PleiadAtlas: The Pocket Star Atlas for the Serious Observer

Version 2.2.1

Contents

Chapter 1

Introduction

Welcome, and thanks for trying out PleiadAtlas. It's my sincere hope that you find it useful for aiding your observation, and I gratefully accept any comments, suggestions, and questions you might have about it. Some questions you have will probably be answered in here, so it may help you to read it first.

But if you're truly perplexed, please feel free to ask any questions! My contact information can be found in Appendix E.

1.1 About PleiadAtlas

PleiadAtlas is a star atlas for personal digital assistants (PDAs) running the PalmOS operating systems. It does not work on PDAs running various versions of Windows CE (WinCE 2.1, or WinCE 3.0, otherwise known as PocketPC). Section 1.2 describes the other system requirements that PleiadAtlas needs in order to run smoothly.

In writing PleiadAtlas, I placed my emphasis on aiding starhopping and object identification. The forte of PleiadAtlas is its deep star catalogue, which runs to magnitude 11.5 and which I hope will help you make sure your telescope—or any other instrument you might use—is pointed in the right direction. After all, no matter how experienced you might be, you can't see something if it's not in the field of view!

Moreover, the symbols used in PleiadAtlas are, as much as possible, the same as those used in ordinary paper atlases. That is, galaxies are represented as ovals, with the proper size and orientation; nebulae are represented as boxes; open clusters as dotted circles; and so on. Although this manual gives a short table giving examples of each of the figures, you shouldn't need to refer to it very often.

One case where the PleiadAtlas display explicitly does not try to match paper atlases is the plotting of stars. Most paper atlases plot stars as filled circles—that is, discs—with the size of the disc commensurate with the brightness of the star. But many PalmOS PDAs have a display that is only 160 pixels square. To maximize the use of that limited space, and at the same time take advantage of what a PDA can do that paper atlases do not, stars are plotted in greyscale.

Thus, for example, at maximum depth, stars dimmer than magnitude 8.0 are all plotted as single pixels, but of gradually fading intensity. In contrast, most paper atlases plot stars with a fixed intensity and vary only their size, and for good reason: they have the high resolution required to do so, and printing in greyscale would increase printing costs significantly. Part of the reason I wrote PleiadAtlas is that I found too many astronomy programs for PalmOS still adhering to the paper model of constant intensity dots for stars, and not tailoring the display to the characteristics of the PDA.

The controls in PleiadAtlas are also designed for use in the field. I have tried, as much as possible, to avoid the use of Graffiti for common functions, such as finding stars and DSOs, or navigation. The reason for this is simple: the Graffiti portion of many PDAs is not illuminated, and it can be hard to do Graffiti in the dark. By putting as much user input into the main, illuminated part of the screen, I hope to eliminate a common source of error and confusion.

On the other side, PleiadAtlas does not support computerized telescopes—at least, not any more than it supports non-computerized ones! It does not show you a time-lapse animation of the retrograde motion of Mars, or illustrate the track of a solar eclipse. Although it's possible that I'll add support for these features later on, the focus of PleiadAtlas will remain the presentation of deep sky maps.

1.1.1 What's in a Name?

PleiadAtlas is certainly a mouthful.[1] It used to be called PalmAtlas, a shorter and easier to pronounce name.

However, in 2001, I was contacted by PalmGear, which apparently is run by Palm, Inc., and asked in no uncertain terms to change the name of PalmAtlas. It seems they were opposed to any application name containing the word Palm as it applied to their PDAs. I think they certainly had the right to defend uses of their trademark, although I don't quite see the utility of it. In any event, rather than take on a legal battle, I simply changed the name. But what to? I still wanted the name to begin with a P, and to contain the word Atlas, since PalmAtlas was more of a computerized star atlas than a planetarium program. Nothing came to mind.

And then, in one of those lucky breaks, I happened to glance over at the icon that I designed for PalmAtlas—a low-resolution image of the Pleiades, a brilliant open cluster in the constellation of Taurus the Bull. What's more, the image at the head of the PalmAtlas web page was the high-power view of the Pleiades displayed by PalmAtlas.

Well, Pleiades starts with a P, doesn't it? But here's the clincher: The brightest star in the Pleiades is Alcyone, at the center of the cluster. But what do you suppose is the *second* brightest star?

Why, Atlas, of course—the father of the Pleiads. That's the proper name of 27 Tauri.

I don't know about you, but I never let a coincidence like that get away scot free. Mouthful or not, that's the name, and I'm sticking with it.

[1] Incidentally, I pronounce it PLEE-ud-AT-las, although I understand that it makes better historical sense to say PLY-ud-AT-las. I'm not particular about the way that others pronounce the name of my software, though.

1.2 System Requirements

PleiadAtlas requires a PalmOS-compatible device running PalmOS 3.3 or later. It has been tested successfully on some earlier versions of PalmOS, but not consistently enough to certify usability. (If you have such a device, you might consider either upgrading your operating system—contact your manufacturer for instructions—or trying out PleiadAtlas v1.2.1.)

PleiadAtlas requires 5.3 megabytes to run with all databases. It can be run without either of the field star databases in 1.4 megabytes. In that case, stars are plotted only to magnitude 7.5; the program will otherwise work just as described in this manual.

PleiadAtlas v2.2.1 can be run from SD/MMC cards. Please be aware that PalmOS copies the entire application—databases and all—from the card into main RAM before starting the program, so you still need to have 5.3 megabytes free to run the full program. The advantage is that if you run other programs from the card as well, PleiadAtlas no longer needs to stay resident in RAM while the other programs are running. Because PleiadAtlas is so large, it may take a long time (about 35 seconds on my m500) to load the entire program from the card.[2]

1.3 Acknowledgements

I would like to acknowledge and thank the following people for testing and evaluating this or earlier versions of PleiadAtlas: Alfred Anheier, Ben Kolstad, Leonard Tramiel.

Your assistance has been greatly appreciated! (If I've forgotten you, let me know, and I'll put your name in the manual for the next release.)

[2]I did give some thought to having the program itself stay in main memory, while loading the databases from the card on demand. Unfortunately, PleiadAtlas routinely must use the entirety of each database as it's plotting maps, so there's little if any to be gained from not loading all of the databases right at the outset.

Chapter 2

Getting Started

2.1 Installation

The zip file for PleiadAtlas contains the following files:

1. ReadMe.txt, containing these installation instructions.
2. manual.pdf, containing this manual.
3. PleiadAtlas.prc, the PleiadAtlas program.
4. HIPDB.pdb, the main star database, drawing 26,880 stars down to magnitude 7.5 from the Hipparcos catalogue.
5. TYCDB.pdb, the field star database, drawing an additional 554,201 stars between magnitudes 7.5 and 10.5 from the Tycho catalogue.
6. EXTDB.pdb, the extended field star database, drawing another 876,583 stars between magnitudes 10.5 and 11.5 from the Tycho catalogue.
7. LINES.pdb, the constellation lines database.
8. MNGC.pdb, the deep sky database, containing the Messier catalogue and most of the NGC and IC, as well as a handful of other objects.
9. MathLib.prc, the math library for PalmOS. This library is covered by a separate license, and is provided here solely for your convenience. As of this writing (January 2004), the web site for MathLib is

   <http://www.radiks.net/~rhuebner/mathlib.html>

PleiadAtlas will run with any or all of the databases installed, although some combinations won't make sense. For example, the field star database does *not* contain within it the main star database, so the display will not match your field of view if you install TYCDB.pdb but not HIPDB.pdb. Nor would it make sense to install HIPDB.pdb and EXTDB.pdb, but not TYCDB.pdb.

PleiadAtlas, like most other astronomy programs, relies on lots of floating point calculations. It uses MathLib.prc, a mathematics library, which is covered by the GNU Public License. If you have not previously installed MathLib for another program, you will need to install it, too. PleiadAtlas requires a version of MathLib at least as recent as the one provided in the zip file (v1.1).

To install PleiadAtlas, use your Desktop application to queue PleiadAtlas.prc and MathLib.prc (if needed), along with the databases you want, for synchronization onto your PDA. In most cases, you should be able to do this by double-clicking on the PleiadAtlas icon. This will bring up a dialog box that will allow you to line up the databases for installation, too. If you plan on running PleiadAtlas from a memory card, all the files (with the exception of MathLib.prc) should be installed onto the card. This includes the registration file. (See Section 2.3.)

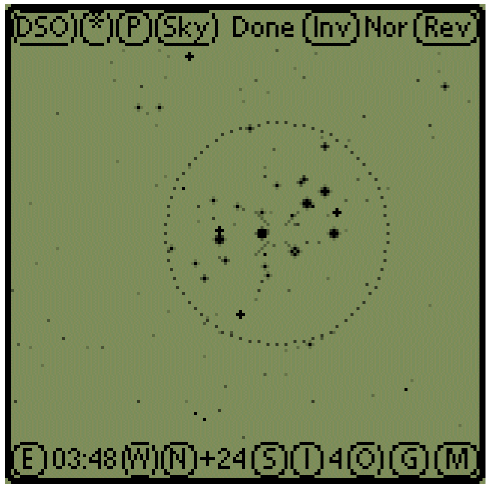
Important

If you have an earlier version of PleiadAtlas or PalmAtlas (the original name of PleiadAtlas), you should erase that program, including any associated databases, from your system. In most cases, PleiadAtlas v2.2.1 will run fine even if you don't remove the old version, but because the database names have changed, the new databases won't overwrite the old ones, and those old databases will take up additional space that the new program won't be using.

Erasing the program from your system will also cause any registration file you may have to be erased as well. (For more information about registration, see Section 2.3.) Before you erase the program, therefore, it makes sense for you to make sure you have a copy of that registration file. If you cannot find that file, please take down the name and serial number as it appears in PleiadAtlas or PalmAtlas, *before you uninstall it*, and send that information to me by e-mail, and I'll forward you a replacement copy. (To get the name and serial number, tap the Menu silk-screen button, then tap **Help**, then tap **About**.) If you never installed it, just send me your name, and I'll see what can be done.

2.2 First Light

There are a few things that you'll probably want to adjust before using PleiadAtlas in earnest, but to test things out, try tapping the following sequence of buttons. First, if you haven't registered PleiadAtlas (see below), tap **OK** to dismiss the registration reminder. Then, in any event, tap **DSO**, **M**, **4**, **5**, **Find**, **GOTO**, **I**, **I**, **M**. You should get a map of the Pleiades at medium high power:



Don't worry: I'll explain that cryptic sequence of controls in short order.

2.3 Registration

PleiadAtlas is "nagware." Each time you start the program, it will pop up a reminder to register. To register, send a check for US$10 to

> Brian Tung
> USC Information Sciences Institute
> 4676 Admiralty Way Suite 1001
> Marina del Rey CA 90292
> U.S.A.

Be sure to include your e-mail address along with your check. When I receive your payment, I'll send you an e-mail. This e-mail will have an attachment called PASerial.pdb. This is a serial number registration file, which you can install onto your PDA just like any other database file. This will eliminate the reminder screen. Also, when you access the About item in the menu, PleiadAtlas will indicate that you've registered. Once you register PleiadAtlas, you are registered for life—all updates are free.

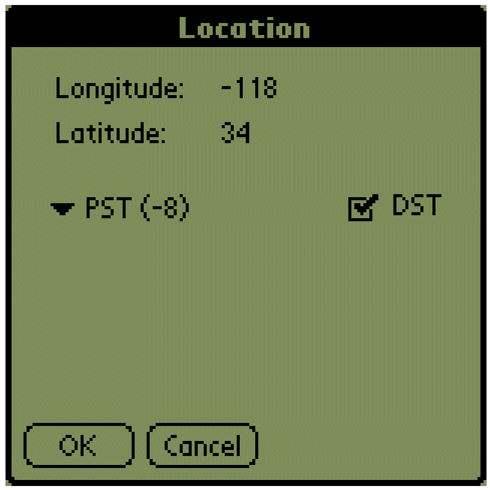
Note: As noted in the Introduction, PleiadAtlas v2.2.1 can be run from an SD/MMC card. However, if you've previously registered PleiadAtlas and plan to run the new version from the card, your registration file won't be incorporated correctly. Simply send me e-mail at <brian@isi.edu> with your name and serial number, and I'll send you a new registration file to replace the old one.

2.4 Configuration

For the most part, PleiadAtlas works the same no matter where you observe from. There are a few things, however, that do depend on your location and time zone, and others that depend on your own personal preferences.

2.4.1 Location

To edit your location, first tap the Menu silk-screen button at the lower-left corner of the Graffiti area. Tap **Location** to pull up the location dialog.



Using Graffiti or a keyboard, enter your longitude and latitude in the space provided. In the longitude field, positive numbers are east longitude, and negative numbers are west longitude. In the latitude field, positive numbers are north latitude, and negative numbers are south latitude. By default, PleiadAtlas uses my own location, which is at 118 degrees west longitude, 34 degrees north latitude. PleiadAtlas does not accept fractions of a degree, nor are fractions needed for the kind of accuracy given by PleiadAtlas.[1]

Then, select your time zone by tapping the preset time zone. This brings up a scrolling window from which you can select your own time zone. If you don't see your own time zone, tap the arrows to scroll through until you see it. For the most part, time zones in the eastern hemisphere have positive numbers; those in the western hemisphere have negative numbers. Be sure to choose the proper zone for your *standard* time. For example, in the Pacific time zone, choose PST (-8), even if it's currently in the summer and you are observing Daylight Savings Time.

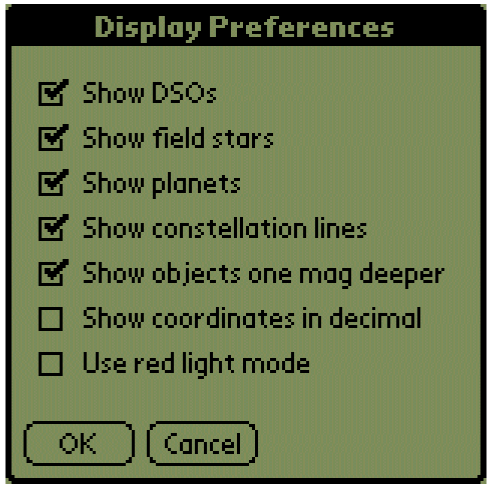
To indicate that the clock on your PDA is running on Daylight Savings Time, check the DST box. If it's running on standard time, uncheck it. By default, the DST box is checked, so if you're running PleiadAtlas for the first time, make sure you've set this checkbox appropriately.

When you're done configuring your location and time zone, tap **OK** to close the dialog and save your new settings. If you want to revert to the previous settings, tap Cancel.

[1] This doesn't mean that objects are plotted only to the nearest degree. The stars and other objects are fixed—more or less—on the celestial sphere and therefore have coordinates given as right ascension and declination, rather than altitude and azimuth. The latter set of coordinates tell you where an object is in the sky from a given place at a given time, and change as the place and time change. The right ascension and declination given for objects in PleiadAtlas are of reasonably good accuracy—to the nearest 1/1,000 of a degree, except for the field stars, which are given to the nearest 1/250 of a degree—and are perfectly sufficient for star-hopping.

2.4.2 Preferences

To set display preferences, tap the Menu silk-screen button, then tap **Preferences** to pull up the preferences dialog. This dialog consists of seven checkboxes:



- **Show DSOs.** When checked, PleiadAtlas shows DSOs, subject to the limiting magnitude constraints described in Section 3.1. When unchecked, no DSOs are plotted. (*Exception*: PleiadAtlas always plots the last DSO for which you pulled up an information box. This permits you to show a detailed star field for a single object, without plotting any nearby objects that might interfere with the stars.) *Default: checked.*

- **Show field stars.** When checked, PleiadAtlas plots stars from the field star database to magnitude 10.5 (if installed), subject to the limiting magnitude constraints listed in Section 3.1. When unchecked, only stars from the main star database to magnitude 7.5 are plotted. (In the Zoom screen, stars are shown to magnitude 11.5 regardless of the setting, if all databases are installed.) *Default: checked.*

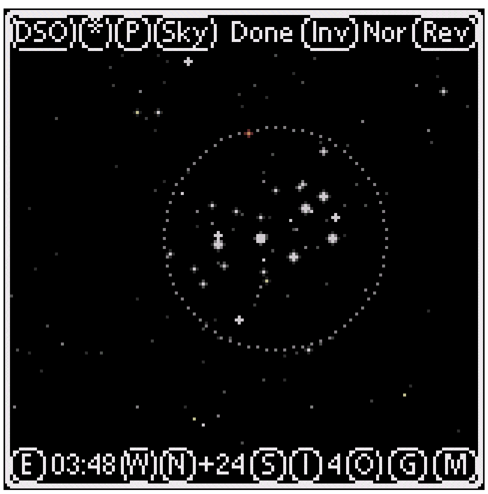
- **Show planets.** When checked, PleiadAtlas computes and plots the positions of the Sun, Moon, and the other eight major planets from Mercury to Pluto. Uncheck this box to save the computation time on the planets, if you don't need to plot them. (You can always request information on any planet by tapping the P button in the main display.) *Default: checked.*

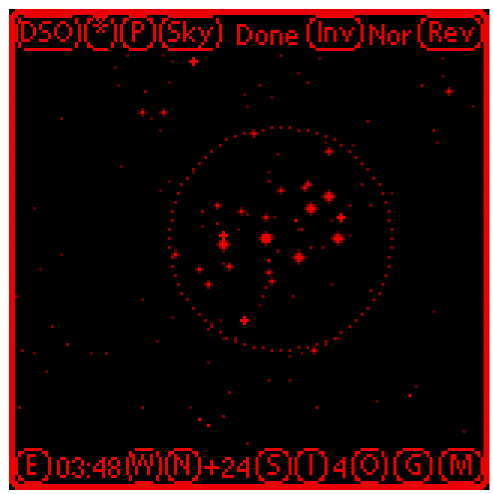
- **Show constellation lines.** When checked, PleiadAtlas plots constellation stick figures; some familiar figures are plotted in bolder lines than the less familiar ones. These figures are based on those given in Ridpath and Tirion's book, *Stars and Planets.* When unchecked, no lines are plotted, saving some time. *Default: checked.*

- **Show objects one mag deeper.** To avoid cluttering the map display with an exorbitant number of stars and other objects, PleiadAtlas imposes a limiting magnitude on the map, depending on the magnification of the map, and also on the setting of this checkbox. When this box is checked, PleiadAtlas generally plots both stars and DSOs one magnitude deeper (and more intense) than when it's unchecked. (*Exception*: Because there is no upper limit to the magnitude of DSOs in the catalogue, DSOs may be plotted two or more magnitudes deeper with this box checked. See Section 3.1 for further details on the actual limiting magnitude for any map.) *Default: checked.*

- **Show coordinates in decimal.** When checked, PleiadAtlas indicates its map coordinates, as well as the celestial coordinates of any selected star or object, in decimal degrees, given to a precision of thousandths of a degree. (DSO positions are given to a precision of hundredths of a degree.) When unchecked, coordinates are given in sexagesimal notation: right ascension in hours, minutes, and seconds; declination in degrees, minutes, and seconds. (DSO positions are given to to a precision of tenths of a minute of right ascension, and minutes of declination.) *Default: unchecked.*

- **Use red light mode.** By default, PleiadAtlas displays its maps on color devices in light on black, with star colors reflecting their spectral classes, when available. When this box is checked on color PDAs, PleiadAtlas will plot its maps in red on black, rather than the default light on black. This is designed to protect your night vision, although you may wish to further protect it by covering your PDA with a sheet of neutral density material. Most of the diagrams in this manual show the display on a monochrome screen, but here's an example of the effect of this checkbox on a color screen:





When you check or uncheck this box, you will have to first exit PleiadAtlas and then restart it, in order to refresh the screen. This checkbox has no effect on monochrome devices. *Default: unchecked.*

As with the location dialog, tap **OK** to close the dialog and save your new settings. To revert to the previous settings, tap **Cancel**.

2.4.3 GRS Longitude

PleiadAtlas keeps track of the visibility of the Great Red Spot (GRS), a long-lived storm in Jupiter's clouds. In particular, when you pull up the information box on Jupiter, PleiadAtlas will give you the times at which the GRS will transit the central meridian of Jupiter—an imaginary line drawn from Jupiter's north pole to its south pole–as seen from the Earth.

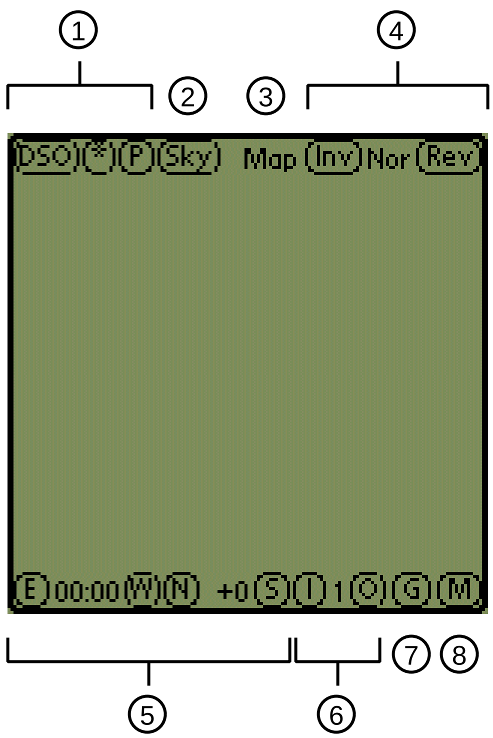
To do this, PleiadAtlas needs to know the so-called System II longitude of the GRS. Unlike storms on the Earth, the longitude of the GRS ordinarily remains essentially the same for months at a time, although it has been known to change by several degrees in less than a month. As of this writing (August 2004), the GRS is at System II longitude 94 degrees. By default, that is what PleiadAtlas uses for the longitude of the GRS. To change it to a more recent value, tap the Menu silk-screen button, then tap **GRS Longitude**. Using Graffiti or a keyboard, enter the new value for the longitude of the GRS in the space provided. Then tap **OK** to save this new value, or **Cancel** to revert to the previous value.

The GRS is typically visible in telescopes for up to an hour before and after the time of transit. The latest longitude figure for the GRS can be found at

<http://skyandtelescope.com/observing/objects/planets/article_107_1.asp>

2.5 Controls

The diagram above shows the controls for PleiadAtlas. Their function will be described in further detail in the next chapter; you can return to this section later as a quick reference.



1. **DSO, *, and P.** Tapping these three controls brings up dialog boxes for looking up DSOs, stars, and planets, respectively. You can search for DSOs by Messier or NGC number; stars by Bayer (Greek letter) designation; and planets by name.

2. **Sky map.** Tapping this control opens up the Sky View window. This window allows you to plot maps showing broad swaths of sky—about 60 by 80 degrees—in various directions around the sky. Unlike the main map window, which plots maps based on right ascension and declination, this sky map window works more like a traditional planetarium program, plotting maps based on altitude and azimuth. You can, for example, find out what stars are up in the west, or which stars are near overhead toward the southeast.

3. **Mapping status.** This field shows one of three words. It shows Map, if you've reset the celestial coordinates or magnification, or if you've otherwise set some configuration that may affect the map. This is an indication that you should redraw the map. When drawing the map, the status indicator shows Wait. Finally, when mapping is completed (usually on the order of 3 to 10 seconds), the status indicator shows Done. In addition, the status indicator may include an exclamation point (!); this tells you that the date and time for which the map is valid is not the current date and time. In other words, the Temporary Date has been set to some other time. (See Section 3.7 for further details.)

4. **Orientation.** These controls determine how the maps are oriented: normal, inverted (that is, rotated by 180 degrees), reversed (that is, flipped east to west), or inverted and reversed (that is, flipped north to south). The orientation indicator gives these four possibilities as Nor, Inv, Rev, and I/R, respectively. You can select among them by using the **Inv** and **Rev** controls: the **Inv** control toggles between Nor and Inv, or between Rev and I/R; the **Rev** control toggles between Nor and Rev, or between Inv and I/R.[2]

5. **Right ascension and declination.** These controls determine where PleiadAtlas will draw its next map. Tapping **E**ast and **W**est change the right ascension either eastward or westward; tapping **N**orth and **S**outh change the declination either northward or southward. Generally speaking, these controls move the coordinates by about one-half of a screen width in right ascension, or by two-thirds of a screen height in declination, meaning that at higher magnifications, these controls adjust the coordinates in smaller steps than at lower magnifications. Remember that PleiadAtlas does not redraw maps until you explicitly request a redraw (see the Map control, below).

6. **Magnification.** These controls determine the scale of the next map. When you first start PleiadAtlas, the magnification is set to 1, which gives a scale of 10 pixels per degree. You can change the magnification by factors of 2 between half magnification (abbreviated h), at 5 pixels per degree, up to a magnification of 8, which gives 80 pixels per degree. (That's 45 arcseconds per pixel.) Tapping **I**n increases the magnification by a factor of 2, and tapping **O**ut decreases it by a factor of 2. Changing the magnification also changes the limiting magnitude of the map (see Section 3.1). Again, remember that PleiadAtlas doesn't actually redraw the map until you tap the Map control.

7. **GOTO.** Instead of adjusting the coordinates in fixed steps with the **E**ast, **W**est, **N**orth, and **S**outh controls, you may choose to enter them in directly. By tapping the **GOTO** control, you pull up a dialog to set the coordinates manually, using Graffiti or a keyboard. This is described in greater detail in the next chapter.

[2]It's less complex than it sounds. Really.

8. **Map.** This is the workhorse control for PleiadAtlas. After you've adjusted the orientation, the coordinates, and the magnification for the map, you tap **M**ap to ask PleiadAtlas to draw the map. Once the map is drawn, you can tap in the main field to get information on the plotted stars and objects. The next chapter goes into more detail on how to interact with the map.

Chapter 3

Using PleiadAtlas

This chapter will describe how to use PleiadAtlas to show maps of the sky and to display information about the plotted objects.

3.1 Mapping

The central function of PleiadAtlas is drawing maps of the sky. It's why it takes up as much memory as it does. All the other functions of PleiadAtlas are driven by what is needed for plotting and using the maps.

One of the counterintuitive aspects of PleiadAtlas is that it does not map "on the fly." You'll notice this the first time you start PleiadAtlas: the program draws all the controls, but no star map. This is a conscious decision on my part, forced by the time it takes to draw a map: about 3 to 10 seconds, depending on how much of the sky is shown on the map, and where in the sky the map is plotting. Certain areas of the sky are densely riddled with stars, and plotting naturally takes longer in those areas. The particular PDA you're using also makes a difference, of course; some devices are simply faster than others.

Since it can take around 10 seconds to plot some maps, it would take a long time to get the map you wanted, if you had to wait after each keytap for a new map to be drawn. So instead, PleiadAtlas doesn't draw a map until you ask it to. You first tell PleiadAtlas where in the sky you want the map to be drawn, and at what level of detail. Then, when you're ready, tap the **M**ap button, and PleiadAtlas draws the map.

The where of a map in PleiadAtlas is determined by two coordinates called *right ascension* and *declination*. The right ascension is the figure in between the **E**ast and **W**est buttons at lower left on the mapping screen, and the declination figure is between the **N**orth and **S**outh buttons at the bottom of the screen. You can adjust the right ascension using the **E**ast and **W**est buttons, and the declination using the **N**orth and **S**outh buttons.

The coordinates are specified in hours and minutes (or, alternatively, degrees) of right ascension and degrees of declination, as is standard in astronomy. PleiadAtlas only permits maps to be centered on whole degrees of right ascension and declination; one degree of right ascension equals four minutes. For example, a map may be centered at RA 15:40, Dec −32, but not at RA 22:30, Dec +15.5; in the latter case, neither the right ascension nor the declination is a whole-degree value. (A right ascension of 22:30 is equal to $(22 \times 15) + (30 \div 4) = 337.5$ degrees.)

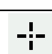
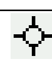
The level of detail of a map is determined by the magnification. The higher the magnification, the more any given part of the sky looks in the map, and the smaller a patch of sky is shown in that map. In compensation, higher magnifications also reveal dimmer objects.

The magnification of the map can be selected from the following values: h (for half), 1, 2, 4, and 8. Magnification 1 is unit magnification, and is the default magnification when you start the program for the first time. At this scale, 10 pixels equal one degree of arc, which is equal to one degree in declination, and the map shows a rectangle of the sky approximately 12 degrees tall by 15 degrees wide. The higher magnifications are multiples of this scale, so that at power 2, 20 pixels equal one degree, and so on. Each higher magnification also generally shows objects one magnitude deeper. The table below gives the limiting magnitude for stars and deep sky objects (DSOs), based on the magnification.

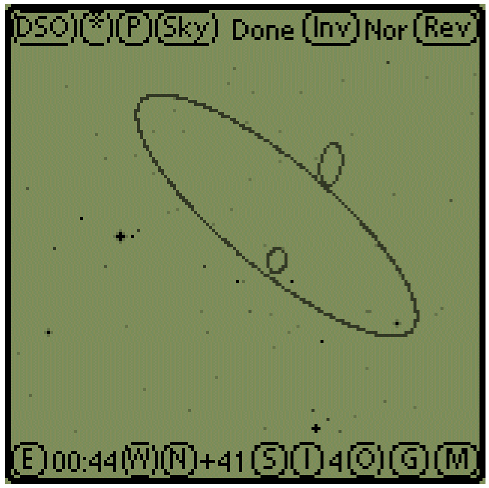
			Stars		DSOs	
Magnification	*Scale of Display*	*Field of View*	*Normal*	*Deep*	*Normal*	*Deep*
h	5 pixels/deg	24 × 30 deg	5.5	6.5	6.5	7.5
1	10 pixels/deg	12 × 15 deg	6.5	7.5	7.5	8.5
2	20 pixels/deg	6 × 7.5 deg	7.5	8.5	8.5	9.5
4	40 pixels/deg	3 × 4 deg	8.5	9.5	9.5	11.5
8	80 pixels/deg	1.5 × 2 deg	9.5	10.5	11.5	—

PleiadAtlas plots three types of objects: deep-sky objects (DSOs), stars, and planets. Planets are plotted as circles; the Moon and Sun are plotted at approximately the correct size at magnifications of 1 or higher. Stars are plotted as dots of gradually increasing size and intensity as magnitude increases; the actual size and intensity depends on the magnification and the "one mag deeper" setting (see Section 2.4.2). A star of magnitude 4.7 looks the same at a magnification of 1 as a star of magnitude 7.7 looks at a magnification of 8.

DSO symbols are, by and large, the same used by paper atlases. Below is a table of the symbols used in PleiadAtlas.

Symbol	*Object Type*	*Symbol*	*Object Type*
	Double star		Nebula
	Multiple star		Planetary nebula
	Open cluster		Galaxy
	Globular cluster		Planet

In some cases, the actual symbols plotted may not be exactly as shown above, because PleiadAtlas plots objects according to their approximate size, and in the case of galaxies, to their proper orientation as well. See, for example, this map of M31 and environs:



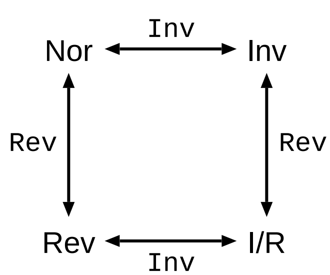
However, galaxies will always be ovals, so they should never be confused for a planet.

3.2 Orientation

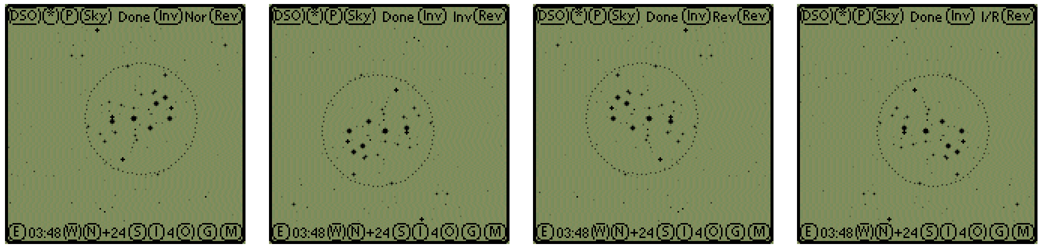
To match the view as seen through some telescopes, PleiadAtlas provides the ability to plot maps in four different orientations, called normal (Nor), inverted (Inv), reversed (Rev), and inverted and reversed (I/R). The current orientation is shown in the orientation indicator at upper right. The following table shows where north and east are for each of the four orientations:

Orientation	*North is ...*	*East is ...*
Nor	up	left
Inv	down	right
Rev	up	right
I/R	down	left

In other words, inverted means rotated 180 degrees; reversed means flipped east to west; and inverted and reversed means flipped north to south. You can change the orientation using the **Inv** and **Rev** toggle buttons, according to the diagram below:



For instance, tapping the **Inv** button toggles back and forth between **Nor**mal and **Inv**erted mapping. Here's the way that M45 (the Pleiades) looks in each of the four orientations:



3.3 Navigation

The term navigation, as used here, covers adjusting both the coordinates and the magnification. Adjusting the magnification is fairly straightforward. You can switch between the five magnification levels by using the **I**n and **O**ut buttons. The **I**n button increases the magnification by a factor of 2, up to a maximum magnification of 8. The **O**ut button decreases the magnification by a factor of 2, down to a minimum of h.

Adjusting the coordinates is a bit more involved, since there are two of them: right ascension and declination. These two coordinates correspond roughly to longitude and latitude on the Earth, although right ascension is usually given in terms of hours and minutes, rather than degrees. (PleiadAtlas does give you the option of working in degrees of right ascension, however. See Section 2.4.2.)

You can adjust the coordinates directly, using the **G**OTO button, or step by step, using the directional buttons: **E**ast, **W**est, **N**orth, and **S**outh. If you use the directional buttons, the map coordinates change by an amount that depends on the magnification: the higher the magnification, the less the coordinates change. That's because the map shows less of the sky at higher magnifications; if you moved the same amount at 8 power as you do at unit power, you'd skip a bunch of sky each time you pushed, say, the **N**orth button. (In the same way, if you had a map of Africa, you'd like the next map to the north to be of Europe. But if you had a map of Nigeria, you wouldn't want the next map to the north to be of Germany; you'd want the step size to be smaller.)

The following is a table of how big a step in declination the **N**orth and **S**outh buttons make, depending on the magnification:

Magnification	*Step Size*
h	±16°
1	±8°
2	±4°
4	±2°
8	±1°

The step size for right ascension is similar. The difference is that since an hour of right ascension is smaller near the poles than it is near the celestial equator, tapping **E**ast or **W**est adjusts the right ascension by a variable amount—more near the poles, and less near the equator. For example, tapping either button when the declination is zero—at the celestial equator—adjusts the right ascension by 16 degrees (1 hour and 4 minutes) at magnification h. But when the declination is, say, +70 degrees, the change in right ascension is 1 hour and 56 minutes, in partial compensation for the "shrinking" hour of right ascension.

Alternatively, you can navigate directly to a pair of coordinates by using the GOTO facility. Select this by tapping the **G**OTO button (next to the **M**ap button) at the lower right corner of the map window. This brings up the GOTO dialog:

You can now tap in the coordinates using the on-screen buttons. The format PleiadAtlas expects for the coordinates depends on whether you selected decimal mode in the Preferences (see Section 2.4.2). If decimal mode is selected, PleiadAtlas expects you to enter the coordinates in the format RRR ±DD, complete with leading zeros. For example, to enter in a right ascension of 30 degrees and a declination of −6 degrees, you tap **0**, **3**, **0**, −, **0**, **6**, **GOTO**.

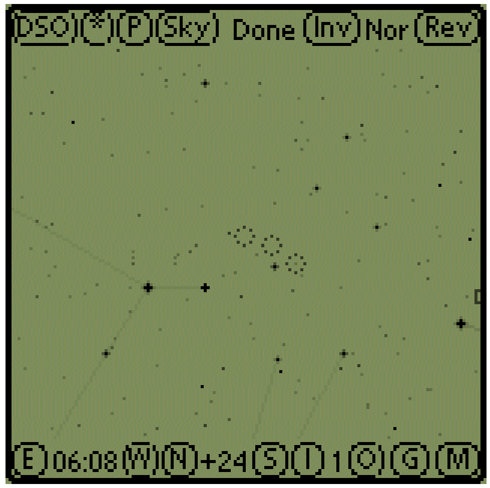
If decimal mode is not selected, PleiadAtlas defaults to sexagesimal mode and expects the coordinates in the format HH:MM ±DD, again, complete with leading zeros. For example, to enter in a right ascension of 8:32 and a declination of +37 degrees, you tap **0**, **8**, **3**, **2**, **3**, **7**, **GOTO**. You can tap in a right ascension in sexagesimal notation that does not correspond to a whole degree (see Section 3.1), but PleiadAtlas will round it to a whole degree; half degrees are rounded up.

If you change your mind, simply tap **Cancel** to return to the map window without changing the coordinates.

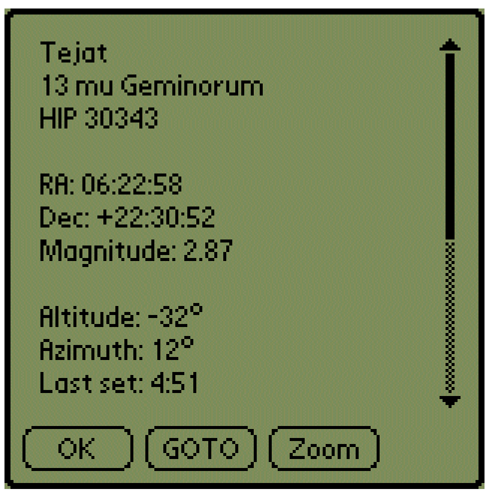
3.4 Object Identification

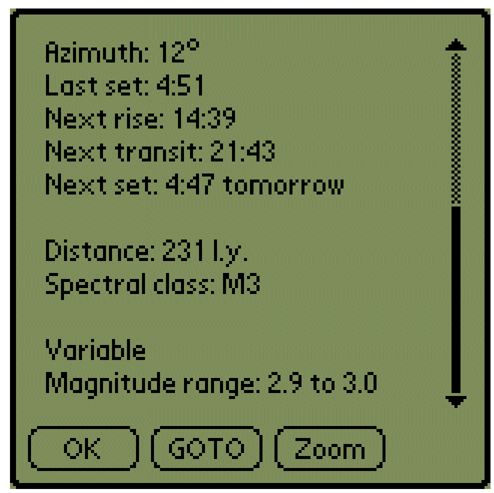
PleiadAtlas plots its maps without labels. In order to identify a star, planet, or DSO, simply tap on it. This will pull up an information box giving the object's name, coordinates, rise and set information, and depending on what kind of object it is, other interesting data on it. Usually, the information will not fit on one screen; to see the rest of it, simply tap the scroll bar or use the up and down hard buttons. Once you're done looking at the information, you can either tap **OK** to close the box, or tap **GOTO** to set the mapping coordinates to that of the object.

For example, suppose PleiadAtlas has just drawn a map at magnification 1, centered on M35, an open cluster in the constellation of Gemini the Twins:



(M35 is the leftmost of the three open clusters near the center.) You might want to know what the brighter star to its east-southeast (lower left) is. Just tap on it, and bring up the star's information box:



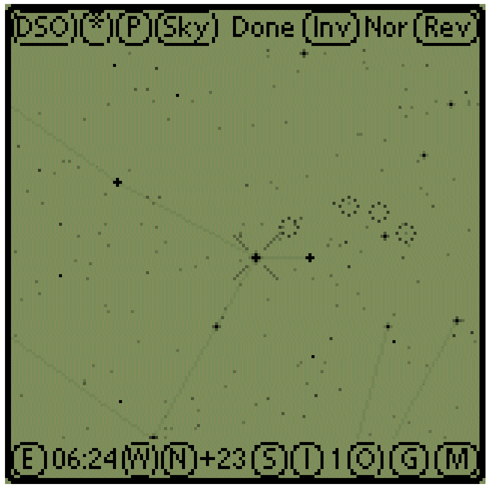


The star is called Tejat, and its Bayer (Greek letter) designation is μ Geminorum.[1] Also given is the star's Flamsteed number, 13.[2] The box goes on to give its right ascension, declination, and brightness, followed by information (specific to your observing location) on when it will rise, set, or transit. (An object is said to transit when it crosses the meridian line, the north-south line passing directly overhead.) For most stars magnitude 7.5 or brighter, as with Tejat, PleiadAtlas will give a star's distance in light-years, and its spectral class. Tejat is 231 light-years distant, and its spectral class is M3, indicating that it should appear a ruddy orange in telescopes. In this case, PleiadAtlas also reveals that Tejat is a variable star.

[1] Most PalmOS PDAs do not support Greek letters, so I give their transliterations. In this case, μ is mu, the twelfth letter of the Greek alphabet. Geminorum is the so-called genitive—a kind of possessive form—of Gemini, so it can be roughly interpreted as "of Gemini," and the whole Bayer designation can be read, "μ of Gemini," or "the twelfth star of Gemini."

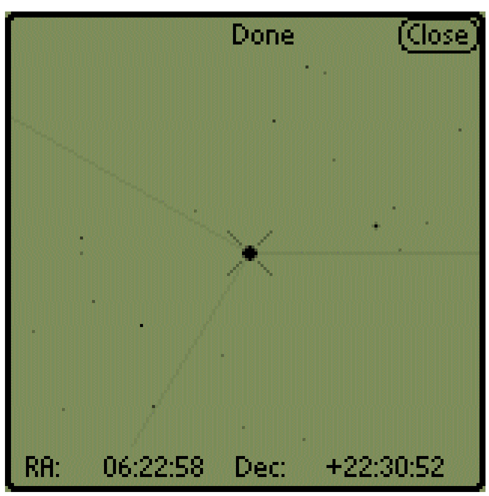
[2] Flamsteed numbers weren't actually assigned by Flamsteed himself. Instead, well after he died, the stars in his catalogue were numbered, in order of increasing right ascension, by the French astronomer, Joseph Jerome de Lalande. Thus, Tejat is the 13th star in Gemini, counting from west to east.

Once you have finished reading the information box, tapping **OK** just closes the box. Or, you can tap **GOTO**, and PleiadAtlas will change the right ascension and declination to those of Tejat. If you now tap **M**ap again, you now get a map centered on Tejat:

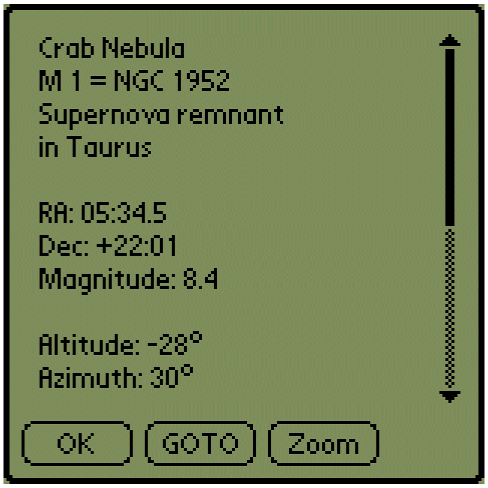


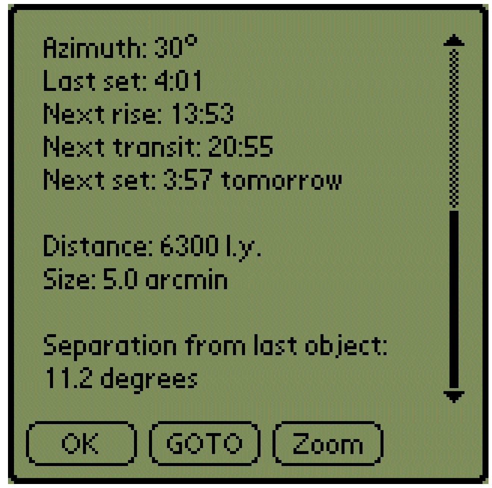
New in v2.2.1 of PleiadAtlas is a target crosshatch (depicted in the map centered on Tejat). In general, PleiadAtlas will draw the crosshatch on the most recently selected object—that is, the last object for which you pulled up an information box.

There is also a **Zoom** button in the information box. If you tap this button, you get a new map, centered precisely on the object, at an effective power of 20x (200 pixels to the degree, or 18 arcseconds per pixel). If the extended field star database (EXTDB.pdb) is installed, you will also have stars plotted to magnitude 11.5, regardless of the setting of the "one mag deeper" preference. For example, here is the Zoom map centered on Tejat:



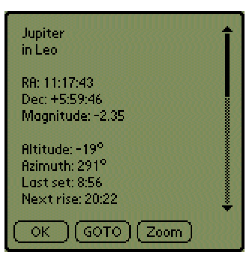
Somewhat different information is given in the case of DSOs or planets. For DSOs, the first few lines give the type of the object in addition to its proper name (if it has one) and its catalogue entry. If the object has more than one catalogue entry, this will be indicated, too. As shown below in the information box for M1, the Crab Nebula, some objects (including all of the Messier objects) have distance and size information:

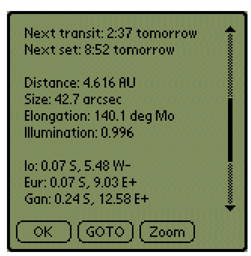


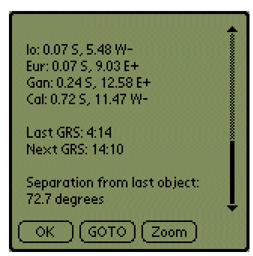


Also, at the bottom of the box is given the separation of the Crab Nebula from the previous object for which an information box was displayed. In this case, that object was Tejat, and the angular separation of the Crab from Tejat is 11.2 degrees. This separation is given for every object of any type, except for the first object tapped or searched each time you start PleiadAtlas (since in that case there is no previous object).

The planets also have slightly different data available. The information box for planets gives their distance from the Earth in terms of astronomical units[3], their apparent size as seen from the Earth in arcseconds[4], their elongation from the Sun (in ecliptic longitude) in degrees, and their phase or illumination. The elongation also indicates whether the planet is east of the Sun and therefore potentially visible in an Evening elongation (Ev), or west of the Sun and therefore potentially visible in a Morning elongation (Mo).







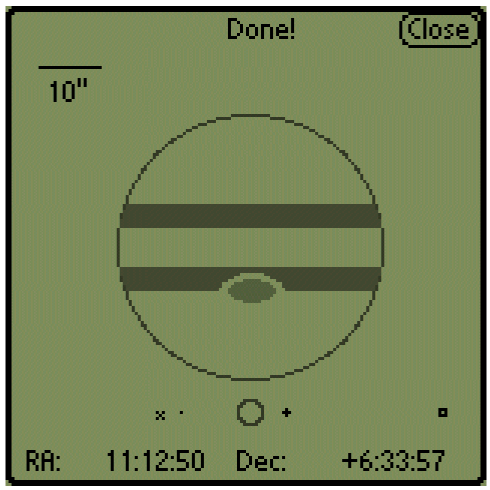
As shown above in the information box, still more information is given for Jupiter. The locations of the four Galilean satellites—Io, Europa, Ganymede, and Callisto—are given in units of Jupiter radii, first north or south of the planet, then east (following) or west (preceding) of the planet. If the satellite is moving away from the disc of Jupiter, the east-west indicator is followed by a plus (+); if it's approaching it, the indicator is followed by a minus (−). Furthermore, the times of the last and next transits of the Great Red Spot (GRS) are given; these are the moments at which

[3]An astronomical unit (AU) is the mean distance between the Sun and the Earth, and is approximately equal to 150 million km. The distance to the Moon is always much smaller than 1 AU, so it's given directly in km.

[4]The planets typically appear quite small; the largest any of them ever gets, as seen from the Earth, is Venus, which occasionally appears about 1/60 of a degree across. Such a small angle is called an *arcminute*, but since the planets are usually even smaller than that, their size is given in terms of *arcseconds*, which are 1/60 of an arcminute, or 1/3,600 of a degree. The only sizable solar system objects, as seen from the Earth, are the Sun and Moon, whose sizes are therefore given in arcminutes.

the GRS is crossing the center of the planet's disc and is thus best placed for observing. Accurate transit times depend on the correct setting of the GRS longitude (see Section 2.4.3).

The **Zoom** button also does something slightly different for the planets. Instead of showing an ordinary map at 20x, PleiadAtlas will plot the planet as a disc, including a depiction of the phase. For Saturn, the rings are also drawn, showing their tilt; and for Jupiter, the location of the GRS (if visible) and the Galilean satellites are shown. To save space, the satellites are identified by the following code: Io (+), Europa (·), Ganymede (×), and Callisto (□). Where the satellites are depicted with respect to Jupiter is affected by the orientation settings. (See Section 3.2.)



Sometimes, several objects overlap; PleiadAtlas does its best to guess which object you mean. For those of you interested in the algorithm PleiadAtlas uses to decide which object has been tapped, please consult Appendix C. Also, plotting a Zoom screen centered on the objects may help you distinguish between them.

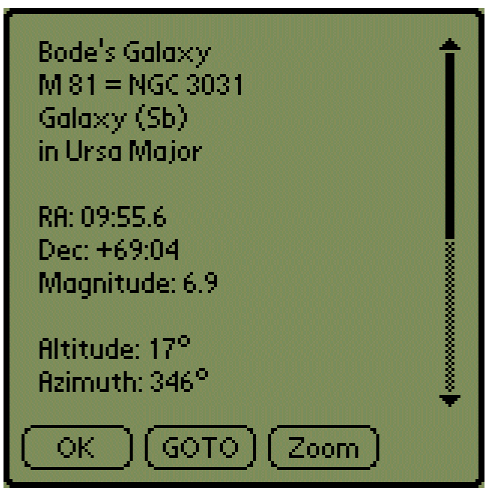
3.5 Object Searching

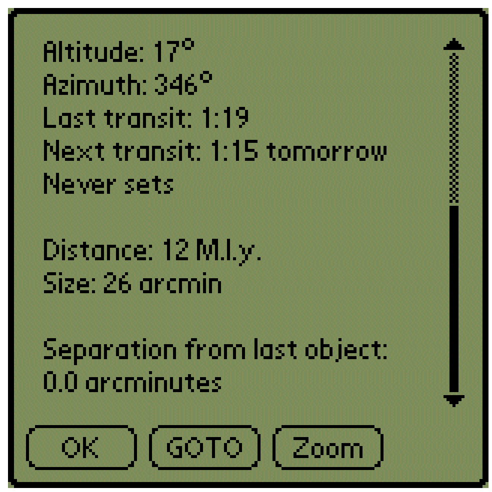
Tapping on a plotted object isn't the only way to get information on it. You can also search for it directly by using the **DSO**, Star (*****), and **P**lanet controls.

3.5.1 DSO Searching

Tapping on the **DSO** control brings up the DSO search dialog, which looks like this:

To search for an object, tap its catalogue and number. For example, to pull up an information box for M81, the 81st object in the Messier catalogue, you can tap **M**, **8**, **1**, **Find**. This brings up the information box for M81, which turns out to be a spiral galaxy in the constellation of Ursa Major the Great Bear:





Finding objects in the New General Catalogue (NGC)[5] or Index Catalogues (IC) is just as easy. In fact, you can decide at any point before you tap **Find** to switch catalogues. Tapping **M**, **8**, **1**, **NGC**, **Find** brings up the information box for NGC 81, a spiral galaxy in Andromeda, not M81, since tapping **NGC** switches the catalogue to NGC.

Aside from these three basic catalogues, there are some miscellaneous objects that I felt should be included in PleiadAtlas. However, they come from several different catalogues, and if I added a separate button for each one of them, I'd run out of space. So, with some misgivings, I've defined a fourth catalogue, called the PleiadAtlas Catalogue (PAC), from which you'll be able to select objects. Their primary identification remains the names by which they're best known, however. For instance, the Horsehead Nebula, Barnard 33, is identified first as B 33, and only secondarily as PAC 33. The PAC objects are listed in Appendix D.

[5]Despite its name, the New General Catalogue is anything but new, although it was when it was compiled in 1888 by Johann Dreyer.

If you make a mistake in any catalogue number before tapping **Find**, you can correct it by tapping **Back** to erase the previous digit of the catalogue number.

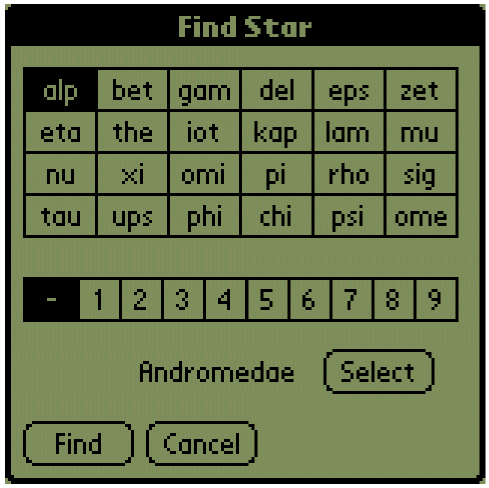
Once you bring up the information box for the DSO, you can then **GOTO** it just as you can when you tap on a plotted object. If the object you ask for isn't in the database, PleiadAtlas will display an error message.

3.5.2 Star Searching

Tapping on the Star (*) control brings up the star search dialog, which consists of two phases. The first phase is the constellation selection phase, which looks like this:

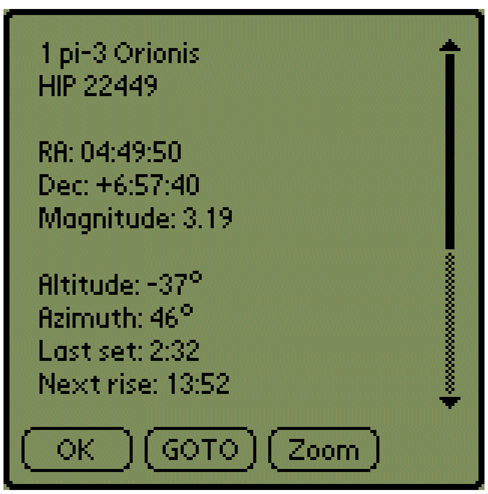
This screen lists the first 48 constellations in alphabetical order, given by their official three-letter abbreviations. (A listing of all 88 constellations, with their abbreviations, is given in Appendix B.) To select one of these 48 constellations, tap on its abbreviation, and then tap **OK**. If the constellation you want is one of the other 40, tap **More** to get to the last 40 constellations, tap the proper abbreviation, and then **OK**. You can switch between the two constellation selection screens by tapping **More** and **Back**.

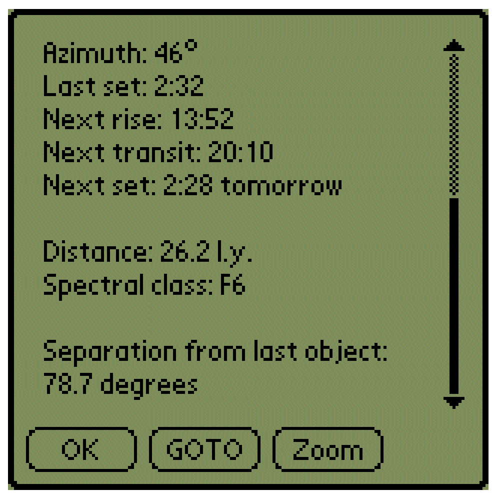
Once you've selected the constellation, choose which of the stars in that constellation you want by tapping one of the 24 Greek letters, abbreviated to three letters each, as in the picture below. (A listing of the Greek letters, along with their full transliterations used in PleiadAtlas, is given in Appendix A.) Then, tap **Find** to bring up the star's information box.



You can change the constellation at any time by tapping **Select** to re-enter the constellation selection screen.

Sometimes, a star isn't uniquely identified by a Greek letter and a constellation. For example, there is not just one star named π (pi) Orionis, but six of them, named π-1 (pi-1) through π-6 (pi-6) Orionis. To select one of them in particular, tap the proper *index number* before tapping **Find**. For example, the entire sequence for bringing up the information box for π-3 (pi-3) Orionis is Star (*), **More**, **Ori**, **OK**, **pi**, **3**, **Find**. That brings up the following box:

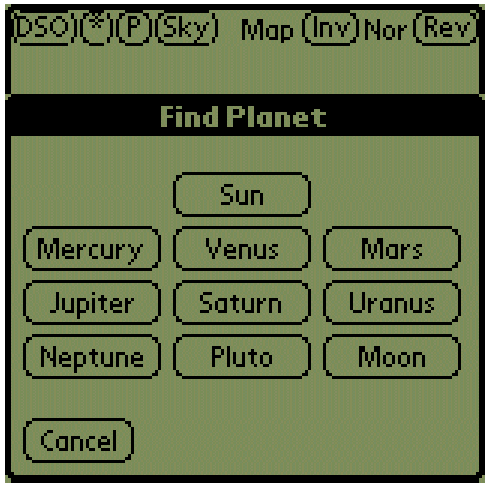




Again, tapping **OK** just closes the box, and tapping **GOTO** closes the box and sets the map coordinates to that of π-3 (pi-3) Orionis. If you ask for a star that doesn't exist, like π-7 (pi-7) Orionis, PleiadAtlas will display an error message. On the other hand, if you ask for a star like π (pi) Orionis, without an index number, PleiadAtlas will assume that you mean π-1 (pi-1) Orionis.

3.5.3 Planet Searching

Searching for planets is easiest of all. Tap **P**lanet to bring up the planet searching dialog. To bring up a planet's information box, simply tap the button with the planet's name.[6]



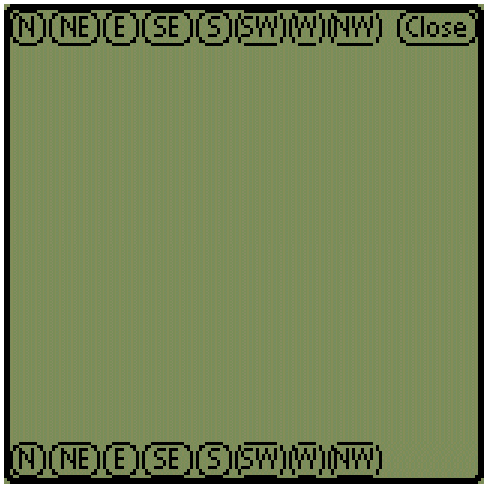
As with the other information boxes, tapping **OK** closes the box, and tapping **GOTO** closes the box and sets the map coordinates to that of the planet.

3.6 Sky View

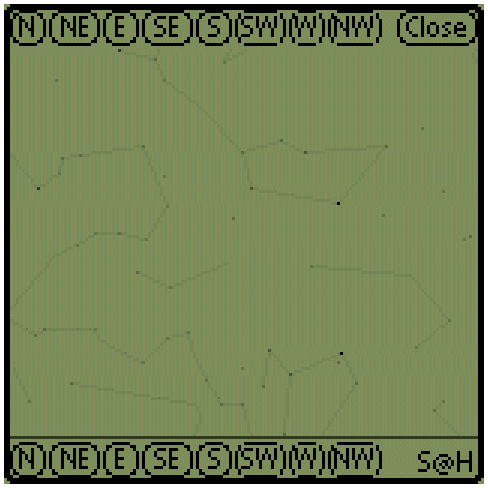
The maps that PleiadAtlas draws in the main window are oriented by right ascension and declination, and thus do not indicate where in the sky the objects in the map actually are at any given time. It's just as easy to plot a map of an object that's 30 degrees below the horizon as it is to plot one that's 30 degrees above it. Still, knowing what's up in the sky *is* useful for orienting yourself. Orion may always be at the same right ascension and declination, but depending on the time and date, it might be up in the south or down below the horizon.

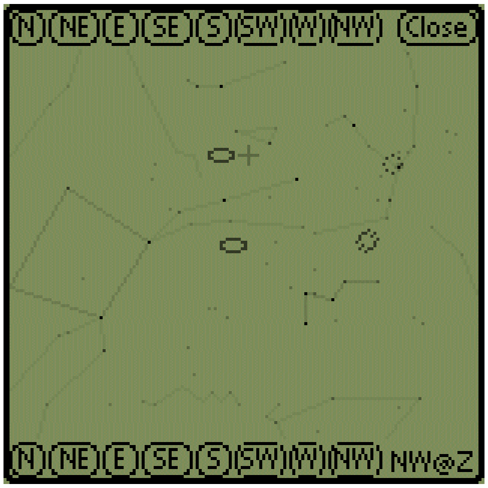
The Sky View feature of PleiadAtlas is designed to help you identify what's up in the sky. You access it by tapping the **Sky** button in the main mapping window, at the top of the screen. This will bring up the Sky View window:

[6]The ancient Greeks considered anything that moved against the celestial sphere a planet, so to them, the Sun and Moon were also planets.



As in the main map window, PleiadAtlas doesn't plot the sky map until you ask for it. Tapping one of the eight buttons at the bottom shows the sky near the horizon in the chosen direction; tapping one of the top buttons shows the sky near the zenith in the selected direction. Which map is drawn is indicated in the lower right corner. For example, the following two screens show the sky maps for south at the horizon, and northwest near the zenith:



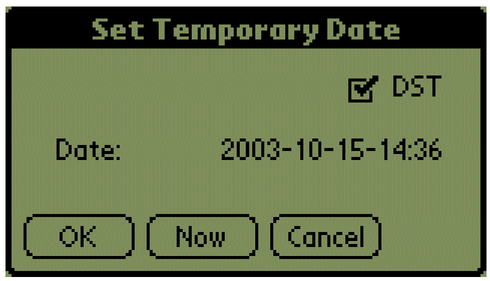


The Sky Map window has no mapping status indicator; you can tell that PleiadAtlas is done drawing the sky map when it either draws the horizon line or the zenith crosshatch (near M33 in the diagram above). These maps are tappable just as the ordinary map is, although you can only tap an object that is actually there; some stars along constellation lines are too dim to be plotted, and nothing will happen if you try to tap them.

The information boxes for objects still have the **GOTO** button. If you tap the **GOTO** button for an object, PleiadAtlas will set the mapping coordinates to those of the object; this setting isn't visible, of course, until you tap **Close** to close the Sky Map window and return to the main mapping window.

3.7 Temporary Date

By default, PleiadAtlas shows maps and gives information on objects for the current date and time, but you can ask it to provide maps and information for any time between 1900 and 2099, inclusive. PleiadAtlas handles this by defining a *temporary date*, which is used for all calculations for planet positions, rise/set times, and altitude and azimuth positions. It doesn't affect your PDA's clock, which is why it's called a temporary date. To set the temporary date, first tap the Menu silk-screen button, then tap the Temporary Date menu item. PleiadAtlas will pop up a window much like the one below.



The actual date and time listed will show what PleiadAtlas is using as the "current" time for calculations; your local time zone is assumed. The DST checkbox indicates whether PleiadAtlas is interpreting the listed time using Daylight Savings Time.

PleiadAtlas displays the date as YYYY-MM-DD-HH:MM, with the time in 24-hour format. To change the temporary date, edit the date using Graffiti or a keyboard, making sure you adhere to the same format. The year of the date entered must be between 1900 and 2099, inclusive. Calculations are not sufficiently high precision to require seconds of time, so PleiadAtlas doesn't accept them here. If you are entering a date and time from a magazine or other outside source, you will want to make sure that you set the DST checkbox appropriately. When you're done editing the date and time, tap the **OK** button to confirm them.

PleiadAtlas employs a "running clock" for the Temporary Date feature. That is, after you set the temporary date, the clock continues to run. If you set the temporary date to 2004-01-15-06:00 (a bit before dawn on January 15, 2004), then 10 minutes later, the temporary date will be 2004-01-15-06:10. There is therefore a constant offset between the PDA's actual clock time, and the temporary date used by PleiadAtlas for its calculations.

To reset this offset to zero, and therefore get PleiadAtlas to use the clock time for its current time, tap the **Now** button instead of the **OK** button. If you decide you've made a mistake, tap **Cancel** to close the dialog without affecting the temporary date.[7]

When you get an information box for an object, the information is valid for the temporary date (if any) set at the time that the box appears, which may be different than the time for the map on the screen. For example, suppose you set the temporary date to January 1930, find Pluto where it was first discovered, **GOTO** those coordinates, and plot a map at those coordinates, displaying Pluto

[7] Although PleiadAtlas only displays time to a precision of minutes, PalmOS PDAs express their clock times in seconds, and PleiadAtlas follows this convention to minimize conversion problems. As a result, if you enter the current time and tap **OK**, the offset is not exactly 0, but instead some number of seconds between 0 and 59. To reset the offset to 0, you should really use the **Now** button.

(next to δ (delta) Geminorum). If you then reset the temporary date to the current time, then tap on Pluto in the map, the information box that PleiadAtlas pops up will show Pluto's *current* location, not its location in 1930.

Regardless of the temporary date effective for any map that PleiadAtlas plots, the coordinates shown in the information boxes are all for equinox 2000.0, and the stars are all epoch 1991.25. That means that the coordinates are not corrected for precession, and the star positions are not corrected for proper motion. (That's the main reason why the temporary date is limited to the two centuries centered around 2000.)

Chapter 4

Troubleshooting

The program resets as soon as you try to start it.	You may not have installed the MathLib library, or perhaps the version of MathLib on your PDA is not recent enough. You need version 1.1 of MathLib; a copy is provided in the download.
The dimmest stars aren't visible on the display.	Check to make sure that "Show objects one mag deeper" is selected in Preferences. If it already is, try adjusting the contrast on your PDA.
You tap one star (or object), but you get information on a different one.	Your digitizer may be off. Exit PleiadAtlas, and recalibrate your digitizer using the Welcome application, or in the Digitizer section of the Prefs application. (Prefs and/or Welcome are packaged along with your PDA and are not part of the PleiadAtlas download.)
The planet positions are wrong, and/or the sky maps don't match what's up in the sky.	Check to make sure that your time zone is set correctly, and that PleiadAtlas knows your longitude and latitude. Also, make sure you have set the Temporary Date feature to the date for which you want positions computed.
There's a cluster of galaxies on the screen, and you can't figure out which one is the one you want.	One way around this is to go to the Preferences screen (see Section 2.4.2), turn off DSO drawing, use the DSO search dialog to look up the galaxy you want, then draw the map again. This should show a map of the region with only the galaxy you want plotted (in addition to the stars and planets, as applicable). Alternatively, you can tap on one of them and Zoom on it, to get a high-power view of the area, which may help to distinguish between the objects.

The red light mode mostly works, but the controls at the top and bottom of the map screen are still in black and white.	PleiadAtlas doesn't refresh the window screen. Tap the Applications silk-screen button, then restart PleiadAtlas. This time, the red light mode should apply to all controls and windows.
You tap **GOTO** from the GOTO dialog (see Section 3.3), but the coordinates don't change.	Be sure to enter the coordinates with all leading zeros. If you're in decimal mode, that means entering the right ascension as a three-digit number; if you're in sexagesimal mode, you need to enter two digits of hours, and two digits of minutes. Also, if the declination you want is negative, be sure to tap the minus button ($-$).
Your preferences have been reset to the default values.	This will happen if you've been using PleiadAtlas v2.0b6 or older. You'll have to re-enter them as explained in Chapter 2, but the good news is that this should be the last time that happens.
You've registered, but PleiadAtlas doesn't recognize this.	Be sure you've actually installed PASerial.pdb onto your PDA. If you're running PleiadAtlas from an SD/MMC card, the problem may be that you haven't gotten a replacement registration file from me. Send me e-mail at <brian@isi.edu> with your name and serial number, and I'll send you a new registration file.
PleiadAtlas isn't working consistently from the memory card.	If you've previously installed a version of PleiadAtlas earlier than v2.1, make sure that you install *all* the files from the latest distribution. If any of the old databases remain, they won't be copied properly from the card into main memory before the program starts. (See Introduction.)

Appendix A

Greek Letters

alpha	α	nu	ν
beta	β	xi	ξ
gamma	γ	omicron	o
delta	δ	pi	π
epsilon	ϵ	rho	ρ
zeta	ζ	sigma	σ
eta	η	tau	τ
theta	θ	upsilon	υ
iota	ι	phi	ϕ
kappa	κ	chi	χ
lambda	λ	psi	ψ
mu	μ	omega	ω

Appendix B

Constellations

This table, and the constellation selection screens in PleiadAtlas, list the constellations in alphabetical order by their complete name, not their abbreviations. For example, Aqr goes before Aql because they stand for Aquarius and Aquila, respectively.

And	Andromeda	Andromedae	Andromeda
Ant	Antlia	Antliae	Air Pump
Aps	Apus	Apodis	Bird of Paradise
Aqr	Aquarius	Aquarii	Water Bearer
Aql	Aquila	Aquilae	Eagle
Ara	Ara	Arae	Altar
Ari	Aries	Arietis	Ram
Aur	Auriga	Aurigae	Charioteer
Boo	Boötes	Boötis	Herdsman
Cae	Caelum	Caeli	Chisel
Cam	Camelopardalis	Camelopardalis	Giraffe
Cnc	Cancer	Cancri	Crab
CVn	Canes Venatici	Canum Venaticorum	Hunting Dogs
CMa	Canis Major	Canis Majoris	Great Dog
CMi	Canis Minor	Canis Minoris	Little Dog
Cap	Capricornus	Capricorni	Goat
Car	Carina	Carinae	Keel
Cas	Cassiopeia	Cassiopeiae	Cassiopeia
Cen	Centaurus	Centauri	Centaur
Cep	Cepheus	Cephei	Cepheus
Cet	Cetus	Ceti	Whale
Cha	Chamaeleon	Chamaeleontis	Chameleon
Cir	Circinus	Circini	Compass
Col	Columba	Columbae	Dove
Com	Coma Berenices	Comae Berenices	Berenice's Hair
CrA	Corona Australis	Coronae Australis	Southern Crown
CrB	Corona Borealis	Coronae Borealis	Northern Crown

Crv	Corvus	Corvi	Crow
Crt	Crater	Crateris	Cup
Cru	Crux	Crucis	(Southern) Cross
Cyg	Cygnus	Cygni	Swan
Del	Delphinus	Delphini	Dolphin
Dor	Dorado	Doradus	Swordfish
Dra	Draco	Draconis	Dragon
Equ	Equuleus	Equulei	Little Horse
Eri	Eridanus	Eridani	River Eridanus
For	Fornax	Fornacis	Furnace
Gem	Gemini	Geminorum	Twins
Gru	Grus	Gruis	Crane
Her	Hercules	Herculis	Hercules
Hor	Horologium	Horologii	Clock
Hya	Hydra	Hydrae	Water Serpent
Hyi	Hydrus	Hydri	Little Water Serpent
Ind	Indus	Indi	(American) Indian
Lac	Lacerta	Lacertae	Lizard
Leo	Leo	Leonis	Lion
LMi	Leo Minor	Leonis Minoris	Little Lion
Lep	Lepus	Leporis	Hare
Lib	Libra	Librae	Scales
Lup	Lupus	Lupi	Wolf
Lyn	Lynx	Lyncis	Lynx
Lyr	Lyra	Lyrae	Lyre
Men	Mensa	Mensae	Table (Mountain)
Mic	Microscopium	Microscopii	Microscope
Mon	Monoceros	Monocerotis	Unicorn
Mus	Musca	Muscae	Fly
Nor	Norma	Normae	Carpenter's Square
Oct	Octans	Octantis	Octant
Oph	Ophiuchus	Ophiuchi	Serpent Bearer
Ori	Orion	Orionis	Orion
Pav	Pavo	Pavonis	Peacock
Peg	Pegasus	Pegasi	Winged Horse
Per	Perseus	Persei	Perseus
Phe	Phoenix	Phoenicis	Phoenix
Pic	Pictor	Pictoris	Easel
Psc	Pisces	Piscium	Fish
PsA	Piscis Austrinus	Piscis Austrini	Southern Fish
Pup	Puppis	Puppis	Stern
Pyx	Pyxis	Pyxidis	Compass
Ret	Reticulum	Reticuli	Reticle
Sge	Sagitta	Sagittae	Arrow
Sgr	Sagittarius	Sagittarii	Archer
Sco	Scorpius	Scorpii	Scorpion
Scl	Sculptor	Sculptoris	Sculptor

Sct	Scutum	Scuti	Shield
Ser	Serpens	Serpentis	Serpent
Sex	Sextans	Sextantis	Sextant
Tau	Taurus	Tauri	Bull
Tel	Telescopium	Telescopii	Telescope
Tri	Triangulum	Trianguli	(Northern) Triangle
TrA	Triangulum Australe	Trianguli Australis	Southern Triangle
Tuc	Tucana	Tucanae	Toucan
UMa	Ursa Major	Ursae Majoris	Great Bear
UMi	Ursa Minor	Ursae Minoris	Little Bear
Vel	Vela	Velorum	Sail
Vir	Virgo	Virginis	Virgin
Vol	Volans	Volantis	Flying Fish
Vul	Vulpecula	Vulpeculae	Fox

Appendix C

Object Selection

PleiadAtlas uses the following algorithm to figure out which object to pop up an information box for, when the user taps a spot near or in more than one object.

1. First, PleiadAtlas checks to see if there is a planet (other than the Sun or Moon) that is within 3 pixels of the spot tapped. If there is, PleiadAtlas pops up the information box for the closest planet. In case of a tie between two or more planets, PleiadAtlas picks the planet closest to the Sun.
2. Otherwise, PleiadAtlas checks to see if there is a star (other than the Sun) within 3 pixels of the spot tapped. If there is, PleiadAtlas pops up the information box for the closest star. In case of a tie between two or more stars, PleiadAtlas picks the brightest star.
3. Otherwise, PleiadAtlas checks to see if the spot tapped is within either the Sun or the Moon. If so, then PleiadAtlas pops up the information box for whichever of the two is closest. In case of a tie, PleiadAtlas picks the Sun.
4. Lastly, PleiadAtlas checks to see if the spot tapped is within the boundaries of a deep-sky object. (*Exception:* For binary and multiple stars, the spot tapped must be on one of the vertical or horizontal lines making up the symbol. The space within the symbol is reserved for stars.) If so, PleiadAtlas pops up the information box for the closest DSO. If the spot is within two or more DSOs, PleiadAtlas picks the smallest DSO.

If the spot tapped is not within range of any object, PleiadAtlas does nothing.

Appendix D

PAC Objects

PAC Number Range	Catalogue	Type
PAC 1–370	Barnard	Dark nebulae
PAC 401–627	Melotte	Open clusters
PAC 701–724	Stock	Open clusters
PAC 801–837	Trumpler	Open clusters
PAC 901–926	King	Open clusters
PAC 1001–1471	Collinder	Open clusters

Appendix E

Contact Information

I can be contacted by postal mail and e-mail. My postal mail address is

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