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FirstLight-Beta 5, June 2, 1995

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Introduction

Welcome to the launch of a new product, FirstLight, version 1.0! FirstLight is the result of 9 years worth of work. Beginning with "Galileo" for the Commodore-Amiga (RIP) back in 1985 it migrated to "Distant Suns" for the Amiga in 1989, Distant Suns for Windows in 1991 and for the Mac in 1992.

After years of working on this thing, I had become somewhat jaded as to the usability issues. The reviews were good and the layout made sense to me. However after taking a closer look and peering at other software I realized that Distant Suns needed a radical redesign.

First and foremost, DS gave the user the universe and expected them to find something interesting. For an amateur astronomer, this is an easy task. For a newcomer to the subject it could be quite daunting. FL was designed to lead a new user to what is interesting while at the same time be a full fledged planetarium program for a sophisticated amateur.

FL starts out with something familiar and leads the user to the unfamiliar.

The name was changed to reflect this different approach. "First Light" is the term astronomers use when a new telescope is christened and turned towards the sky for the first time.

FirstLight vs. Distant Suns

As mentioned, this is a fundamental redesign of Distant Suns, in effect, the third generation reflecting the increased power computers now have and the increased expectations of the user, not to mention the newer multi-media models current software now use.

Two key elements are the navigational tools and methods used to permit a person to roam around the sky, and the new menu approach.

The new tools include a monthly calender (stuffed into DS 3.0 at the last moment), full sky startup screen, using the mouse to drag the sky around, and a tool called the "navigator" for a "you are here" display. Novice and expert modes are likewise supplied.

The new menu takes the "object-action" approach where a user decides what OBJECT they want to deal with (planet, star, etc) and then decide what they want to do with it. Whereas with DS, not to mention every other astro program out there, used the "action object" design, where the user knows what they want to do, then decides what object they apply it to. Object-action seems to approach the way the mind thinks more closely than the other, and hence should appear much more natural feeling.

There are also a host of great new features: 24 bit planetary rendering, flyby mode (duplicating the flyby trajectories of the NASA spacecraft), a 3D local star display, support for creating AVI files, use of "ctrl3d", for a nicer 3D look to the controls, really really fast real-time animation, NASA satellites, and if I have enough time, multimedia instructional files.

IMPORTANT !!!!

In the files\startup preferences window there are two extra items at the bottom for test purposes only:

Splash screen when off will prevent the opening artwork from being seen. This may be needed if FL crashes on startup. Showing the splashscreen will cover up the debug window. If you are stuck in this mode and get crashes go into the data2\misc directory and open up the file st_prefs.txt file. The 7th flag is the splash screen flag. Set it to 0 and try again. The 3rd flag is for Sky Tonight and may be likewise set to zero if you are getting problems from that.

Maximized, when turned off will open up the planetarium window over to the side in a non-maximized state. This is for the same reason as the feature above : to prevent covering up the debug window at startup.

Things to look for

When using FL assume the position of an astronomy neophyte, someone who knows no more about the subject than what they see with their own eyes :
That there is something called the moon and sun "up

there", and that we orbit around the sun. Most people I've met also seem to know at least 2 constellations, the Big Dipper, and their astrological sign. With that it mind spot anything that might confuse such a person early on. Over time I expect most folks to join the ranks of experts and go to the full set of options, but for the first sessions while in novice mode, anything that might intimidate a person or cause confusion should be flagged. It might be as simple as a menu label for instance.

Make sure the documentation is correct for the features.In particular the docs for each dialog. I will be changing things from time to time (adding or deleting buttions for instance), and may forget to modify the docs.

Into

This space for rent...

Reference

This section provides a handy reference to the options available in FirstLight.

Toolbar

Stretched along the top of the main star window is the toolbar. By now you should be used to such things, as they are quite standard items for windows based software. The most commonly menu selections have been duplicated and placed here to make them easier and quicker to access.

The first several buttons deal with the solar-system and constellations.

Center the sun

Center the Moon

Center a planet (this will open the planet center window)

Turn on or off the names of the planets

Move your eyepoint off the earth and out into the solar system

Turn off or on the constellation outlines

Turn off or on the constellation names

Center a constellation

Next come buttons to handle the display's internal clock, and are styled to resemble a VCR control pad. The clock is set to advance at certain given increments. When used, these controls can give you a "time lapse" effect, showing more clearly the motions of the planets up against the stars.

This will decrease the time according to the increment set. Clicking once will start the clock decreasing as fast as possible, clicking the center button will stop it.

Decrease the time 1 increment per click. So if the increment was set to 5 hours, this button will take subtract 5 hours each time it is used.

Freezes the internal clock.

Increase the time 1 increment per click. So if the increment was set to 5 hours, this button will add 5 hours each time it is used.

This will increase the time according to the increment set. Clicking once will start the clock increasing as fast as possible, clicking the center button will stop it.

Open the clock control window. Using the clock control you may set the time from each time update. It can be as short as 1 minute, useful for animating eclipses,on up to many years.

The following buttons set up the "quickview" mode. These simply turn on a number of features to show the sky from your home position aimed towards any of the four main directions.

Next come the deep-sky objects, control.

The "NGC" button turns on a selected number of objects in the NGC catalog, while the "M" button toggles those objects in the Messier catalog.

The zoom buttons will set the field-of-view of the display to two commonly used settings.

The first button sets the display to 60 degrees wide which is close to what the human eye sees, while the other, 120 degrees will give a somewhat wider image (smaller objects) but show them in a much broader context. Remember that the wider the field, the slower the display gets since it has many more items to redraw.

The final button is "reset" and will let you reset the screen back to some commonly used set of options. This will save you time from having to turn off a bunch of stuff you might have turned on if you want to get back to an empty sky. See save/reset to show you how to customize this

feature.

Menus

File
View
Planets
Stars, etc.
Info
Extras
Tools
Preferences
Expert
Help

Help

Brings up standard Windows help support for the full manual, or specific to the mouse or menus.

Closest Stars

put info about the closest stars here

Changes since Beta 1 (things for Beta 2)

Bugs fixed

0) On selected machines the background images in hover mode was really messed up. This has been fixed.

1) The colormaps are no longer are screwed up after the 24 bit rendering.

2) The 24 bit planets are now rotated correctly to match the fast rendered ones.

3) The "xxxx.dll in use" message during installation has been removed.

4) Using the star_data/magnitudes option when with a tight zoom would cause a crash.

5) The aim panel lookangles are updated properly.

6) The explore button was dumped from the Navigator window since there was nothing for it to do.

7) The names of the objects when viewed using the flyby window would get trashed and could crash the machine. That has been fixed. It mainly showed up as extra trash at the end of "shoemaker-levi 9".

8) The constellation borders, names and Deep-sky objects no longer write on top of the planets in hover mode when first turned on.

9) The info menu items have been enabled and some new ones added.

10) The tables in the info window are now help based.

11) The movie player colormaps are now fixed.

12) The prefs/music menu has been changed to "sound" and hooked up.

13) The activities and tutorial menu items have been hooked up and dummy help files supplied.

14) The textured planets now show up when viewed from the Earth at bootup.

15) When on the Earth you would sometimes get a warning saying "oops! you're too close..." which was meant only for Hover mode. You no longer see this.

16) The real-time clock now updates only once every 10 minutes when you are not on the earth or in local mode. So you can park your eye in hover mode and set the clock to real time and not be constantly fighting updates.

17) The dialog buttons have been twiddled with to make them more windows like. EXIT is now cancel. And they have been reordered according to the Windows so-called style guide.

New Features

1) Orbit mode : this will let your eyepoint slowly orbit around the hover object. Orbit prefs are located in the Hover settings window.

2) Added a "tutorial" menu item which will present a couple of dozen help-based astronomy tutorials.

3) The Info menu has been severely modified. "daily activities" gives you a new astro lesson or project a day. Constellations, planets and stars will bring up various tidbits and tables. There is nothing for stars yet.

4) The planet-rendering menu has been changed, the fast-renderings choice has been removed since it was not useful.

Deep-sky objects : Anything not classified as a star or solar-system object such as galaxies, star-clusters, etc..

File

Printer functions

Print

Prints out the star charts for use away from home. The usual format make the stars black with a white sky in order to save printer ink or toner.

Printer Setup

Lets you change some of the common printer features. You might want to do an inverse print to get the more traditional black sky, or you may print in landscape mode to get larger images.

Set Page Title

Lets you title your particular printout.

Expert-mode

When on, extra menu selections become available. These are items that might only appeal to more advanced users.

Startup Preferences

This will permit you to set basic session wide preferences. See Startup Preferences for more information.

Settings

A settings represents the "state" of the program at any one time. For instance, you might set up FirstLight and upcoming eclipse and save it as a setting file You can then reload it at any time and it will set the date, time and selected features correctly.

Load - use system time...

This will load the settings file except for the date and time letting you use it to only store preference settings. So you may have one state file to highlight the constellations only using their names, outlines and borders, while another one is used to highlight the planets, while turning off the stars.

Load - use stored time...

This will load the entire settings file, including the internal date and time of when it was saved.

Save...

Lets you save a settings file using the standard windows file dialog.

Save startup...

This will let you save the configuration you want whenever the program is started up including which direction you're looking at and what features are on or off.

Save quickview...

Lets you save what features you want for the quickview option.

Save reset...

Lets you save what features you want to reset back to when using the reset button in the toolbar or the view/reset menuitem. For instance if you always want the constellation outlines to stay on, set up the sky with only the outlines on and select this option.

Exit

Do I really have to explain this one??

Changes since Beta 4 (June 2, 1995)

1) The Last View menu has been removed. It would have been more trouble then it was worth with my schedule to get it working right with the new stuff.

2) The moon-map and full-screen images will now really display in a full screen. The smaller window I was using just didn't work out. On the floppy version you only have the moon-map to look at, but test it out and see if the colors in the main program get reset properly.

3) Selecting lockview while in hover mode now should alert you to any problems.

4) The planetarium icon in the Sky Tonight window was touched up to make more understandable. Some users were confused as to just what it did.

5) The timezone is now calculated right when the user changes the DST setting.

6) The program name now prints on the printouts.

7) The sky tonight window now extends all of the way to the right side.

8) The magnitude legend along the bottom of printouts is no longer clipped.

9) The lat/long strings in the When and where window

10) The month abbreviations are now capitalized in the When and Where window.

11) You should no longer get "unable to read from drive x:" warnings, unless your harddrive is trashed, but hey, that's not my problem. (I hope!)

12) THE program no longer crashes when you try to do a second printout.

13) "Show" in the location window now works.

14) The flashing circle in the location window is now at the correct locations.

15) Distant units have now been added to the planet and dso data windows.

16) I no longer cache brushes at the program startup but allocate them dynamically since I use them so seldom. This means that the program should use up a lot less GDI space. The only possible problem right now from the new code is that the sun might show up as a yellow circle instead of a filled disk. Let me know if this happens.

17) The titlebar of the main screen is now updated properly after finishing creating a movie.

18) You should no longer get crashes when zooming in on other planets when located on a non-earth planet.

19) You should no longer get the message "oops! you are too close...", at random intervals when in hover mode.

20) You should no longer be able to make small zoom rectangles on the screen that hang around.

21) The load-settings file dialog extension list should now be correct.

22) When in OEV mode (out in the solar-system), the stars now show if you drag the sky around.

23) When going from on a planet to hover, the planet will now be switched back on.

24) The orbital traces and grid are now turned off when going into hover mode.

25) The last item in the status bar is now cleared when you go from local to equ mode.

26) AVI file creation is now stopped by hitting the "e" button and not the spacebar since Windows uses the spacebar for other stuff.

27) The buttons on the movie controller are ghosted or activated as needed.

28) The "don't rotate" checkbox in the movie controller now works.

29) The state of the printout setup dialog now remains unchanged across uses. Before it would reset back to a default state.

View

The view menu will let you set the way to view the sky.

Tutorials

This will lead you through a number of basic astronomy tutorials. Not available in the beta versions.

Quickview

This will quickly set up the display in local mode,oriented toward any one of nine directions. Certain other options which you may preset will also be turned on. You may decide just which features you want to show and use the File/save quickview selection to preserve them.

Quickview saves you the time it would otherwise take to turn on everything separately while waiting through several screen refreshes.

The "up" option displays the entire sky as seen from the selected location with a 180 degree field of view (simulating a "fish-eye" lens). Due to the wide field the constellations near the edge will be distorted, or scrunched up. The display is drawn as if you were outdoors facing North and looking up. That way, North would be below your chin or down relative to your face.

No exit is required from Quickview as it is just like a macro, performing several other functions at once. When done, merely select your options as you normally would.

The Sky Tonight

Displays the startup screen showing you an overview of the your own sky at the current time.

Summary

This will display a printed summary of the planets, Sun and Moon and their current locations. See What's Up? for more information.

Mode

Local

Firstlight uses two main display modes-*Local* and *Equatorial*. In Local mode, the sky is displayed as seen from the time and location given in the When and Where dialog. Using Quickview is the suggested way of entering Local mode in order to save time spent setting up the screen. In this mode, the sky changes from night to night and from one location on the Earth to another. Furthermore, the local coordinates of the stars, their altitude and azimuth, change as the Earth rotates. if you are in the Northern hemisphere, you will notice that the North Star, Polaris is at an altitude above the northern horizon equal to your latitude. Were you exactly at the pole, the sky would resemble Equatorial mode.

Equatorial

In Equatorial mode (the default), the sky is displayed as if there were no Earth underneath distort your perspective. This removes any ambiguities that your own location introduces and is therefore the mode used by in star charts by astronomers. This is slightly faster than Local mode as there are fewer calculations needed to position the stars.

Navigator

The Navigator is perhaps the most powerful single tool in all of FirstLight. Through the Navigator you can get a visual overview of where you are or what you're looking at. It may take a little getting used to however. See the section on the Navigator for further details.

Remove Clutter

Selecting Reset will reset the display back to a preferred set of basic options. Typically you will use it to turn off a bunch of things all at once and return to a plain display with no identifiers of any kind. If you want some things left one, select the ones desired and select the *save/save reset* option.

Viewpoint

This will permit you to set your viewpoint out into the solar-system. See the section on Viewpoint for more information.

Zoom

This will let you set the "magnification" of the display, usually called *field-of-view* and which is measured in degrees. The first general selections are the most commonly used ones. Underneath those is a specific set of choices. The fields between 45 and 60 degrees are the most natural to the unaided eye. A pair of binoculars will have a field of about 5 degrees and a low power telescope will be 1 degree or less. A field of 1/2 degree will be small enough to cause the Moon to fill the eyepiece.

When and Where...

This will let you set the date and location of your viewing site. When you first use the FirstLight you should set the location to your own home. See When and Where for more details.

The Sky Tonight

One for the more difficult tasks in observing the starry sky is being to fully grasp what you are really looking at. This display makes an attempt at doing just that by showing most of the sky in one window for current program date and time. The Sun, Moon and planets are all displayed if they are currently up, along with a simulated horizon.

Along the bottom are controls to set the viewing direction and time of day. You will also find several other buttons for accessing other displays.

Nightly Grabbag will give you an astronomical tidbit or project, a different one for each night. *Planetarium* will close this display and open up the main portion of the program, and *Calender* will show you what interesting things will be happening for the current month.

Calender

The calender will show you a months worth of astronomical pleasures. Major events such as eclipses and meteor showers are highlighted in red and the currently selected day is flashing yellow. You can click on any of the days to bring up more detail regarding the rise and set times of the Sun and Moon, the lunar phase and fuller explanations of any events.

The arrow keys will change your date and the now button will reset the calender to the current time.

astronomical unit : a convenient distance unit astronomers use instead of miles to state solar-system distances. 1 astronomical unit (AU) is equal to the average distance between the Sun and the Earth, or about 93 million miles.

Meteors

(use the text out of the mac manual for this)

right ascension : the sky's "longitude", measured in hours, minutes and seconds, each hour being 15 degrees. Right ascension, or RA, is teamed with declination to show where and object is located in the sky. RA goes from 0 to 24 hours.

declination : the sky's "latitude" measured in degrees. Declination, or Dec. is teamed with right ascension to show where and object is located in the sky. Declination goes from -90 degrees to +90 degrees where the northern star, Polaris, is located.

Navigator

The Navigator is the single most powerful tool in all of FirstLight.

The intent of the Navigator was to give you a single tool that could give you access to the majority of most useful functions and help you be able to visualize more clearly your position in space.

You Are Here

The top window is the "you are here" display. This will vary depending on the location of the viewpoint and viewmode. Beneath his are 3 buttons that will let you select this location. *Earth* is equivalent to *Equatorial Mode,* where you view the sky from the vantage point of Earth, but your viewpoint is not bound to any particular location, as if you are in the very middle of the planet looking out. Home is the same as *Local Mode*, where you view the sky from your home location and local time, and Space will more your eyepoint out away from the Earth into the solar-system.

When set to *Earth,* the display will show a 3-dimensional diagram of the way man has historically tended to visualize the sky : a globe with him at the center and the various objects plastered on the side. Our viewpoint of this diagram is actually placed outside the globe so we may see all, so because of that things are in effect, backwards. The red object in the center is the "view-cone" showing just how much of the sky is being looked at in the main display, and in turn, how much we can't see. Notice that the planets, moon and sun are also rendered. If you center the sun, you will see the view-cone more and center on the yellow ball. If you move the sky with the mouse you will notice the cone moving as well keeping track of things. And just as the sky is measured in right-ascension, you will notice the RA hour markers every 6 hours along the border.

This globe may be rotated to any angle by dragging the mouse over the window while holding the right mouse button down. Holding the left mouse button will drag the view direction around instead letting you aim your line of site. Holding down both mouse buttons at the same time and moving the mouse in our out will change the field-of-view.

When the location is set to Home, only half a globe appears. This is due to the fact that the other half goes below your horizon and is therefore not visible. Other than that, this is identical to the other display. Notice that since your viewpoint is placed outside the dome, the direction points will appear to be opposite what you are used to.

The display is quite a bit different for the Space option. Here your eyepoint is moved off of the Earth and out into space. The circles are the orbits of the

various planets, the bright dots on the circles are the planets themselves, and the yellow dot is of course the sun. Your eyepoint's location is marked by the green dot. That is the place in the solar-system where the eye is located that views the scene depicted in the main window. The line going down from or up to the green dot shows the relative distance the eyepoint is from the plane of the solar-system (the ecliptic). If the line is green, the point is above the plane, red if below. The blue line is pointing to the starting point for the right-ascension measurements, known as the "first point of aries". This is simply an arbitrary point whose location is the "origin" of the equatorial coordinate system.

As with the previous displays, dragging with the right-mouse-button down will position the angle at which you view the display. However, in this case you may also move your actual eyepoint around as well using the left mouse-button. While holding the button down and moving the mouse left-to-right, you will see the eyepoint rotate the sun. Moving the mouse up and down will cause it to likewise move up or down. You may move the eyepoint further or closer to the sun by holding down *both* mouse buttons then moving the mouse up and down. Trying to duplicate 3-dimensional space on a flat surface of a monitor is always tricky and is likely to fall short of the programmer's intent so this will take some getting used to.

Status Display

Below the radio-buttons is a small status window with some basic information in text form. Here you can see more precisely your location in space and any display information such as zoom value, look angle, date, time and so on.

Button Panel

Planets will open up the planet centering window, permitting you to quickly aim at any planet you deem interesting. See Viewing the planets for more information.

Constellations will let you center any one of your favorite constellations.

Find lets you locate any item in the database by name. This is most useful for centering deep-sky objects.

Lines/names will toggle on or off several of the common opens such as constellation outlines and names.

Date/time permits you to set the date, time and location of your viewing site. See when and where for more information.

Explore will lead you into the multi-media learning modules.

Novice mode toggles on or off the menubar, toolbar and caption while expanding the window to fill up the entire screen. It simplifies the display.

ecliptic : the plane of the solar-system defined by the Earth's orbit. Most planets stay very close to this plane, only pluto goes way above or below. Also comets are notorious for their oddball orbits for being way out of plane.

Viewing the planets

(put stuff here about the planet centering window, hover, flyby, etc.)

Menus

File
View
Planets
Stars,etc
Info

Extras
Tools
Preferences
Expert
Help

Using the Mouse

As with most Windows products the mouse is heavily used to navigate around FirstLight's own universe. By holding down or clicking the buttons, and dragging the mouse several common features become available.

Aiming your viewpoint

First and foremost, the mouse may be used to change your viewing direction. First you may center a spot in the sky by merely clicking on it with the right button. This is called *point and center*. You may drag the sky in real time by holding down the right mouse button and dragging the mouse.

Zooming in and out

You may zoom in to an object or part of the sky by merely holding down the left mouse button and dragging a box from left to right, around the area you want to magnify. Likewise you can zoom out by dragging the mouse from right to left.

Changing your position in space

When in hover or flyby mode the use of the mouse is changed to let you move your position instead (since in either mode you will likely want to stay aimed at the same object but will need to easily move around it). With the mouse you can move your place around the planet in real-time by dragging with the right button down. Moving the mouse left and right will rotate you around the planet, and up and down will move North and South, still keeping the object centered.

Selecting objects

You can bring up information on any displayed object on the screen by merely clicking on it with the left mouse button. For stars you'll see information about their distance, magnitude, whether their a double-star or not, etc. Information on planets include distance, location, rise/set times, and so on. Similar for deep-sky objects. See the section on More Information About Objects to explain the various fields.

Julian Date : The absolute date used to pinpoint astronomical events, and is the number of days (yes, *days*) from January 1, 4713 BC.

Viewpoint

Not only can you view the heavens from Earth, FirstLight will permit you to move your eyepoint out into the solar-system and inspect the planets close up as if you are in your own private spacecraft.

You should note that some of the features for Earth based viewpoints are turned off because they are meaningless when off the Earth.

Return to Earth

This will move your eyepoint from out in the solar-system back to the home planet.

Lookdown

These three selections will place your eyepoint directly above the sun looking down on top of the solar-system at different distances. Inner-planets will let you view all of the planets from Mercury to Mars, middle-planets go out to Saturn and outer-planets out to Pluto.

Fixed

Fixed will let you position your eyepoint to a specific location using heliocentric-coordinates.

From a planet

If you tire of viewing the solar-system from the Earth, you might want to try to view things from Mars or Pluto for instance using this feature. Or load in the Galileo spacecraft and check out Jupiter as would be seen by its TV cameras.

Heliocentric coordinates

Heliocentric ("Sun centered") coordinates is a fancy way of expressing just where something is (be it an asteroid, comet or burrito) in relation to the Sun. As with a person's position on the Earth, your position in space can be given in latitude and longitude. Add the distance from the Sun and we have a set of Heliocentric-cooridnates.

As with the Earth, latitude goes from -90 to +90 degrees. At 0 degrees you are exactly on the plane of the Earth's orbit. That is, by definition, the Earth is itself at 0 degrees latitude.

The longitude goes from 0 to 359 degrees relative to the First Point of Aries, or the point in the sky which marks a right ascension of 0.

If you use one of the Lookdown choices then open up this window you will notice that the latitude is 90 degrees (directly over the Sun), and the distance will vary depending just how much of the solar-system you want to view.

Setting your Location

The Location window, called up from When and Where, will let you set your location visually by using a world map, by lists or by direct numerical entry if you know your longitude and latitude exactly.

Your viewing location directly effects just what you see and when. For example, with solar eclipses the area of totality is so narrow, position is critical. The same goes for lunar occultations. The positions of the stars and planets will likewise change depending on your latitude. The further North you the go the higher in the sky the Northern Star (Polaris) will be, not to mention the fact the the Southern constellations and objects become impossible to see.

You may set your position by clicking on the map. The flashing circle highlights the current settings.

The buttons on the right may be used for more accurate positions as they will bring up lists of large cities in the respective region. That is, *NA* will list out cities for North America and so on. The *obs* button will give you a list of major observatories around the world to select from.

If you're city is not listed then you might want to set the location directly with the *lat* and *long* items. Once set, clicking on *show* will update the map display moving the circle to the proper position.

You can add a city or location to any one of the lists yourself. Using a word processor open up the necessary file located in the data2\user\ directory. The city files are named with a ".dat" extension. For example, Africa will be "af_loc.dat". To add in the new data simply type a new line at the end of the file. The first number is latitude in degrees and minutes. The second is longitude and the third is the timezone. Positive values for locations with a Western longitude (North and South America, Pacific), negative for the places with an Eastern longitude (most of Europe, Africa and Asia). When done simply save the file back out to disk, but remember to save as *straight text*, not as a document formatted specially for your word processor otherwise it will become unreadable to FirstLight. (If this does happen, you can simply reload the file back in the word processor and resave it out).

Greek ID : A star's Greek identifier is a greek letter followed by the constellation name it may be found in. The brightest stars are higher up in the alphabet so those that are "alpha" are usually the brightest in the constellation. Since the letters are limited, few stars actually have formal Greek names.

Universal Time : the standard way time is stated for scientific and technical purposes, and is based on the time at 0 degrees longitude (Western Europe).

Occultation : When the Moon occults, or eclipses a star or other planet.

totality : the time during a solar eclipse when the Moon completely covers the Sun. This usually lasts for only a few minutes at best.

Planets Menu

The Planets menu will give you control over the way you view and find the planets.

Center

This menu supplies several options used for finding and centering solar-system objects.

Major planets

Opens a window listing out each of the planets. It is handy to keep this up all of the time as it gives you the fastest way to get to any of the planets.

Comets and things

Covers non-planetary objects such as comets, asteroids and spacecraft.

Look behind

Shows you what is behind you, useful for bouncing directly from North to South, or for finding the Earth's shadow (center the Sun and look behind). *Zenith* will center the part of the sky directly overhead from you current location.

Load

This will let you load in other objects such as comets, asteroids and spacecraft. (Note that some spacecraft may not show if the date is set before their launch date or after planetary encounter).

Unload will let you clear specific objects previously loaded, and *Unload all* will do the same, but for all objects at once.

Flyby

Perhaps one of the most interesting features of FirstLight, Flyby will let you recreate the planetary flybys of NASA spectacularly successful Pioneer and Voyager probes. See Flying by the planets for more information.

Hover

The Hover mode will move you off of the Earth out to any of the planets. See Hover for more details.

Flying by the Planets

Few NASA programs are more highly regarded than the Voyager probes to the outer planets. FirstLight will let you duplicate their historical and spectacular flybys of Jupiter, Saturn, Uranus and Neptune.

Because of these probes entire new worlds were discovered, millions of high quality images returned and our concept of the solar-system was changed forever.

Using a chance alignment of the planets the spacecraft were able to use gravity of each planet to shoot it to the next one. This "gravity assist" method is a highly efficient way of going great distances on very little fuel, and in the late 1970s the 4 gas giants were aligned in such a perfect way to permit the Voyager missions to occur. And such an alignment is possible only every 175 years.

Voyager I was launched on September 5 and Voyager II, August 20, 1977. Voyager I was the first to encounter Jupiter in March of 1979 followed by its sister spacecraft in July of that year. During that time active volcanoes on the moon Io were witnessed for the first time, and Jupiter'S highly complex atmosphere was filmed and photographed in astonishing clarity. (All of the images of these planets that come with FirstLight are Voyager pictures). The probes were then redirected towards Saturn making their closest approaches in the early 1980s. At that time the mysterious "spokes" of Saturn's rings were discovered along with the tangled outer ring, the sheparding moons and the deep atmosphere the the giant moon, Titan.

After Saturn, Voyager I was flung out of the solar system, but Voyager II was sent on the blue planet of Uranus which it encountered in January of 1986. Here it photographed the enigmatic moon Miranda along with the faint Uranian rings. But wait, there's more! Another 5 years of space travel brought the little spacecraft to Neptune, at that time the furthest planet out. Neptune surprised scientists with it's dynamic atmosphere after a relatively benign Uranus, and later the Neptunian moon Triton hit the headlines with its bizarre pinkish surface and nitrogen geysers.

The *flyby* option will let you more closely investigate all six of the Voyager planetary flybys. Opening up the flyby window will automatically set your eyepoint in the vicinity of Jupiter looking down on the Voyager I path. The blue dots form the part of the pathway before closest approach, the red, after. Each dot is 1/2 hour of motion and the entire trail begins at one day before closest approach and ends a day after. The two arrows will change the time by 1/2 hour each time.

The drop-down list will let you select any of the 6 possible missions.

You may attach your eyepoint to the salellite by setting the attach viewpoint control.

When in flyby mode, the target planet is fixed in the center of the screen. By holding down the right mouse button and dragging the mouse around you may reposition your eyepoint to any location around the planet.

The movie button will let you create your own flyby movies similar to those made by NASA. See Making Your Own Movies for more information.

Note the Flyby mode is similar to Hover mode, but the two cannot be used together.

When going to Flyby mode, constellation names, outlines and planetary orbit lines are turned off in order to remove clutter. Since your interest is an individual planet these extra options can only get in the way but they may be turned back on at any time however.

Making Your Own Movies

Hover

Hover will let you easily move off of the Earth to any of the planets.

Merely set the planet in the *object* list along with the desired distance. Distance is in terms of the radius of the planet. For instance if the distance is 50 and the object is Earth, you real distance would be 50 times 4000 miles, or 200,000 miles away. A relative distance was used so you could hop from planet to planet with a minimum of fuss.

When in hover or flyby mode the use of the mouse is changed for positioning. With the mouse you can move your place around the planet in real-time by dragging with the right button held down. Moving the mouse left and right will rotate you around the planet, and up and down will move North and South, still keeping the object centered.

The *attach* checkbox will bind your eyepoint to the object, so as the planet moves you move along with it.

The *orbit* options will set various parameters for the orbit mode. *Shape* specifies whether the orbit is circular or elliptical. An elliptical orbit means that the orbit roughly "egg shaped", going from close to far and back to close. The *elliptical* setting has an eccentricity of 0.4 and *highly elliptical* will launch you way out into space far away from the planet with an eccentricity of 0.7. *Rate* selects how quickly the updates take place. *Fast* will update your orbital position and refresh the screen every 5 seconds, *medium*, 10 seconds and *slow*, 30 seconds. The *step* list selectes how many degrees around the orbit you're viewpoint will move between each update. *Small* is 1 degree, *medium,* 2 degrees and *large* is 5 degrees per update. Selecting the *orbit* menuitem will then turn on this mode.

When going to Hover mode, constellation names, outlines and planetary orbit lines are turned off in order to remove clutter. Since your interest is an individual planet these extra options can only get in the way. You may turn them back on at any time however.

Gas Giants : The name given to the planets Jupiter, Saturn, Uranus and Neptune due to their size and the fact that they are primarily made of gas with no real surface to speak of.

Stars,etc

The stars menu will permit you to center and examine objects outside the solar-system such as stars, galaxies, constellations and so on.

Center

The *center* menu offers several different modes for centering objects.

Custom

This opens a custom list that you yourself can add to, such as a new discovery by the space telescope or that star that mom had named after you for Christmas. (Objects are added with help from the *extras/add to center list...* feature).

By name

Opens up a simple text entry window and let you center things if you know their exact name. This is needed for some of the larger object lists that would be impractical for a standard list window.

Zenith

Centers the part of the sky directly overhead from you current location.

Constellations

Lists out the 89 major constellations. You will notice that names such as "The Big Dipper" are not included since those are not really constellations, but form part of an existing constellation. Such groupings are called "asterisms", and some of the common ones may be found in the custom search list.

Stars

Opens a special window that will locate a star based on 1 of 3 possible identifiers : Greek ID, HD Number and SAO Number. See Naming the stars for more details.

Galaxies and things

helps you to find many of the common objects by their proper names.

Constellations

This menu will give you control over the way constellations are identified and highlighted on the screen.

Borders

Toggles the internationally recognized constellation boundaries.

Names

Turns on or off the constellation names. The gold names highlight the constellations of the Zodiac. Note that when you zoom in to a field smaller than 35 degrees the names are printed in a larger font with a dimmer color.

Outlines

Turns on or off the constellation outlines.

Galaxies, etc.

The NGC and Messier items will display selections from the two most common catalogs of deep-sky objects. *Legend* opens up a small window displaying the symbols used.

Names

This simply turns on or off names for several classes of objects. Galaxies, etc. will toggle the labels for the deep-sky objects. When off, only the object symbols will be displayed. *Stars* toggles the proper names of the brightest stars such as those for "Sirius", "Antares", etc..

Naming the stars

Each star will have a minimum of several different names. The brightest have proper name handed down to us through thousands of years of tradition and myth. These included Rigel, Altair and Canopus. A somewhat easier way was developed in 1603 in which the main stars in each constellation were assigned a Greek letter based on their brightness. In general, the brightest was called *Alpha,* the next, *Beta,* and so on. The letter was then followed by an abbreviation of the constellation. For example, the brightest star in Orion can be called Alpha ORI.

However the Greek alphabet is rather limited in size so various other systems were developed, two of which FirstLight uses : The Henry Draper ("HD") catalog and the one developed by the Smithsonian Astrophysical Observatory ("SAO"). All of the stars in the main catalog have both of these numbers assigned to them. In magazines stars referenced will usually be identified by either one of these two.

NGC : The New General Catalog ("NGC") of deep-sky objects (Galaxies, Nebula, etc.) which contains over 9000 objects. FirstLight displays the 1500 most important entries.

Messier : A catalog of 110 of the most spectacular deep-sky objects (Galaxies, nebula, etc.) compiled by Charles Messier in 1781.

Info Menu

The information menu will connect you with numerous sources of information to add to your knowledge of astronomy.

Calender

This feature will give you a monthly calender displaying upcoming astronomical events, historical anniversaries and the phases of the moon. Clicking on any of the squares will open a window giving more data about that particular day. The arrow buttons at the bottom will page you from one month to another. *Now* will reset the calender back to the current date.

The highlight window will likewise show the phase, but also adds the rise and set times for the Sun and Moon and further details on the events of the day. Red events are the most important such as eclipses, blue events are interesting, but can be missed with no retribution, and black events are the least critical. Clicking on the text will direct FirstLight to center the object of interest.

Next Event

Selecting Next Event will alert you of any major upcoming events.

Nightly Grabbag

Selecting this will give you a new activity, project or astronomy tidbit every day.

Constellations

Displays basic constellation information.

Planets

Displays basic planetary data.

Stars

Displays basic stellar data and tables.

Eclipses

Opens up a list of solar and lunar eclipses over the next several years. NEVER MISS ANOTHER SOLAR ECLIPSE!!

Meteor Showers

Opens up a list of the year's major meteor showers.

Tables

Gives you access to many other tables of common information.

meteor showers

Tools

The Tools menu supplies you with various little tools to aid you further in your exploration of the Universe.

Aim

The *Aim* display will give you a full-sky chart showing you the area current in view in context of the entire sky. The green circle is centered at your current look angle. By holding down the right mouse button and dragging the mouse around you can reposition your view dynamically. The outline checkbox turns on the constellation outlines, equ. and local sets the display mode.

The controls at the bottom will let you set the look angle directly. Once set, click on aim to refresh the display to the new position.

Browse

This menu provides two browsers, one for images and one for the online movies.

Clock

The Clock menu will let you control the display time in many different ways.

Settings

Opens up the clock control window that will let you set the increments used for changing the time via the toolbar buttons.

Freeze

Stops automatic clock updates set by auto or real-time. *Auto* will cause the entire display automatically update as fast as possible at the selected increment and *real-time* does the same except it updates things based on normal time (that is, for every minute that goes by the display will be updated by a minute).

"*+1 day*" and "*-1 day*"

These are simple ways to change the clock in single day increments.

Now

Resets the clock to the system time.

Sunrise/sunset

This will set the clock accordingly, handy when in local mode and you want to check out what is going to be visible just as the Sun goes down or comes up.

Flashcard

The Flashcard tool is designed to help you in learning to identify the constellations. Selecting Flashcard turns off all of the identifiers in the main star window, centers it at a random location and challenges you to figure out just what you're looking at.

The identifiers can be toggled on and off with the *show* and *hide* buttons. *Flash* turns everything off again and moves to a new location.

Moon

The *Moon* menu offers a couple of extra tools having to do with the moon. The first is a simple moon map highlighting major features and spacecraft landing sites. *Phases* presents a diagram for the entire year's worth lunar phases.

Nearby stars

This opens up a small display showing in 3D the most stars out to 100 light years from the Sun. The *Labels* control turns on the scientific names of the major stars, while *names* turns on the proper names of some of the more common objects. *Lines* will draw lines out to some of the stars so you can get a clearer sense of their distance compared to others.

You can rotate the stars or change your distance by simply using the mouse. Click on the display and hold the right button down while dragging the mouse around. To zoom in or out, hold down the left button and move the mouse back and fourth.

Planets

The Planets menu will give you some additional tools for studying the planets. *Planet guide* will show you only the planets which are visible from your current location. Similar but more simple that the *Sky Tonight* display.

The *rise/set plot* is another form of chart which shows the visibility of each planet over the next day from noon to noon at your current location. The vertical red line is the current display time, the yellow bars show sunrise and sunset. It differs from planet guide in that the guide shows only the planets for a specific time whereas this covers an entire day at a glance.

Extras

The Extras menu supplies you with various extra features of interest to more advanced users.

Add to center list

This will let you add new objects to the custom centering list. Simply center the area of interest, set the zoom value and supply the desired name.

Chart

The chart display will give you a view of the entire sky at one time. Various sky items can be turned on or off using the check boxes on the left. When you turn on the NGC objects notice how the gold objects, the galaxies, clump up in various areas. These are the parts of deep-space *not* obscured by our own galaxy, the Milky Way. The red are nebulae which in turn mark the regions of the Milky Way.

Earth's Shadow

This will display a red double-circle showing the location of the Earth's shadow at the distance of the moon. The outer ring is the area of partial shadow, and the inner ring is total shadow. In you can't find the shadow, try centering the Sun, then select *planets\look behind* to flip your view.

Landscape

Landscape will turn on an artificial horizon to simulate mountains in the distance and is available only in Local mode. When on, your vertical positions are limited to only a range of plus or minus 20 degrees in altitude. You may adjust the landscape profile to match your own location; see the section on Adding Your Own Data . Due to the coarseness of the landscape detail, it is recommended that you use a zoom value of 20 degrees or more.

Magnitude Legend

This will open up a simple display showing a legend for the stellar magnitudes.

Markers

Markers are various addition lines and symbols which will make it easier to find things or visualize the sky.

Crosshair

Turns on a small cross marking the middle of the screen. *Ecliptic* turns on a line which marks the plane of the solar system and therefore the region of the sky where the planets will be found. Equator turns on the celestial equator, the line that marks 0 degrees declination.

Horizon

This will mark your local horizon. You will notice that while in Equatorial mode, this will be tilted based on your latitude, and will change depending on the time of day due to the Earth's rotation.

Grid

Overlays a right ascension/declination grid on top of the stars much like the grid in an atlas.

Local Altitude

Draws a line indicating the altitude above the horizon. This is active only in Local mode.

Redraw

With the many options that FirstLight offers it is possible that from time to time various screen elements may trash others. Redraw will simply refresh the screen to clean it up if possible.

Star Trails

A person's first encounter with the art of astrophotography is usually through the taking of stellar time exposures with a camera fixed on a tripod. The results will produce streaks called "star trails", due to the motion of the stars across the field of view. This may be simulated by going into Local mode, turning on star trails and advancing the time either automatically or manually.

System

The system menu supports any miscellaneous features not directly related to actually viewing the sky. So far only one feature is supported that will close all of subwindows at once if the screen gets too cluttered.

Twinkle

This will turn on a twinkling effect if you miss the way the atmosphere messes up the sky.

magnitude : Brightness of a star, the smaller the number the brighter the object. The brightest star next to the Sun is Sirius which shines at a magnitude of -1.46 while the Sun itself shines at a whopping -26.3. The unaided eye can see down to a magnitude of about 6.5.

look angle : The direction of your current view.

Preferences

The *preferences* menu will let you set various global elements such as which color set to use, objects to show, etc.

Animation prefs

This menu gives you control over several handy-dandy animation features.

Object droplines

Turns on lines from the object to the planet of the ecliptic, green lines indicate that the object is above the plane, and red, below.

Date trails

Leaves a trail of dates for each point enabling you to create accurate charts of fast moving objects such as comets or asteroids that might collide with the Earth.

Line trails

Draws a line of an object's pathway, and *dot trails* will do the same but with dots instead.

Colors

Colormap

Controls 3 possible colors sets that you can use.

Bright

Brightens up the stars, useful for low contrast monitors or brightly lit rooms such as school lecture halls.

Colors

Change the shadings of the stars from levels of gray to various colors making it easier to identify the individual magnitudes.

Normal

Returns the the default color set.

Distance Units

This will let you select the displayed distance units from either km or miles.

Sound

Turns on or off the sound effects.

Show

The *Show* menu will let you select which objects to show. Turning off unneeded planets for instance will speed up certain operations.

The magnitude limiter lets you select which minimum magnitude to display. It defaults to all stars. Eye will set it to only the stars visible to the naked eye, all resets it back to show all stars. Try will refresh the display using the new setting.

Status-bar

This will toggle on or off the status bar at the bottom of the display.

Toolbar

Toggles on or off the toolbar.

Viewpoint

This will open a window letting you change certain preferences that will make it easier to visualize the solar-system when using and off-Earth viewpoint such as Hover or Flyby.

The *orbits* option will toggle on or off the circular outlines of the orbits.

Orbit droplines are lines drawn from an orbit to the ecliptic. If they are red the orbit is below the ecliptic, if green, they are above. This is best used on orbits that are highly tilted from the ecliptic such as Pluto or cometary orbits.

Object droplines are the same as those for orbits, but simply work on the actual object. You might want to use this instead in order to remove screen clutter.

Grid will place a gray grid on the plane of the ecliptic giving you a size reference. The squares default to a width of 1 astronomical unit, but may be changed using the dropdown list.

The *try* button will let you try the settings without closing the window.

light year : the distance it takes light to travel in a single year, about 5.86 TRILLION miles. The nearest star, Alpha Centauri, is a mere 4.34 light years away. Compare this to our Sun which is only 8 light minutes away.

Animation

put stuff here about using the clock panel

Expert

If you are an astronomical expert, or aspire to be one, the Expert menu is for YOU!

Create a new orbit

This feature will allow you to add new objects such as comets, asteroids or giant mutant space potatoes to the system as they are discovered. See the section on Creating New Orbits for more details.

Lock view

The Lock menu allows you to lock your view on any solar system object. This is useful when you want to follow a specific object over a period of time without having to recenter things each time.

Select will let you choose which object to lock on. Once an object lock is set, you cannot center any other object until *release* is selected.

Movies

Using movies you may create your own animations of celestial events in standard Video for Windows format.

When creating movies the window MUST be entirely in view (otherwise the image ceases to exist in memory so cannot be saved).

To create a movie you must first open it, using the open button. Next set the various options, described below. Set up the desired view (you may want to lock on the moon for instance, set the time increment to 12 hour intervals and follow it for a month to show the phases). Clicking on start will turn on the clock and close the movie window (so it doesn't appear on the animation). A small window in the corner will appear displaying frame count and a stop button. When you've collected as many frames as needed, clicking on stop will return you to the main movie window. You can add further frames to the same file by starting and stopping as before. When done, close will end the file creation and let you view it.

The *size* option will set the final size of the movie, the larger the frame the slower it will play back and the more memory it will require, so small movies are recommended. You may display data such as date/time/position by turning on the *show data* checkbox. *Rate* will set playback rate in frames-per-second. If your machine cannot handle the selected rate Video For Windows will drop frames giving the jerky appearance that you may have seen in which case you can either use a slower rate or a smaller size. If you are in hover mode you may select render planets which will cause FirstLight to generate full color rendered images. (this is the same as the *Planet rendering/slow menu* select below, but is placed here for convenience). If you are using this feature you might want to consider the no rotation option. Normally the planets will rotate in a realistic fashion but if your time increment is large the rotation between frames will be very large and therefore distracting. If you want to show planetary rotations keep the time increments down to less than an hour.

Observing

If you are an amateur astronomer, the observing menu will supply you with tools that will aid you in planning your evenings viewing sessions.

Ephemeris

Prints out a location table for a desired object over a period of time. In the ephemeris window select the object of interest via the *select* button, then set the range of dates you want and the increment.

Print will send the tables to a printer where *save* will send them to a disk file that may then be imported to astronomical newsletters for example.

Planning guide

Prints out lists of objects that may be visible for a given date. First enter the date and the range of times you are going to observe then select the class of objects and the minimum desired magnitude. Print will send it a printer and save will save it as a text file.

Reticle

The reticle is an aid for measuring angular distances in the sky by displaying a set of concentric circles around a point (looking much like a bullseye). The degree labels mare the radius of each circle. After you select this menu and click on the spot in the main star window where you want it to be centered. The reticle will continue to be displayed at that location until it is turned off by reselecting the menu. While being displayed it will change size to match the current zoom value.

Telescope control

Telescope control is not yet installed.

Planet rendering

This will let you choose the way planets are drawn on the screen. When in hover mode you will see the planet as a globe, instead of a mere dot in the sky unfortunately this can be rather time consuming depending on which machine you have.

The default mode is the quickest way taking only a second or less. It will only work however when you are runningwith 256-colors. This is a windows limitation and not a programmers limitation.

Select "24-bit rendering" if time is of no concern. It should only be used once you have set up your desired view as it involves image simulation techniques used by Hollywood special effects labs. The larger the image the slower it will take, but the results should be worth it. On slower equipment however expect to wait 30 seconds or more for even the most basic of images.

See Drawing the Planets for more information.

Precession

This will turn on precession, but is not typically used due to the extra time it adds to calculating the positions of everything. *Auto* will force precession if the date is changed by more than 200 years. *Stars* forces precession calculations to be done on just the stars. *Lines* will do the same for the constellation outlines. Separating them like that will let you precess the stars for instance, and compare their new positions with their former ones using the lines as a point of reference.

Skylight

Using *skylight* will cause First Light to attempt to duplicate the ambient light generated by cities which can wash out the dimmer stars. In other words, if you are in downtown Cleveland the sky looks a great deal different than it does, from say, Buffalo Wyoming. In fact, many people find it hard to identify constellations in a country sky because there are just too many stars!

Show custom data

First Light will permit you to add your own custom data if you have favorite objects not listed in the main

database. See the section on Adding your Own Data for more details.

Stars

The *Stars* menu offers you more information about the stars than you could ever hope to use. Data will stamp the individual data fields next to each star. See the section on the Stars for more information as to what each field means.

More stars

Accesses the Hubble Space Telescope Guide Star Catalog, up to 16 million total stars down to 16th magnitude (dimmer that what most amateur telescopes can even see). Due to the huge number of stars, this feature can only be used when the zoom is 5 degrees or less.

Proper motion

Illustrates just how the stars move in relation to each other. Contrary to what it may seem, the stars move on their own just as the planets do. But this effect is so slow that it is virtually impossible to detect over an average lifetime, until now. This feature will draw little lines through each star in the direction it is headed. The lines represent 50,000 years worth of movement from 25,000 years before the current date to 25,000 years after. The red dot is the endpoint.

Creating New Orbits

FirstLight will let you create a new orbit for an object which may then be displayed along with of the other solar-system objects. With this you can add data for any comet, asteroid, giant mushroom people intent on making all of humanity domestic servants, or even interplanetary satellites.

Orbital data may be found is various astronomical books and catalogs or on astronomy computer bulletin boards.

Orbits are typically quite complicated and must by defined by a number different values. The understanding of these values is not really necessary, as the published tables available will usually have all of the information that you need. Also, not all of the fields will be used. Asteroids use a slightly different set of data than a comet would. Besides the date you will need a total of 6 numbers. The codes after each field will show typically which are used for what kind of object. "c" is for comets, and "a" for asteroids.

Creating an orbital trace is very computationally intensive so it will take a considerable amount of time on an older machine.

object : this is the name of the new object.

color : the orbital trace may be one of any of these colors.

epoch date (a,c) : (sometimes called "T") the date that either the data was taken or of the closest approach to the sun, called the "perihelion epoch".

eccentricity (a,c): ("e") this serves as a measure of the flattening of an orbit. A value of 0 indicates a perfectly circular orbit. A value between 0 and 1.0 indicates an elliptical orbit, and if it's 1.0 or larger it will have a parabolic or hyperbolic path. Objects in parabolic or hyperbolic orbits are not bound to the Sun and once having swept on by will precede out of the solar-system never to return. Most of the naked-eye comets seem to be of this variety, called "non-periodic" objects meaning that these come by only once. The recently discovered Comet Mueller appears to be in this category, and made its closest approach in March 1992. Sometimes cometary data is published without the eccentricity stated, so in this case assume it is a parabolic orbit with an eccentricity of 1.0.

perihelion longitude (c): ("omega-bar") this is the longitude of the perihelion, the closest approach to the Sun. Given in degrees.

longitude of ascending node (a,c) : ("capital Omega") Sometimes called just "node", this is the longitude of the point at which the orbit ascends from below the plane of the solar-system (the ecliptic) to above the plane. Given in degrees.

period (c) : ("P") the time required to complete one full orbit, not used for non-periodic objects.

inclination (a,c) : ("i") this is the angle at which the orbit is tilted to the plane of the ecliptic and will be between 0 and 180 degrees.

mean anomaly (a): ("M") the angle used to describe the current position of the object. Typically used only for asteroids.

argument of perihelion (a): ("small omega") this is sometimes used in lieu of the perihelion longitude, and is the perihelion longitude minus the longitude of ascending node. Commonly used only for asteroids.

size (a,c): the size of the orbit is determined by one of three possible values. The semi-major axis ("a") is a direct measurement of the size in astronomical units, generally used for periodic comets. Mean daily

motion ("n") describes an average motion in degrees/day the object moves. Perihelion ("q") is the distance of the closest approach to the sun in AU and is used for parabolic orbits.

Once the data is entered, hit save to preserve it and add it to the system.

Several sample objects are provided.

Planetary exploration satellites such as Voyager or Galileo require special segmented orbits due to the complex nature of their trajectories, and such orbits cannot be entered by this tool but they have been supplied already. Use *planets\load\spacecraft...*

See the chapter on comets and asteroids for further information.

comet : Chunk of ice 'n stuff that in wildly elliptical orbits. When close to the Sun the ice will evaporate and leave lengthy tails streamers or tails. Comets are thought to contain some of the most pristine material leftover from the formation of the solar system.

asteroid : a chunk of rock left over from the formation of the solar-system which can range in size from only a few dozen feet to over 600 miles. Over 3500 are now known.

comets and asteroids

Guide Star Catalog : A catalog of all stars down to 16th magnitude used by Hubble Space Telescope researchers to guide the telescope during long photographic exposures. A star near the object of interest is chosen as a reference point that the telescope locks on to.

precession : slow wobbling of the Earth's axis much like a child's top, that changes the apparent positions of the stars. Due to precession the North star will cease being the North star in a few hundred years. One "wob" takes about 25,800 years. This is why star charts are typically assigned a year or "epoch" to show which date was used for the stellar positions.

Stars and Things

Add in the stuff about the star data fields, n' stuff here.

More Information About Objects

Put details about the Point and identify fields here.

test

This is used to test new Help stuff :

This is a test of the MCI stuff. Play movie with dedicated macro!

This is a test of avi.dll: apollo 17!

Play liftoff.avi!

moon map

Chart

The chart display will give you a view of the entire sky at one time. Various sky items can be turned on or off using the check boxes on the left. When you turn on the NGC objects notice how the gold objects, the galaxies, clump up in various areas. These are the parts of deep-space *not* obscured by our own galaxy, the Milky Way. The red are nebulae which in turn mark the regions of the Milky Way.

What's Up?

This will display a printed summary of the planets, sun and moon and their current locations (in right ascension and declination), whether they're visible or not, distance (in astronomical units), rise set time and the time it takes for light to travel from the current eyepoint to the object (in minutes).

If the object has an asterisk beside it, that indicates that it is currently above your local horizon.

Diam is the angular diameter in degrees. For comparison, both the sun and moon are about 1/2 a degree in diameter. You will notice these values go up and down depending on how far away the object is throughout the year.

The light distance plays an important part in how spacecraft such as Galileo or Voyager are controlled. For instance, when Voyager flew by Neptune in August of 1989, it took radio signals over four hours to reach it. This meant that if something in the spacecraft needed to be turned on by ground control it would take a full *eight hours* to find out whether or not the spacecraft carried out the command.

Next meteor shower will display a description of any upcoming displays. Remember that Meteor showers are best viewed after midnight and when there is no moon visible.

Aim

The *Aim* display will give you a full-sky chart showing you the area current in view in context of the entire sky. The green circle is centered at your current look-angle. By holding down the right mouse button and dragging the mouse around you can reposition your view dynamically. The *outline* checkbox turns on the constellation outlines, equ. and *local* sets the display mode to Local, which defaults to Equatorial.

The controls at the bottom will let you set the look-angle directly. Once set, click on aim to refresh the display to the new position.

Equatorial Mode : In this mode (the default), the sky is displayed as if there were no Earth underneath distort your perspective. This removes any ambiguities that your own location introduces and is therefore the mode used by astronomersin in their star charts . This is slightly faster than Local mode as there are fewer calculations needed to position the stars.

Local : Displays the sky as seen from the time and location you have set using When and Where. In this mode, the sky changes from night to night and from one location on the Earth to another. Furthermore, the local positions of the stars, their altitude and azimuth, change as the Earth rotates. if you are in the Northern hemisphere, you will notice that the North Star, Polaris is at an altitude above the northern horizon equal to your latitude. Were you exactly at the pole, the sky would resemble Equatorial mode.

altitude : The altitude above your horizon in degrees. An object at 0 degrees is exactly on the horizon, and an object at 90 degrees is directly overhead.

azimuth : the position of an object relative to North. An object at an azimuth of 0 degrees is directly North, 90 degrees it will be East, 180 degrees, South, and 270 degrees, West.

Controlling Time

The clock control window will give you a great amount of control over the date and time of your display. It may be used for quickly changing the time forward or backward so as to observe long term events, or for real-time animation of the planets.

The time is controlled by the VCR-like buttons. The double-arrow towards the left is equivalent to rewind, while the right button is fast-forward. Clicking on them once will start the fast clock, clicking on the center button will stop it. The single arrow buttons step one increment at a time.

The change in time for each update is set by the two drop-down lists. Step sets the number of units set by the increment list. So if step is set to 2 and the in cement is "hours", the clock will change 2 hours for each refresh.

Single day increments are useful for studying the motions of the inner planets and the Sun, 1 week or more for observing the slower, outer planets. Use an hour or less for lunar motions, and cut it down to a minute for animating solar-eclipses.

Phases of the Moon

This is a simple window to show all of the Moon's phases over the entire year. A phase of 0 or 1 is the New Moon, while a phase of .5 is Full. The numbers along the top are the day of New Moon which is useful if you want to do some astronomical observing when the sky is going to be really really dark.

The red value is the current phase, given in the amount the Moon has traveled along its orbit.

Traveling to the Stars

This opens up a small display showing in 3D the most stars out to 100 light years from the Sun. Your distance is set with the radio buttons at the top left of the panel, and position is setby the 4 direction arrows. The *Labels* control turns on the scientific names of the major stars, while *names* turns on the proper names of some of the more common objects. *Lines* will draw lines out to some of the stars so you can get a clearer sense of their distance compared to others.

The space near the Sun is very empty as you can see. In some areas of the galaxy the stars are so dense that this same size of space would blaze forth with the light of literally *hundreds of thousands* of stars.

Planet Guide

This display will show you only the planets which are visible from your current location at the current time. Similar but more simple that the *Sky Tonight* display.

Planet Rise/Set Plot

The *rise/set plot* is another form of chart which shows the visibility of each planet over the next day from noon to noon at your current location. The vertical red line is the current display time, the yellow bars show sunrise and sunset. It differs from planet guide in that the guide shows only the planets for a specific time whereas this covers an entire day at a glance.

Ephemeris

The ephemeris prints out a location table for a desired object over a period of time. For instance, if you wanted a table showing the motion of Mars for every day in April, you would use this tool.

In the ephemeris window select the object of interest via the *select* button, then set the range of dates you want along with the time increment. *Print* will send the tables to a printer where *save* will send them to a disk file that may then be imported to other documents such astronomical newsletters.

Planning Guide

The planning guide will create a list of objects that may be visible for a given date. Useful if you are an amateur astronomer planning an observing session. First enter the date and the range of times you are going to observe then select the class of objects and the minimum desired magnitude. *Print* will send it a printer and *save* will save it as a text file.

Major Meteor Showers

shower	date	rate (per hour)	peak
			--
Quadrantids	January 3-4	40	--
Lyrids	April 20-24	15	April 22
nu-Aquarids	May 1-7	20	May 4
delta Aquarids	July 23 to August 1	20	July 28
Perseids	August 10-15	66	August 12
Orionids	October 20-22	25	October 21
S. Taurids	November 3	15	--
Leonids	November 18	15	--
Geminids	December 12-16	50	December 14
Ursids	December 21-23	15	December 22

See Meteors for more information.

Quadrantids

date : Jan. 1 to 6 (Jan. 3-4)
duration : 1 day
rate : 40/hour
RA : 15:28
dec : +50 degrees

This is a brief, but very intense shower. In northern latitudes the radiant doesn't reach a usable altitude until 2:00 am, so there isn't much time to catch it. In the past 15 years the shower has had as many as 235 meteors per hour (1985), so if the moon isn't too bright, and if you can stand the January weather, give this a shot.

Lyrids

date : April 20-24 (April 22)
duration : 2 days
rate : 15/hour
RA : 18:16
dec : 34

The earliest recorded of all major showers, the Lyrids produce a fairly consistent display. The meteors are medium fast (28 mile/sec) with the hourly rates rarely going above 20. There have been exceptions with 1803 and 1922 giving rates of 96/hour, and a burst of 250/hour (for a few minutes) in 1982.

nu Aquarids

date : May 1 to May 7 (May 4)
duration : 3 days
rate : 20/hour
RA : 22:24
dec : 0 degrees

Producing very swift meteors (40 miles/sec), the Aquarids are believed to be derived from none other than Halley's comet. They generate long, glowing trails, many bright meteors, often yellow. The rates may exceed 40/hour. The Aquarids are best seen in the Southern hemisphere. The Orionids in October are believed to be from the same meteor stream, crossing our orbit a second time.

delta Aquarids

date : July 23 to Aug 1 (July 28)
duration : 7 days
rate : 20/hour
RA : 22:36
dec : -17

This show is considered "the greatest" in total numbers, but since it is stretched out for so many days (actually going from July 15 to August 29), it is far less spectacular than the more condensed ones. Comprised mainly of fainter, slower meteors, the delta Aquarids are actually made up of several meteor streams.

Perseids

date : Aug 10-15 (Aug 12)
duration : 4.6 days
rate : 66/hour
RA : 3:04
dec : +58

Once considered the finest and most reliable of the major showers, the Perseids are slowly declining from a peak during the 1970s. Rates may exceed 100/hour. There is a wide variety of meteors, the fainter ones being white of yellow, brighter ones, green, orange or red. About 1/3 leave trails. Occasional fireballs often ending in bursts. This is a very good photographic shower.

Orionids

date : Oct 20 to 22 (Oct 21)
duration : 2 days
rate : 25/hour
RA : 6:20
dec : +15

The Orionids are believed to be the other side of the stream which produces the eta Aquarids in May. Better for observers in low latitudes or in the Southern hemisphere, this shower produces fast meteors (40 miles/sec). About 20% leave trails. While the rate is stated to be 25/hour but can vary between 10 and 70.

S. Taurids

date : Nov 3
duration : ?
rate : 15/hour
RA : 3:32
dec : +14

The Taurids result from Comet Encke. While few in number they produce many fireballs. This shower was one of the greatest in the 11th century, but has slowly declined since then. The meteors are quite slow, usually less than 18 miles/sec.

Leonids

date : Nov. 18
duration : ?
rate : 15/hour
RA : 10:08
dec : +22

This shower is legendary for producing some of the greatest showers in history. Associated with Comet Tempel-Tuttle, showers in 1867, 1868 and 1883 hit rates of 10,000/hour. The morning of November 17, 1966, produced the greatest recorded shower with rates estimated at 150,000/hour! (The author of this program slept through it, and has regretted it since). Look for another peak in 1999 when the comet returns.

Geminids

date : Dec. 12 to 16 (Dec. 14)
duration : 2.6
rate : 50/hour
RA : 7:32
dec : +32

Slowly improving since 1960, the Geminids have knocked the Perseids out of first place for overall quality. Bright (ave. magnitude of 2.7) and medium in speed, this shower comes from a dead comet discovered by the IRAS satellite. Most Geminid meteors are white, with few producing trails. This is one of the few showers which is good before midnight.

Ursids

date : Dec. 21 to Dec. 23 (Dec. 22)
duration : 2 days
rate : 15/hour
RA : 14:28
dec : +76

Best for Northern observers, the Ursids produce medium speed (20 miles/sec) meteors. Some bright, many faint. The Ursids are derived from Comet Tuttle, and are felt to be decreasing over the past few years.

eclipse type : Total solar and annular eclipses are when the Moon passes between the Earth and the Sun. A total eclipse is when the Moon completely covers the sun. If the Moon is at its furthest point of its orbit it will be too small to cover the Sun completely causing a firely ring around its edge for an annular eclipse. Lunar eclipses are when the Earth passes between the Sun and Moon. Partial eclipses occur when only part of the object is covered.

Your Handy Eclipse Table

date	duration or start	type	location
June 30, 1992	5m21s	total solar	South Atlantic
May 10, 1994	6m13s	annular solar	Central/East USA
November 3, 1994	4m23s	total solar	South America
April 15, 1995	12:09 UT	partial lunar	Western Pacific
April 29, 1995	6m37s	annular solar	South America
October 24, 1995	2m09s	total solar	India, Iran, Malyasia
April 3/4, 1996	22:21UT	total lunar	Europe, Africa, S. America
April 17,1996	--	partial solar	New Zealand
September 26/27,1996	1:12	total lunar	USA,Europe,Africa, S. America
October 12, 1996	--	partial solar	Europe, Northern Africa
March 9, 1997	2m50s	total solar	Mongolia, Russia
March 23/24, 1997	2:58 UT	partial lunar	North and South America
February 26, 1998	4m09s	total solar	Columbia
July 28, 1999	10:22 UT	partial lunar	Western USA, Pacific
August 11, 1999	2m23s	total solar	Central Europe
January 21, 2000	3:01 UT	total lunar	North, South America, Europe
July 1, 2000	--	partial solar	Southern Chile
July 16, 2000	11:57 UT	total lunar	Pacific, Australia
December 25, 2000	--	partial solar	USA, Canada
January 9, 2001	20:25 UT	total lunar	Asia, Africa, Europe
June 21, 2001	4m56s	total solar	Southern Africa
July 5, 2001	15:05 UT	partial lunar	Australia, East Asia
December 14, 2001	3m53s	annular solar	Pacific, Costa Rica
June 10, 2002	0m23s	annular solar	North Pacific
December 4, 2002	2m04s	total solar	South Africa
November 11, 2003	1m57s	total solar	Antarctica
April 8, 2005	0m42s	total solar	Columbia
March 29, 2006	4m07s	total solar	West Africa, Turkey
August 1, 2008	2m27s	total solar	Siberia
July 22, 2009	6m29s	total solar	India, China
July 11, 2010	5m20	total solar	South Pacific
March 20, 2012	5m46s	annular	Western USA
November 13, 2012	4m20s	total solar	South Pacific
November 3, 2013	1m39s	total solar	Central Africa
March 9, 2016	4m09s	total solar	Indonesia
August 21, 2017	2m40s	total solar	USA (at last!!)
July 2, 2019	4m32s	total solar	Argentina

duration or start : for total or annular solar eclipses, the time is the duration of maximum totality and is highly dependent on your location on the Earth. For lunar eclipses, the time is the start of the eclipse in Universal time. To convert to local time, use the "time zone" value you have set in the When and Where panel.

planets in brief

Sun
Mercury
Venus
Earth
Moon
Mars
Jupiter
Saturn
Uranus
Neptune
Pluto
Asteroids
Comets
other moons...

Sun

this space for rent

Mercury

Venus

Earth

Moon

Mars

Jupiter

Saturn

Uranus

Neptune

Pluto

Asteroids

Comets

other moons...

Mars

Phobos
Diemos

Jupiter

Callisto
Io
Europa
Ganymede

Saturn

Dione
Enceladus
Hyperion
Iapetus
Mimas
Phoebe
Rhea
Tethys
Titan

Uranus

Ariel
Miranda
Oberon
Titania
Umbriel

Neptune

Neried
Triton

Pluto

Charon

Phobos

Diemos

Callisto

Io

Europa

Ganymede

Dione

Enceladus

Hyperion

Iapetus

Mimas

Phoebe

Rhea

Tethys

Titan

Ariel

Miranda

Oberon

Titania

Umbriel

Neried

Triton

Charon

Grand Tour

The Grand Tour window will give you a pictorial overview of the solar-system. The planet buttons select the object while the up/down arrow will cycle you through the pictures. Captions for each picture will be found in the text display below the image.

If you want to see the image full size, click on the zoom button underneath the arrows. If there is an associated movie a movie button will appear under the zoom control. The Earth and Space buttons will let you view the object in various ways.

Drawing the Planets

The planets normally are drawing using a relatively quick process. The default process sacrifices quality for speed, typically taking a second or less for an image. But the image will be fairly coarse when enlarged and doesn't quite have a realistic quality. The other method, ("24-bit" rendering) is very time intensive and should only be used once you have set up your desired view as it involves image simulation techniques used by Hollywood special effects labs. The larger the image the slower it will take, but the results should be worth it. On slower equipment however expect to wait 30 seconds or more for basic images. However many subtle lighting and shading effects can now be included such as clouds, atmospheres and surface shadows.

The default rendering has several preference options available. Normally when you drag the sky to reposition the eyepoint you will see a very simple drawing of a gridded sphere, called a "wireframe", which is much fast than the textured image. However if you have a fast enough machine (486-100 or Pentium), the textured planets may draw fast enough for you to set the *draggable* option which uses the fancier images all of the time. This feature will only work when you are in 256 color mode. If you are set for more colors, then these menu selections will be disabled. The slow-rendering will work in any color mode.

Selecting *sharp shadows* will sharpen the edge of the planets terminator, the twilight line that separates the day side from night. This depends on your own tastes, but leave this off for more realistic images.

Using *show clouds* you may turn on or off the clouds of Earth and Venus. Now you can see exactly what Venus would look like if stripped of her thick veil.

If you choose *show feature names*, major features on several of the planets will be highlighted. You may then click on these to get further information about them.

Feature names and the cloud options do not work on 24-bit planets. In order to speed up the higher quality rendering, reset your system to use more than 256 colors, the "65536" mode works the base. This not only cuts the time by a third, it will give better quality images. However you will no longer have access to the quicker renderings, but instead will see the wireframe planets all of the time.

You may abort a 24-bit rendering process by simply hitting any key. The simpler image will takes its place, until you move your eyepoint around, then the next screen refresh will kick back in again.

Also you will notice a dramatic difference in time depending on which planet you render. Jupiter for instance will be relatively fast. The Earth on the other hand will take 2 or 3 times longer since there are a lot of extra calculations needed to generate cloud patterns, atmospheric transparency, and so on. Plus if the Moon is in view it too will be drawn adding to the time.

One really neat effect in this mode is the use of a technique called "bump mapping" which will create realistically illuminated terrain. Mountains for instance, on the terminator will be lit on the side, rising above the darker flat areas. Using a flat model you would not get this effect. It is subtle but can add to the realism. On the Earth, look for the polar caps to be outlined, as the glaciers catch the sideways rays of a Sun low on the horizon.

Any of the ringed planets (Saturn, Uranus, Neptune), will likewise take somewhat longer, since the ring calculations add a considerable bit of extra overhead.

gamma : sets the image's gamma correction to adjust for monitor differences

tables

Constellations
Planets
Stars

Things NOT installed yet

The Sky-tonight display is also meant to be the startup window, the first thing a user will see at startup.

The help file is by no means complete.

The fast planetary rendering will not work for screens with more than 256 colors displayed. (This is a windows limitation).

The 24-bit rendering stuff won't work since the texture maps are too big to distribute right now. (If you have the latest version of DS/Win, 3.0, you will find the same maps on the CD. Look for the files labelled "marss.r", "marss.g", etc. You can grab these and put them in the textmap directory and the 24 bit stuff should work.).

The Hubble star data stuff won't work as the files are too big for floppy distribution. As with the texture maps above, if you have
the new version of DS, the same files are used. Merely move the hubble data over to the "\data3\gsc"

The moon map is too big for the floppy distribution.

"Tutorials" is not hooked up.

README_first

Recommended equipment

486-33 (minimum), 486-66DX2 recommended, Pentium if you have one.

(development was done on a 486-66 DX2)

8 meg RAM

Sound card (not really needed))

256 colors.

FirstLight is optimized for 256-color graphics modes and looks best in 1024 x768 resolution. One major feature, fast-texture mapping of the planets will work ONLY in 256 color mode, if you are running with more colors, the fast-texture menus will be disabled. The slow-texture mapping will work with more colors. If you use fewer colors the toolbar is disabled as I discovered at the last minute that it crashes in 16 colors mode. If you don't know how many colors you are running in, or how to change them, go to the "Windows Setup" icon usually located in the "Main" folder. Open that and the first line under the menu will tell you the resolution and number of colors such as "800x600x256". The last number is the number of colors. If this is not 256 go to the options menu, select "change system settings" and make the needed modifications.

The planetarium screen (the main one) will be off center at startup. This is for the TEST version only so you can see the debug text window. If the program hangs or crashes check this window for any diagnostic messages. For the release the main screen will fill the entire monitor.

NOTE : In the "test" menu on the menubar there are three "debug" items. **Debug refresh** will turn on some debugging information (numbers such as "34" or "35") that will indicate portions of the code being processed in the main refresh loop. If you get a crash see if you can get this option turned on to see roughly where the crash is taking place. The same goes for the **debug planet rendering** code if you think that the crash is taking place there. The third one Printf will turn off ALL printed output. Please test this. That is, at some point turn off the printing and tell me if anything still prints out on the little white console screen. I don't want a customer to be playing with this and have that screen pop up on him all of a sudden.

I have also placed some flags in the init stuff that will automatically print out at startup. If the program crashes before you even get to the main screen, copy down the last number printed and let me know.

Startup Preferences

This window will permit you set a number of basic features to be set at startup.

Navigator Open will open the Navigator window automatically.

Expert Mode turns on the expert-mode menu.

Sky Tonight will show you the Sky Tonight window first instead of the main planetarium window.

Use km for distances tells First Light to use kilometers instead of miles for any distance displays.

Planet Selector open will activate the planet center window.

NOTE FOR BETA TESTERS :

There are other items at the bottom for test purposes only:

Splash Screen when off will prevent the opening artwork from being seen. This may be needed if FL crashes on startup. Showing the splashscreen will cover up the debug window. If you are stuck in this mode and get crashes go into the data2\misc directory and open up the file st_prefs.txt file. The 7th flag is the splash screen flag. Set it to 0 and try again. The 3rd flag is for Sky Tonight and may be likewise set to zero if you are getting problems from that.

Maximized, when turned off will open up the planetarium window over to the side in a non-maximized state. This is for the same reason as the feature above : to prevent covering up the debug window at startup.

eccentricity : a measure of an orbit's shape going from 0 to 1.0. A value of 0 is perfectly round, a value of 1.0 means that it is "open", and the object will pass by the planet only once (most cometary orbits are like this). A value in between 0 and 1.0 will make the orbit an elllipse, a flattened circle.

Constellations

name	*abbreviation*	*meaning*
Andromeda	And	Daughter of Cassiopeia
Antila	Ant	The Air Pump
Apus	Aps	Bird of Paradise
Aquarius	Aqr	The Water-bearer
Aquila	Aql	The Eagle
Ara	Ara	The Altar
Aries	Ari	The Ram
Auriga	Aur	The Charioteer
Bootes	Boo	The Herdsman
Caelum	Cae	The Chisel
Camelopardalis	Cam	The Giraffe
Cancer	Cnc	The Crab
Canes Venatici	CVn	The Hunting Dogs
Canis Major	CMa	The Big Dog
Canis Minor	CMi	The Little Dog
Capricorn	Cap	The Horned Goat
Carina	Car	The Keel
Cassiopeia	Cas	The Queen
Centaurus	Cen	The Centaur
Cepheus	Cep	The King
Cetus	Cet	The Whale
Chamaeleon	Cha	The Chameleon
Circinus	Cir	The Compasses
Columba	Col	The Dove
Coma Berenices	Com	Berenice's Hair
Corona Australis	CrA	The Southern Crown
Corona Borealis	CrB	The Northern Crown
Corvus	Crv	The Crow
Crater	Crt	The Cup
Crux	Cru	The Cross
Cygnus	Cyg	The Swan
Delphinus	Del	The Dolphin
Dorado	Dor	The Goldfish
Draco	Dra	The Dragon
Equuleus	Equ	The Little Horse
Eridanus	Eri	The River
Fornax	For	The Furnace
Gemini	Gem	The Twins
Grus	Gru	The Crane
Hercules	Her	Son of Zeus
Horologium	Hor	The Clock
Hydra	Hyd	The Male Water Snake
Hydrus	Hyi	The Female Water Snake
Indus	Ind	The Indian
Lacerta	Lac	The Lizard
Leo	Leo	The Lion
Leo Minor	LMi	The Little Lion
Lepus	Lep	The Hare
Lynx	Lyn	The Lynx
Lyra	Lyr	The Lyre
Mensa	Men	Table Mountain

Microscopium	Mic	The Microscope
Monoceros	Mon	The Unicorn
Musca	Mus	The Fly
Norma	Nor	The Square
Octans	Oct	The Octant
Ophiuchus	Oph	The Serpent-bearer
Orion	Ori	The Hunter
Pavo	Pav	The Peacock
Pegasus	Peg	The Winged Horse
Perseus	Per	Rescuer of Andromeda
Phoenix	Phe	The Phoenix
Pictor	Pic	The Painter
Pisces	Psc	The Fishes
Piscis Austrinus	PsA	The Southern Fish
Puppis	Pup	The Stern
Pyxis	Pyx	The Compass
Reticulum	Ret	The Reticle
Sagitta	Sge	The Arrow
Sagittarius	Sgr	The Archer
Scorpius	Sco	The Scorpion
Sculptor	Scl	The Sculptor
Scutum	Sct	The Shield
Serpens	Ser	The Serpent
Sextans	Sex	The Sextant
Taurus	Tau	The Bull
Telescopium	Tel	The Telescope
Triangulum	Tri	The Triangle
Triangulum Aust.	TrA	The Southern Triangle
Tucana	Tuc	The Toucan
Ursa Major	UMa	The Great Bear
Ursa Minor	UMi	The Little Bear
Vela	Vel	The Sails
Virgo	Vir	The Maiden
Volans	Vol	The Flying Fish
Vulpecula	Vul	The Fox

Obsolete Constellations

-

Antinous	Lover of Hadrian
Argo Navis	The Ship
Cerberus	Three Headed monster
Felis	The Cat
Gallus	The Cockerel
Globus Aerostaticus	The Balloon
Honores Friderici	The Glories of Frederick
Jordanus	The River Jordan
Lochium Funis	The Log and Line
Machina Electrica	The Electrical Machine
Quadrans Muralis	The Mural Quadrant
Rangifer	The Reindeer
Robur Carolinum	Charle's Oak
Telescopium Herschelii	Herschel's Telescope

Turdus Solitarius	The Solitaire

Planets

planet	*dist*		*day*	*year*	*ecc.*	*incl.*	*diameter*	*albedo*
gravity								
mercury	.387	58.6	87.9d	.206	7.0	.38	.11	.38
venus	.723	243.0	224.7d	.007	3.4	.95	.65	.91
earth	1.00	1.0	365.2d	.017	0.0	1.0	.37	1.00
mars	1.52	1.0	686.9d	.093	1.8	.53	.15	.38
Jupiter	5.20	.41	11.9y	.048	1.3	11.2	.52	2.54
Saturn	9.53	.44	29.5y	.056	2.5	9.4	.47	1.08
Uranus	19.18	.72	84.0y	.047	0.8	4.0	.51	.91
Neptune	30.06	.77	164.8y	.009	1.8	3.9	.41	1.19
Pluto	39.44	6.38	247.7y	.250	17.2	.24	.50	.05

---

dist : distance in astronomical units
day : in Earth days
year : in Earth days or years
ecc : eccentricity
incl : inclination
diameter : as compared to the Earth's diameter
albedo : how much sunlight the planet reflects, 1.0=pefect reflectivity
gravity : as compared to the Earth's gravity

Known Bugs (May 14, 1995)

Known Bugs

(things that don't work or are operations
that could be tweaked up just a bit)

[NOTE to new testers : it is absolutely essential that you try to reproduce a bug when found. Don't simply say "it crashed dammit!", say, "when I did a, b, c and d, it crashed, dammit!"]

--- new additions May 14, 1995 ---

Mark got a crash when zooming really close to Mars while in hover mode. I cannot reproduce this.

Tim would get a crash when in hover mode and scrolling around while using more than 256 colors. I couldn't reproduce this either.

The ephemeris will let you select the earth as an object, which of course is meaningless.

The Sky Tonight buttons don't behave exactly like standard windows buttons.

When using GSC stars, I sometimes get white bands across the top of the screen.

The user can attempt to start up the program more than once, since the installer cannot set the icon's properties to lock that out.

--- new additions April 27, 1995 ---

The movie window doesn't have any controls yet so it plays once and that's it. I tried using the Microsoft movie window object, but it seems to have some bugs of its own.

The when-and-where panel sometimes opens up with the system time instead of the time set within the program. I cannot reproduce that regularly.

FL will crash on some pentiums.

The navigator will crash on occasion, but I can't reproduce that.

AVI files created will have the first frame blank.

* fixed : FL could crash when the user attempts to run it with fewer than 256 colors.

The rings of saturn print out in solid form rather than outline form.

Rendered planets print out in their wireframe form, but are not solid so you can see through them.

It is very difficult to halt creating an .avi file when using the 24 bit stuff, it doesn't pick up the hit-key event consistently.

Printing out stuff seems to screw up the colormaps sometimes.

* fixed : Textual data when printed out is not aligned properly.

* fixed : The solar-system button does nothing and will probably be yanked for the first version.

inclination : The tilt of the orbit in degrees relative to the Earth.

Planet Data

Deep Sky Object Data

Stellar Data

Solar Data

Lunar Data

This space for rent

Making Your Own Movies

Using movies you may create your own animations of celestial events in standard Video for Windows format.

When creating movies the window MUST be entirely in view (otherwise the image ceases to exist in memory so cannot be saved).

To create a movie you must first open it, using the open button. Next set the various options, described below. Set up the desired view (you may want to lock on the moon for instance, set the time increment to 12 hour intervals and follow it for a month to show the phases). Clicking on start will turn on the clock and close the movie window (so it doesn't appear on the animation). A small window in the corner will appear displaying frame count and a stop button. When you've collected as many frames as needed, clicking on stop will return you to the main movie window. You can add further frames to the same file by starting and stopping as before. When done, close will end the file creation and let you view it.

The *size* option will set the final size of the movie, the larger the frame the slower it will play back and the more memory it will require, so small movies are recommended. You may display data such as date/time/position by turning on the *show data* checkbox. *Rate* will set playback rate in frames-per-second. If your machine cannot handle the selected rate Video For Windows will drop frames giving the jerky appearance that you may have seen in which case you can either use a slower rate or a smaller size. If you are in hover mode you may select render planets which will cause FirstLight to generate full color rendered images. (this is the same as the *Planet rendering/slow menu* select below, but is placed here for convenience). If you are using this feature you might want to consider the no rotation option. Normally the planets will rotate in a realistic fashion but if your time increment is large the rotation between frames will be very large and therefore distracting. If you want to show planetary rotations keep the time increments down to less than an hour.

Day Details

The day window gives further details about any day of the year as shown in the calender. It shows the rise and setting times for the Sun and Moon, the lunar phase, and fuller details about the events mentioned. Click on any one of the events and the object of interest will be centered, or an event file will be loaded up to have First Light demonstrate it for you.

Fixed Viewpoint

Position your eyepoint around the Sun using heliocentric-coordinates (Sun centered).

OK :
Closes the window and uses the new values.

cancel :
Closes the window without doing anything.

try :
Tries the new values without closing the window.

help :
Brings up this file.

heliocentric latitude :
Similar to the Earth's latitude, this goes from -90 to +90 degrees. At 0 degrees you are exactly on the plane of the Earth's orbit. At 90 degrees you are directly over the top of the Sun.

heliocentric longitude:
Similar to the Earth's longitude, but this is relative to the Sun and goes from 0 to 359 degrees.

solar distance :
This is the distance from the Sun in astronomical units ("AU"). One AU is the distance between the Earth and the Sun, or about 93 million miles.

Changes since Beta 2a-April 27, 1995 (things fixed since v. 2a)

1) FL no longer crashes when you place your eyepoint on a planet.

2) If you are in hover mode and try to aim your viewpoint you will now get a warning that you are in hover and will be permitted to exit hover.

3) The sun and moon entries in the list used for placing your eyepoint on a planet have been removed since there is no logic to do that right now.

4) The next-major-event error dialog has been removed.

5) FL now has a minimized icon.

6) The stars in the 3d-stars display have been brightened up a bit.

7) When in hover-mode, the aim window menu item is disabled.

8) The font in the navigator has been enlarged so the text should be much more readable.

9) The orbit parameters can now be changed in the hover settings window while in orbit mode.

10) The NOW button in the calendar uses the system time, instead of the program time.

11) The landscape menu and limits are no longer in effect if you go from local/landscape mode directly to hover.

12) .AVI files created by FL no longer crash the system when played.

13) The .avi creator window has been redesigned to make it a lot easier. The items have been rearranged, the show-planets button is now "24-bit". The little exit/status window is no more, now you can exit by hitting the space-bar. The frame count is placed in the title bar.

14) The auto-clock mode doesn't update quite as fast so you get some extra time to turn it off.

15) All of the help buttons have been hooked up and should bring up something.

16) You can now do 24-bit renderings of Saturn.

17) The object trace lines will now stay up on the screen when you do stop the fast time stuff.

18) When running more than 256 colors you will no longer have the fades or the fade sound in hover mode. (Windows limitations).

19) Added a toolbar help menu item.

20) The hubble data is turned off when doing a zoom or drag.

21) Jean was getting a "jump" in the zoom when going from a wide angle to a narrow angle while in hover

mode. This is behaving the way it was supposed to. There were about 4 or 5 steps in a zoom, the last one will always be the greatest as a percentage. If my zoom steps are 15 degrees and the second to the last field of view is 30 degrees, the last will be 15 degrees, hence a large "jump". It was softened a bit since the last zoom would stall a bit, rendering the planets instead of using the faster grid. So the last zoom uses the grid first, then the rendered planets.

22) The next-meteor-shower in the summary window now works.

23) The gibberish at the end of the file-type list in the browser windows has now been removed.

24) Printing should now work (yippee!). Of course you should have a printer. Please test this!

25) One tester was having the program exit when the novice mode in the navigator window was selected. I think this might be fixed.

26) Larry said the planetarium button in the Sky2nite window wasn't clear enough so the user would know how to get back. The image was touched up just a bit to make it apparent as to what it does.

27) The "reset" menu has now been changed to "remove clutter" just to make it clearer.

28) The hover settings window now has a cancel.

29) Using the toolbar deep-space button now turns on the orbit outlines and the grid.

30) The view button in the event alert menu was removed.

31) The refresh debug code is now turned on at startup in case the program crashes first off.

32) The daylight savings time flag is now saved when you hit the "save" button on the w&w window.

33) Postscript printers would puke on some scenes for narrow fields of view, less than 1 degree.

34) You no longer get a crash when in narrow zoom values with the star-data on.

35) You no longer get a divide-by-zero error if you hit "show" in the new orbit window without entering any data.
(thanks Jennifer!)

NO! README first!!

For the new testers from Fishnet, Thanks! As I mentioned in my posting, there was alot of confusion regarding the testing program. I thought the software was really working fine since I wasn't getting any reports from down south. Jean thought that Tim was testing the stuff, Tim thought that Jean was doing it. Meanwhile Jean was waiting to get the CD-ROM mastering equipment running properly which it did not due to a bad SCSI board and the wrong software. It took him 2 weeks to get it working, meanwhile Beta 4 was never tested. Oh well. . .

How to test the software

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First do the "Columbus test". That is, just start playing with the menus, trying stuff while not attempting to read the documentation. In otherwords, just like most people normally would. If stuff crashes, it is usually here, since the programmer can't anticipate the oddball combinations of selections that might be made.

When you find a crash or a bug of any sort, make sure to be able to reproduce it if possible, then give me the step-by-step procedure to do so.

Make sure to read all of the other intro documentation as well for additional tips.

Our immediate goal is to make sure the program doesn't crash. Next, it must behave the way the manual says it should. Third, what bugs that there are should have easy work arounds and not prohibit the user from having fun with his investment.

1

Look for menu names that don't make sense, things that just aren't intuitive, etc. When a menu is selected are the results immediately understandable?

2

Test the printing. This is the most poorly tested part since there are literally thousands of kinds of printers out there and printouts are a major feature of the package.

3

Test the Hover mode. This is fairly complicated code and I think even more important than the printing. Are the colors correct? When you exit and return to earth, due you get funny colors or do things stay realistic. If the printing and hover mode are solid, we're in good hands.

4

You will notice the "Debug" menu. The last item is "Printf", and will be checked at startup. Turning this off will disable any printing of text to the console window. At some point turn off the printing and see if any stuff still comes out. If so, let me know what it says and what causes it. I don't want a user to be merrily clicking away only to trigger a debug statement like that.

5

Test everything else. Create weird combinations of events that a sane and knowledgeable user wouldn't consider and see if you can bring the machine down.

6

Have fun!
