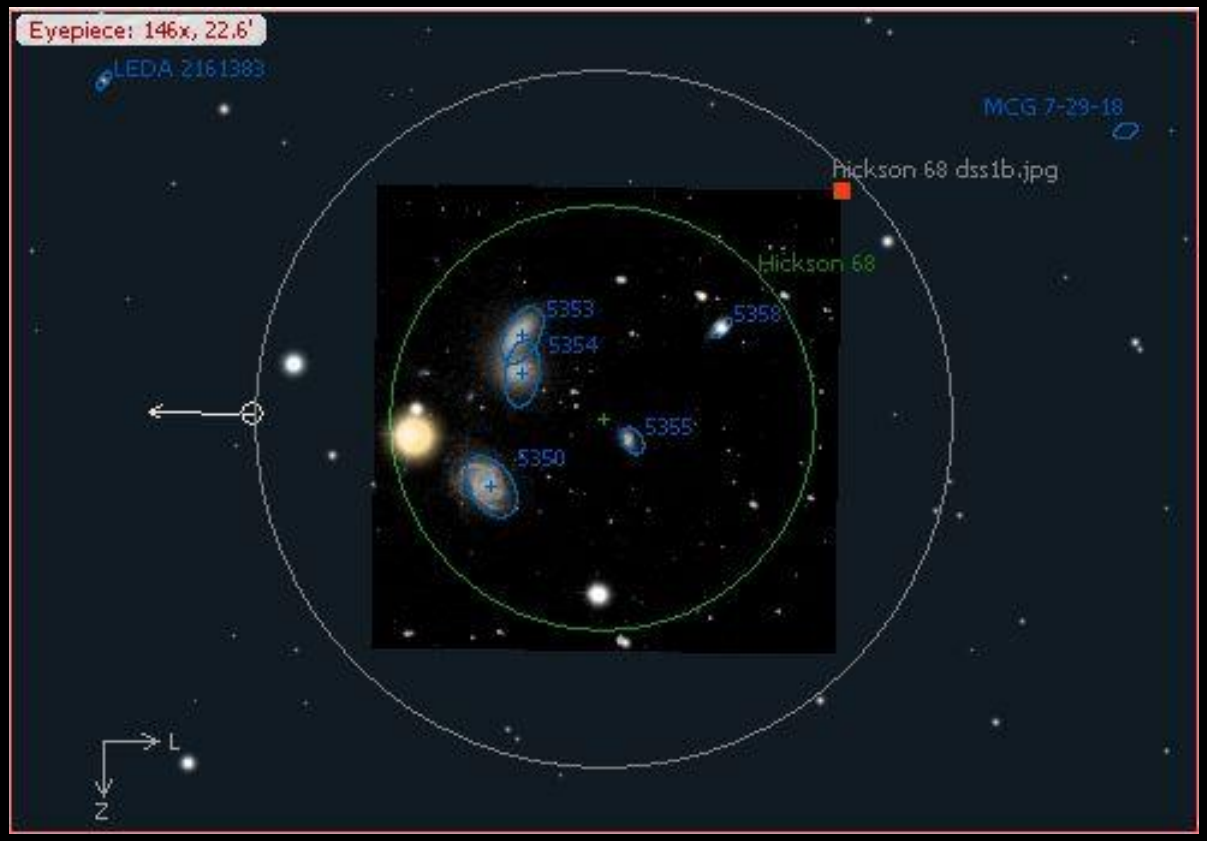
1. Use View button to open View Controls.
2. In the Plottable Images section, select “Plot according to individual selection”.
3. Push the Apply button
4. Push the Close button.



Next, remove fill from the galaxy symbols in the Chart Preferences dialog box for the Eyepiece view.

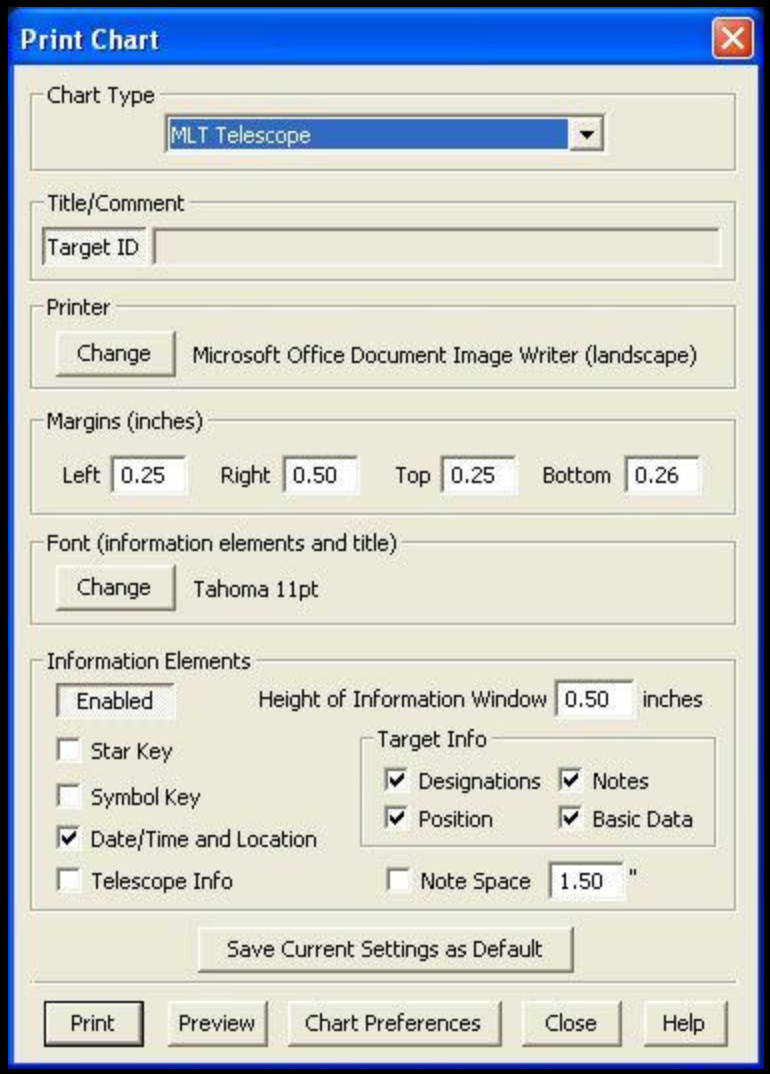

Object Info Insert
Center View at Cursor Home
Add Object at Cursor to Observing List
Create Quick Log Entry for Object at Cursor
Show plottable image
Angular Measure a
Get DSS Image at Cursor d
Create Skymark at Cursor x
Copy J2000 Coordinates at Cursor C
Slew to Chart Target F2
Slew to Cursor F3
Slew to and Center at Cursor F4
Sync Telescope Space
Sync Telescope to cursor
Center Chart at Scope Position Bksp
View Controls Ctrl-v
Bootes
Corona Borealis
Eyepiece: 146x, 22.6'
LEDA 2161383
Hickson 68
5353
5354
5358
5355
5350
hickson 68 dss1b.jpg, V0.0

The Final Result

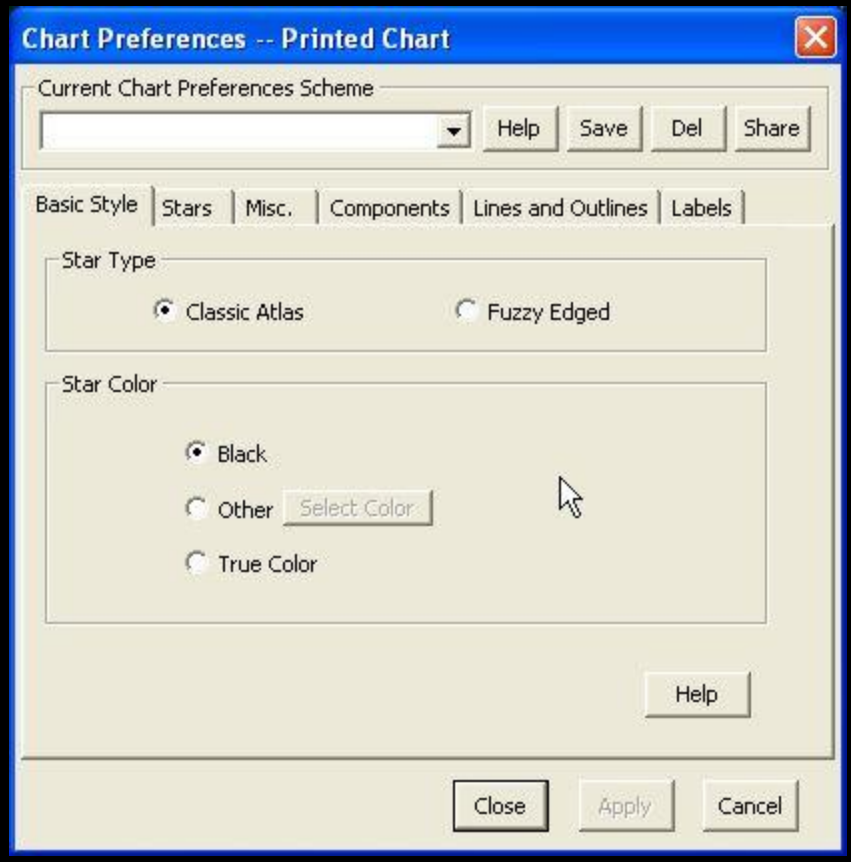


Exercise: Right-click on another object in the automatically-generated observing list and create the corresponding Visual Sky Simulation associated with the instrument of your choice. Then overlay the object with an image of your choice.

Printing a Visual Sky Simulation

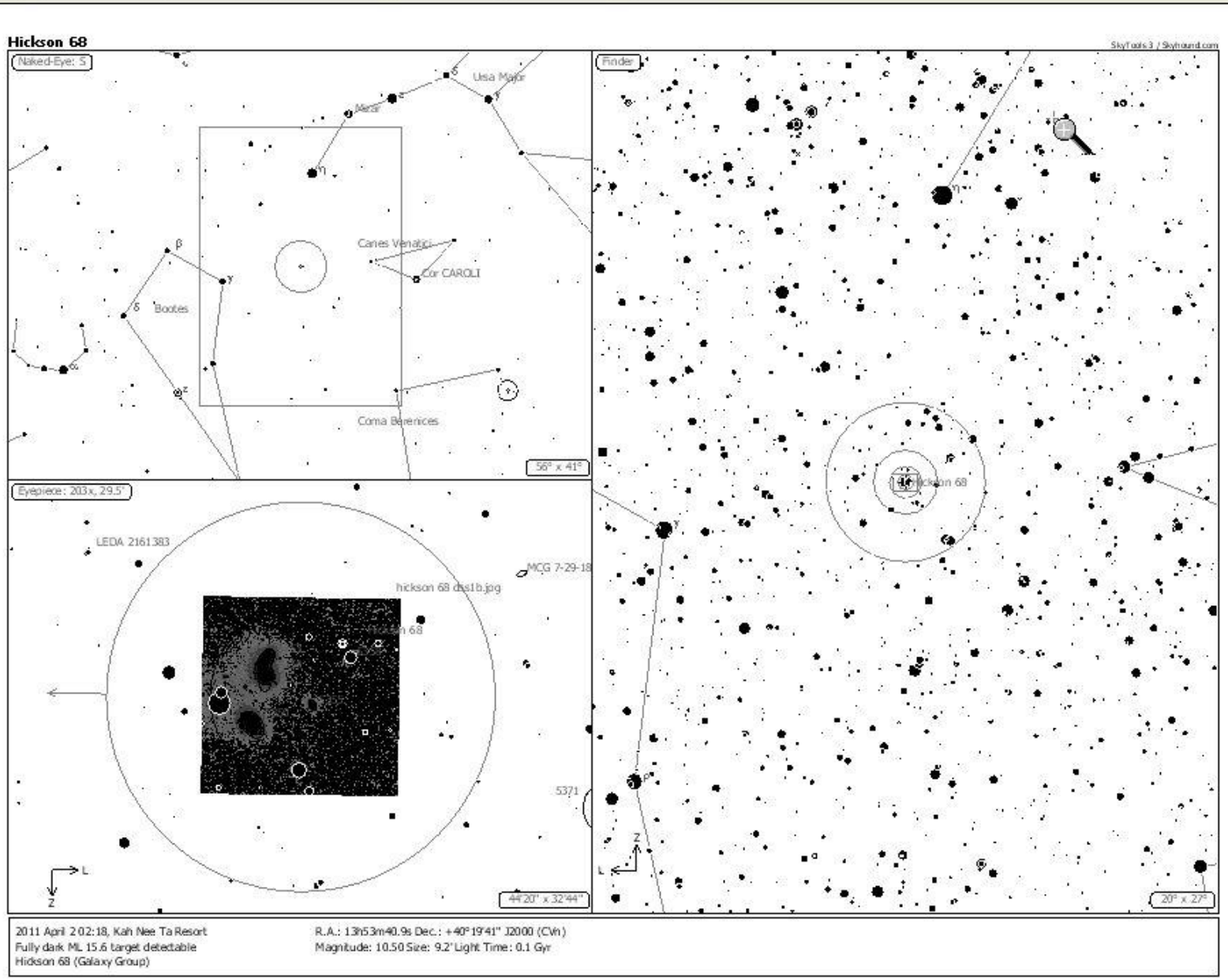


Preferences may also be set from a preview.



SkyTools Chart Print Preview

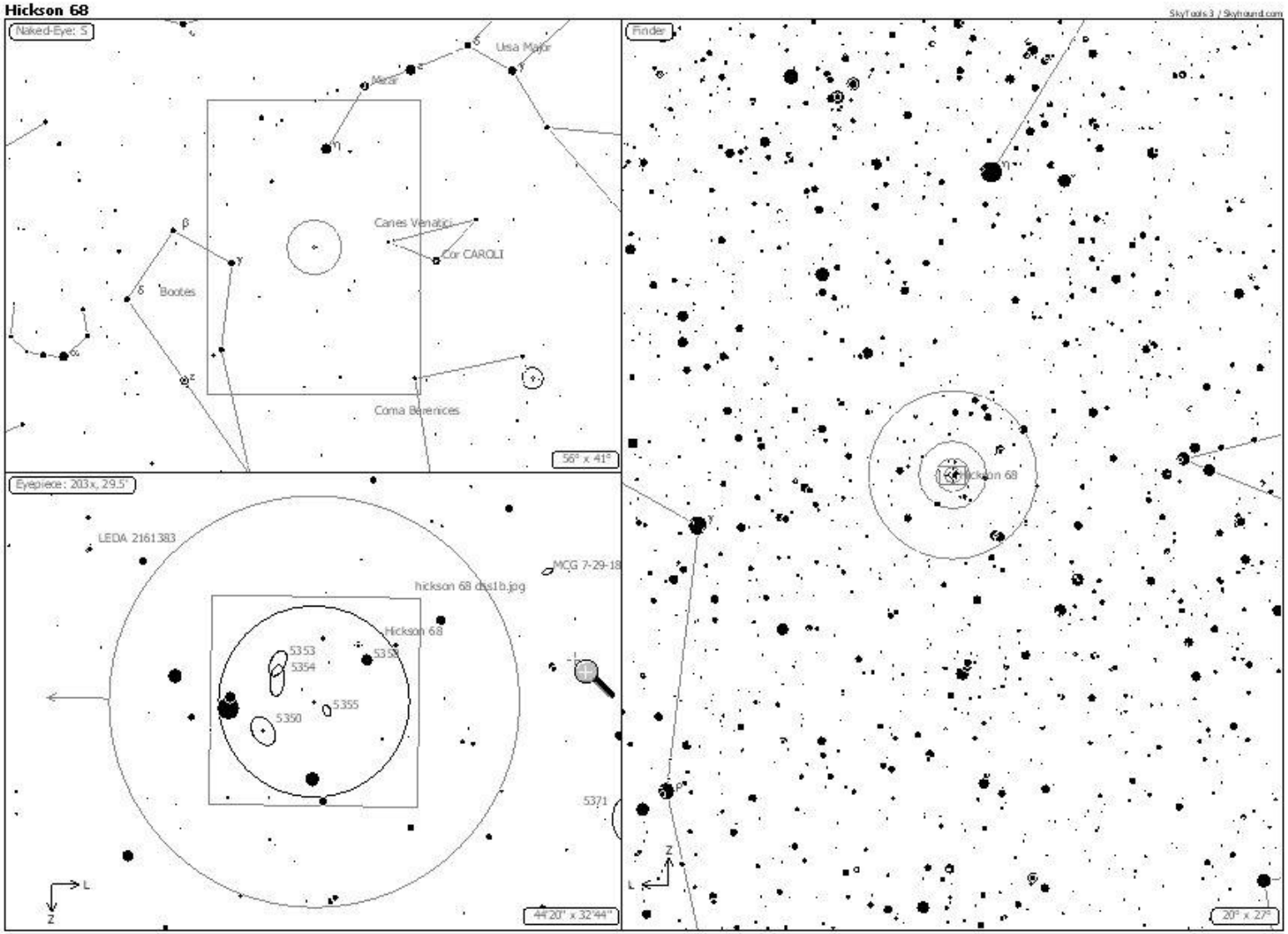
Print | Preferences | Prev Page | Next Page | Zoom In | Zoom Out | Close | Page 1 of 1



SkyTools Chart Print Preview

Print | Preferences | Prev Page | Next Page | Zoom In | Zoom Out | Close | Page 1 of 1

Hickson 68

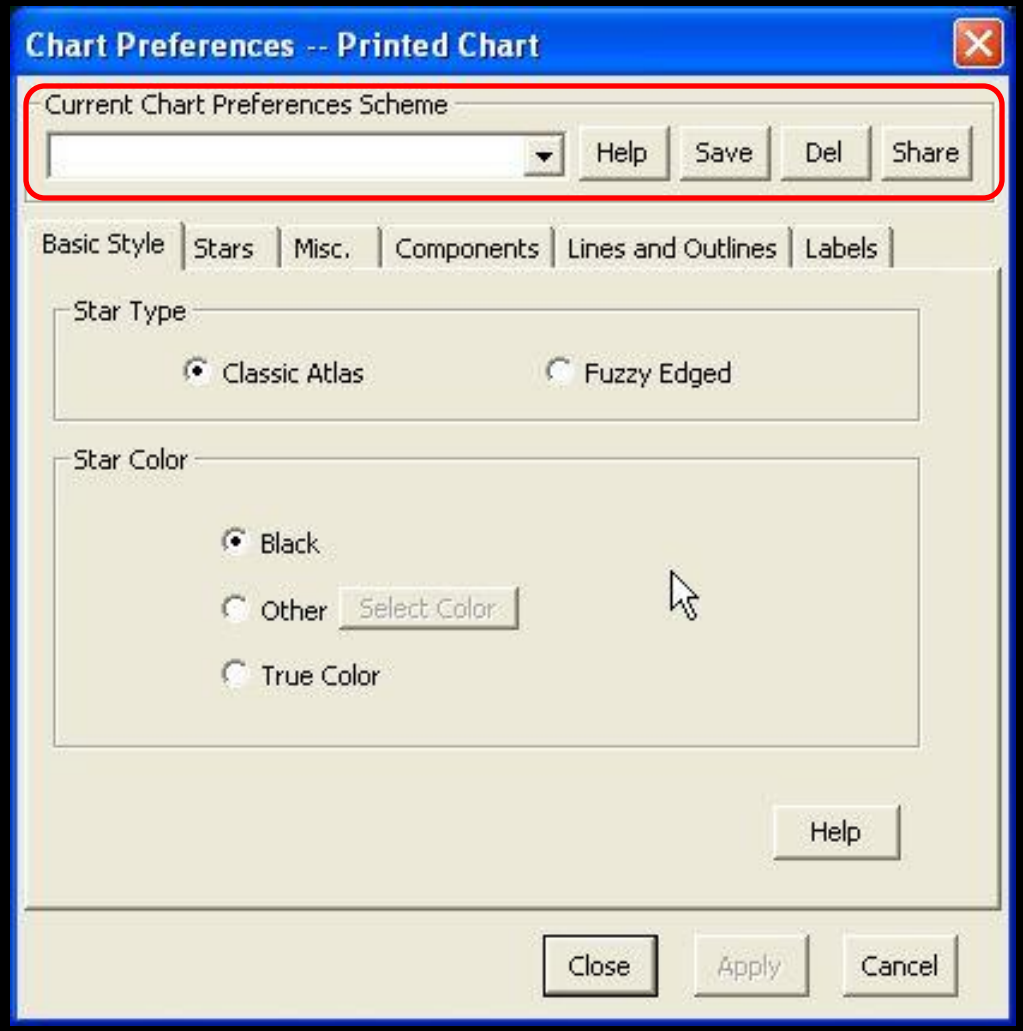


2011 April 2 02:18, Kah Nee Ta Resort
Fully dark ML 15.6 target detectable
Hickson 68 (Galaxy Group)

R.A.: 13h53m40.9s Dec.: +40°19'41" J2000 (CVn)
Magnitude: 10.50 Size: 9.2' Light Time: 0.1 Gyr

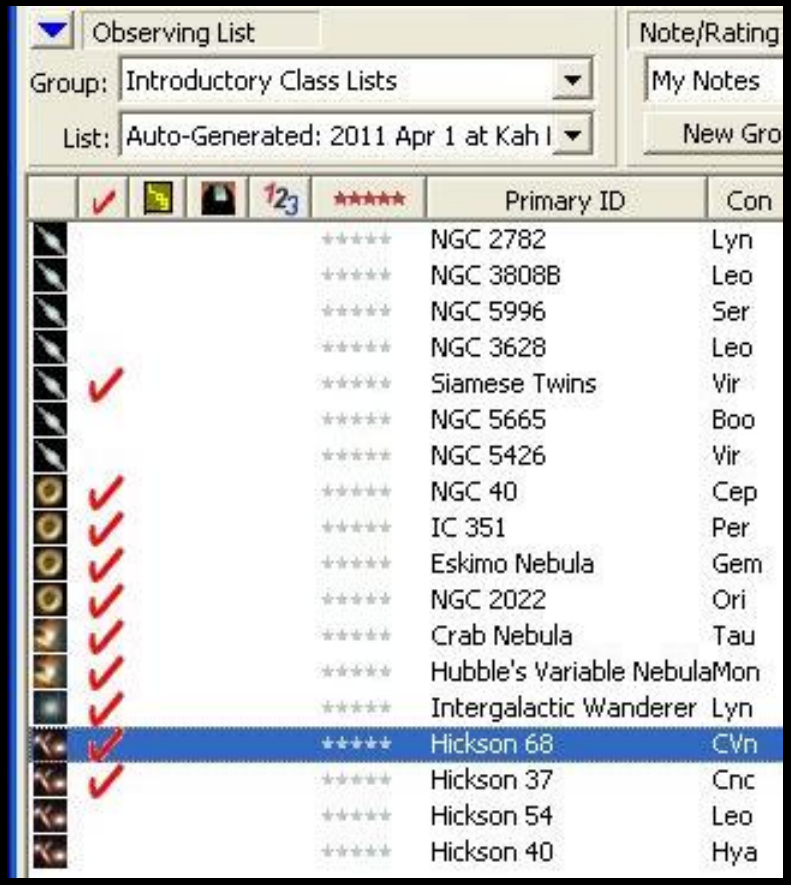
Settings that you like can be saved as a Chart Preferences Scheme.

Chart Preference Schemes are managed from this dialog box.



Exercise: Switch to the Visual Sky Simulation for the object you chose in the last Exercise. Push the Print button and open the preview. Experiment with the Chart Preferences until you find a format you like. Save your settings as a Chart Preferences Scheme.

I'm adding Hickson 68, Hickson 37, the Siamese Twins, and all other objects that are not galaxies or galaxy groups to the Kah Nee Ta 2011 observing list. This is 10 more objects.



As before, check the objects to copy.

Then right-click in the check column and choose "Copy Checked To …"

Finally, select the Kah Nee Ta 2011 observing list as the destination.

When you're done, you can clear the checks from the list or even delete the automatically-generated list.

Exercise: Add whichever 10 objects you prefer from your automatically-generated list to the Kah Nee Ta 2011 observing list. Afterwards, the Kah Nee Ta 2011 should have 64 objects.

Finding and Keeping Track of Interesting Events

Aside from interesting celestial objects, SkyTools 3 can also help us find interesting events. These events involve bodies within the solar system that move quickly enough for us to observe their motions and include

- ✓ eclipses;
- ✓ major meteor showers;
- ✓ lunar phases;
- ✓ conjunctions, oppositions, and elongations for major and minor planets;
- ✓ events involving the major satellites of Jupiter and Saturn;
- ✓ and events involving Jupiter's Great Red Spot.

Two major tools calculate events:

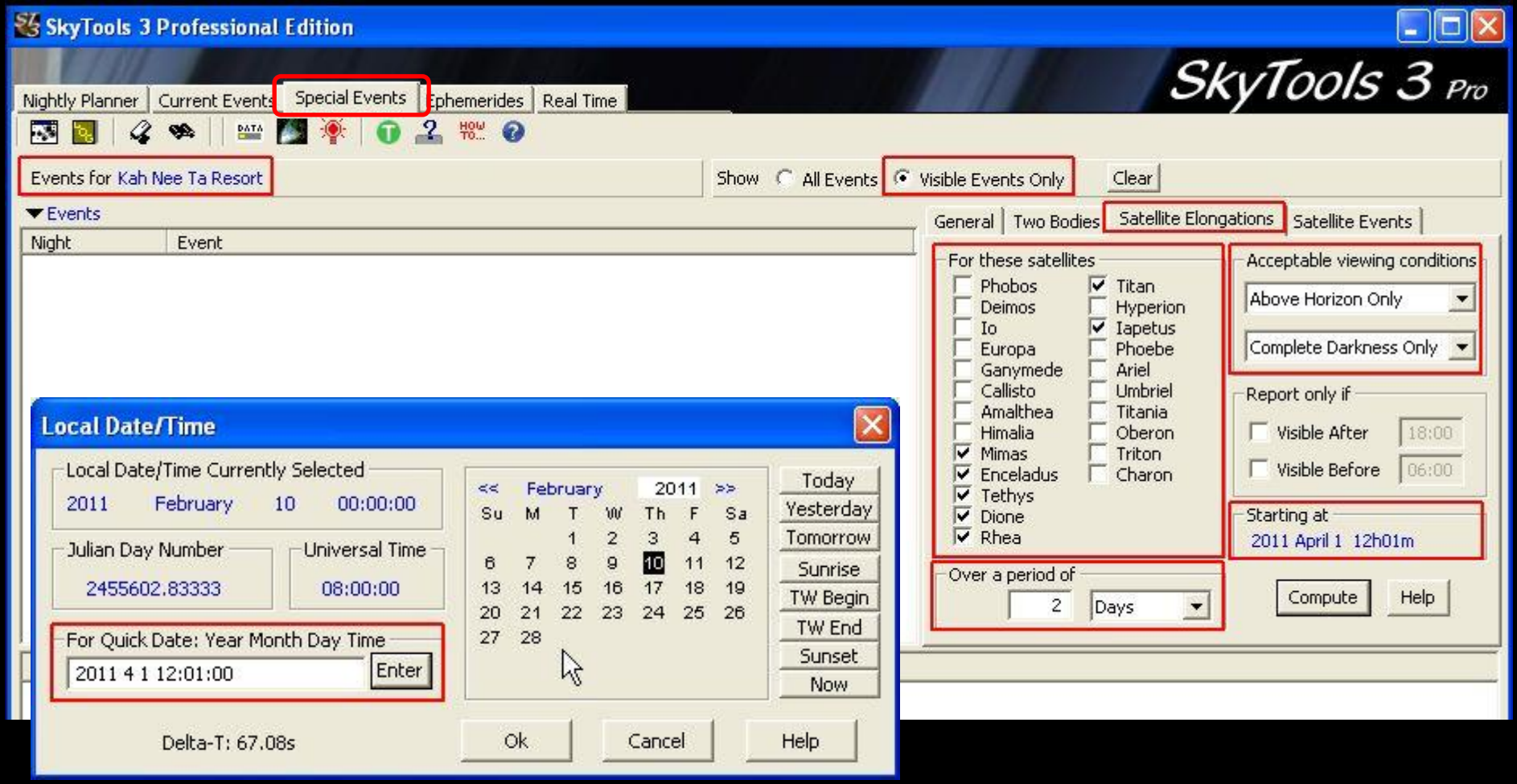
1. The Current Events Tool
    a) Events a number of months in the future from the current date
    b) Populates the Events Calendar and the Nightly Events Planner
2. The Special Events Tool
    a) Events between a nearly arbitrary date and a date up to years from the first date.

Both tools calculate the same types of events but are configured a little differently.

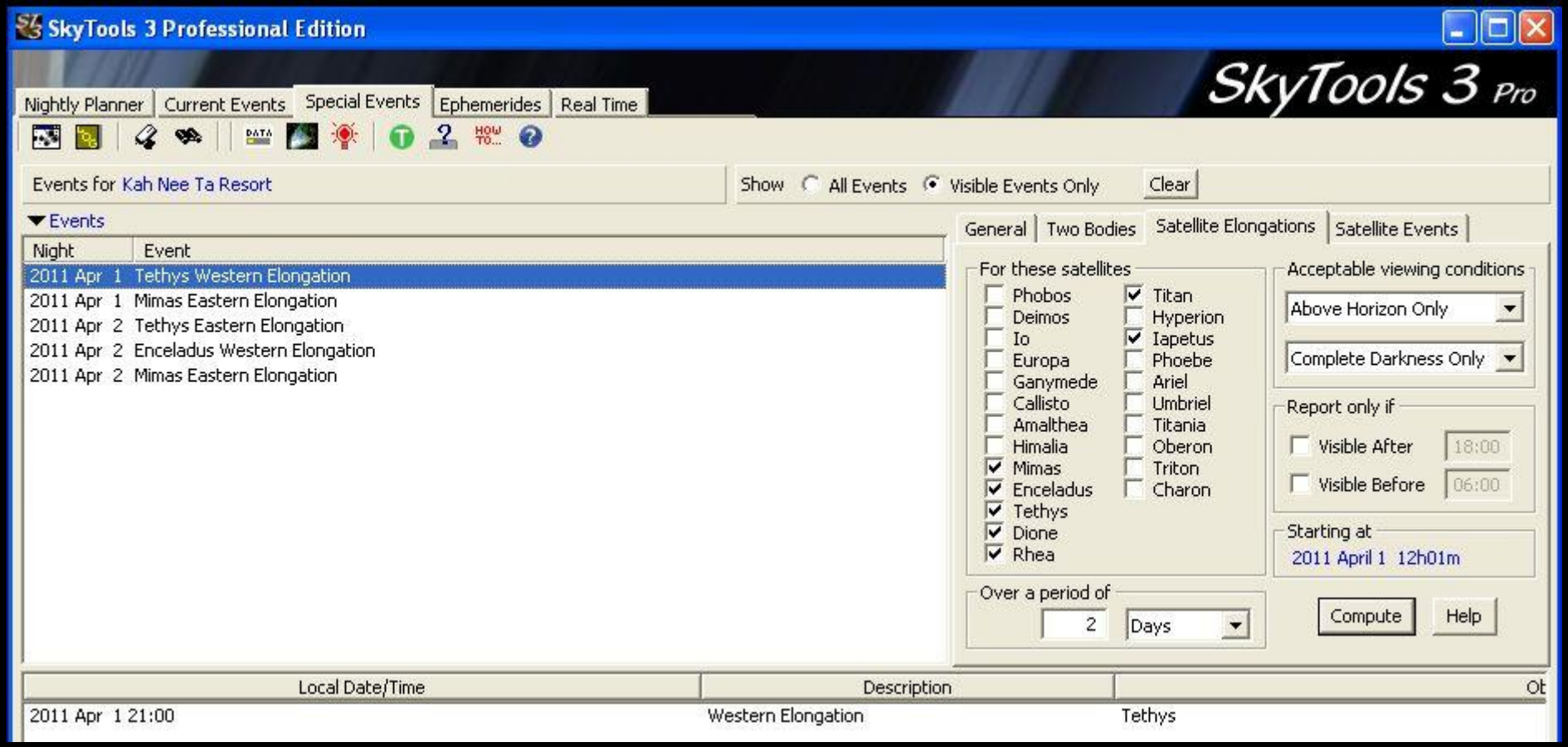
Calculating Elongations of Saturn's Major Moons During the Star Party

We'll use the Special Events Tool for this, to reduce the number of events to sift through.
The 7 largest moons of Saturn, in order of decreasing size, are

Titan, Rhea, Iapetus, Dione, Tethys, Enceladus, & Mimas.



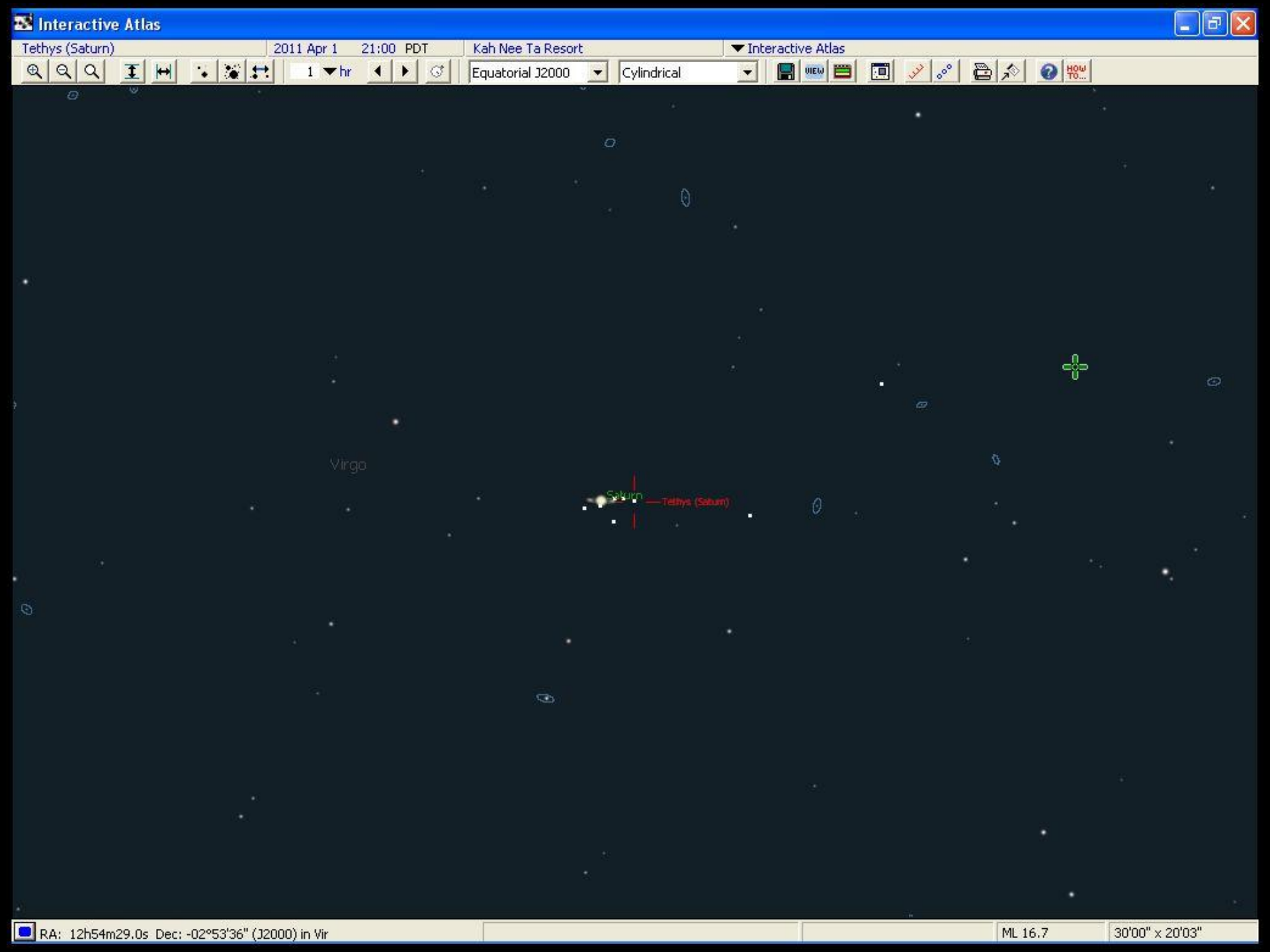
Pressing the Compute button shows there will be 5 events.
Select an event by clicking on it. This will show its details below.



The Western Elongation of Tethys will occur at 9 p.m., which is prime viewing time.
Let’s see what the Saturnian system will look like at this time.

Right-click on the event details and choose “View Interactive Atlas”.

The Interactive Atlas is SkyTools’ general star chart, useful for free-form exploring.

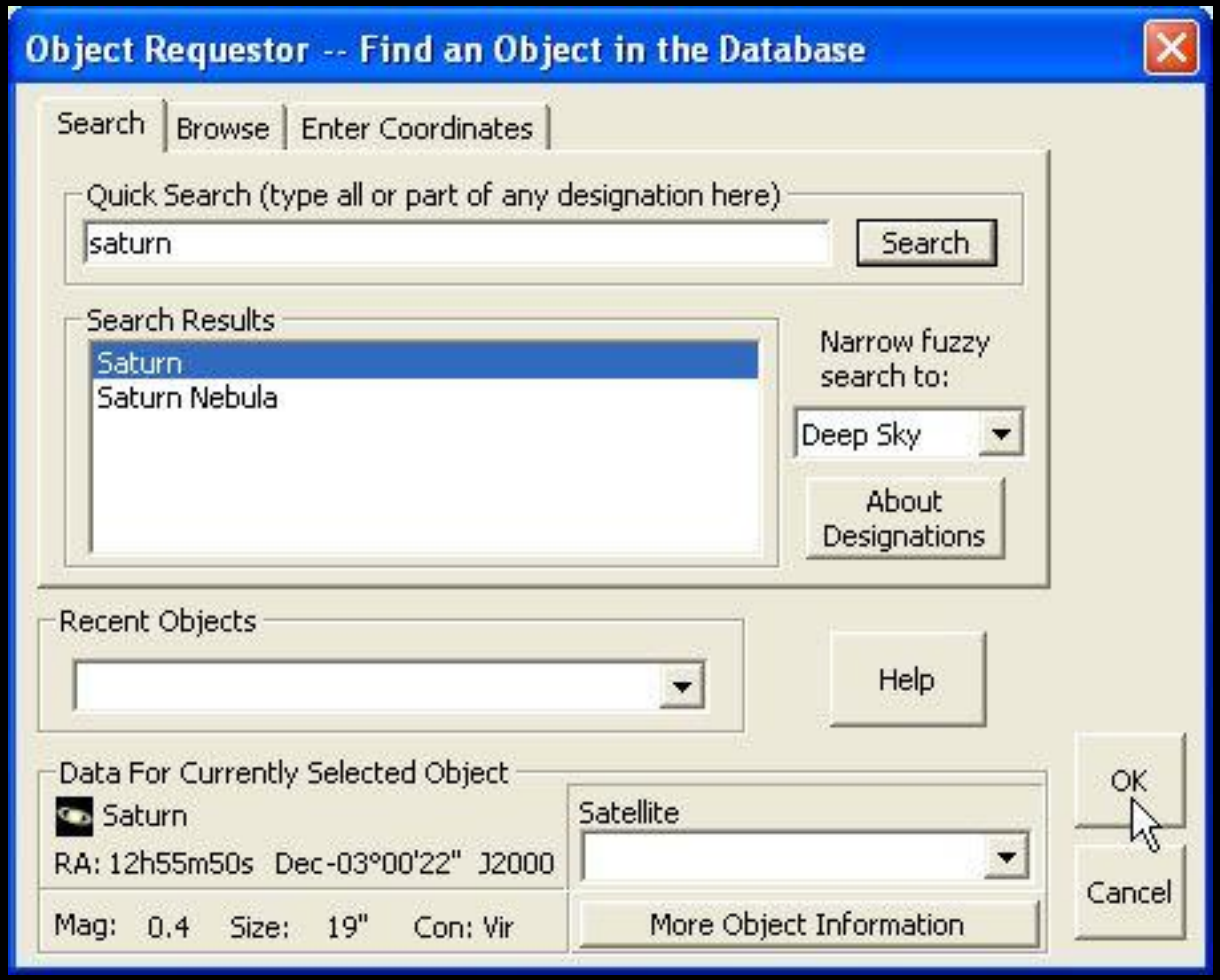

Interactive Atlas
Tethys (Saturn)
2011 Apr 1 21:00 PDT
Kah Nee Ta Resort
Interactive Atlas
1 hr
Equatorial J2000
Cylindrical
Virgo
Saturn
Tethys (Saturn)
RA: 12h54m29.0s Dec: -02°53'36" (J2000) in Vir
ML 16.7
30'00" x 20'03"

Follow the object link in the upper left-hand corner to open the Object Requestor.

Type “saturn” in the Quick Search box.

Then press the Enter key or the Search button.

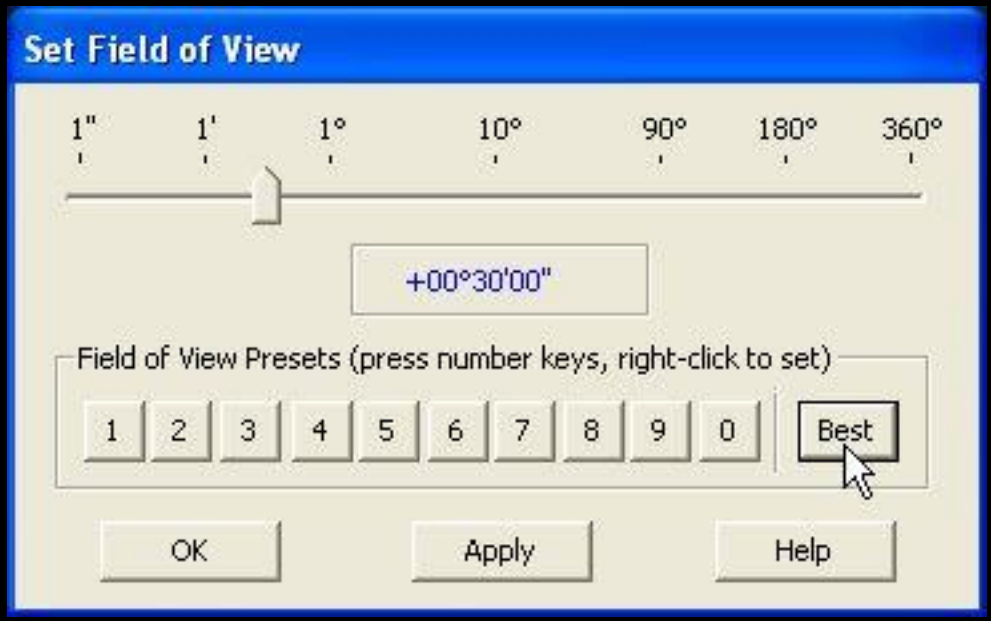
Last, push the OK button.

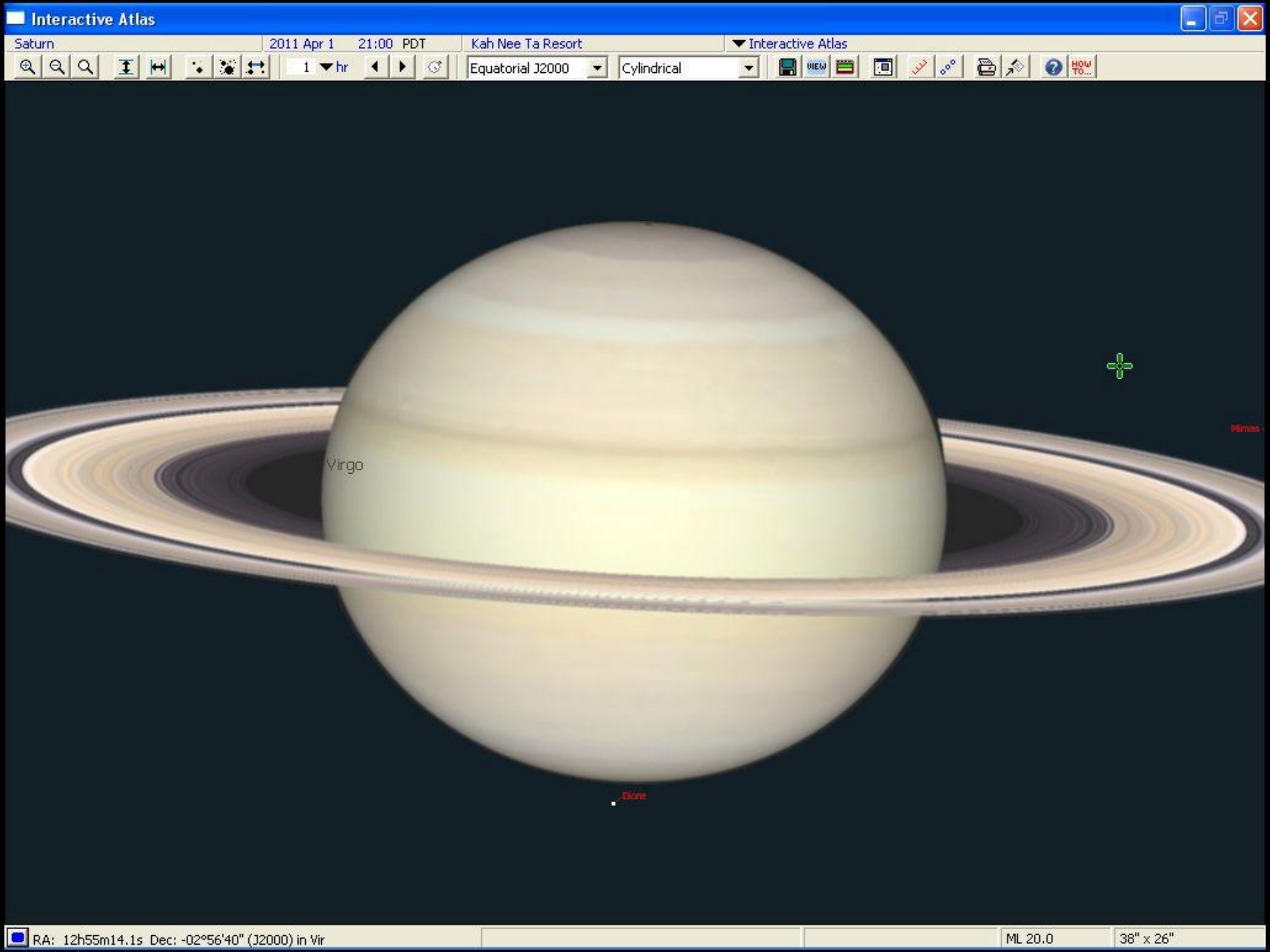


Push the Set Field of View button in the upper left-hand corner of the Interactive Atlas.

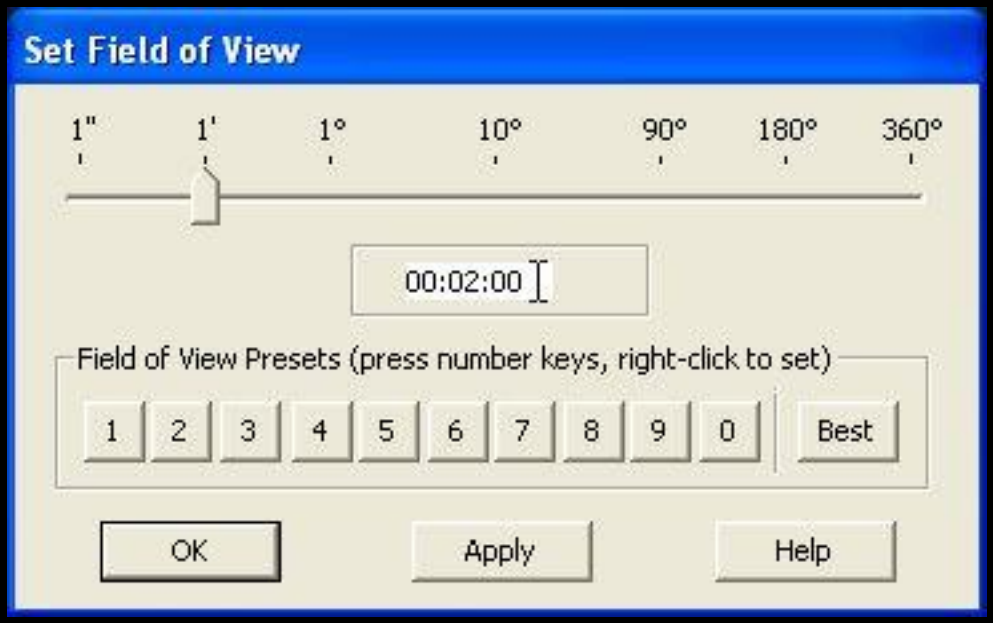
Push the Best button in the Set Field of View dialog box.

Then press the OK button.




Interactive Atlas
Saturn
2011 Apr 1 21:00 PDT
Kah Nee Ta Resort
Interactive Atlas
1 hr
Equatorial J2000
Cylindrical
Virgo
Mimas
Dione
RA: 12h55m14.1s Dec: -02°56'40" (J2000) in Vir
ML 20.0
38" x 26"

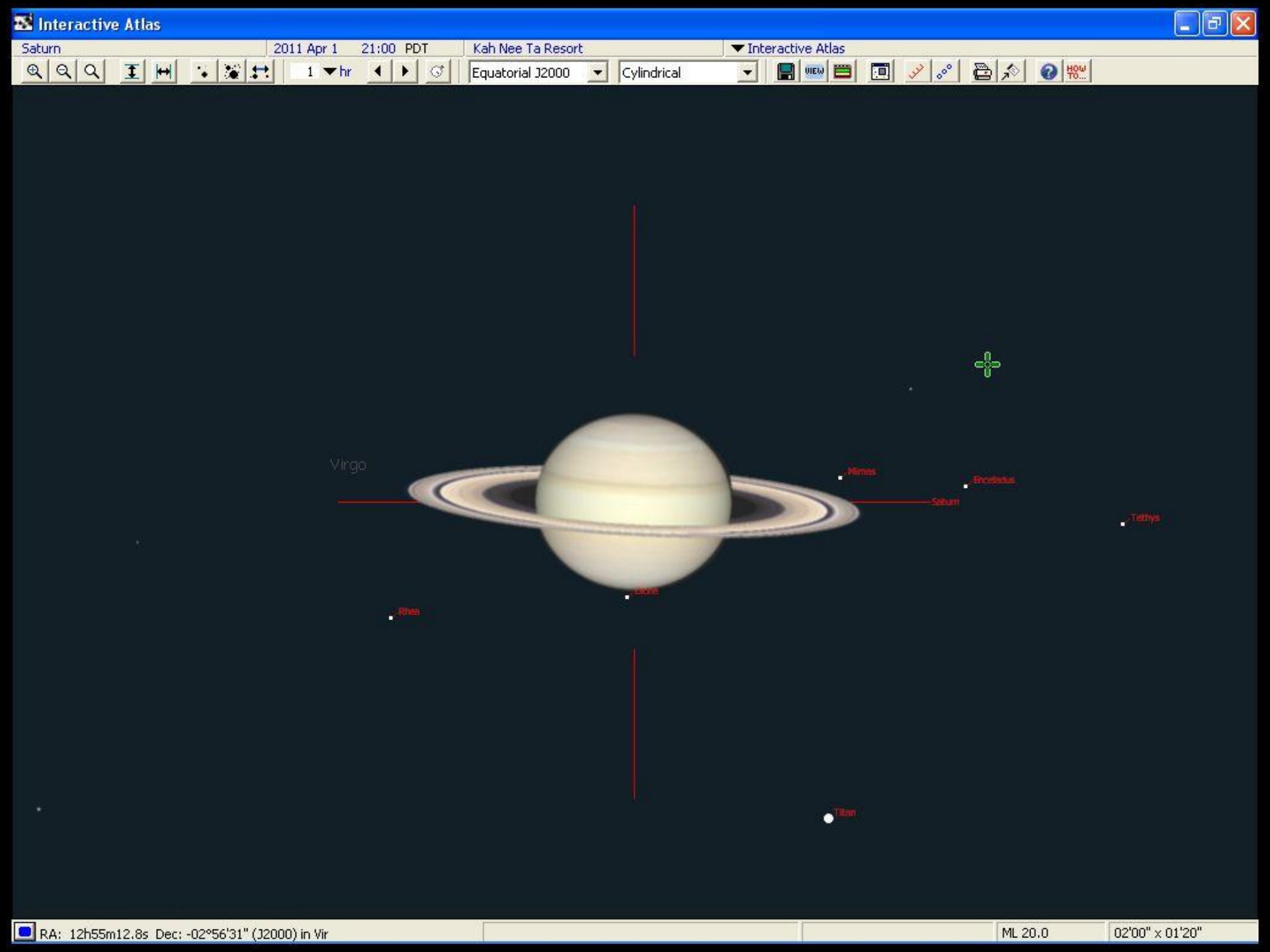
It’s a nice view but too close to Saturn to show us the configuration of the moons.



Open the Set Field of View dialog box again.

Click on the field in the middle and enter 00:02:00 for 2 arcminutes.

Then press the OK button.


Interactive Atlas
Saturn
2011 Apr 1 21:00 PDT
Kah Nee Ta Resort
Interactive Atlas
1 hr
Equatorial J2000
Cylindrical
Virgo
Mimas
Enceladus
Saturn
Tethys
Dione
Rhea
Titan
RA: 12h55m12.8s Dec: -02°56'31" (J2000) in Vir
ML 20.0
02'00" x 01'20"

This view shows 6 of the 7 largest moons. Only Iapetus is missing.
Since this is a nice configuration, we'll plan to observe it during the star party.
But, first, let's take the opportunity to explore the Interactive Atlas more.

Control	Action
Select Region with Left Mouse Button	Zoom in on selected region.
Hold Control Key and Select Region with Left Mouse Button	Zoom out from selected region.
Mouse Wheel Forward One Click	Zoom in one step.
Mouse Wheel Backward One Click	Zoom out one step.
Page Up Key	Zoom in one step.
Page Down Key	Zoom out one step.
+ Button	Zoom in one step.
- Button	Zoom out one step.
"b" Key	Set field of view to "best" level for the selected object.
Number Keys 0 – 9	Set field of view to the predefined level for that number.
Set Field of View Button	Set field of view to a desired value.

Field of View Controls, i.e. Zoom Controls, in the Interactive Atlas

Control	Action
Arrow Keys	Shift view one frame in the direction of the arrow key pressed.
Cursor	Can choose to center chart on the selected target using the right-click menu.
Object Link	Entering a different object will create the chart centered on that object.

Navigation Controls in the Interactive Atlas

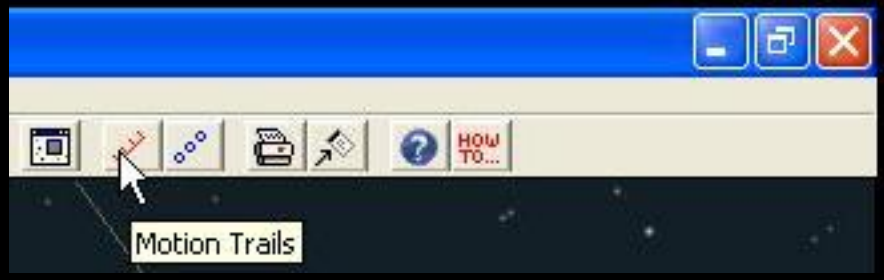
To display the list of all keyboard shortcuts, press “k” when any chart is selected.

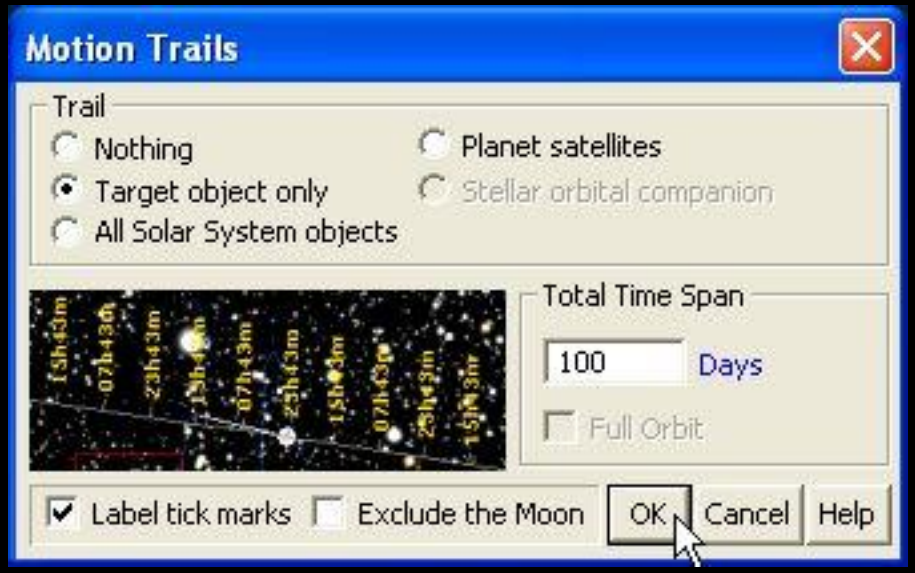
Exercise: Use the object link to navigate to NGC 4438, which is a galaxy in a crowded region of the Virgo-Coma cluster, and set the field of view to 2°. Experiment with navigating and zooming among the plentiful galaxies. Right click on any object in the field of view and choose Object Info to learn more about the object. After experimenting for awhile, close the Interactive Atlas by clicking on the window's “X” and re-open it for the elongation of Tethys from the Special Events tool.

Motion Trails

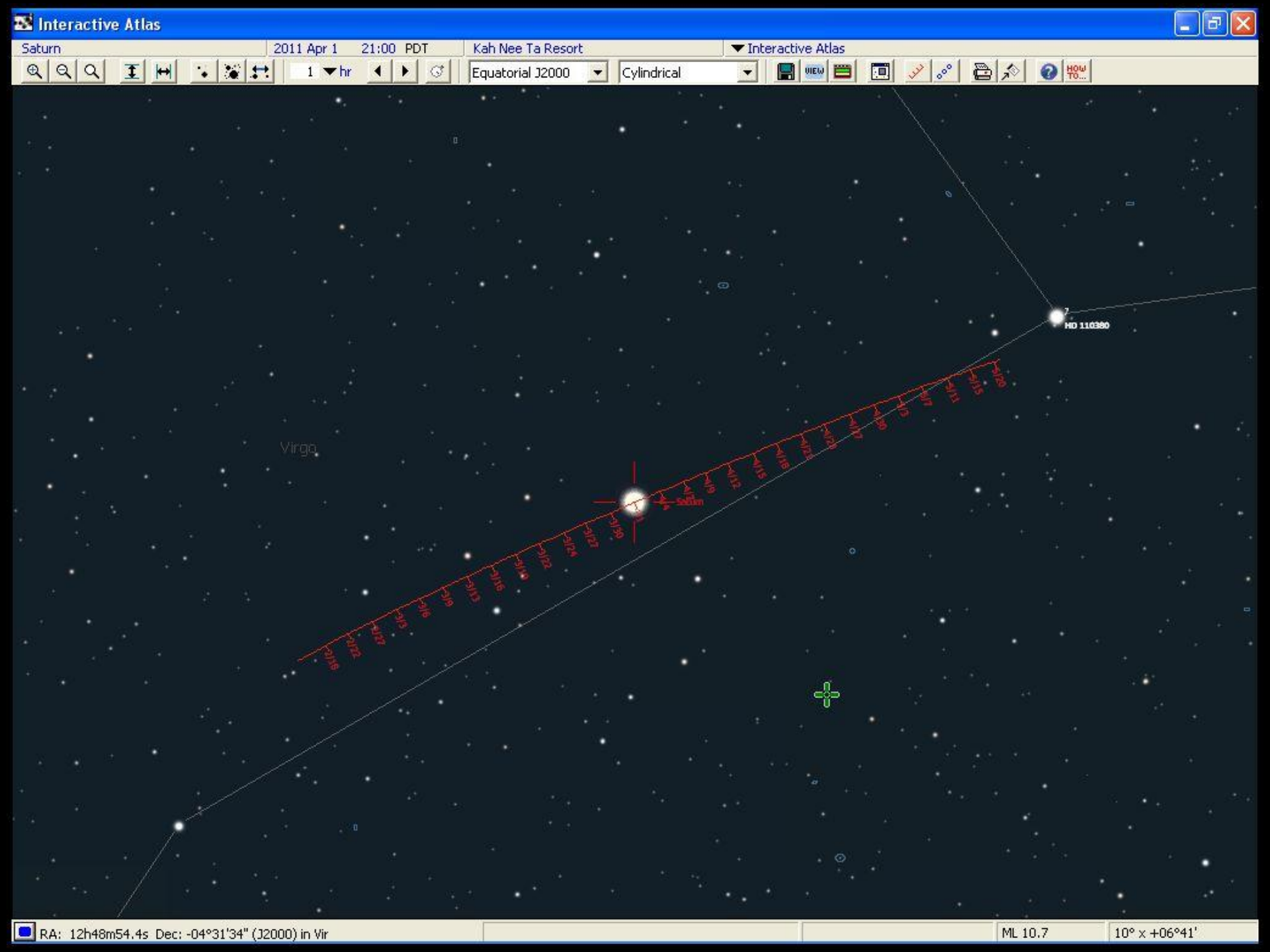
Center the field of view on Saturn again but, this time, set the field of view to 10°.

Push the Motion Trails button on the top left side of the Interactive Atlas.





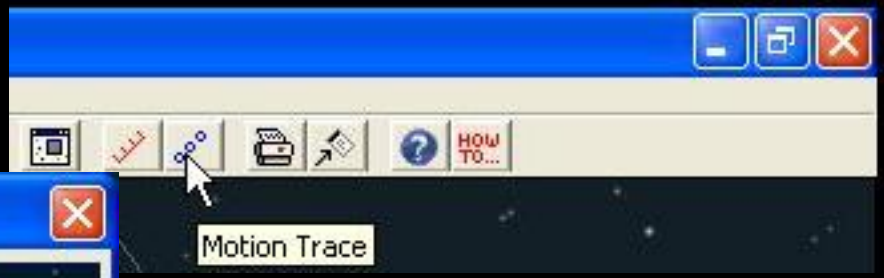
Select “Target object only”.
Set the Time Span to 100 days.
Check “Label tick marks”.
Then press OK.

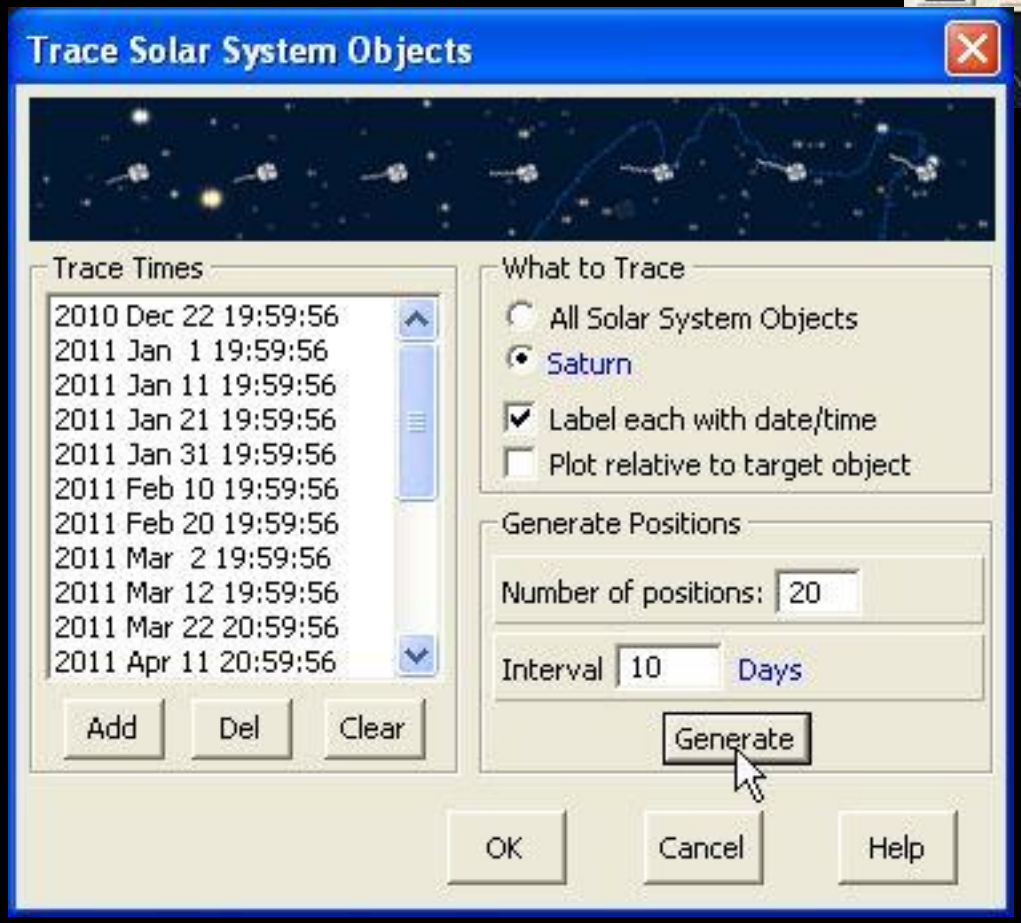

Interactive Atlas
Saturn
2011 Apr 1 21:00 PDT
Kah Nee Ta Resort
Interactive Atlas
1 hr
Equatorial J2000
Cylindrical
HOW TO...
HD 110380
Virgo
RA: 12h48m54.4s Dec: -04°31'34" (J2000) in Vir
ML 10.7
10° x +06°41'

Motion Trace

Turn off the motion trails by opening the Motion Trails dialog box again and selecting "Nothing" in the Trail frame.

Push the Motion Trace button.



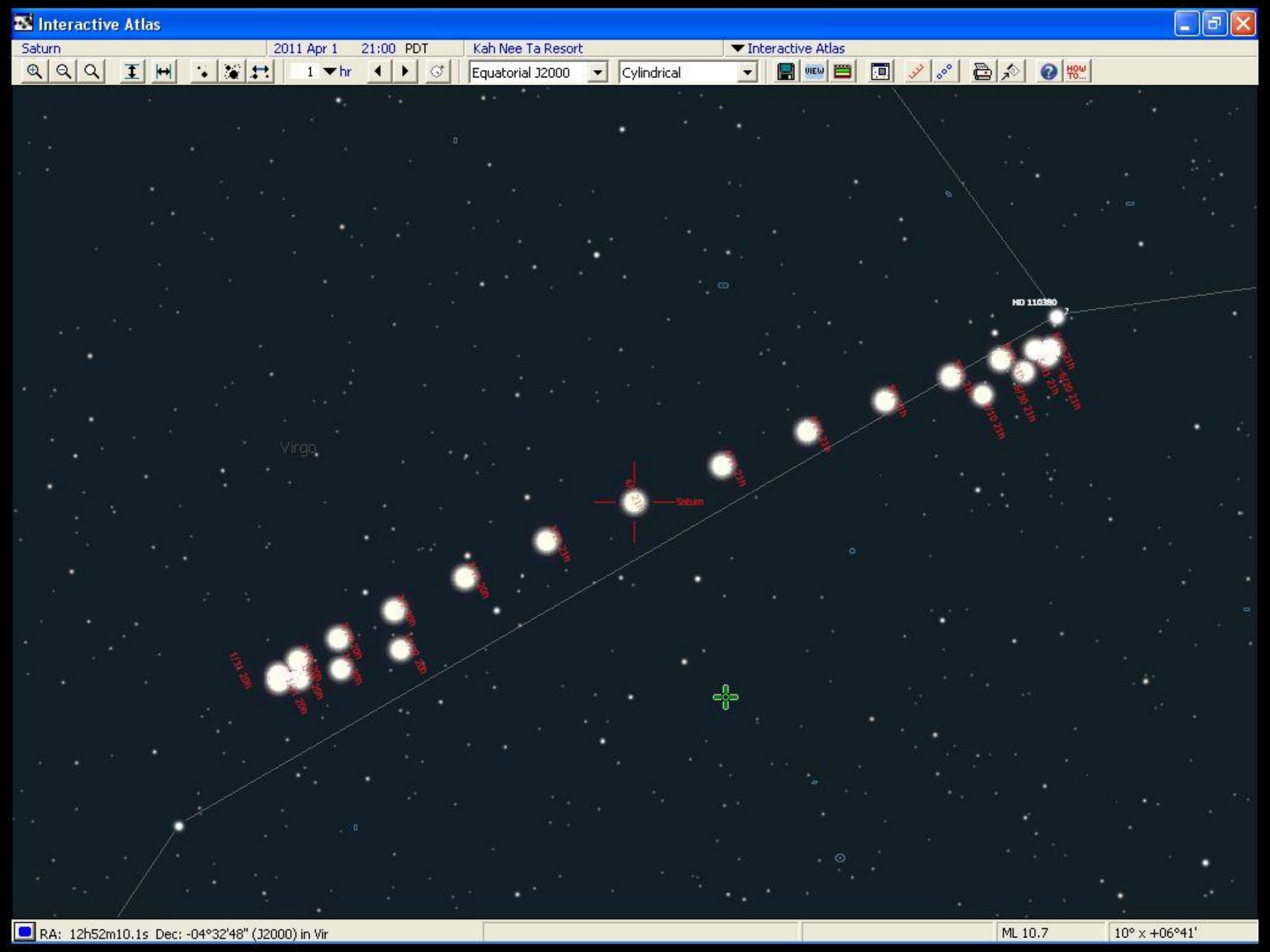


Under "What to Trace", select Saturn and check "Label each with date/time".

Set number of positions to 20 and interval to 10 days

Press the Generate button.

Then push OK.

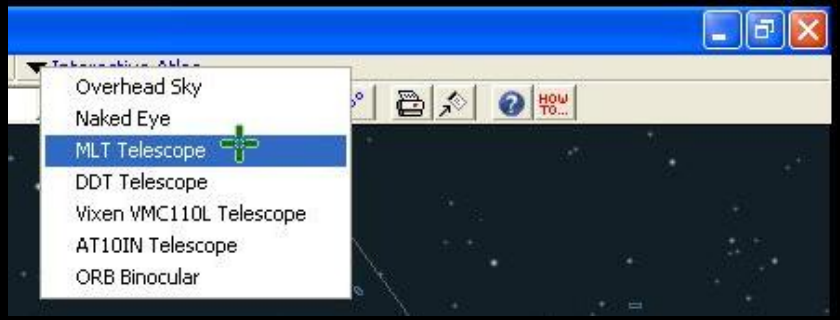

Interactive Atlas
Saturn
2011 Apr 1 21:00 PDT
Kah Nee Ta Resort
Interactive Atlas
1 hr
Equatorial J2000
Cylindrical
HOW TO...
Virgo
Saturn
HD 110380
RA: 12h52m10.1s Dec: -04°32'48" (J2000) in Vir
ML 10.7
10° x +06°41'

Each trace is an image of Saturn at the specified date and time. If the field of view was narrower, we would even see some of Saturn's moons at the time points.

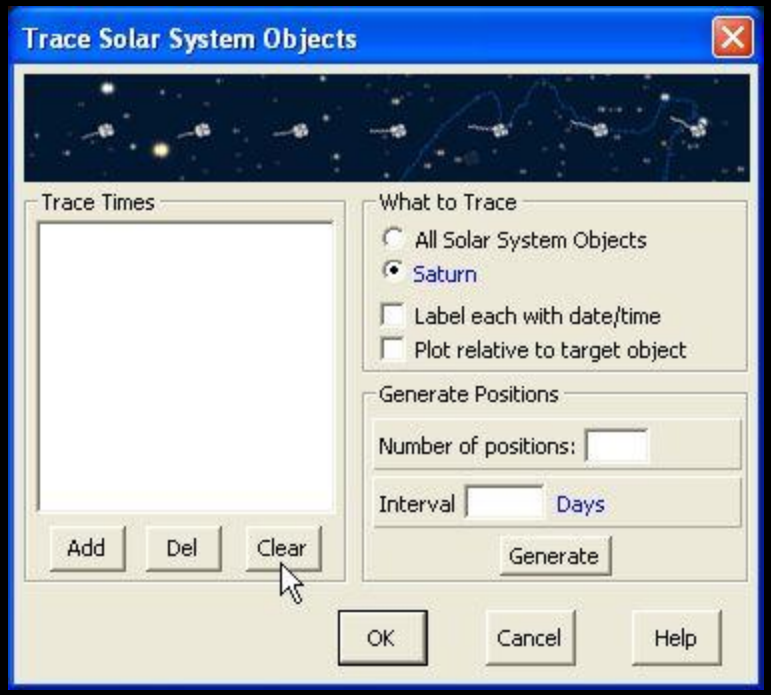
Exercise: Zoom in close enough to see some of Saturn's moons in the traces near one of its turning points. Reset the date and re-center the field on Saturn, if necessary.

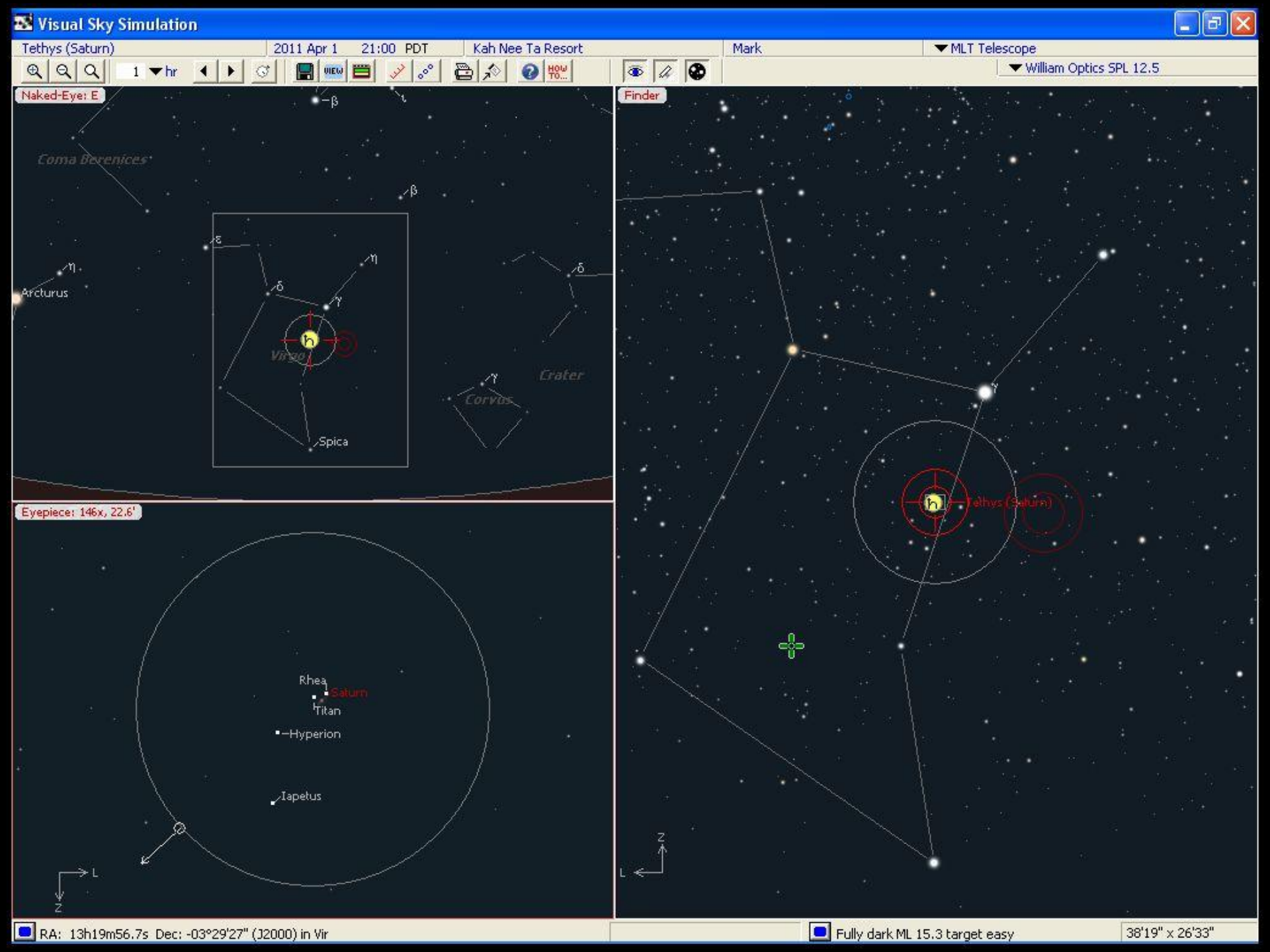
We've seen that the Saturnian system will be in an attractive configuration at the time of the April 1, 2011 Western elongation of Tethys. But what will the view look like in our telescopes? To answer this, we need to consult a different chart.

First, turn off traces by clearing trace times.



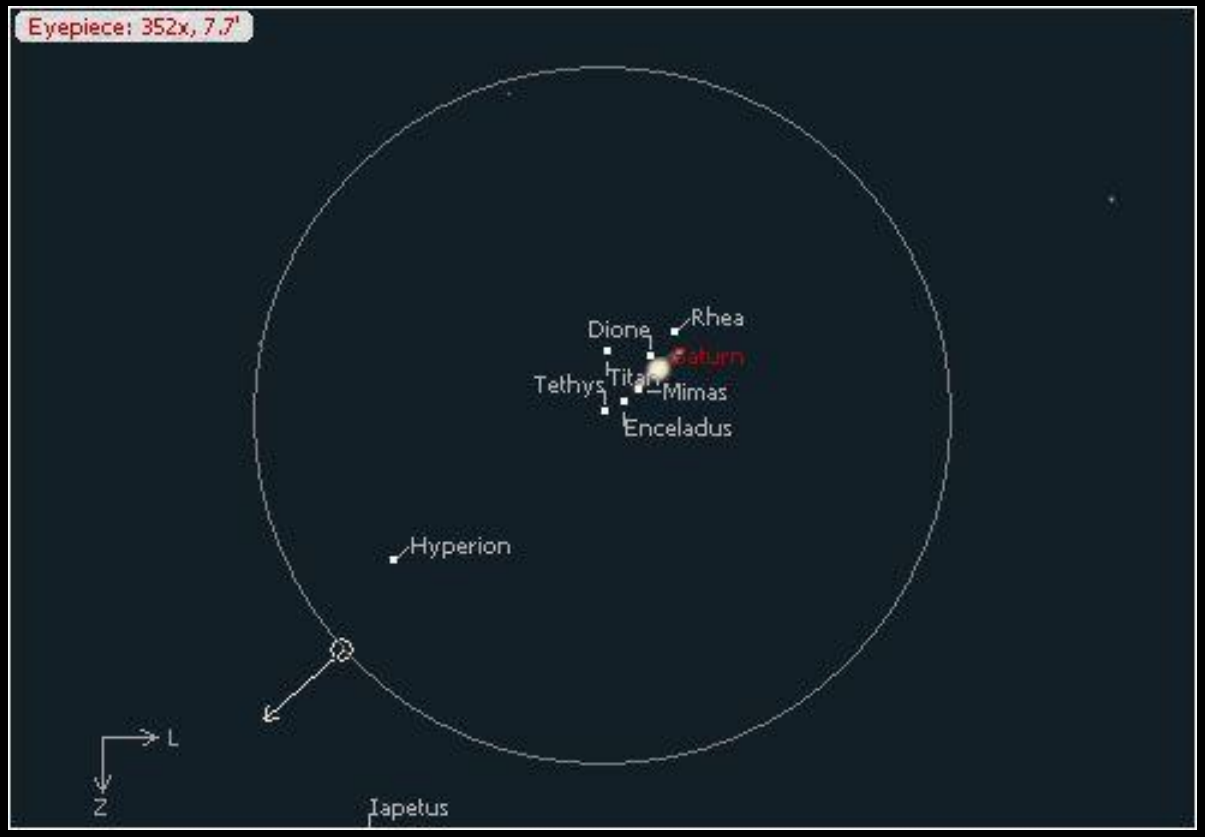
Then choose a telescope from the instrument link on the IA.




Visual Sky Simulation
Tethys (Saturn)
2011 Apr 1 21:00 PDT
Kah Nee Ta Resort
Mark
MLT Telescope
William Optics SPL 12.5
Naked-Eye: E
Coma Berenices
Arcturus
Virgo
Crater
Corvus
Spica
Finder
Tethys (Saturn)
Eyepiece: 146x, 22.6'
Rhea
Saturn
Titan
Hyperion
Iapetus
RA: 13h19m56.7s Dec: -03°29'27" (J2000) in Vir
Fully dark ML 15.3 target easy
38'19" x 26'33"

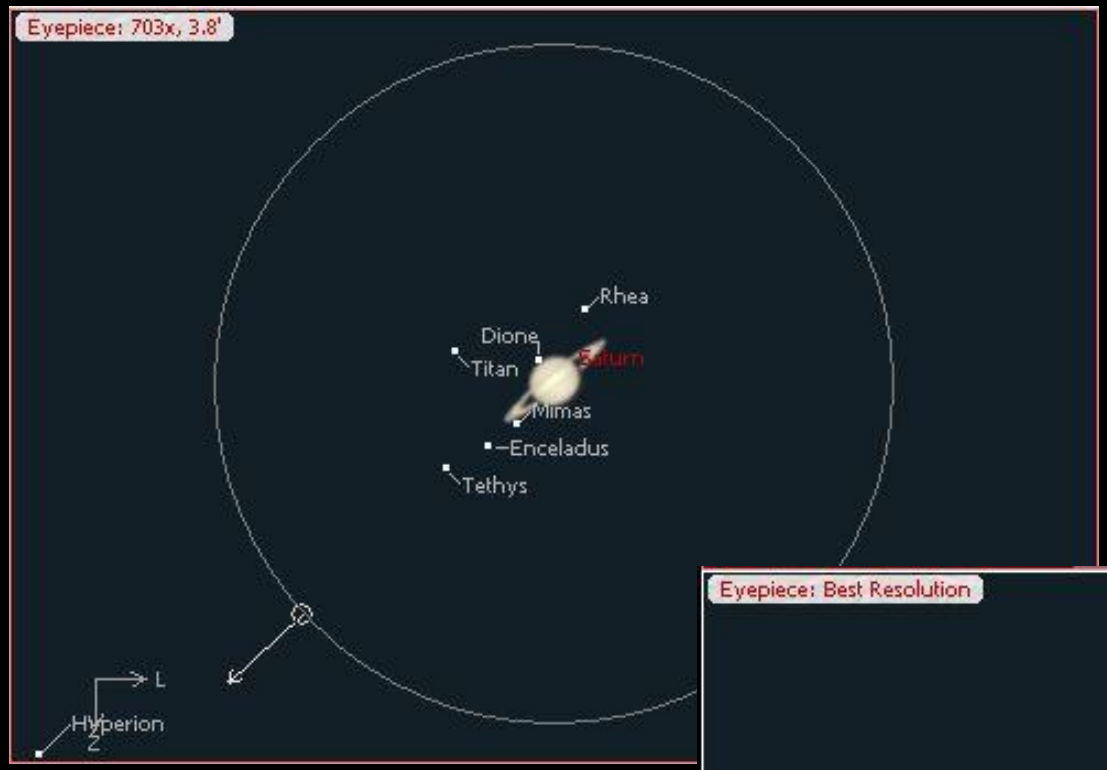
The dimmer concentric red circles in the Naked Eye and Finder views denote the Earth's shadow in the sky.

We now see Iapetus in the eyepiece view, which is ≈ 38' x 27'.
Before, it was far outside the field of view.

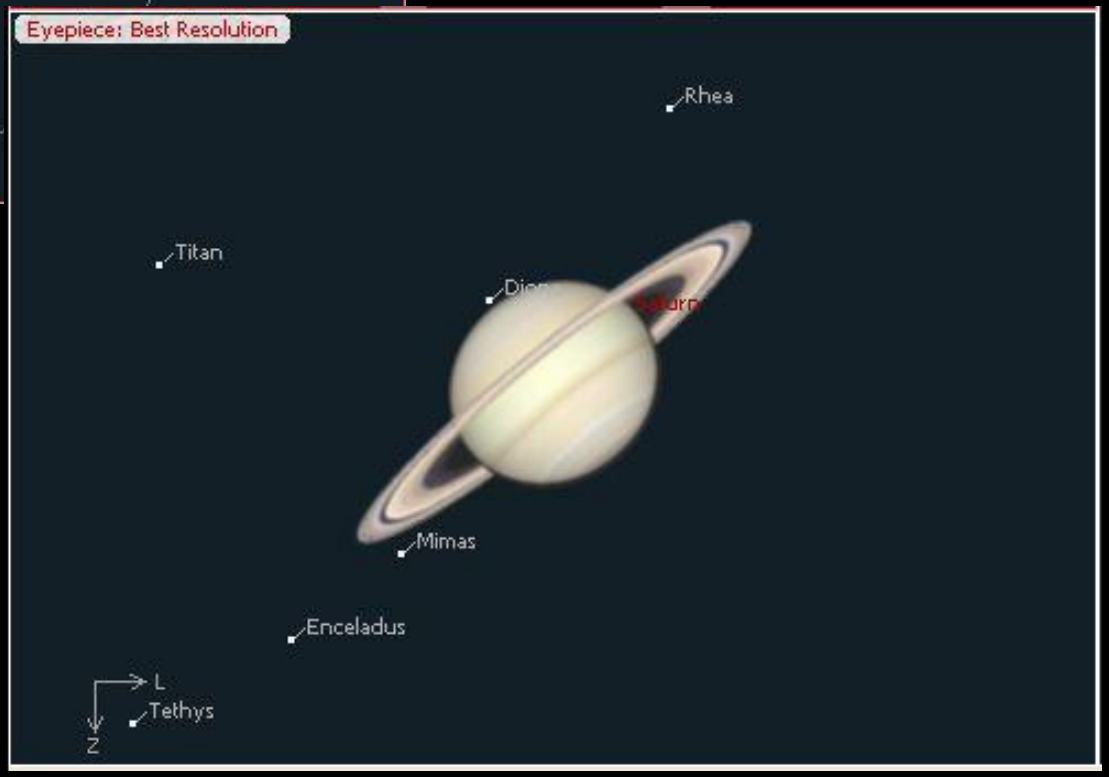


Change eyepieces to investigate possible views.

This is 352x, which is probably my highest usable magnification.



This is the highest magnification hypothetically possible with my equipment.



This is the “Best Resolution” view, which corresponds to Dawes’ Limit. It’s awesome but impossible.

Exercise: Calculate the events for Saturn's major moons using the Current Events Tool instead and verify that the April 1 Western elongation of Tethys is predicted to occur at the same time. Open the Events Calendar from the Current Events Tool and see what information it contains for March. Open the Nightly Events Planner for the first night of the star party April 1, 2011 and explore the information it contains.

I'd like to observe this event at the star party. But you can't add events to observing lists. What can you do?

1. Print a chart of the event to remind you about it.
2. If you use SkyTools at the telescope, open the Nightly Events Planner during the observing session to remind you. You can also slew a telescope to the event from here if you have one connected.
3. Set an alarm on your watch or computer for a time long enough before the event to allow you to set up to observe it.

Preparing an Observing List for a Visual Observing Session

Consider the size of your list.

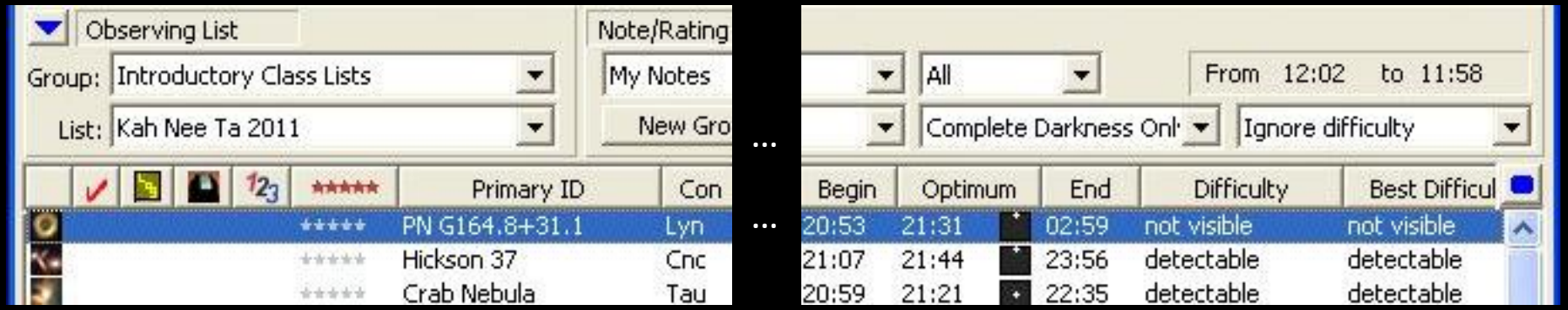
My list currently contains 64 objects and there is one event I'd like to observe for a total of 65 observations. That's a lot! But there are reasons to have a larger list than you expect to be able to finish.

1. Visibility may be poor in some parts of the sky or at some times during the night.
2. Your observing window may end up being different than you expect.
3. You change your mind at the last minute about the objects you'd most like to see.
4. Conditions end up being ideal and you're able to make more observations than usual.
5. Unobserved objects can be easily copied or moved to another observing list.
   So your efforts are not wasted.

On a good night, I've been able to observe approximately 35 objects. So maybe my list is even a bit too small.

Check for objects that won't be visible or will be too hard to see.

Sort list by Visual Detection Difficulty and remove, move, or hide objects that you won't be able to see or that have difficulties that are too high.



Move this object to the list "Kah Nee Ta 2011 Imaging" in case it will be visible to a camera. All other objects have difficulties that are "detectable" or easier.

Set filters to make sure that objects will be visible under good conditions.

All objects on my list will be optimally visible in complete darkness and above the horizon. Only 6 objects will be optimally visible below 2x airmass – those in Crv, Hya, CMa, and And.

Exercise: Check the visibility of the objects on your Kah Nee Ta 2011 list.

Prioritize objects.

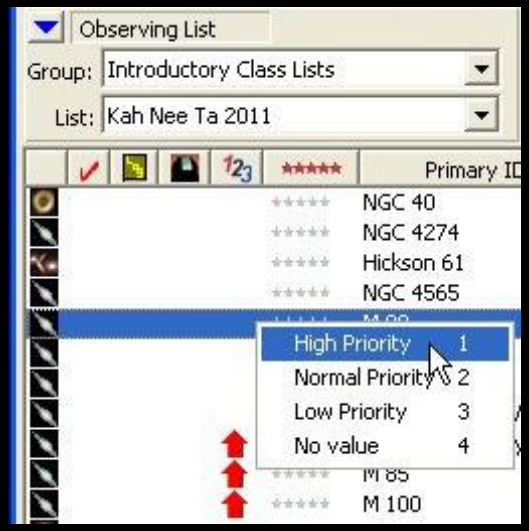
Give objects high, normal, or low priorities.

Some possible criteria are

1. Give a higher priority to objects in any observing programs you're participating in.
2. Give a higher priority to objects with smaller observing windows, e.g objects to the South for a Northern Hemisphere observer.
3. Sort by object type an d give a higher priority to the objects of each type that you'd most like to see and lower priorities to other objects.

Right-click in priority column for object and choose 1 of 4 priority values.

Must be done one at a time.



Exercise: Prioritize the objects in your Kah Nee Ta 2011 observing list.

Check optimal observing times.

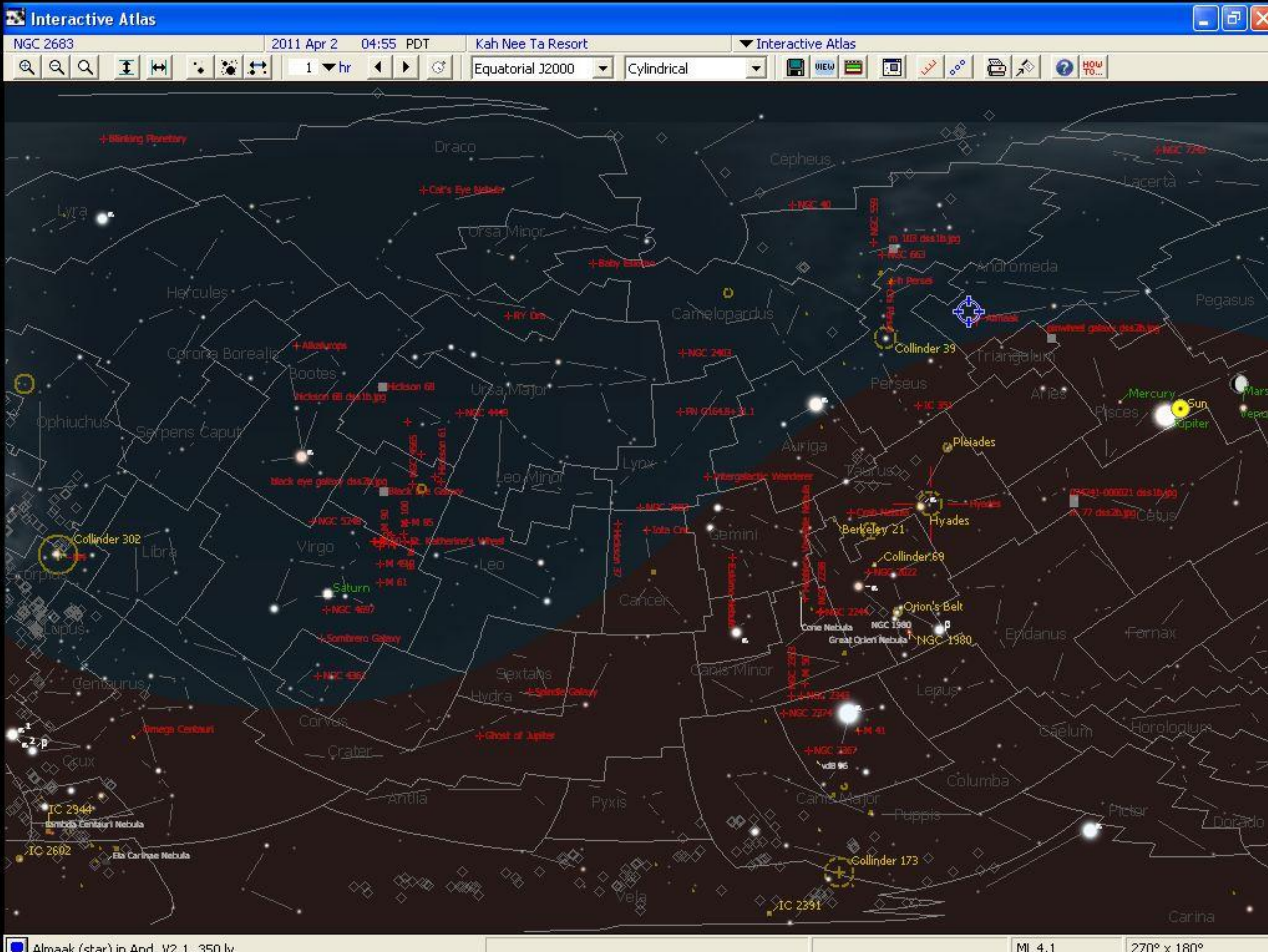
Sort by optimal observing time and make sure that there aren't too many objects to observe around the same time.

Or look at all objects at the same time in the Interactive Atlas and make sure that there aren't too many objects around the same right ascension.

My list is somewhat concentrated around the Coma-Virgo Cluster of Galaxies.
But that's because it contains all of the Messier galaxies in Coma & Virgo.
There are also quite a few optimal observing times around 9 p.m.
Otherwise, it's pretty well distributed.

(See the Interactive Atlas image on the next slide. It's a Cylindrical projection with a 270° FOV centered on NGC 2683.)

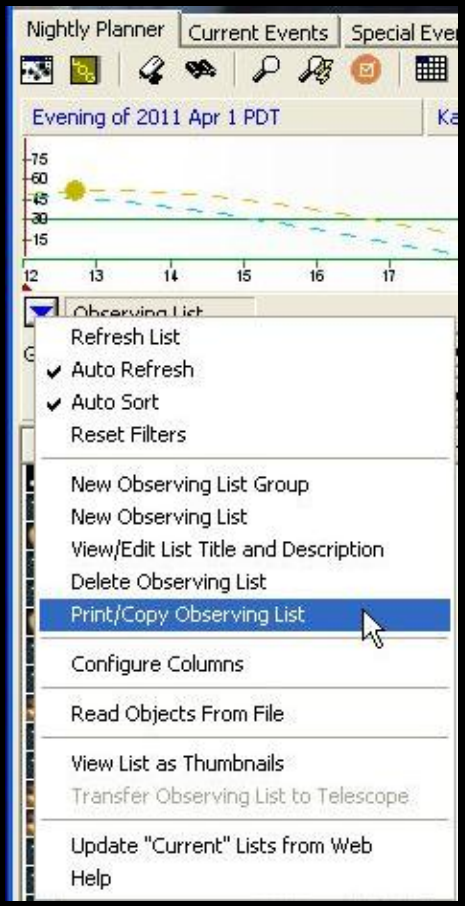
If the objects are bunched up, you might consider adding objects in other regions of the sky and possibly moving or deleting some of the objects that are crowded.


Interactive Atlas
NGC 2683
2011 Apr 2
04:55 PDT
Kah Nee Ta Resort
Interactive Atlas
1 hr
Equatorial J2000
Cylindrical
Draco
Cepheus
Lacerta
Lyra
Ursa Minor
Andromeda
Hercules
Camelopardus
Pegasus
Corona Borealis
Bootes
Ursa Major
Collinder 39
Triangulum
Perseus
Aries
Ophiuchus
Serpens Caput
Mercury
Sun
Mars
Pisces
Jupiter
Venus
Auriga
Pleiades
Lynx
Leo Minor
Taurus
Hyades
Collinder 302
Libra
Virgo
Gemini
Berkeley 21
Cetus
Leo
Collinder 69
Saturn
Cancer
Orion's Belt
Lupus
NGC 1980
Eridanus
Fornax
Centaurus
Sextans
Canis Minor
Hydra
Lepus
Corvus
Caelum
Horologium
Crater
Crux
Columba
Antlia
Pyxis
Canis Major
IC 2944
Puppis
Pictor
Dorado
IC 2602
Collinder 173
Vela
IC 2391
Carina
Almaak (star) in And, V2.1, 350 ly
ML 4.1
270° x 180°

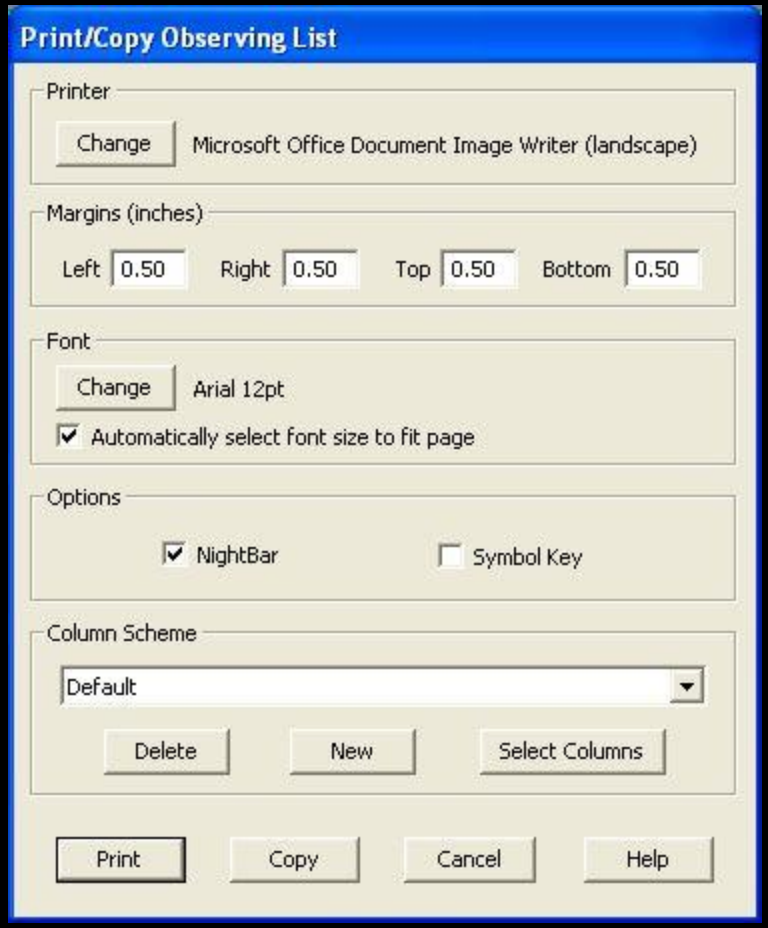
Print anything needed.

If you won't be using a computer at the telescope, print the observing list.

Print any charts you'd like to have hard copies of while observing.

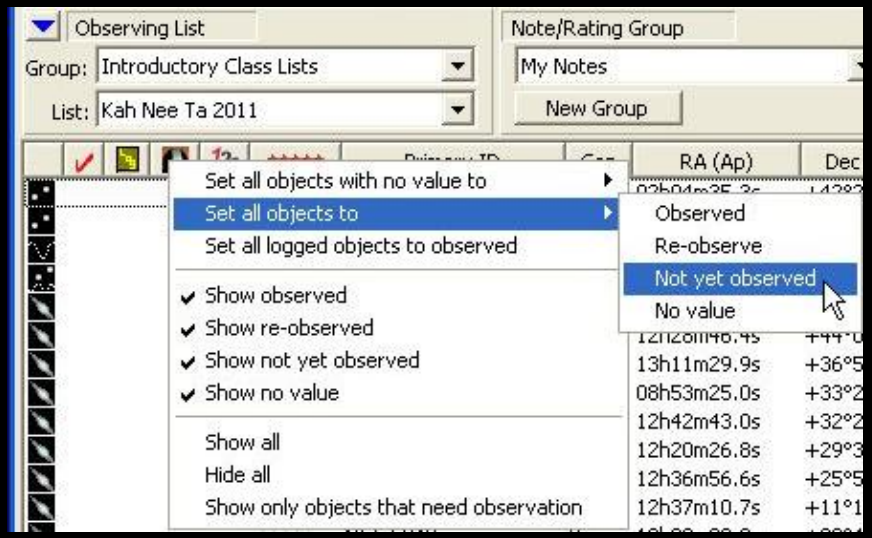


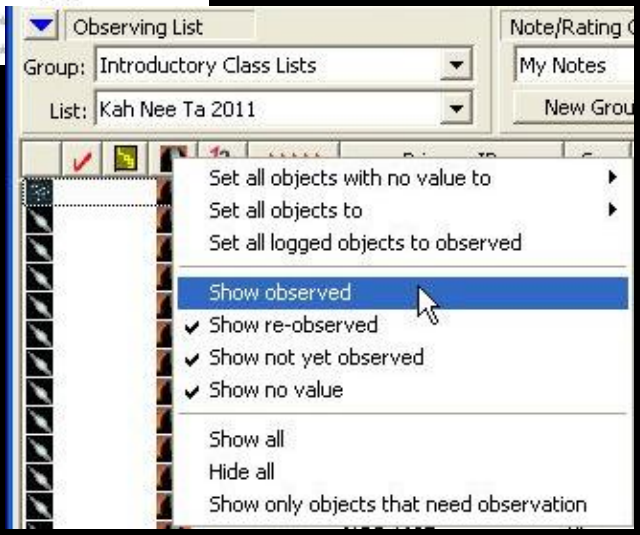
To print an observing list, choose "Print/Copy Observing List" from the Observing List Menu.



Set Observation Status for all objects.

If you will be using SkyTools at the telescope, set the observation status of all objects to “Not yet observed” and set the list to hide objects with the observation status “Observed”.





Adjust settings on the day of the star party.

On the day of the star party,

1. Reset weather conditions for the observing location.
2. Set the times that the observing session will start and end.
3. Set an alarm or alarms on your computer or watch to remind you of any events you want to observe.

Planning an Imaging Session

My Imaging Equipment

- ❑ 10” Astro-Tech Imaging Newtonian (≈ $600, AT10IN)
- ❑ Canon 40D 10.1 MP DSLR camera (≈ $500 – 1000)
- ❑ SBIG ST-7XME Deluxe astronomical CCD camera ($2495)

At prime focus with the AT10IN telescope, the cameras have the fields of view and resolutions

- ➢ Canon 40D = 75’ x 50’, 3.3”/pixel
- ➢ SBIG ST-7XME Deluxe = 23.3’ x 15.5’, 5.2”/pixel

Piggyback, the Canon 40D camera with a 50 mm f/1.4 lens has a field of view of 25.4° x 16.9°.

SkyTools 3 supports afocal, eyepiece projection, prime focus, and piggyback imaging with DSLRs, astronomical CCDs, and web/video cameras. I will only discuss prime focus imaging of deep sky objects.

Choosing Suitable Targets

It's easy enough to find objects that would look great if you could take a high-quality image of them. And you could easily make an observing list of these objects using any of the methods I showed you for finding objects in the SkyTools database. But finding objects that your equipment is capable of imaging well is another challenge altogether.

What we really need is a way to search the database for only those objects that you could image well. The Database Power Search Tool is helpful for this purpose. But the Database Power Search Tool doesn't have an imaging mode and there are some issues to consider.

Using the Database Power Search Tool to Identify Potential Targets

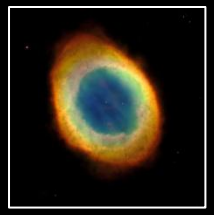
Probably want to restrict targets to high altitudes and appropriate levels of darkness. These choices correspond to filters in the Power Search Tool. Must use visual mode to activate filters.

Might only want to search for a class of objects with an object type. For example, it probably isn't very interesting to image elliptical galaxies.

What are the smallest sizes for objects to be reasonably imaged with the cameras? Objects look smaller and have decreased resolution with larger pixel sizes.

Pixels = 800 x 500
Apparent size ≈ 9.4’ x 5.9’

HST reduced, pixels ≈ 0.7” x 0.7”



Pixels = 174 x 177
Apparent size ≈ 2.0’ x 2.1’

These don’t include the effects of atmosphere, differences in sensor sensitivity, imperfections in imaging sensors, or differences in processing.

Pixels = 160 x 100

Pixels = 100 x 63

Canon 40D
pixels ≈ 3.5” x 3.5”

Pixels = 37 x 38

SBIG ST-7XME
pixels ≈ 5.6” x 5.6”

Pixels = 23 x 24

If an object is too large for the FOV, you'll have to take multiple images, appropriately placed to create a mosaic of the object. You might want to limit the object size to avoid having to make a larger mosaic than you're comfortable with.

What is the minimum surface brightness or minimum magnitude needed to keep exposure times reasonably short relative to pixel sensitivity & noise? It depends on the characteristics of your camera and the spectrum of light that an object emits. If you don't know an appropriate limit, don't set one at first. Then, after you've generated an initial list, try different limits to find the brightest targets.

Once we identify potential targets, the Exposure Calculator will help with this.

For example, let's find all of the spiral galaxies larger than 8' and surface brightness ≤ 22 mag/arcsec^2 that are visible in complete darkness and above 2x airmass on the first night of the star party.

- Open the Database Power Search Tool.
- Enter the settings shown on the next slide.
- Push the Search button.
- Then select the Kah Nee Ta 2011 Imaging list from the Introductory Class Lists group, push the Select All button, and press the Add to List button.

Database Power Search Tool

Stars | Galactic Deep Sky | Extragalactic | Minor Planets | Comets

Databases to Search
- Galaxies
- Galaxy Groups
- Quasars

☐ Supplemental Deep Sky

Catalog Designations
◉ All ○ Selected only

Common Name, Messier, NGC, IC, Arp, Markarian, MCG, UGC, ESO, PGC/LEDA

Common Data Limits
Magnitude ≥ None ≤ None
Size ≥ 8.00 ' ≤ None '

◉ Light travel time ≥ None ≤ None Myr
○ Z (redshift) ≥ None ≤ None

Galaxy Limits
Class: Spiral
Orientation Any
SBr: ≤ 22.0 mag/arcsec²
Interacting with 0 or more
V(r) ≥ None ≤ None km/s e (b/a) ≤ None

Quasar Type include BL Lac

Galaxy Group galaxy count ≥ None

Mode | Reset

Visibility Filters
Evening of 2011 Apr 1
Kah Nee Ta Resort
Mark
MLT

Visual Detection Difficulty
Ignore difficulty

Conditions (for specific date)
Above 2X (Airmass) Only
Complete Darkness Only
☐ If visible after 00:00
☐ If visible before 00:00

Search Constellations
◉ Any ○ Selected

And	Ari	CVn	Cen	Com
Ant	Aur	CMa	Cep	CrA
Aps	Boo	CMi	Cet	CrB
Aqr	Cae	Cap	Cha	Crv
Aql	Cam	Car	Cir	Crt
Ara	Cnc	Cas	Col	Cru

Select All | Clear All

Search Radius
☐ Within 001 degrees of Nothing

Include Objects With Log Entry
◉ Any ○ Logged ○ Unlogged

Search | Help

Object ID	Con	RA	Dec	Mag	Light Time	Type	Difficulty
NGC 2683	Lyn	08h53	+33°23	10.0	---	Spiral b	easy
Bode's Galaxy	UMa	09h57	+69°01	7.8	12 Myrs	Spiral b	easy
M 65	Leo	11h20	+13°02	10.1	41 Myrs	Spiral a	easy
M 66	Leo	11h21	+12°56	9.7	41 Myrs	Spiral b	easy
Sombrero Galaxy	Vir	12h41	-11°41	9.1	60 Myrs	Spiral	easy
Whale Galaxy	CVn	12h43	+32°29	9.5	---	Spiral c	easy
NGC 4656	CVn	12h45	+32°06	9.7	---	Spiral	easy
M 94	CVn	12h51	+41°03	8.7	17 Myrs	Spiral b	easy
Black Eye Galaxy	Com	12h57	+21°37	9.3	12 Myrs	Spiral b	easy
Whirlpool Galaxy	CVn	13h30	+47°08	8.7	43 Myrs	Spiral c	easy

Destination Observing List Group
Introductory Class Lists | New

Destination Observing List
Kah Nee Ta 2011 Imaging | New

Add to List | Select All | Unselect All

Search Complete: 10 objects found

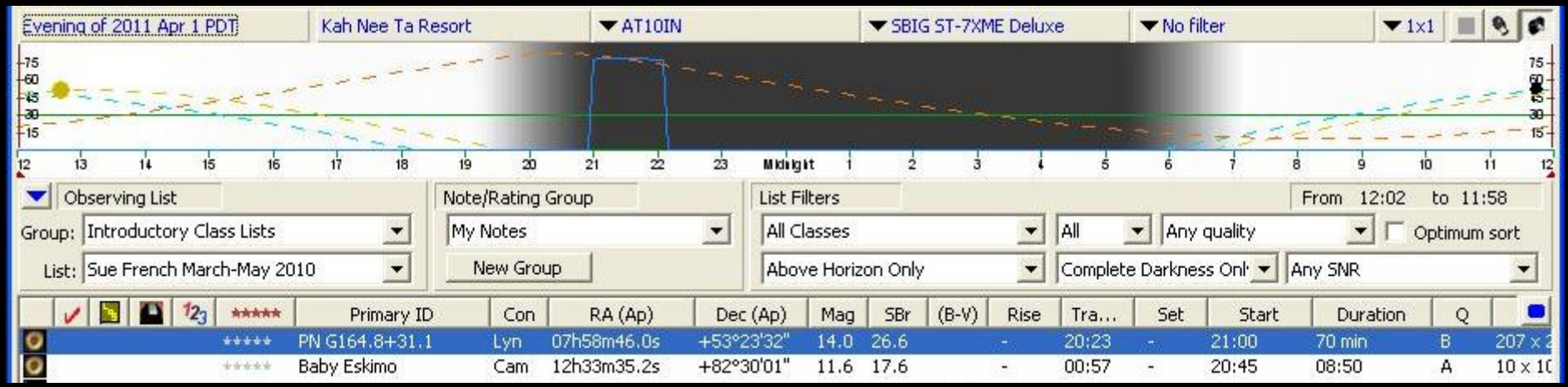
Suggestions for Using the Database Power Search Tool to find Suitable Imaging Targets:

- ✓ Use the tool in visual mode rather than simple mode to activate filters.
- ✓ Set Conditions filters to limit search to appropriate altitudes and darkness. Might want to set time limits (or constellations) too to help insure that objects will be visible long enough to image.
- ✓ Restrict searches to appropriate classes within object types, e.g. spiral galaxies rather than just galaxies.
- ✓ Set a minimum object size based on what's reasonable for your camera.
- ✓ You might want to set a maximum object size too to avoid the need to create mosaics larger than you're comfortable making.
- ✓ Try setting upper limits for object surface brightness or magnitude.

Exercise: Use the Database Power Search Tool to find all of the globular clusters with diameters larger than 8' visible in complete darkness, above 2x airmass only, and before 1 a.m. on the first night of the star party. Add these objects to the Kah Nee Ta 2011 Imaging observing list.

Exercise: Find all planetary nebulae larger than 7’ with surface brightness ≤ 26 mag per arcsec^2 visible before midnight in complete darkness and above 2x airmass on the first night of the star party. Add these objects to our imaging list. What happens if you decrease the surface brightness limit?

If you do both visual observation and imaging, you might want to revisit objects rejected from your visual observing lists. For example, consider the planetary nebula PN G164.8+31.1 that I rejected from the visual observing list since it wasn’t visible in my telescope.



Load the Sue French March-May 2010 observing list in the Nightly Planner and make sure that you are in imaging mode. This PN is large enough to occupy 207 x 207 pixels in the SBIG camera and it has an overall quality rating of B, which is pretty good. It might be worth considering. Let’s go ahead and copy it to our imaging list.

Taking a Closer Look at Our Imaging List

We now have a list of 23 objects that we want to consider imaging at the star party. Since you might typically image only a few objects per night, this is a long list. However, most of the reasons I gave for wanting a large list for visual observation also pertain here. And we aren't done refining our list yet.

Next steps

1. Prioritize objects. Your priorities are used in sorting.
2. Set Observation status of all objects to "Not yet observed".
3. Set list filters to guarantee appropriate altitude, darkness, exposure quality.
4. Set times for beginning and end of observing session.
5. Check the "Optimum sort" check box.
6. Look at timeliness index and image size, resolution, and quality.

These should help narrow the list down some more.

Exercise: Perform these steps for the Kah Nee Ta 2011 Imaging list. Would any of these objects be good targets for your imaging equipment? If so, write down a list of the objects that you would choose to image at the star party.

Using the Interactive Atlas and the Context Viewer to Frame Images

In addition to looking more closely on the list itself, you might want to get a better idea of what the images might look like. As with visual observing, one of the SkyTools charting tools can help us here.

The Context Viewer simulates an instrument within the Interactive Atlas.
It allows you to use the eyepiece or camera view while using the Interactive Atlas and allows you to control a mount from the Interactive Atlas.

Use the IA and the Context Viewer to frame nice images. Print any that look good.

Create an Exposure Schedule

Use the exposure windows in the Night Bar or the exposure intervals in the list to make a rough plan of imaging for the night. Don’t forget to include the time required to reposition and readjust equipment between exposures.

It should be possible to greatly refine your exposure schedule using the Exposure Calculator.

SkyTools 3 and Optical Filters

Using a filter with a telescope and camera is like using a different instrument.

What to Do After an Observing Session

Back-up and print logs to preserve them. Use the Search tab on the Log Browser to list only the logs that are new since you last printed them.
Copy unobserved objects to future lists.