

SKYGLOBE 3.6

Congratulations and Welcome!!!

You are now the proud owner of an evaluation copy of SkyGlobe 3.6, the fast, fun, and easy-to-use educational astronomy program.

SkyGlobe is distributed as shareware to reach the widest possible audience, but it is still copyrighted material.

You are granted permission to try out the program to see if you want to keep it and use it, and if you decide the program is worth the reasonable \$20 fee, there are many easy ways to get in touch with us and many attractive incentives when you register.

Also, you are encouraged to copy the entire shareware package and pass it around to anyone who may be interested, as long as you don't change any of the files and at the very most charge a small media and handling fee.

This manual was converted almost directly from the printed version you will receive when you register, except for changes necessary for an ASCII file and for a non-registered copy.

Other than that the text is the same, as is the .EXE.

Installing and running SkyGlobe was designed to be fast and easy. All you need to do is copy all the files to a directory on your hard disk and invoke the .EXE. Here is a little script that will work for many systems; you may need to change some of the drive letters for your own, or to un-archive the files with PKUNZIP or something similar.

C:

CD \

MD KLASSM

CD KLASSM

COPY A:* *

(Possibly PKUNZIP SKYGLOBE here or something similar.)

SKYGLOBE

That's all there is to it! Now you are ready to enjoy looking at the stars with SkyGlobe. The first few pages of this manual act as a Quick-start Introduction, the rest is a more detailed reference.

Have fun, and Peace and Clear Skies!

Mark A Haney

Roscommon, MI

Table of Contents

A SkyGlobe Overview.....	
Access SkyGlobe.....	
Tour SkyGlobe with a Quick Tutorial.....	
On-Screen Displays Will Guide You.....	
When You Want to Exit.....	
What Are You Viewing?.....	
Seeing More Stars.....	
Z Is for Zoom.....	
Understand SkyGlobe's View Direction and Elevation.....	
Change Direction and Elevation.....	
See a View at a Different Time or Date.....	
Displaying Planets and Their Motions.....	
Adjust Lines and Labels.....	
Function Keys Control SkyGlobe Parameters.....	
Miscellaneous Commands.....	
Use Special Command Modes.....	
Change View Location.....	
Find and Lock SkyGlobe Objects.....	
Displaying Images.....	
Demonstrating Precession.....	
Printing SkyGlobe Screens.....	
Displaying Custom Objects.....	
Change Your Default Environment.....	
Enter Exact Values.....	
SkyGlobe Q&A.....	
Explaining the Cycles.....	
Sources.....	
Future Plans.....	
Our Support Policy.....	
ASP Ombudsman Statement.....	
Discerning Our Universe.....	
Glossary.....	
Copy of ORDER.TXT.....	

Manual and SkyGlobe program Copyright (c) 1989-93 Mark A Haney

SkyGlobe and CircumSpace are trademarks of KlassM Software, Inc.

The GIF file format is copyrighted by CompuServe.

All other trademarks are property of their respective owners, and are used purely for illustrative purposes.

Files in SKYGLO36.ZIP:

SKYGLOBE.EXE	Main executable file
SKYGLOBE.DAT	Contains more stars and names, and RA-Dec lines
SKYGLOBE.TXT	This manual
README	Short loading, running, and registering info
ORDER.TXT	Convenient order form
OVERSEAS.TXT	International registration agents
VENDOR.TXT	Distribution instructions
FILE_ID.DIZ	Standard Description In ZIP

A SkyGlobe Overview

SkyGlobe is a fast, fun, and easy-to-use educational astronomy program. With it, novice and experienced stargazers alike can view the heavens as they appear from their own Home Town or over two hundred other locations, and can compare a single location's celestial view from the current date, the ancient past, and the far-off future.

Use SkyGlobe to see the effect of the Earth's **25,800-year** wobble called precession, to practice celestial navigation, and to learn about planetary orbits. These activities aid in "Discerning Our Universe," the grounding philosophy of KlassM Software and the ultimate objective of SkyGlobe.

This manual will help you discern SkyGlobe. This first section, Getting Introduced, is designed as a tutorial to get you to the stars as soon as possible. Take the SkyGlobe tour that begins on this page to become familiar with basic SkyGlobe features. Then turn to subsequent sections for more complete reference information. Refer to the Glossary for unfamiliar astronomical terms, and use the Table of Contents to help find information you're looking for.

Access SkyGlobe

At the SkyGlobe directory, type SKYGLOBE and press Enter. (For many installations, typing CD \KLASSM will get you to the right place.)

A view of the southern sky for the current Time and Date appears, with a welcome and copyright message superimposed over the screen's top center. These messages disappear when you press the first command key.

Tour SkyGlobe with a Quick Tutorial

Navigating in SkyGlobe generally requires pressing only a single key. The following tutorial steps you through basic SkyGlobe actions, like changing the Time, Date, View Direction and Elevation, and others. Keys used during the tutorial are defined in your screen's upper right corner.

- 1. Press A to start the Auto-Increment of Time.** Time (shown in the screen's upper left corner) begins to change forward in 5-minute increments and the display adjusts to reflect the new sky view.
- 2. Press Shift-A. Time changes backward in 5-minute increments.**
- 3. To stop Time movements, press A again (as in Step 1).**
- Press the + key a few times and watch more stars appear.
- Press - and watch the dimmest stars vanish.
- 6. Press Z and then Shift-Z a few times to Zoom in and out.** (Notice that using the Shift key with a command key reverses the action.)
- 7. Press M, H, D, or T to advance the Month, Hour, Day, or Time (in minutes).** The view adjusts with each action. Time and Date in the screen's upper left corner also reflect your changes.
- Try combining M, H, D, or T with the Shift key to reverse Time and Date changes (as in Shift-M).
Note: You can also change Time by Year, Century, or milleniUm with Y, J (for Jump a century), or U.
- 9. Press N, S, E, or W to change your View Direction to North, South, East, or West.** Not only does the sky view adjust instantly, but the direction indicator (Dir) in the screen's upper left corner shows your selected View Direction.
- Press the up or down arrow keys, to change View Elevation by 5 degrees, or press PgUp or PgDn to change it in larger increments. The Elev indicator in the screen's upper left corner reflects your change.
- SkyGlobe normally starts out with all possible Constellation lines displayed. Press Shift-C once or twice to decrease the number of these lines, then press C if you want to turn them back on. These lines are especially helpful to the novice just learning star patterns.
- Function keys are used to toggle various display features, such as F10 for the constellation lines you

- just tinkered with. Try some of the others, and try using Alt, Shift, or Ctrl with them to adjust the way the associated feature is displayed.
13. Try viewing a specific planet, star, Deep Sky Object (DSO), or favorite constellation:
Press F to display the Find menu.
Use the mouse or arrow keys to highlight Orion in the list of planets, constellations, Messier objects, NGCs, and stars.
Click on Orion or press Enter. The sky view adjusts to show Orion in the screen's center.
 14. To Lock a planet in the screen's center, repeat Step 13 but press L (or right-click) to select and Lock a planet (you choose) in the screen's center.
 15. Turn on Auto-Increment mode again and watch the sky view adjust while the planet remains centered.
(Remember, press A to stop.)
 16. Press Esc to unLock the planet.
 17. Try printing the displayed SkyGlobe screen: Just press P! (Then follow the instructions.)
- Feel free to go beyond the steps of this tutorial! Try some keys listed in the screen's upper right corner. Or try repeating the tutorial for some additional practice. More detailed descriptions of navigating with SkyGlobe command keys follow.

On-screen Displays Will Guide You

SkyGlobe has several on-screen displays to help track where you are. Until you're familiar with SkyGlobe, we recommend using the program with these displays turned on.

Parameter Display. The Parameter display in the top left corner tracks your Time, Date, Location, View Direction, Elevation, and Zoom factor. Press F2 to toggle this display, or Shift-F2 to list Auto-Increment parameters, Print parameters, and other information. You can press Ctrl-F2 to erase one portion of the display at a time.

(The Parameter display is more fully described below.)

Help Display. The Help display in the top right corner lists SkyGlobe alphabetic and function keys for initiating all SkyGlobe commands. Press F1 to toggle this display, or Shift-F1 to display function key assignments (on non-CGA machines).

Mouse Cursor Display. The Mouse Cursor display in the screen's bottom left corner lists the cursor Azimuth and Altitude (the direction and sky height of the cursor), RA-Dec coordinates, and the name and magnitude (if a star) of any object under the cursor.

When You Want to Exit

It's hard for us to imagine ever wanting to exit SkyGlobe, but if you find it necessary to do so just press Q, Esc, or Alt-X to return to DOS.

What Are You Viewing?

Lots and lots of stars! Depending on your View Location and the current time and date, you will also see various constellation lines, some of the planets, a green line representing the Horizon, RA-Dec coordinate grid lines, and a red dotted Ecliptic line for the Sun's path. The globe appears as if you're looking through a fish-eye lens.

Seeing More Stars

As the tutorial in Getting Introduced demonstrates, you can use the + and - keys to control the number of stars to display. You can see the number of stars from which the program is currently selecting in the upper left Parameter display, followed by the limiting magnitude this number represents. This is the magnitude of the dimmest stars shown. Assuming SKYGLOBE.DAT is present, you should be able to display over 29,000 stars, up to magnitude 5.6. Registered users are able to purchase a \$5 optional disk that increases this total to 250,000 stars, the entire SAO catalog.

Z Is for Zoom

SkyGlobe allows you to adjust the magnification of your sky view with the Zoom feature. At a nominal magnification of 1, half of the celestial sphere is visible. Because the eye can focus on far less area than this, a certain amount of distortion is evident at low magnifications. The center of the screen is always the most accurate portion.

Press Z (Zoom) to increase the magnification or Shift-Z to decrease it. You can use Alt-Z and Ctrl-Z to Zoom in larger and smaller increments (respectively). Home followed by Z quickly sets the magnification to 1.0, and End-Z or End followed by Shift-Z is used to rapidly step through zoom

levels.

Understand SkyGlobe's View Direction and Elevation
To understand what you're viewing, you need to understand how SkyGlobe interprets directions and elevations. SkyGlobe assumes you're standing outside looking in the same direction your feet are pointing. This is the View Direction. The display shows this direction in degrees, ranging from 0 for due north, through 180 degrees for due south, to 350 degrees for 10 degrees west of north. The View Direction is indicated by degrees in the screen's upper left corner as well as by initials (N, S, etc.) along the Horizon line.

The View Elevation ranges from 0 degrees to 90. The Horizon appears as a straight line at the 0-degree setting. Imagine that you're extremely short, so the ground covers the lower half of your vision, but is transparent. The 90-degree setting is like looking straight overhead at the Zenith.

Change Direction and Elevation

SkyGlobe provides many convenient methods for rapidly changing the sky view. The up and down arrow keys change the View Elevation by 5 degrees. The left and right arrow keys work with the View Direction. When the View Elevation is near the Horizon, these keys work side-to-side as you expect, but nearer to the Zenith they rotate the view more than they move it. This is correct when you remember the View Direction stands for where your feet are pointing. You can also use these keys to change Direction and Elevation:

Alt-arrow,	Ctrl-arrow	Change Direction or Elevation by small amounts
N, S, E, or W		Change Direction instantly to compass points
PgUp, PgDn		Change Elevation in larger jumps

See a View at a Different Time or Date

SkyGlobe provides many ways to adjust a view's Time or Date.

Using Alphabetic Keys. Using SkyGlobe's alphabetic keys, Time can be changed forward or backward by a minute or an hour. The Date can be changed forward or backward by a day, month, year, century, or millenium.

Use the following alphabetic keys to change Time or Date:

To Change	Forward	Backward
1 Minute	T	Shift-T
1 Hour	H	Shift-H
1 Day	D	Shift-D
1 Month	M	Shift-M
1 Year	Y	Shift-Y
1 Century	J	Shift-J
1 MilleniUm	U	Shift-U

Note: Press Home-Y to return to the current year at any time.

Using Auto-Increment Mode. Auto-Increment mode, one of SkyGlobe's most useful features, simulates the passage of Time on your computer. Once activated, it automatically and continuously increments Time or Date, either forward or backward, until it's turned off.

Several parameters control Auto-Increment behavior. By default, the program increments the Time, by 5 minutes per view. If you switch to increment by Date, the program defaults to a speed of 1 day. Increments are usually forward, but you can set SkyGlobe to move backwards too. You can see the current settings by pressing Shift-F2 until all values are displayed. The parameter names are AutoTspeed, AutoDspeed, AutoType, and AutoDir. Use the table below to make changes.

Press this Key	To Do this
A	Toggle Auto-Increment mode on and off
Shift-A	Toggle Auto-Increment forward and backward
Alt-A	Toggle Auto-Increment between Time and Date
>	Increase Auto-Increment speed
<	Decrease Auto-Increment speed

Setting Real-Time Mode. To synchronize Time and Date to the system clock, press R to activate (or deactivate) Real-Time mode. The letter R in Time display indicates that Real-Time mode is activated. You still have control over all commands except those related to Time and Date.

Using Sidereal Day As Auto-Increment Speed. Press Shift-R to set the Auto-Increment speed to one Sidereal day, which is one complete Earth rotation, or about 23 hours and 56 minutes. The star and constellation display seem to freeze, although planets continue along the Ecliptic. This is

useful for learning about retrograde motion and about a planet's relative speed of motion. Press Shift-R again to deactivate Sidereal Day Auto-Increment mode.

Displaying Planets and their Motions

You can use SkyGlobe to learn how planets move around the Sun. Follow these steps to display planets and their orbits.

- 1. Press F3 to toggle display of planets and their labels. EGA/VGA color users see the planets in more or less appropriate colors. You may need to change the Time or Date to see your favorite planet.**
- 2. Change the View Direction to South and the Time to 12:00 noon.**
- 3. Press V to turn off Daylight Savings Time. If D doesn't appear next to Time in the Parameter display, Daylight Savings Time is off.**
- 4. If necessary, press Alt-A to set the Auto-Increment Type to Date.**
- 5. If the Ecliptic isn't displayed, press F6.**
- 6. Press A and watch the show!**

While watching the display, note these points:

Because your Location may not fall exactly on the standard time zone meridian, the Sun may not be due South for you at Civil noon.

Notice how the Sun wanders from side to side of the meridian throughout the year as Earth speeds up and slows down along its slightly elliptical orbit.

Mercury and Venus stay close to the Sun. Mars exhibits strange behavior because it's outside the Earth's orbit but relatively close by. It also has an eccentric orbit. Other outside planets drift more slowly against the background of the stars.

Watch the change in the Moon's icon to see how it goes through its phases, being always in New Moon phase when near the Sun. Move to Midnight and the Moon will be in Full Moon phase when it shows up in the South.

Because the Moon's orbit is inclined about 5 degrees to the Ecliptic, it wanders above and below the Ecliptic each month. This motion, which rotates through an 18-year cycle, accounts for the near periodicity of eclipses. For example, take a look at the solar eclipse of July 11, 1991. Slowly step through the hours and watch how the moon gradually overtakes the Sun.

The Sidereal day mode of the Auto-Increment feature provides another interesting way to watch the motion of planets. Find a direction and a Time and Date that contain some planets and press Shift-R. The Time begins incrementing by 23 hours and 56 minutes, or one sidereal day. The planets, especially the Sun, Moon, and inner planets, begin to drift against the unmoving background of the stars.

Shift-F3 and Ctrl-F3 decide whether labels are displayed or planets only. Alt-F3 switches the entire display from an Earth-based sky view to a bird's-eye view of the solar system. Time, Date, and all Auto commands will still be active in the mode, as will Zoom and some mouse features.

Adjust Lines and Labels

SkyGlobe can quickly and easily change the lines and labels that help your eyes and mind make sense of the sky's vastness. This can be very helpful to the novice just learning the stars. If you want to save any combination of lines and labels as a default, see Customizing SkyGlobe.

Adjusting Constellation Lines. The Constellation lines are grouped by importance, with some constellations having several classes of lines, such as the extra lines that change the Big Dipper into Ursa Major, the Great Bear.

Press Shift-C to reduce the number of lines displayed, and C alone to restore them. Press F10 to instantly turn on or off these lines. Turning the lines on and off is a good way to learn the star patterns underneath the constellations.

Press G (Guidelines) to toggle constellation boundary lines on and off. Press Shift-G to change the color of these lines, and Alt-G to select between dotted and solid lines.

The International Astronomical Union (IAU) standardized these boundaries, which are similar to state or county borders, so every star or object could be said to belong to a particular constellation. SkyGlobe's lines are a little rough to save memory, like a cheap TV weather map, so once in a great while a star might show up in the wrong "county".

Labeling Constellations. You can also label the constellations in several ways. Press F9 to toggle labels,

or Alt-F9 to activate several labeling options: no labels, abbreviations, full names in small font, full names in large font.

Labeling Stars. The 3216 brightest stars (up to magnitude 5.6) can be labeled with names or their rank order brightness numbers. Press F8 to toggle, and Alt-F8 to activate several labeling options: no labels, numbers, names in small font, names in large font. Use F8 with Shift and Ctrl, or use F12, to control the number of stars labeled.

Displaying Horizon, Zenith, and Hash-Marks, and Ecliptic. Press F5 to toggle the display of Horizon line, Zenith cross, and Hash-Marks, and use Shift and Ctrl to select the type of display.

Displaying RA-Dec Grid Lines. F7 controls two levels of display for RA-Dec grid lines. These lines act somewhat like latitude and longitude lines on the Earth's globe.

(RA-Dec stands for Right Ascension and Declination, the astronomical analogues of terrestrial longitude and latitude.) Try looking due North in Auto-Increment mode with the lines on and watch the celestial sphere rotate. Notice that the Pole Star appears almost motionless.

F6 toggles the Ecliptic line display. In both cases, the Alt key selects between dotted and solid lines.

Viewing Messier Objects. Press F4 to display Messier Objects--110 Deep Sky Objects compiled by Charles Messier to distinguish them from comets--and a selection of NGC objects. Press Alt-F4 to label these objects with their names; Shift and Ctrl determine how many to display. The different types of objects are: open clusters, globular clusters, nebulae, spiral galaxies, and elliptical galaxies.

Displaying the Milky Way. The K key controls a beautiful representation of the Milky Way. The key alone toggles, while Shift selects between several display options: no display, outlines only, gray-shaded regions, blue-shaded regions. Press Alt-K (VGA and SVGA only) to adjust the total brightness of the shaded regions, while Ctrl-K adjusts the difference between them.

Outlining the SkyGlobe Display. The letter O places a frame around the rectangular screen and the round SkyGlobe. Press O to activate several outlining options: no display, rectangular frame, round frame, round frame and rectangular frame. Press Shift-O to change the color of the outlines (there are 13 displayable colors). Alt-O toggles display of field of view circles, with Ctrl-O selecting between 1/2 degree, 1-degree, and 2-degree circles, to assist in simulating a telescopic eyepiece view.

Star Display Options. There are several combinations of displays available for the star display. SkyGlobe starts out with almost the brightest possible settings, but you can use Shift-B and Ctrl-B to decrease either the type or color of the star display if you prefer a subtler effect, perhaps for a darkened room. Use B and Alt-B to select brighter options. These are among the settings that can be saved with configuration files, as described in the Customizing SkyGlobe section.

Function Keys Control SkyGlobe Parameters

The following function keys are used to control SkyGlobe parameters:

This Key Allows You to

- | | |
|------------|--|
| F1 | Control the Help display |
| F2 | Control the Parameter display |
| F3 | Display Planets |
| F4 | Display Messier objects and DSOs |
| F5 | Display Horizon, Zenith, and Hash-Marks |
| F6 | Display the Ecliptic line |
| F7 | Display the RA-Dec grid |
| F8 | Label stars |
| F9 | Label constellations |
| F10 | Control constellation lines display |
| F11 | Control the Mouse Cursor display |
| F12 | Control the number of labeled stars |

Combining the Alt, Shift, and Ctrl keys with function keys F1 through F10 allows you to do more than just toggle the associated display features, which is what using the function keys alone does. In most cases, use the Shift key to increase the level of the display, use the Ctrl key to decrease it, and use the Alt key to change the type of display.

For instance, Alt-F7 selects between dotted and solid lines for the RA-Dec grid, Shift-F4 increases the number of Messiers and DSOs while Alt-F4 controls whether the object

name is displayed, etc.

F11 and F12 aren't present on all machines, nor do they always work the same way, so their functions are duplicated through other means. The Insert key is a synonym for F11, and Shift-F8 is a synonym for F12, with Ctrl-F8 used for Shift-F12. The F12 operation is more similar to alphabetic command keys than it is to function keys, and works that way to remain compatible with earlier versions of SkyGlobe.

Miscellaneous Commands

Here are several other useful keys, most not previously described.

These Keys	Allow You to
Enter	Begin Enter exact value mode
Backspace	Undo your last keystroke
TAB	Find the next sunrise or sunset, depending on the situation
" (as in ditto)	Repeat last keystroke
/	Brighten text of on-screen displays
. (period)	Toggle between normal and reversed text
[Toggle Precession Flag
V	Toggle Daylight Savings Time (Shift-V forces its use.) SkyGlobe tries to determine when Daylight Savings Time should be active, depending on the Location and Date. Before 1918 Daylight Savings Time isn't usually active, because it wasn't widely used then.
X	Switch to mirror image display
Alt-F	Flip hemisphere
Alt-T	Toggle Time display, either AM/PM or 24-hour
Ctrl-N	Restrict the stars and planets displayed to only those used for celestial navigation
Ctrl-G	Toggle backGround color between black/blue
Ctrl-T	Toggle Twilight background brighten mode

Use Special Command Modes

The SPACE bar, Home and End keys, and Alt and Ctrl keys have special meaning in SkyGlobe. These command modes make SkyGlobe even easier to use!

SPACE Bar. The SPACE bar activates Turbo mode, which takes the next keypress and continually feeds it to the program until the SPACE bar is pressed again. This feature is useful with Zoom, Direction, and Time and Date commands. Try it with J or U while facing North to see a great demonstration of precession. (Precession is described in more detail in Demonstrating Precession.)

Home and End Keys. The Home and End keys, for many commands, take the next keypress and either minimize the program parameter altered by that key, or jump to its next major increment. These are helpful for Zoom and Brightness and are convenient ways to set the Time and Date to even numbers, such as midnight, January 1, or the current year.

Alt and Ctrl Keys. The Alt and Ctrl keys often work as smaller positive and negative increments for the command with which they are used. Once again, Zoom and direction commands work well with these keys.

Try Using Special Command Modes. Try an example that illustrates these command modes:

1. Press Home and, when prompted for the Home key, press Z. This resets the Zoom factor to 1.
2. To use Turbo mode, press the SPACE bar and, when prompted, press an alphabetic key to change Time, Date, or Zoom. Your request continually feeds and incrementally changes the sky view. A message at the screen's bottom reminds you to press the SPACE bar when you want to exit Turbo mode.
3. Try Turbo mode again for a reverse Zoom: Press the SPACE bar and then press Alt-Z. The display begins to expand.
4. Try it again! In Step 3, try pressing Ctrl-arrow or Alt-arrow when in Turbo mode.

Mouse Alternatives. You can use the mouse as a shortcut instead of the keyboard in some situations. Moving the mouse cursor to the edge of the screen is similar to using the arrow keys, and it will slide the display in the appropriate direction. If the Help display is on, you can click, right-click, double-click, or right-double-click on top of those descriptions to activate the appropriate command key, or its Shift, Alt, or Ctrl state respectively.

Change View Location

A popular pastime for new astronomers is seeing what the sky looks like from other places. Maybe you're planning to move and want to be sure the stars will make interesting

viewing from your new prospective home. (They will!)

You can change your View Location in several ways.

Using the Location Menu. Press L to display a menu of Locations from which to choose. Your current view remains at the bottom of the screen. Use the cursor keys and press Enter (or the mouse) to select any Location listed. You'll return to the program with all other parameters just the way you left them. Because SkyGlobe has over 230 Locations, there are two pages of Locations to choose from. Press End to quickly move to the end of a page, then press Enter to view the next page.

Using Function Keys. Press Home-L, End-L, Alt-L, and Ctrl-L to change Locations without using the menu. The first two select the first Location on the menu, usually Caledonia, Michigan or your hometown, and the Equator. The last two move either one down or up on the menu.

Changing by Compass Direction. To move a small amount in a compass direction, press Alt-N, Alt-S, Alt-E, or Alt-W. The east and west moves have the effect of changing the local time by 1 minute of Time, which corresponds to 15 minutes of longitude. The north-south changes are 1/4 degree, about 17 miles.

Find and Lock SkyGlobe Objects

Suppose you want to view a particular planet, constellation, Deep Sky Object, or favorite star. You can find and display objects in several ways--by menu and by mouse. You can also lock these images so they remain centered despite Time and Date changes.

Finding an Object with the Find Menu. Follow these steps to use the Find menu:

1. Press F (or click on F in the Help display) to display the Find menu. The menu displays. On several pages, it lists planets, constellations, Messier objects, NGCs, and stars.
2. Navigate the menu using arrow keys, PgUp, PgDn, or the mouse.
3. Press Enter or left-click when your desired object highlights. The SkyGlobe display re-centers at the chosen object if it is visible from your latitude. If necessary, Time increments until the object is above the Horizon. The next time you use the Find menu, the last chosen object will be automatically highlighted.
4. Now try Locking an object in the screen's center by repeating Steps 1 and 2, then selecting the object by pressing L (or right-clicking). The object is now Locked in the center. If you don't Lock your object, Time and Date changes cause the object to move around on the screen. SkyGlobe may need to adjust the View Direction and Elevation to allow the object to remain centered.
5. Try changing Date or Time and observe how the Locked object remains centered. SkyGlobe's animation works great in conjunction with Locking mode.
6. At any time, press Esc to unLock the object.

Finding an Object Using the Mouse. Rather than using the Find menu, you can directly identify many stars by placing the mouse cursor over them. If they are among the brightest 3,216 (through magnitude 5.6), their name appears in the lower left-hand corner along with their magnitude display. You can also use the mouse to re-center the display, to Lock on an object or a sky position, and to display images for objects. Click to instantly change the direction and elevation so the position under the mouse cursor will become the new center of the display. Right click to lock the position or object under the cursor. The chosen object remains at the screen's center if possible for your Location, regardless of time changes, until you press Esc. Double-click to display an image of a planet or DSO, if one is available for that object. See the next section for more about images.

Displaying Images

If a .PCX or .GIF file is present for your chosen object, you can display the image by double-clicking on the object, or by pressing I while in the Find menu. The file can be in the directory you used for SkyGlobe (usually KLASSEM), or you can use a SET command in your AUTOEXEC.BAT to direct the program to search for image files in another directory.

Here is the set path command I use:

SET SGIMAGE=C:\ASTROGIF\SKYGLOBE

The portion up to and including the = must not be changed, but the rest depends on your own hard drive and directory structure.

SkyGlobe can display properly named 16 or 256-color .PCX or .GIF files on VGA or better displays up to 1024x768. The most common image format and video mode will be 640x480x256, and normal left-clicking will use that mode if the program detects that your card will support it. If a smaller mode will do, the program will use that mode instead.

If a higher-resolution mode would be better, you can use right-clicking instead to let the program use the mode it thinks is most appropriate for the image and your system. While SkyGlobe checks your card to see what resolutions are supported, it can't tell what kind of monitor is hooked up. The combination most likely to cause trouble is a 1024x768 image, a video card that will handle that resolution, hooked to a monitor that can't.

It is possible to have up to twenty-two different image files displayed for any given object. These images can be from any source, as long as they are properly named, or you can purchase a few selections from us. Use the name alone, or add a prefix numeral from 0-9, as shown below:

Object	Sample File Name
Planet	SATURN.PCX
Messier object	M31.GIF
NGC	N1365.GIF or N40.PCX
Prefixed planet	0JUPITER.GIF or 9MARS.PCX
Prefixed NGC	3N7000.GIF

There have been sporadic reports of problems displaying images under Windows Enhanced mode on some systems. I'm still tracking this one down, but hopefully by the time you read this it will have been fixed! (First I have to be able to make the problem happen on my machine enough to figure it out.) If you have trouble yourself, you may want to run SkyGlobe exclusively from DOS or in Standard mode. I'm also working on a real Windows version, that of course will have no Windows compatibility problems!

Demonstrating Precession

A pattern that is difficult to explain with words but which lends itself perfectly to SkyGlobe's animation features is the 25,800-year wobble of the Earth's axis called precession. We think of the North Star as constant and unchanging--Shakespeare wrote that this is so!--but it is in fact a lucky accident that Polaris, a second-magnitude star, is currently so very close to the celestial north pole.

(SkyGlobe trivia: Polaris used to be the defining star of the magnitude scale until it was discovered to be slightly variable. It was set exactly equal to magnitude 2.0 and all other brightnesses were compared to it using a logarithmic scale.)

Our North Star will gradually come even closer than its current 3/4-degree to the actual pole until about 2100, when it will start to draw away. Future stargazers will use stars such as Errai, Alderamin, Deneb, Delta Cygni, Vega, Thuban, and Kochab as their North Stars, as well as some lesser-known lights. The pattern will begin to reappear in about 27900 AD, when Polaris will again be very close to the pole. The same sequence extends into the past.

Enough talk about precession; follow these steps to see it!

1. Find a view where the celestial north pole is easy to see. You can do this in one of several ways:
Press N to instantly choose a View Direction of North and use the Zoom feature and up or down arrows to select a view that displays the coming together of the RA-Dec lines at the pole.
Press F and use the Find menu to locate Polaris. You may find it helpful to change your latitude with Alt-N or Alt-S to an even number so the pole falls on top of a hash-mark.
Change your Location to the North Pole and look toward the Zenith.
2. Press the SPACE bar to start Turbo mode and select U to continually increment the Date by one milleniUm.
Polaris and the RA-Dec coordinates for the current epoch start to spin off to the side and the North Stars come in from the other side.

Note: In Step 2, you can press J to Jump by a century instead of a milleniUm. The algorithm that precesses the view gets a little slow for faraway Dates, especially without a math coprocessor, so you want large Time changes. Combining J or U with the Shift key (Shift-J or Shift-U) allows you to view reverse precession.

Starting precession with the mouse on top of the old pole helps to show the changes happening. The RA-Dec coordinates stay fairly near to 90 degrees Declination (with some error) while Polaris gets farther away. If you move the mouse cursor on top of Polaris again--you should turn off Turbo for this--notice from the displayed RA-Dec coordinates that Polaris is no longer near the new celestial pole. SkyGlobe is limited to about one precession cycle in each direction--forward or backward--because it gets pretty slow going toward the endpoints. The planets still display throughout this range, but we wouldn't plan a trip to them based on these coordinates. Their coordinates are approximately correct for as far back and forward as we have data. We've followed the astronomical convention of using the Julian calendar backward indefinitely, although our month names weren't in use tens of thousands of years ago.

Precession is toggled with the [key, which is conveniently placed next to the P key it would have made sense to use if it weren't needed for printing. Since precession doesn't cause any noticeable problems or differences for years anywhere near the present, and since the program default is for it to be turned on, there should be no need for you to turn it off except to see the difference. If you have any trouble with the preceding examples, though, you might want to make sure you didn't accidentally turn it off by using Shift-F2 to turn on all the parameter displays.

Displaying Custom Objects

If an exciting new comet or supernova should appear in our skies, you can add its position to the SkyGlobe display and determine when and where it will appear each night. The file SKYGLOBE.EXT can contain up to 10 custom objects, in which each line has RA (in decimal hours) followed by a space followed by Dec (in decimal degrees including sign if necessary) followed by the name, which should have no spaces.

Printing SkyGlobe Screens

To print a copy of any SkyGlobe screen, simply press P. You will then be asked to select a type of printout, and following that selection, directed to choose either LPT1 or LPT2.

Regardless of your video type, an image is created in VGA resolution for dot-matrix printers or SVGA resolution for HP-compatible laser printers. For dot matrix printers, line feeds are normally inserted, but you can change this with Alt-P.

Change Your Default Environment

SkyGlobe can customize many program settings and save them as either the new program default or special views.

Saving and Loading Settings. Use SkyGlobe's number keys to save current settings. Up to 10 different settings can be saved, one of which will be used as the new program default. These number keys create the file SKYGLOBE.CF#, where # is a digit 0 through 9. When SkyGlobe starts, it looks for the .CF0 file for its initial settings. If you would rather use the standard default settings, DELETE or RENAME this file or start SkyGlobe by typing SKYGLOBE N. If you want to start SkyGlobe using one of the other settings files, just type SKYGLOBE #, such as SKYGLOBE 4 to use SKYGLOBE.CF4.

This scheme allows you to use batch files, such as ECLIPSE.BAT = SKYGLOBE 1, where SKYGLOBE.CF1 has been previously set up by you for July 11, 1991. These parameters can be mixed with video choices (see below), as long as you separate the parameters with spaces.

To retrieve a configuration file while the program is running, hold down the Shift key while pressing the appropriate number key. Shift-0 will load your own personal default settings, if you have any, or you can press I for Initialize and accomplish the same thing. If you earlier pressed the 1 key to save an eclipse configuration, pressing Shift-1 (which is the same as !) will bring it back. Shift-I will bring in the normal Initialization setting the program will use if you don't have a .CF0 file, or if you start up with SkyGlobe N. You may find this easier than DELETing or RENAMing that file, or for occasional use. SkyGlobe saves the exit state of the program every time you quit. To retrieve this configuration file, start SkyGlobe with SKYGLOBE I, or press Alt-I at any time during the next run.

SkyGlobe automatically detects your video adapter, and runs in VGA if possible. If for some reason you would like to try lesser modes, start the program with SKYGLOBE H for

Hercules, SKYGLOBE C for CGA, SKYGLOBE E for EGA, or SKYGLOBE M if you want to force monochrome output. Mono mode is normally only used if there is a severe lack of available memory, since laptops these days do a good job of gray-scaling color video modes. If you have an SVGA video adapter and would prefer an 800x600x16 sky view, simply use the starting command SKYGLOBE S. If there is enough memory, and your card is among the many now supported by the program, you should then enjoy finer details and less obtrusive text. If for any reason the display fails to properly appear, probably pressing Esc will safely return you to DOS, where the normal SKYGLOBE command will give the 640x480 VGA view.

Enter Exact Values

You can enter exact values for many parameters by pressing the Enter key and then filling in values on the text menu. You can skip entries if you don't want to change them at this time, although there are some interactions. You have to enter both RA and Dec if you enter one, and you can't change both Elev-Dir and RA-Dec, since the SkyGlobe can't center on two places at once.

SkyGlobe Q&A

How can I speed up SkyGlobe?

This question has several answers. The first method involves asking SkyGlobe to do less work. Try turning off everything you can do without, especially the Milky Way, dim stars, the RA-Dec lines, the planets, and Messiers and DSOs. In addition, determining the location of the mouse cursor can be a slow operation, so you may want to turn it off by using Insert or F11.

Of course, if you find the program too fast as some people do, simply reverse the process and treat yourself to more stars and other features.

Another method applies to Auto-Increment mode. SkyGlobe starts out changing the view 5 minutes at a time. You can increase this rate by pressing >. Another way is to change the increment type to Date mode by pressing Alt-A, then increase the Date increment rate by pressing >.

Finally, you can use several helpful keyboard shortcuts to quickly create the view you desire. Turbo mode, which is started by pressing the SPACE bar, takes your next keystroke and continually repeats it, as if you were pressing it yourself. Use this to zoom in with Z or Alt-Z, then sit back and watch it happen, instead of deciding how many Zs to press. When you are satisfied, just press the SPACE bar again. Try this with Alt-arrow keys, or Ctrl-arrows, because all keyboards aren't the same. It's also convenient for Turbo-H or Turbo-M if you really want to get to a Time or Date in a hurry.

The Home and End keys can save a lot of time as well. They generally go immediately to the minimum value of a command or feature for Home, and to the next major increment for End. With Time or Date commands, this is the quickest way to go to midnight or noon, or the 1st or 15th of the month, or January or July. End+ a few times is the quickest way to turn on all the stars. Home-Z is the quickest way to return to the minimum Zoom and you can follow it with SPACE-Z to get to some moderate value. For changing direction quickly, you can't beat the N, S, E, and W direction commands. PgUp and PgDn can change the View Elevation faster than single arrow commands. Use the mouse button to quickly recenter the display at the position of the mouse cursor. And you can use Find to center the display at a particular object, instead of figuring out how to get there with the right combination of arrow keys.

Is there a version of SkyGlobe for the Macintosh?

Because so much of SkyGlobe depends on assembly language programming, porting the program to the Macintosh would be a major undertaking. There are no immediate plans for a Macintosh version. There are still too many improvements to be made in the DOS world!

Why does the display sometimes jump?

Jumps are usually due to Daylight Savings Time becoming active or inactive. SkyGlobe currently uses U.S. average dates for Daylight Savings Time (summer time) in Northern Hemisphere Locations, and common Australian dates for the Southern Hemisphere. Policies vary from year to year and place to place. Although it was Ben Franklin who first proposed Daylight Savings Time, it wasn't widely used in

the U.S. until WWI in 1918. Therefore, even for Locations that customarily use Daylight Savings Time today, it is usually deactivated before that date.

At any time, you can force Daylight Savings Time with Shift-V. If it's active when you don't want it, press V to deactivate it.

The display also jumps during the changeover from the Julian to the Gregorian calendar. This took place at many different times in different countries, but SkyGlobe assumes that October 4, 1582, was followed by October 15, 1582.

Why can't I see more than 3216 (magnitude 5.6) stars?

SKYGLOBE.EXE is the only file that is absolutely necessary in order to run SkyGlobe. If you wish to see more than 3216 stars, you will need the file SKYGLOBE.DAT in the same directory as SKYGLOBE.EXE. This increases the dataset total to over 29,000 stars (magnitude 7.6)

If you have decide to purchase the extended star database, the two files SKYGLOBE.DT1 and SKYGLOBE.DT2 increase the number of stars to over 250,000. You will still need the SKYGLOBE.DAT file.

Why does the time change sometimes when I Find an object?

If the desired object is not currently above the Horizon, but will be sometime during the next 24 hours, Time automatically increments until the object clears the Horizon. Perhaps you're more interested in the Date that an object appears over the Horizon for a given time. You can use Sidereal Time mode to your advantage here, but there's currently no way to select for Date instead of Time or to defeat the Auto-Increment feature.

Why won't SkyGlobe run in color on my system?

This question has two answers. Many people with color CGA systems expect SkyGlobe to run in color on their systems. Unfortunately, CGA color mode resolution is only 320x200, which is insufficient to produce the high-quality display SkyGlobe requires.

Those with EGA or better displays may be equally dismayed if SkyGlobe displays in monochrome mode. This is due to a lack of available memory. A message to that effect will appear when SkyGlobe starts. (You can force monochrome mode by starting with SKYGLOBE M, but why?)

Why can't I use my Alt-arrow keys? Or F11 and F12?

A better question would be, why are there so many slightly quirky computers out there? Try starting the program with SKYGLOBE K (for keyboard), which will make fuller use of some enhanced keyboards.

Why can't I display images properly? Or use 800x600?

A better question would be, why are there so many slightly quirky computers out there? (Is there an echo in here?) SkyGlobe uses a professional graphics library to work with your video adapter for SVGA purposes, and it tries the VESA standard modes first if it detects a VESA driver. If it finds no such driver, SkyGlobe then tries to deal with the chipset directly, if it determines your system to be one of the 20 or so the library can currently handle. On the off-chance VESA standard won't work but direct chipset will, try SKYGLOBE F to Force the chipset direct method. To use VESA where the support for your system is not in the BIOS, load the TSR utility such as VESA.COM that should have come with your system or video card. See the appropriate manual for details, or contact us to see if we have recently added support for your system.

Explaining the Cycles

Why Different Stars Appear at Different Times

The Earth makes one complete rotation every day. If there were no Sun we could see that the stars appear to make one complete revolution at the same time. The North Star, Polaris, is almost directly above the North Pole on the Earth's axis of rotation. So the stars near the North Star (about halfway up the northern sky in mid-northern latitudes) make tiny little circles every day. Farther from the North Star, the stars and the constellations they form wheel across the sky in huge arcs before they disappear below the Horizon.

Why Different Stars Appear at Different Dates

Imagine midnight in April. The Sun is behind the Earth, and you're facing away from it if you face due south. Now imagine midnight in October, 6 months later. You're still

facing away from the Sun. But because the Earth has moved halfway around the Sun in its yearly orbit, you're looking in exactly the opposite direction you were in April. Different stars are visible at midnight, and the ones near the North Star have made half a revolution. If there were no Sun, you could see that at noon the October sky is the same as the midnight sky in April.

Before Standard Time Zones, the Sun was due south at noon everywhere. That was what noon meant. Now that is true only if you happen to live near the time zone's center. If you live in Michigan, the Sun is due south around 12:30. In New York City, which is near the centerline for the same time zone, the Sun reaches due south a few minutes before noon, over a half hour earlier than in Michigan. The Sun reaches due south somewhat later in Chicago than in Michigan, but because Chicago is in the Central time zone, this occurs before 12:00 PM. This has to be allowed for to make the display correct, and is unique to each Location. Daylight Savings Time is handled similarly. The letter D appears next to the Time in the Parameter display if Daylight Savings Time is in effect.

The sky can be viewed as a sphere with the Earth at the center and stars as fixed points on the sphere. Representing this 3D space on a 2D surface introduces some distortion. SkyGlobe uses a unique projection that calculates rapidly and accurately renders shapes as they appear in the sky, even near the display's edge.

Sources

A program as involved as SkyGlobe draws on many sources. The ultimate source in most cases is the academic community or NASA, but some of the best collections and representations of the data available are from the commercial realm.

The SAO star database was derived from the NASA CD-ROM "Selected Astronomical Catalogs, Vol 1. This great disc is packed with all sorts of useful information, and I hope to find interesting ways to represent even more of it graphically and accessibly in future SkyGlobes and other programs.

The Milky Way representation has its origin in the work of Antonie Pannekoek, and was re-adjusted by hand for this version to give a smooth and pleasing effect with the minimum possible number of lines. Obviously even the darkest of skies do not contain a big blue "tire track" running across it, but it is true that urban dwellers don't know what they are missing if they haven't ever experienced really good seeing.

The constellation boundary lines were derived from the NASA CD. To save space only the corners were used; this will be improved in future versions as system resources continue to grow.

The star names were based on the SAO database from the CD, Sky Catalogue 2000.0, and Star Names: Their Lore and Meaning for the most part. The latter is a fascinating work originally published in the 19th century.

Some good texts on computation are Spherical Astronomy by Green, Astronomical Algorithms by Meeus, and Practical Ephemeris Calculations by Montenbruck. I also highly recommend A Field Guide to the Stars and Planets by Menzel and Paschahoff, and Wil Tirion's Uranometria 2000.0 and Sky Atlas 2000.0.

Future Plans

SkyGlobe has been continually evolving since it was originally released in November 1989, and my future plans for the program and its sibling program CircumSpace are pretty ambitious. The next incremental version of SkyGlobe itself will have printer-resolution printing, hopefully including PostScript, even more stars available than the current 250,000+, many more DSOs with more information, more star names including the option of true Greek letters, and everything on the suggestion list that didn't make it this time.

In addition, I am planning on a Windows version and an SVGA 256-color 386-specific edition of SkyGlobe. CircumSpace has even more potential for expansion since it is a newer product, and I even hope to expand to CD sometime soon, first simply for distribution but eventually making use of its full potential.

As always, I will do my best to support the people who support the program with their registrations by giving steep discounts on updates, package offers, and extra datasets. I encourage you to pass around the shareware version to anyone who may be interested, and to take however long you like to see if you

find the program worth registering. Just be aware that you may be missing out on something even better if you wait too long!

Our Support Policy

KlassM Software is committed to offering the biggest bang for the byte in astronomy software. We're proud of SkyGlobe and want to make sure it works for you. We're also interested in hearing your ideas for improvement.

If you have problems or suggestions regarding SkyGlobe, you can contact us in one of several ways:

Mail: KlassM Software, Inc.

PO Box 1067

Ann Arbor, MI 48106

Fax: (313) 426-5533

800-Order Line: (800) 968-4994

CIS-Mark A Haney: 76207,3377

CIS-KlassM Software: 75020,1431

Wolverine BBS (v.32bis) (517) 695-9952 or 695-9964

Ombudsman Statement

As a member of the Association of Shareware Professionals, I am required to include the following statement, but of course I would prefer to communicate with you directly through one of the methods printed above if there is ever any problem with SkyGlobe.

"This program is produced by a member of ASP. ASP wants to make sure that the shareware principle works for you. If you are unable to resolve a shareware-related problem with an ASP member by contacting the member directly, ASP may be able to help. The ASP Ombudsman can help you resolve a dispute or problem with an ASP member, but does not provide technical support for members' products. Please write to the ASP Ombudsman at 545 Grover Road, Muskegon, MI 49442 or send a CompuServe message via CompuServe Mail to ASP Ombudsman 70007,3536".

Discerning Our Universe

A grounding philosophy of KlassM Software is "Discerning Our Universe." The way I see it, many of you have ideas about how you would develop programs yourself to portray or simulate the world around us, if only you had the time. There's bound to be something you've always wanted to see on your computer screens, or there's bound to be a way you've always wanted to explain something to the youngsters of any age who are important in your lives.

By listening to your ideas, by offering discounted registration packages to educational institutions, and by continuing to market our software as shareware with low registration fees, we try to do our part in "Discerning Our Universe" together. We appreciate your support as you do your part by writing in with registrations and suggestions, and you have our heartfelt thanks. When I first came up with the phrase "Discerning Our Universe", I wanted to see if anyone had used similar wording in the past. Naturally the first place I turned was to the computer, specifically to perform a CD search on a reference disc that came with my drive. The little selection below was one of my favorites from the result of those searches, and I hope you enjoy it too.

A little world, in which we may discern a body mingled of earthly elements, and a heavenly spirit and the vegetable soul of plants ... the senses of the lower animals, and reason ... and the likeness of God.

Pico Della Mirandola

15th Century Italian philosopher

Glossary

altitude In SkyGlobe, the sky height of the cursor represents altitude.

aspect ratio The ratio of the width of an image to its height. The aspect ratio can be adjusted, mainly for laptops and SVGAs, using =.

Association of Shareware Professionals (ASP) An association formed a few years ago to help improve the image of shareware, and to offer support services to authors, vendors, and BBSes.

Auto-Increment mode The SkyGlobe feature that simulates the passage of Time. Once activated by pressing A, it automatically and continuously increments Time or Date, either forward or backward, until it's turned off. The active parameters for auto-incrementing Time or Date are shown in the screen's upper left corner, possibly by

pressing Shift-F2.

Azimuth The arc of the Horizon measured clockwise from the south point to the point where a vertical circle through a given heavenly body intersects the Horizon. In SkyGlobe, the direction of the cursor represents azimuth.

celestial navigation Navigation by observing apparent positions of heavenly bodies. Ctrl-N restricts the SkyGlobe display to only those stars and planets used for celestial navigation.

celestial pole Each of two points (north and south) in which the extended Earth's axis cuts the celestial sphere (the imaginary spherical shell formed by the sky) and about which the stars seem to revolve.

constellation boundaries Border lines, similar to state or county borders, that group constellations. Constellation boundaries were standardized by the International Astronomical Union so every star or object could be said to belong to a particular constellation.

Deep Sky Object (DSO) As distinguished from stars, these are usually dimmer, but more interesting for telescopic viewing, and they include a list 110 objects compiled by Charles Messier, a French astronomer, to distinguish them from comets. Those not making his list are often referred to by their number in the New General Catalog.

Ecliptic The annual path of the Sun. In SkyGlobe, this path is represented with an dark red dotted line.

eclipse When the Moon's light is obscured by the Earth intervening between it and the Sun (lunar eclipse) or when the Sun's light is obscured by the Moon intervening between it and the Earth (solar eclipse).

Equator The great circle of the earth, equidistant from the North Pole and South Pole.

fish eye lens A hemispherical convex lens for viewing in a full 180 degrees in all directions, creating a circular image with increasing distortion from the center to the periphery. The SkyGlobe sphere appears as though it were being viewed through a fish eye lens, with objects at the edges showing more distortion than objects at the center.

Hash-Marks These are intermediate markings between the zenith cross and the horizon, and represent 15-degree intervals.

Horizon The line or circle that forms the apparent boundary between Earth and sky. In SkyGlobe, the Horizon is shown as a green line. It represents an Elevation of 0 degrees.

International Astronomical Union (IAU) This international body gets together to decide various standards, including constellation boundary lines and astronomical constants.

limiting magnitude The magnitude of the dimmest star displayed. The number of visible stars displayed is shown in the screen's upper left corner, followed by the limiting magnitude this number represents. See also magnitude.

latitude The angular distance north or south from the Equator of a point on the Earth's surface. See also Right Ascension and Declination (RA-Dec).

longitude The angular distance east or west on the Earth's surface, measured by the angle contained between the meridian of a particular place and some prime meridian, such as that of Greenwich, England. See also Right Ascension and Declination (RA-Dec).

magnification The ability to increase the size of an image and thereby view greater detail. In SkyGlobe, magnification possibilities range from 1.0 (the smallest image, a view of a full 180 degrees) to 26.0 (the largest image and therefore the greatest detail, generally about 7 degrees top to bottom). Z (for zoom) controls magnification. See also Zoom factor.

magnitude The brightness of a star or other celestial body as viewed by the unaided eye and expressed by a mathematical ratio of 2.512. For example, a star of the first magnitude is about 2-1/2 times brighter than a star of the second magnitude and 100 times brighter than a star of the fifth magnitude. Only stars of the sixth magnitude or brighter can be seen by the unaided eye. In SkyGlobe, the magnitude of selected objects is shown in the screen's lower left corner. See also limiting magnitude.

Messier objects See Deep Sky Object (DSO).

New General Catalog (NGC) A more complete catalog of DSOs than Charles Messier's, originally compiled by John L. E. Dreyer.

North Star See Polaris.

orthographic A projection method for displaying a curved surface on a flat surface. SkyGlobe uses a modified orthographic projection of my own devising to attempt a rapid and realistic portrayal of large areas of the sky.

Polaris A guiding star in celestial navigation because of its relative constancy (due to its close proximity to the North Pole). Polaris is also called the North Star and the Pole Star.

precession The wobbling motion of the Earth's axis of rotation, so slight that it's evident only after long spans of time (25,800 years).

retrograde motion Apparent movement on the celestial sphere in the direction opposite to the natural order of background stars, or from east to west.

Right Ascension and Declination (RA-Dec) The astronomical terms for terrestrial longitude and latitude in space. Right Ascension corresponds to longitude while declination corresponds to latitude. In SkyGlobe, the cursor's RA-Dec coordinates display in the screen's lower left corner. RA-Dec grid lines are shown on the sphere by pressing F7. See also latitude and longitude.

Shareware A distribution method for software whereby people are encouraged to make copies for evaluation purposes, only paying if they plan to continue enjoying its use. Without this distribution channel there would almost certainly be no SkyGlobe as we know it today.

Sidereal day A day measured by or from the stars and which is equal to 23 hours and 56 minutes. To have SkyGlobe Auto-Increment the Date by one Sidereal day, press Shift-R. See also Auto-Increment mode.

View Direction The orientation of the SkyGlobe display, represented by degrees: 0 for due north, through 180 degrees for due south, to 350 degrees for 10 degrees west of north. The view SkyGlobe provides assumes you're standing outside looking in the same direction your feet are pointing. The View Direction is shown in the screen's upper left corner.

View Elevation The orientation of the SkyGlobe display, represented in degrees ranging from 0 degrees (viewing the Horizon) to 90 degrees (viewing the Zenith). The View Elevation is shown in the screen's upper left corner.

Zenith The point on the celestial sphere that is directly overhead from the observer's position. In SkyGlobe, the Zenith is shown as a cross mark (+) on the screen. It represents an Elevation of 90 degrees.

Zoom factor The measurement for magnification, which in SkyGlobe ranges from 1.0 to 26.0. See also magnification.

SkyGlobe 3.6 Registration Form: October 15, 1993

Registration (\$20) entitles you to:

- 1) A customized copy of SkyGlobe 3.6 with your name and Home Town(s).
- 2) A printed manual and handy reference card.
- 3) A SkyGlobe-like Windows screensaver.
- 4) A neat VGA demo program called Crystal Sphere.
- 5) Direct access to special offers and low-cost program updates.
(For instance, our \$15 CircumSpace, which simulates traveling in and amongst our nearest 7700 neighbor stars at warp speeds, is available in combination with SkyGlobe for only \$25 total.)

There are several ways you can register:

- #1. Fax this form with a credit card number to 313-426-5533.
- #2. Mail this form with a check, currency or a credit card number to:
KlassM Software, Inc., PO BOX 1067, Ann Arbor MI 48106, USA
- #3. E-Mail this form to KlassM Software via CompuServe, 75020,1431.
- #4. Call our 800 Number, 1-800-968-4994. Credit card orders only please.

Shipping Address: Name:.....

Street:.....

City, ST, ZIP:.....

Country:.....

Home Towns (up to 3) :.....

[] I can read 3.5 1.44M disks. Optional extra datasets

[] I require 3.5 720K disks.

[] I prefer 5.25 1.2M disks. These optional datasets work

[] I require 5.25 360K disks. with SkyGlobe to make it even

better! All sets are 1.44MB;

.GIFs require SVGA capability.

SkyGlobe 3.6 alone \$20.00 SAO star catalog \$5.00....

SkyGlobe and CircumSpace \$25.00 Assorted .GIFs \$5.00....

Optional datasets total Inner Planet .GIFs \$5.00....

Overseas shipping add \$5.00 Outer Planet .GIFs \$5.00....

Total DSO .GIFs \$5.00....

VISA/MasterCard Information

Card # _____ Date of Authorization

Signature _____ Amount \$ _____ Expiration

International customers: Payment can be in the form of a VISA/MasterCard authorization, a US\$ dollar check from a US bank, or US or other major currency. See OVERSEAS.TXT for our international agents.