

Part 1_1: Introduction to directory structures and command line



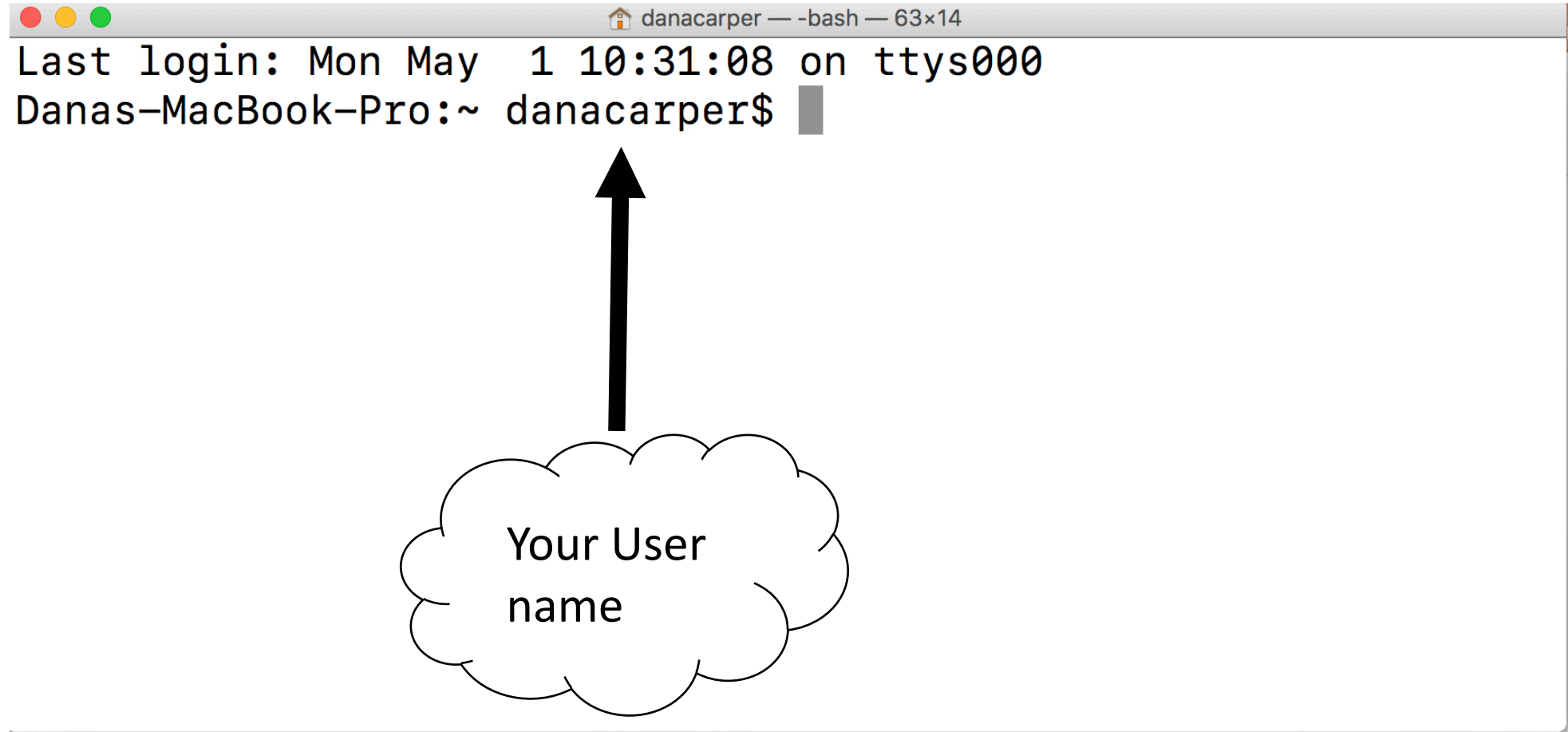
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Quantitative and Systems Biology
University of California, Merced

Where to find a terminal?

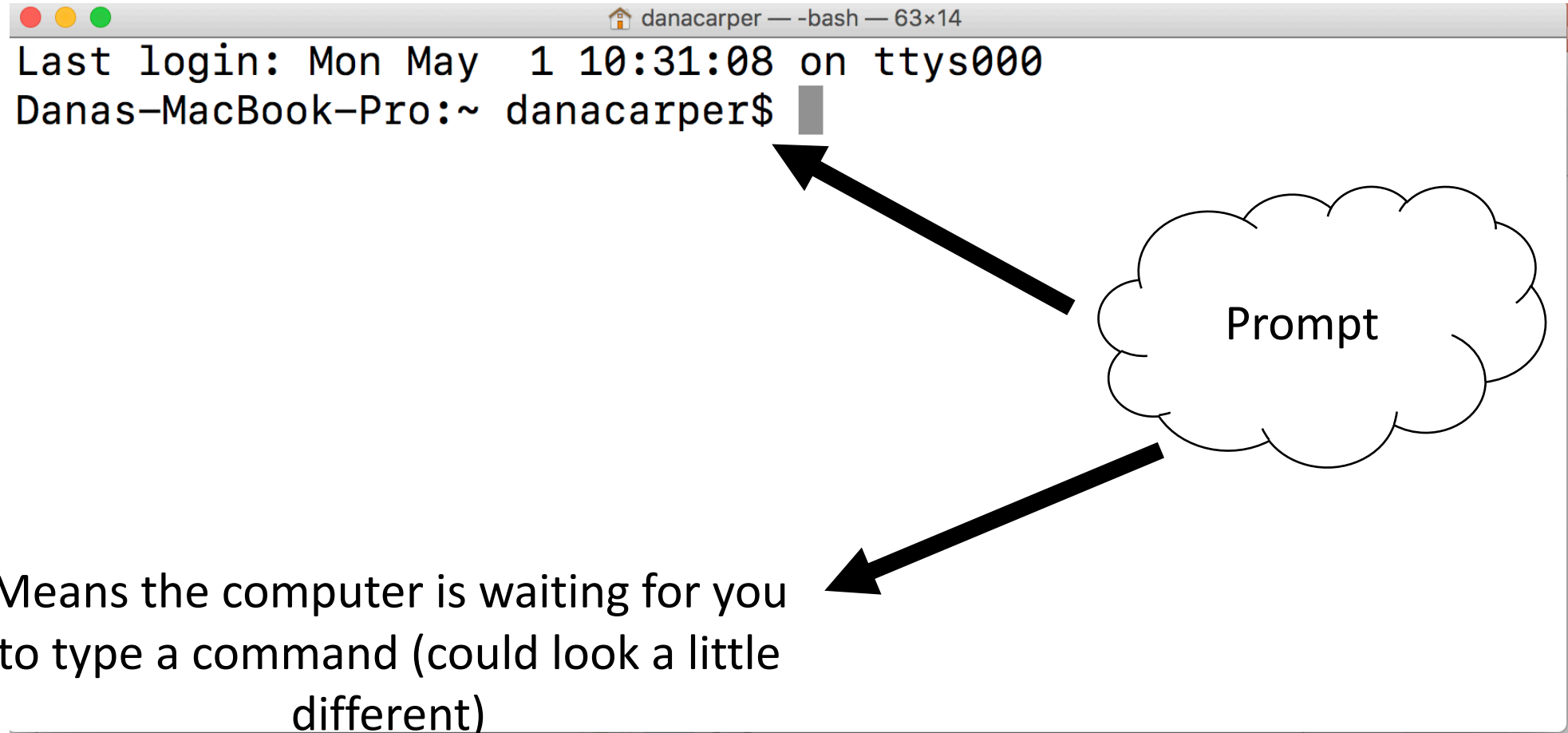
- A Terminal is a device that allows you to talk to the computer
- It can usually be found within the utilities folder in mac
- In ubuntu, under applications or search for terminal



Opening Terminal



Opening Terminal



Computer Terminology

Directory



Folder

How do we determine which directory we are in?

```
danacarper — -bash — 63x14
Last login: Mon May  1 10:31:08 on ttys000
Danas-MacBook-Pro:~ danacarper$ pwd
```

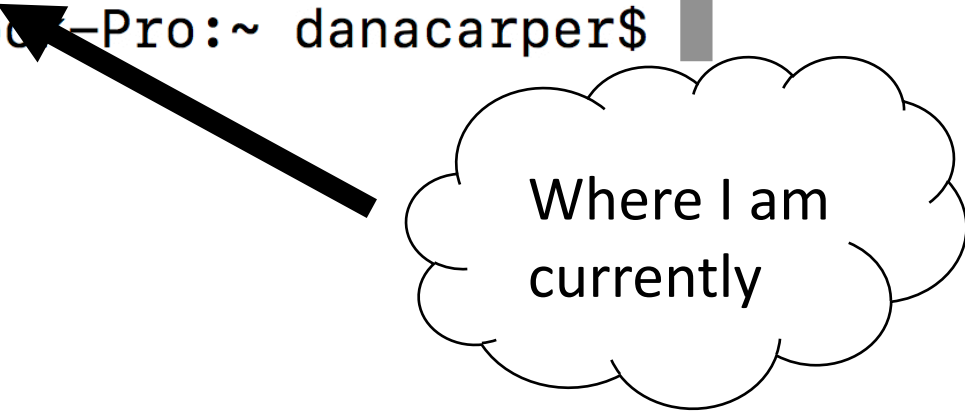


Print
working
directory

Print out which directory (folder) I am in
currently

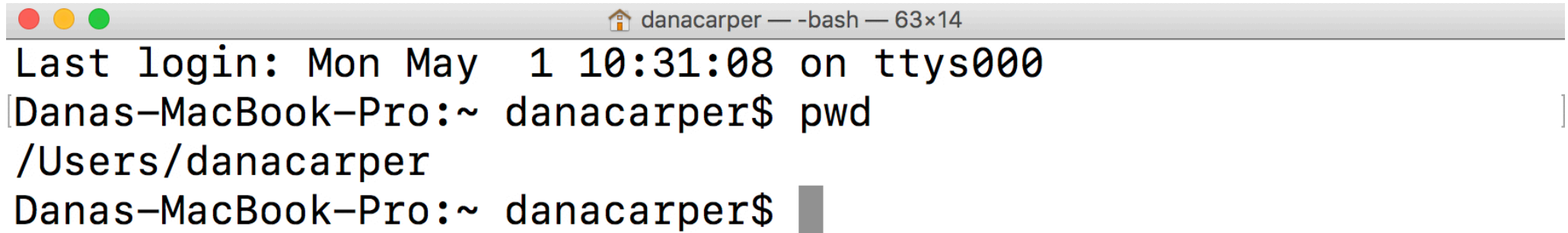
How do we determine which directory we are in?

```
danacarper — -bash — 63x14
Last login: Mon May  1 10:31:08 on ttys000
Danas-MacBook-Pro:~ danacarper$ pwd
/Users/danacarper
Danas-MacBook-Pro:~ danacarper$
```

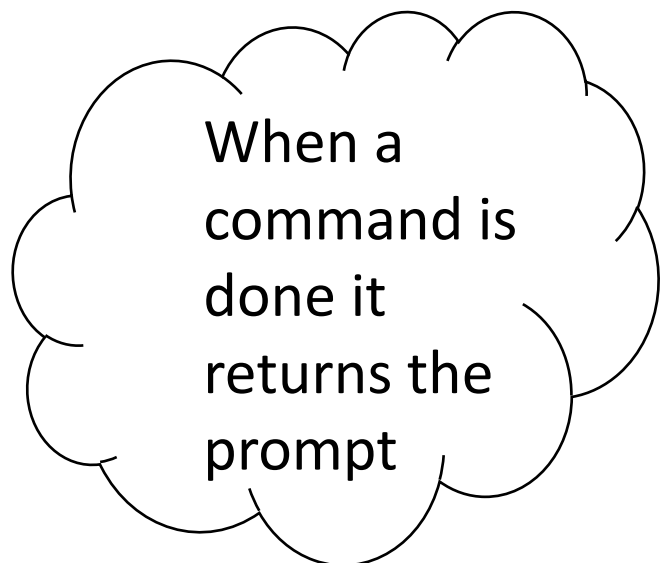


Where I am
currently

How do we determine which directory we are in?

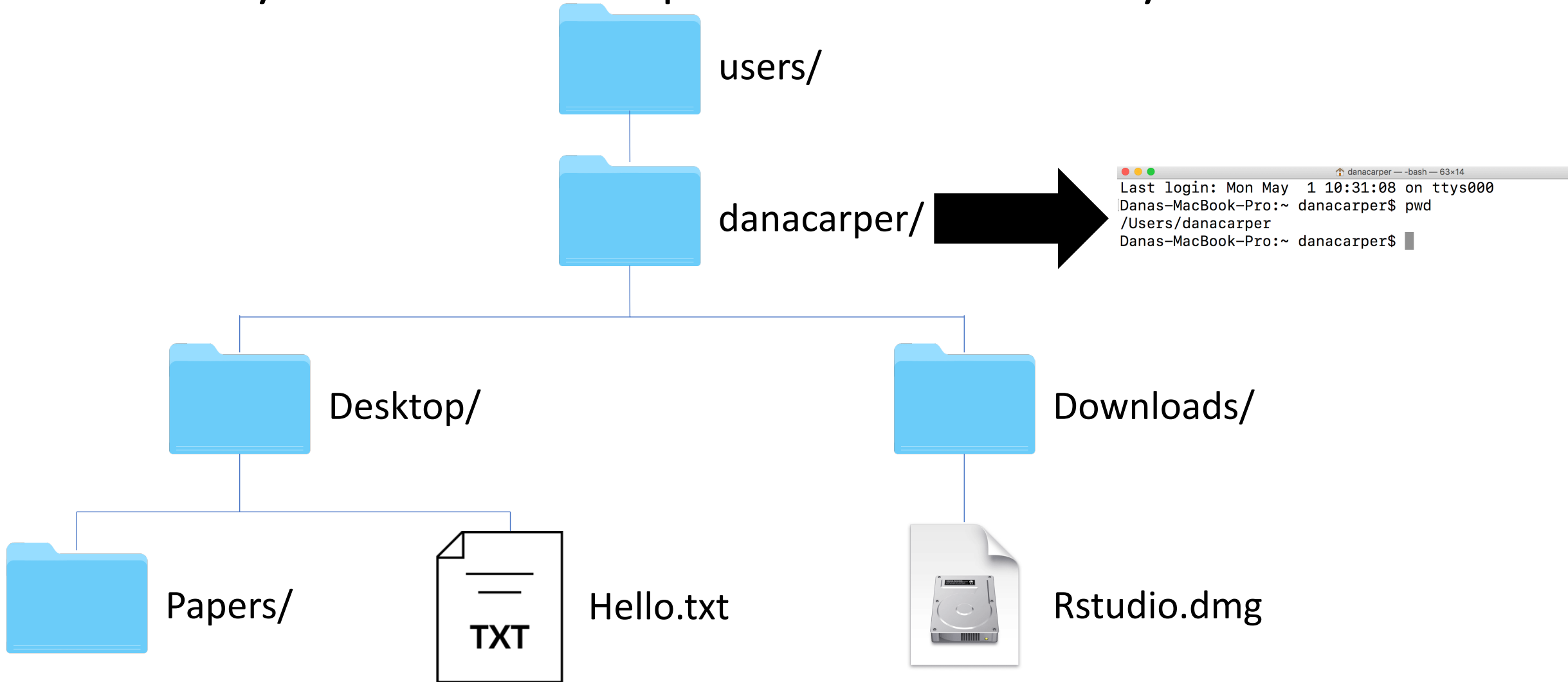


```
danacarper — -bash — 63x14
Last login: Mon May  1 10:31:08 on ttys000
Danas-MacBook-Pro:~ danacarper$ pwd
/Users/danacarper
Danas-MacBook-Pro:~ danacarper$
```



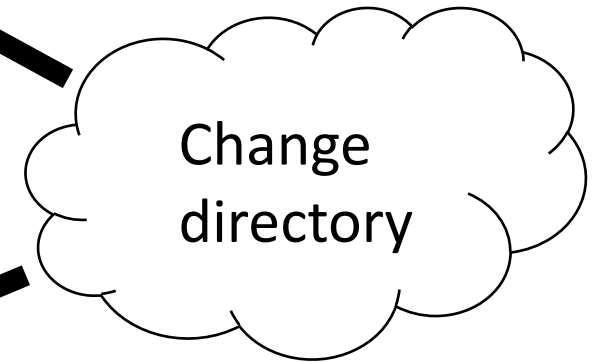
When a
command is
done it
returns the
prompt

A file system is set up like a hierarchy



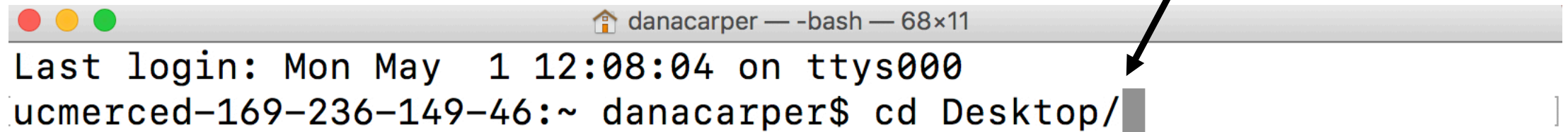
Moving to a different directory

```
danacarper — -bash — 68x11
Last login: Mon May  1 12:08:04 on ttys000
ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
```



This is the same as double clicking on a folder

Moving to a different directory



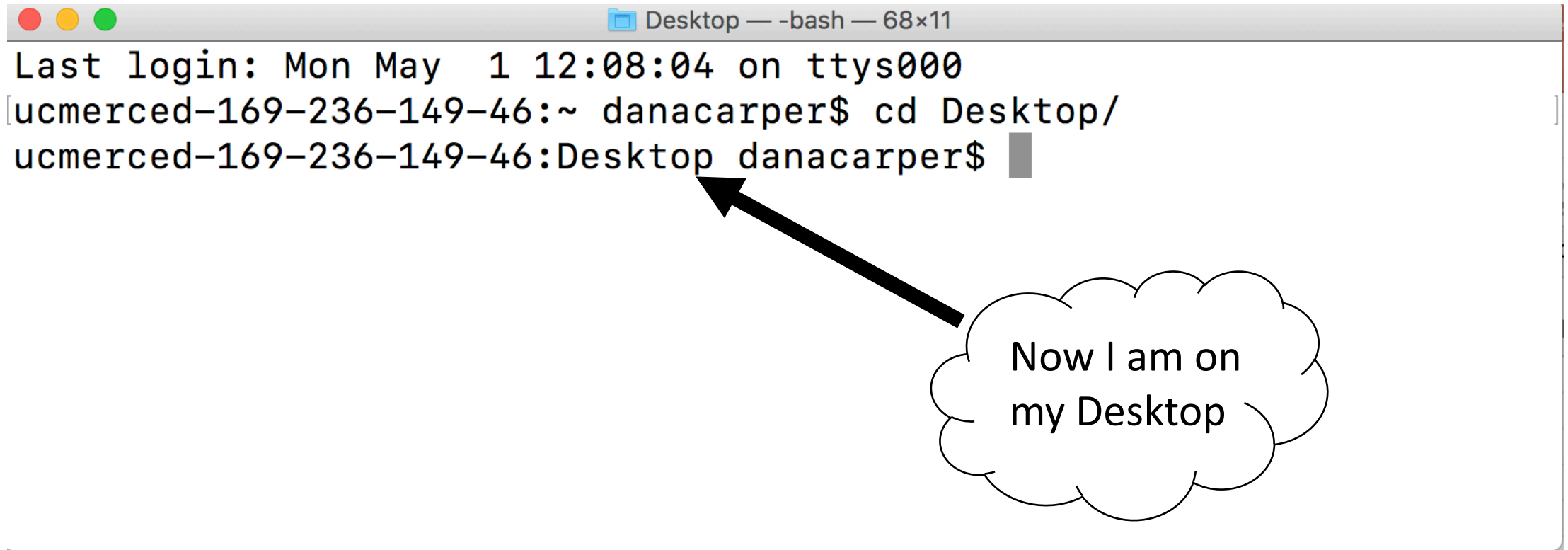
A terminal window with a title bar showing 'danacarper — -bash — 68x11'. The terminal text includes a login message and a command to change directories. A cursor is positioned at the end of the command. A cloud callout points to the slash in the command.

```
Last login: Mon May  1 12:08:04 on ttys000
ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
```

A slash
indicates it
is a folder

Which folder
I want to go
to

Moving to a different directory

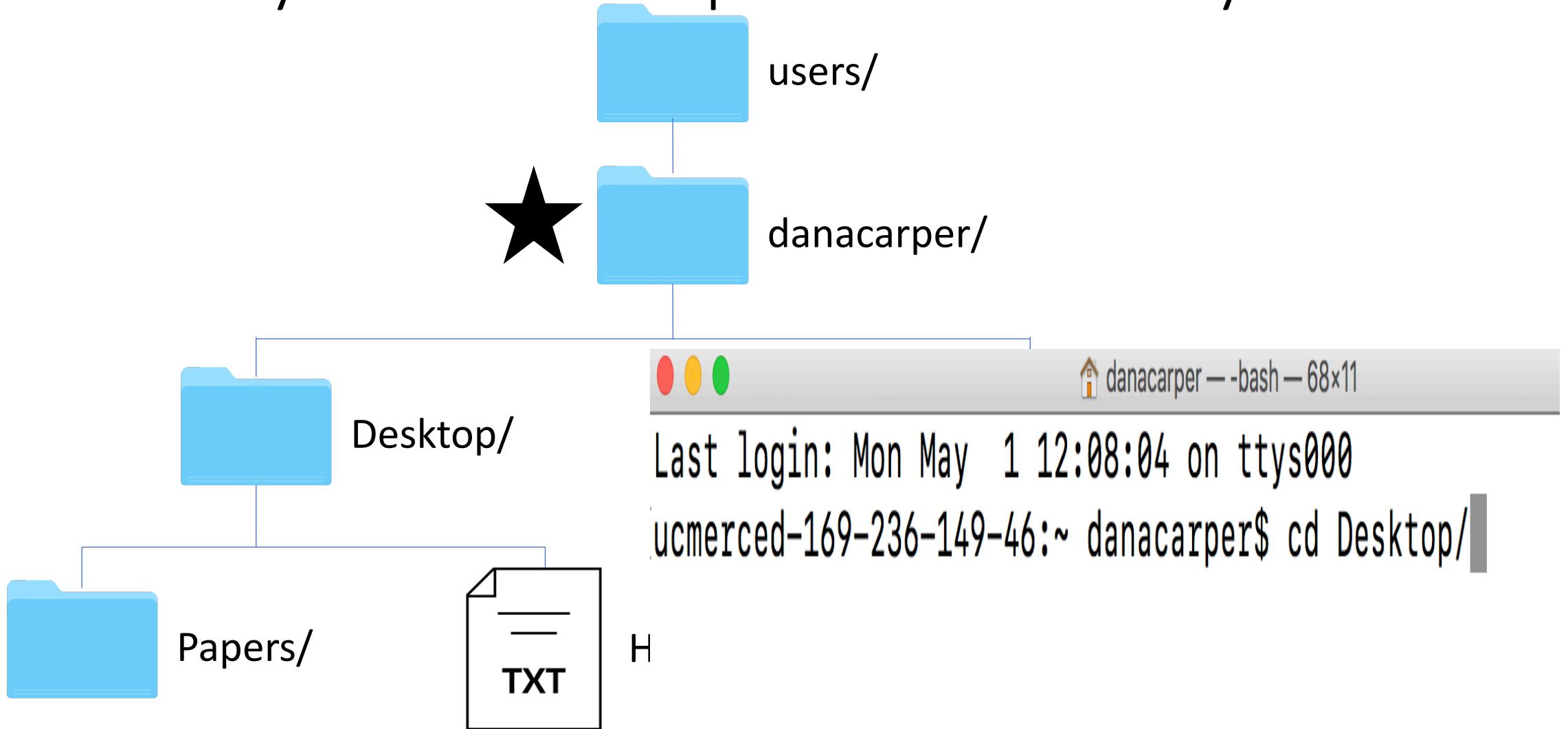


A terminal window titled "Desktop — -bash — 68x11" with standard macOS window controls (red, yellow, green buttons). The terminal output shows a login message and a directory change command. A black arrow points from a cloud-shaped callout bubble to the word "Desktop" in the prompt.

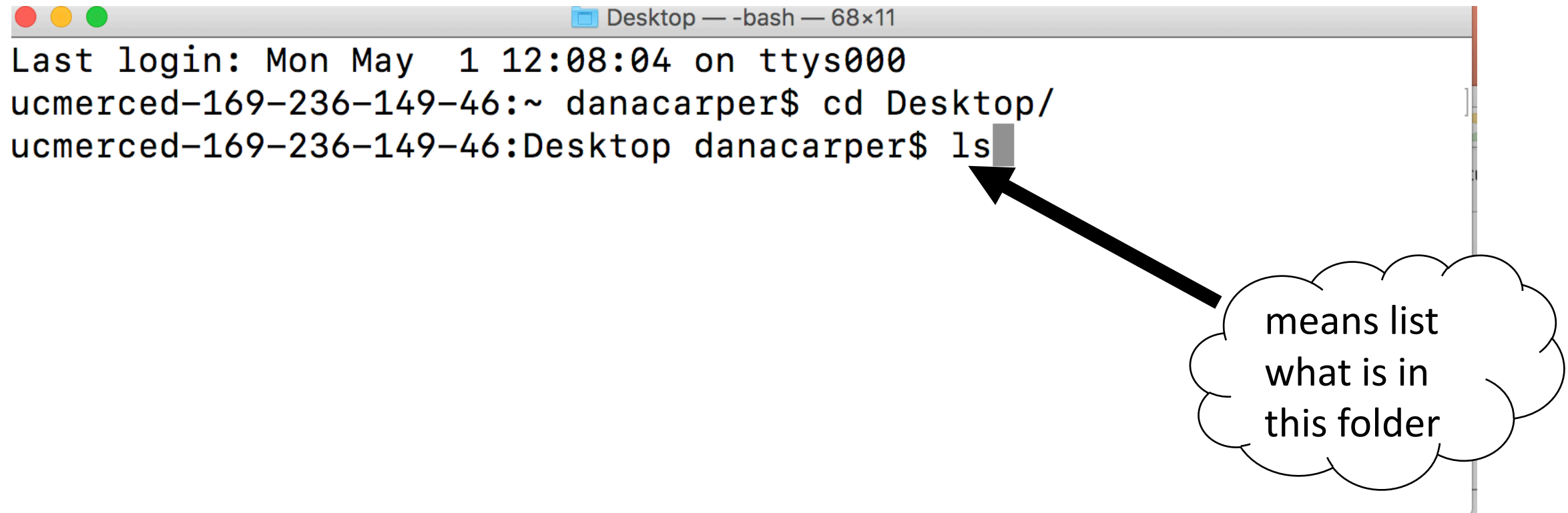
```
Last login: Mon May  1 12:08:04 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
ucmerced-169-236-149-46:Desktop danacarper$
```

Now I am on my Desktop

A file system is set up like a hierarchy



How do I know what is in a directory?



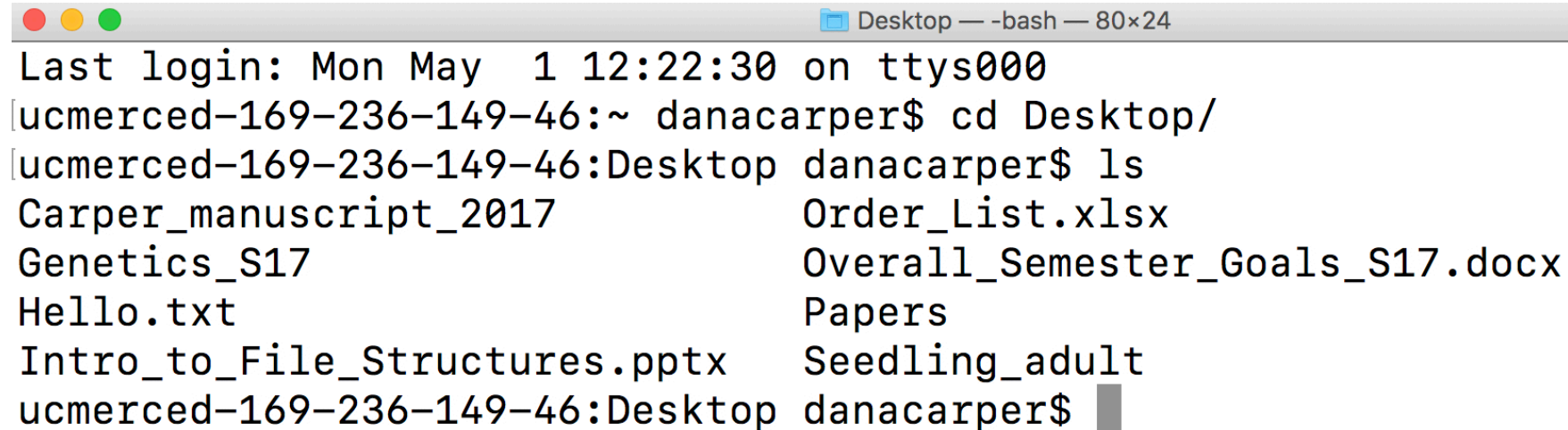
A terminal window titled "Desktop — -bash — 68x11" is shown. The window contains the following text:

```
Last login: Mon May  1 12:08:04 on ttys000
ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
ucmerced-169-236-149-46:Desktop danacarper$ ls
```

An arrow points from a thought bubble to the `ls` command in the terminal.

means list
what is in
this folder

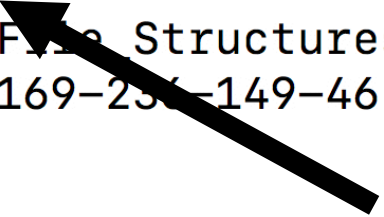
How do I know what is in a directory?

A terminal window titled "Desktop — -bash — 80x24" with three colored window control buttons (red, yellow, green) in the top-left corner. The terminal displays the following text:

```
Last login: Mon May  1 12:22:30 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
[ucmerced-169-236-149-46:Desktop danacarper$ ls
Carper_manuscript_2017      Order_List.xlsx
Genetics_S17               Overall_Semester_Goals_S17.docx
Hello.txt                  Papers
Intro_to_File_Structures.pptx  Seedling_adult
ucmerced-169-236-149-46:Desktop danacarper$
```

How do I look at a file?

```
Desktop — -bash — 80x24
Last login: Mon May  1 12:22:30 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
[ucmerced-169-236-149-46:Desktop danacarper$ ls
Carper_manuscript_2017      Order_List.xlsx
Genetics_S17                Overall_Semester_Goals_S17.docx
Hello.txt                  Papers
Intro_to_Fish_Structures.pptx  Seedling_adult
ucmerced-169-236-149-46:Desktop danacarper$ █
```



I want to
look at this
file

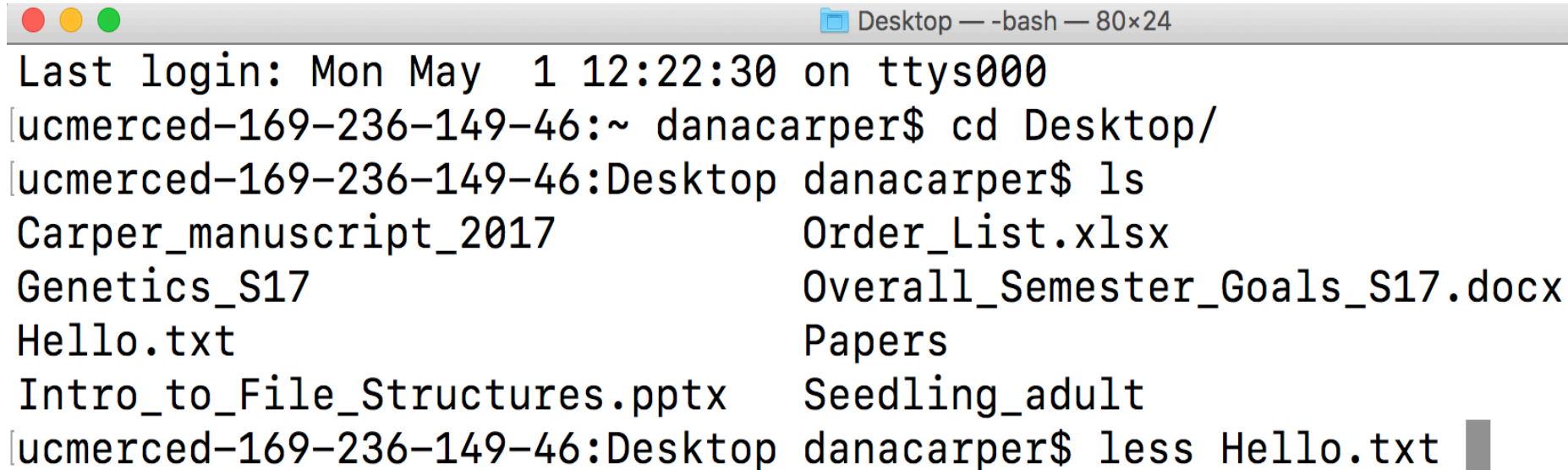
How do I look at a file?

```
Desktop — -bash — 80x24
Last login: Mon May  1 12:22:30 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
[ucmerced-169-236-149-46:Desktop danacarper$ ls
Carper_manuscript_2017      Order_List.xlsx
Genetics_S17               Overall_Semester_Goals_S17.docx
Hello.txt                  Papers
Intro_to_File_Structures.pptx Seedling_adult
[ucmerced-169-236-149-46:Desktop danacarper$ less Hello.txt █
```

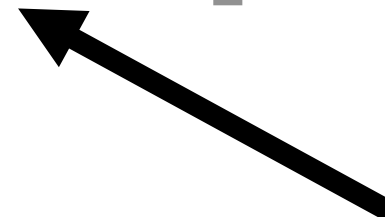


Means view

How do I look at a file?

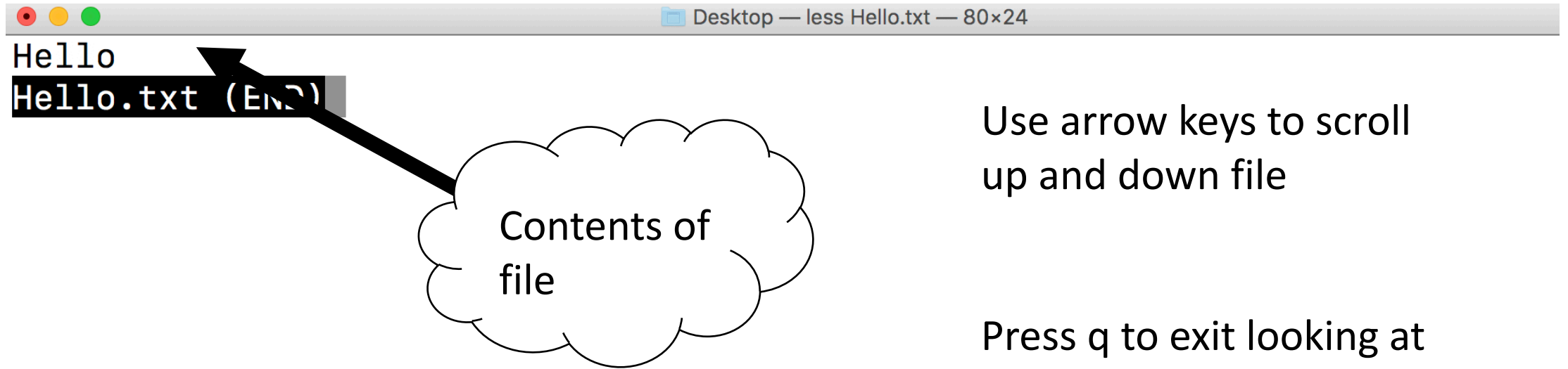


```
Desktop — -bash — 80x24
Last login: Mon May  1 12:22:30 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
[ucmerced-169-236-149-46:Desktop danacarper$ ls
Carper_manuscript_2017      Order_List.xlsx
Genetics_S17               Overall_Semester_Goals_S17.docx
Hello.txt                  Papers
Intro_to_File_Structures.pptx  Seedling_adult
[ucmerced-169-236-149-46:Desktop danacarper$ less Hello.txt
```



The filename
with extension
(.txt)

How do I look at a file?



Use arrow keys to scroll
up and down file

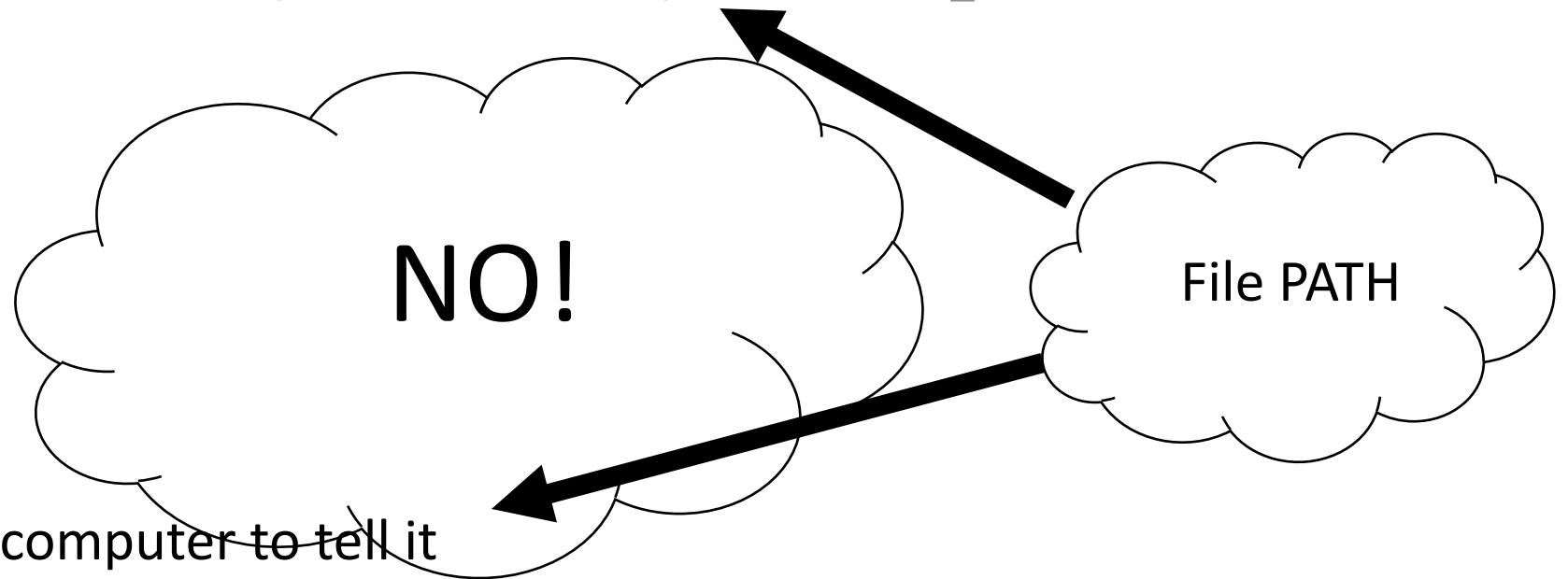
Press q to exit looking at
the file

Do I have to be in the same folder as the file to look at it?

danacarper — -bash — 93x23

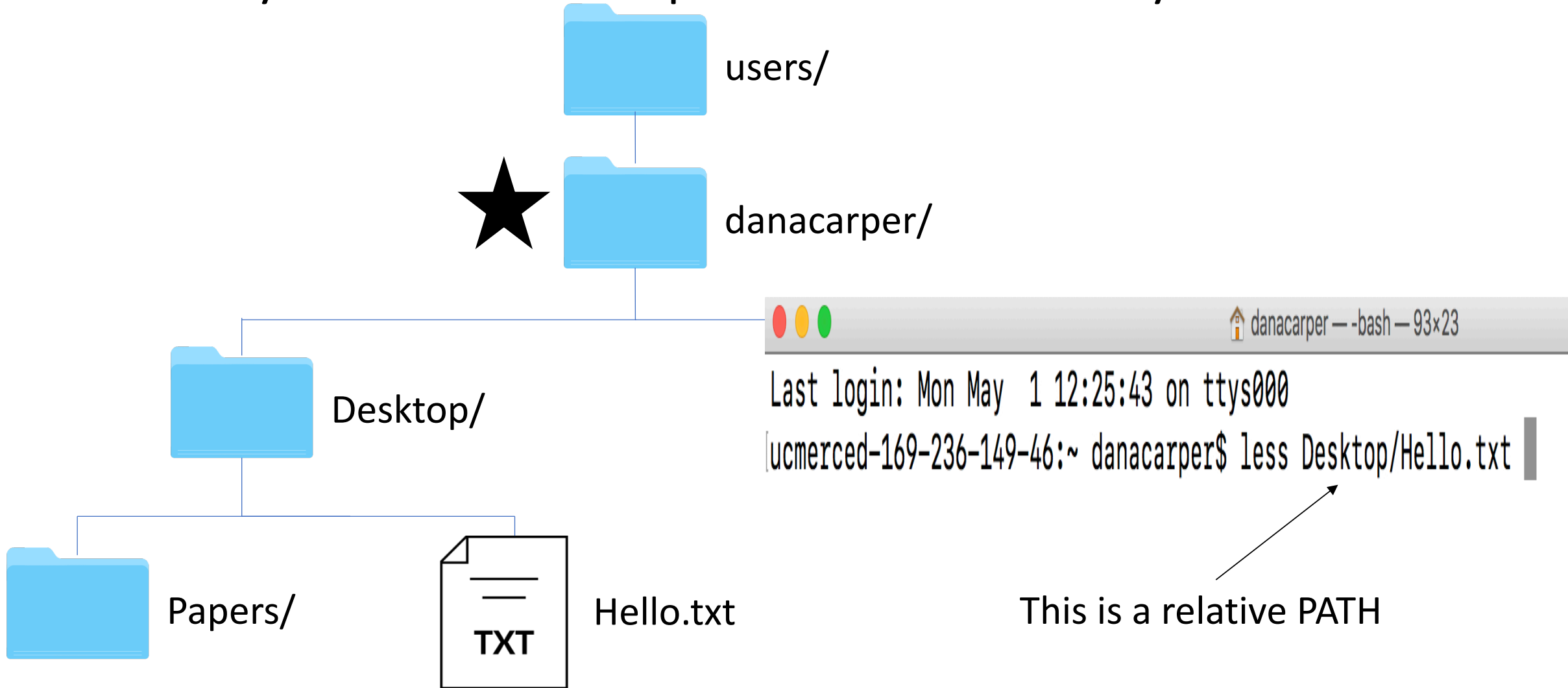
Last login: Mon May 1 12:25:43 on ttys000

ucmerced-169-236-149-46:~ danacarper\$ less Desktop/Hello.txt

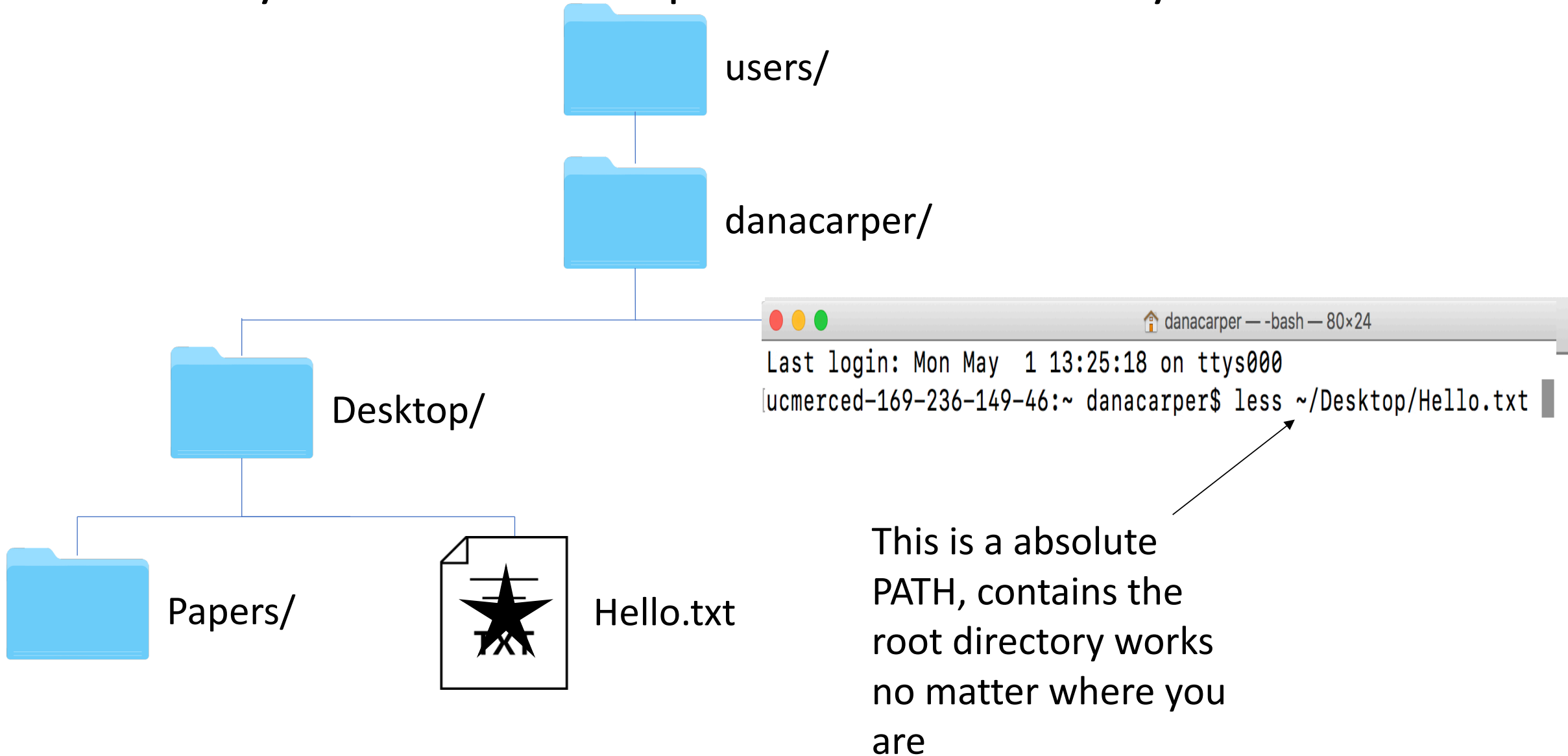


Directions for the computer to tell it
where the file is

A file system is set up like a hierarchy



A file system is set up like a hierarchy



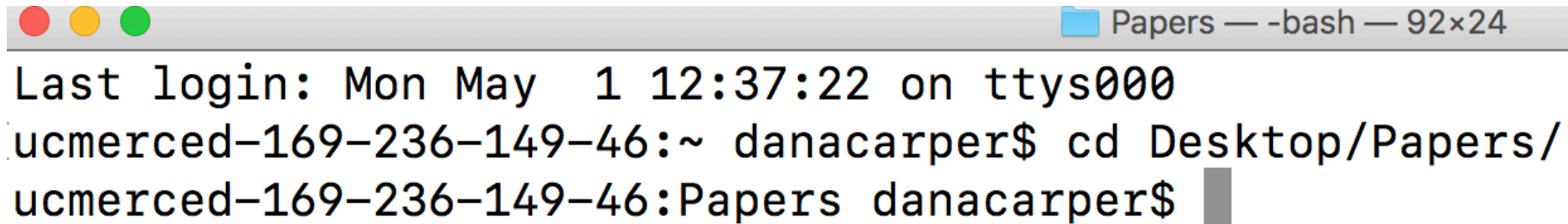
Absolute PATH

```
danacarper — -bash — 80x24
Last login: Mon May  1 13:25:18 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ less ~/Desktop/Hello.txt
```

~ = HOME
(danacarper/)



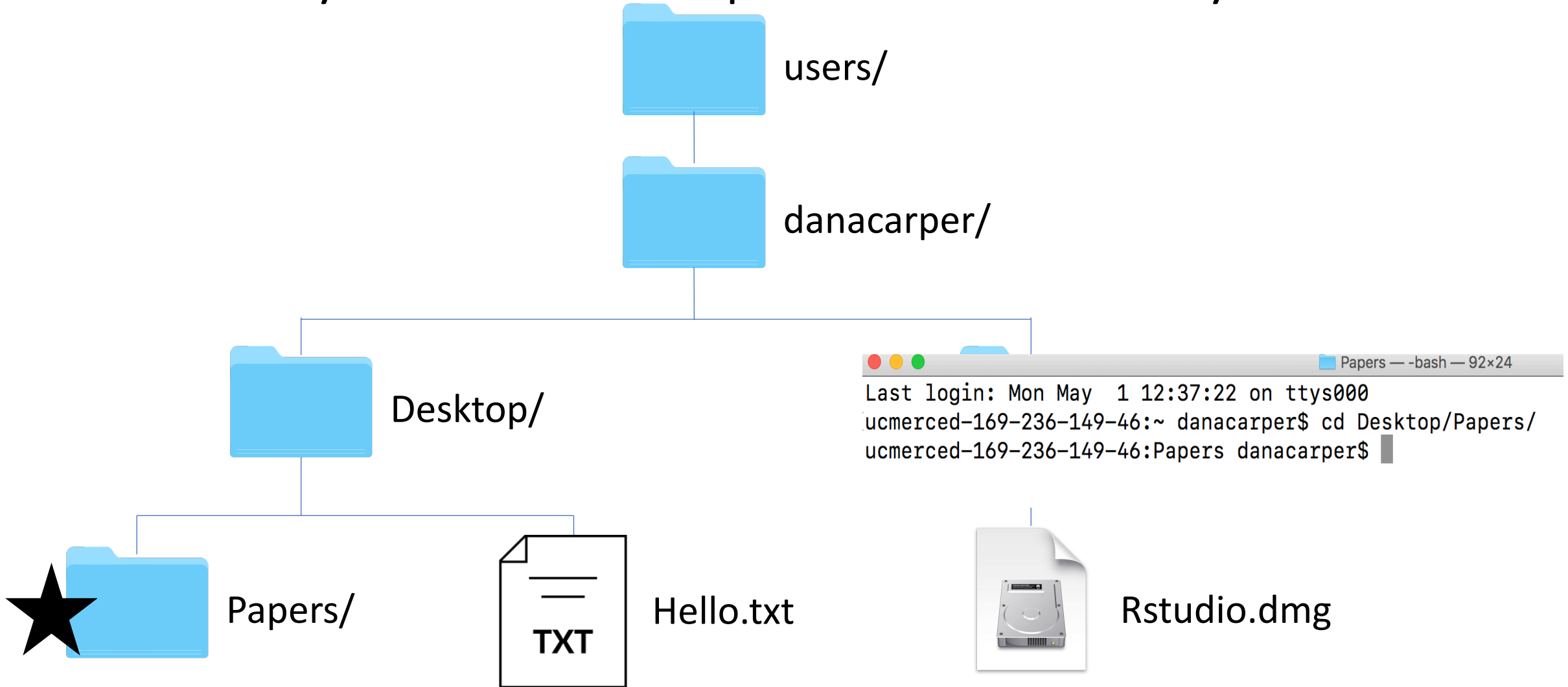
Giving the PATH works for other commands too!



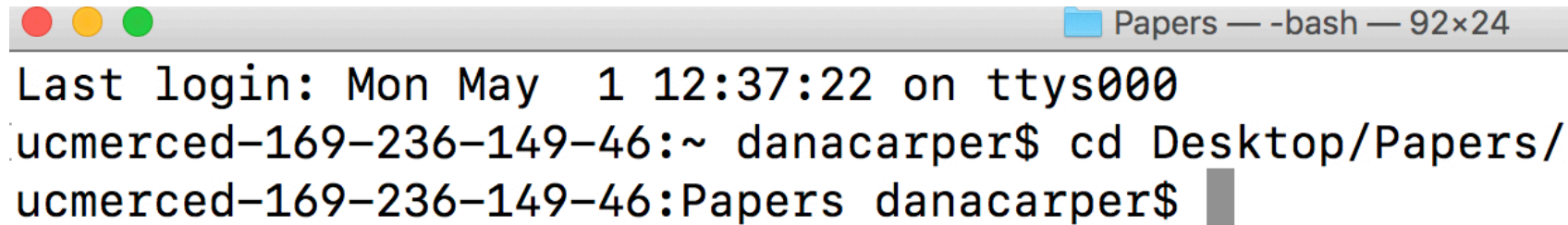
A terminal window titled "Papers — -bash — 92x24" with standard macOS window controls (red, yellow, green buttons). The terminal output shows a login message and a directory change command. A black arrow points to the word "Papers" in the second line of the output.

```
Last login: Mon May  1 12:37:22 on ttys000
ucmerced-169-236-149-46:~ danacarper$ cd Desktop/Papers/
ucmerced-169-236-149-46:Papers danacarper$
```


A file system is set up like a hierarchy



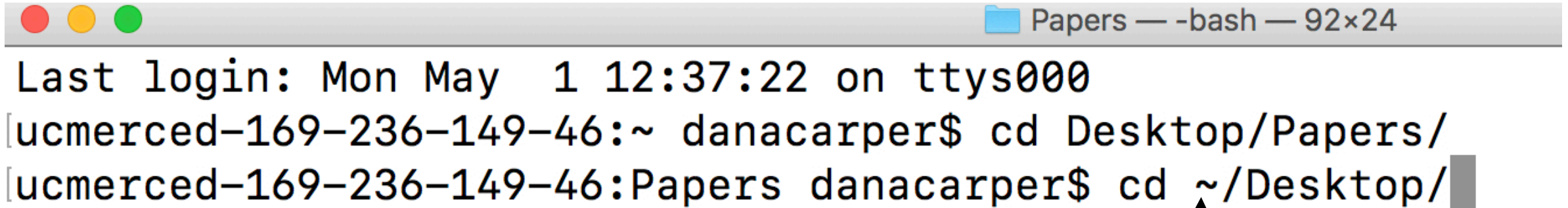
Oops I went too far I meant to be on the desktop, How do I go back?



A terminal window titled "Papers" with a window size of 92x24. The window has three colored window control buttons (red, yellow, green) in the top-left corner. The terminal text shows a login message and a directory change command.

```
Last login: Mon May  1 12:37:22 on ttys000
ucmerced-169-236-149-46:~ danacarper$ cd Desktop/Papers/
ucmerced-169-236-149-46:Papers danacarper$
```

Multiple ways to go back

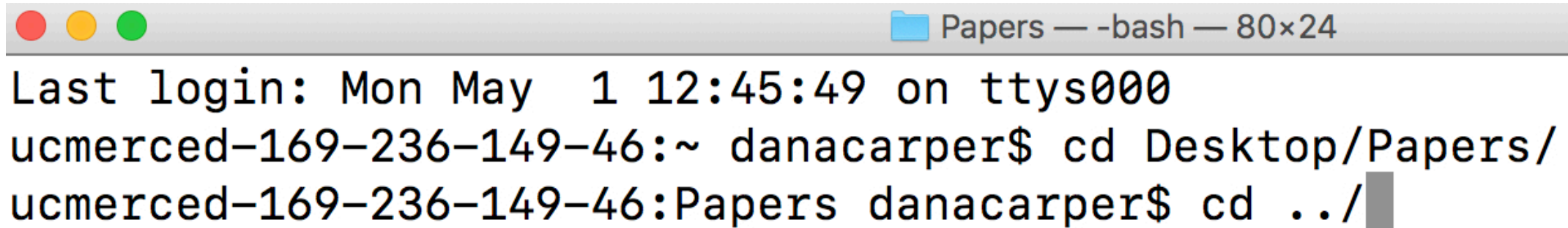
A screenshot of a macOS terminal window. The title bar at the top shows three colored window control buttons (red, yellow, green) on the left and a folder icon followed by the text 'Papers — -bash — 92x24' on the right. The terminal content shows a login message and two command-line prompts. The first prompt is '[ucmerced-169-236-149-46:~ danacarper\$ cd Desktop/Papers/' and the second is '[ucmerced-169-236-149-46:Papers danacarper\$ cd ~/Desktop/'.

```

Last login: Mon May  1 12:37:22 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/Papers/
[ucmerced-169-236-149-46:Papers danacarper$ cd ~/Desktop/
```

Means Home
(danacarper/)

Multiple ways to go back



A terminal window titled "Papers — -bash — 80x24" with three colored window control buttons (red, yellow, green) on the left. The terminal output shows a login message and two directory change commands. The first command moves from the home directory to "Desktop/Papers/". The second command moves from "Papers" to its parent directory using the relative path "..". A black arrow points from the text below to the ".." in the second command.

```
Last login: Mon May  1 12:45:49 on ttys000
ucmerced-169-236-149-46:~ danacarper$ cd Desktop/Papers/
ucmerced-169-236-149-46:Papers danacarper$ cd ../
```

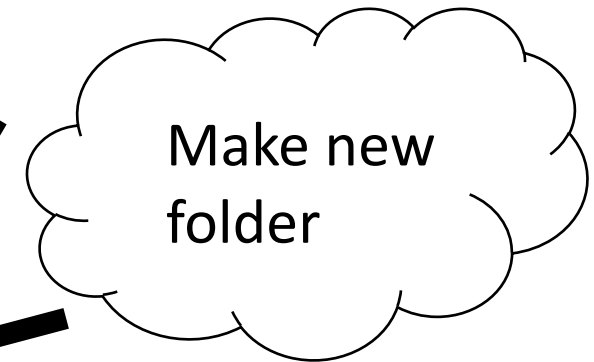
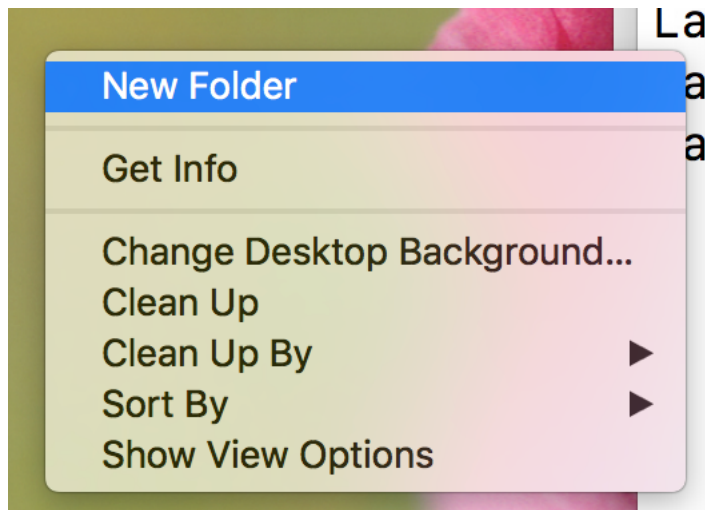
Means go back
one folder

Now that we have navigated
directories

How do we create a new directory?

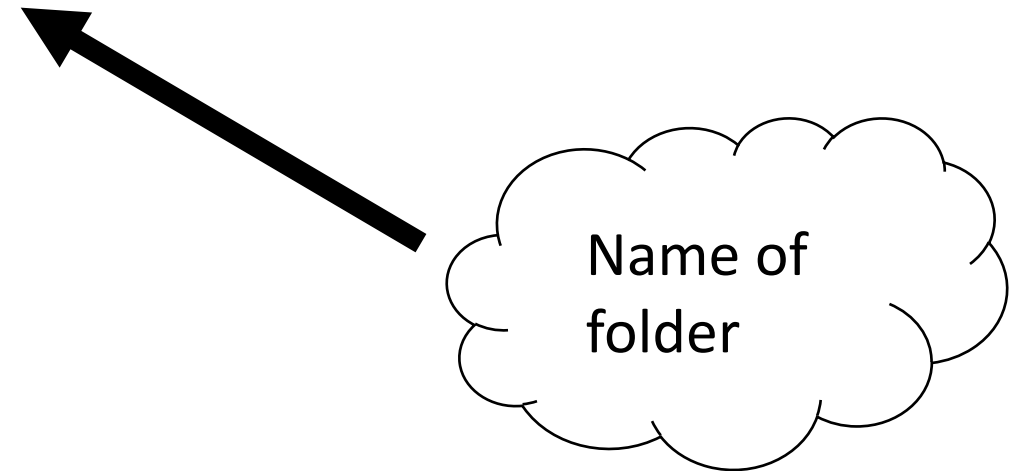
```
Desktop — -bash — 80x24
Last login: Mon May  1 12:55:46 on ttys000
[Danas-MacBook-Pro:~ danacarper$ cd Desktop/
[Danas-MacBook-Pro:Desktop danacarper$ mkdir BOTANY2017]
```

The same a
right clicking
to make a
new folder

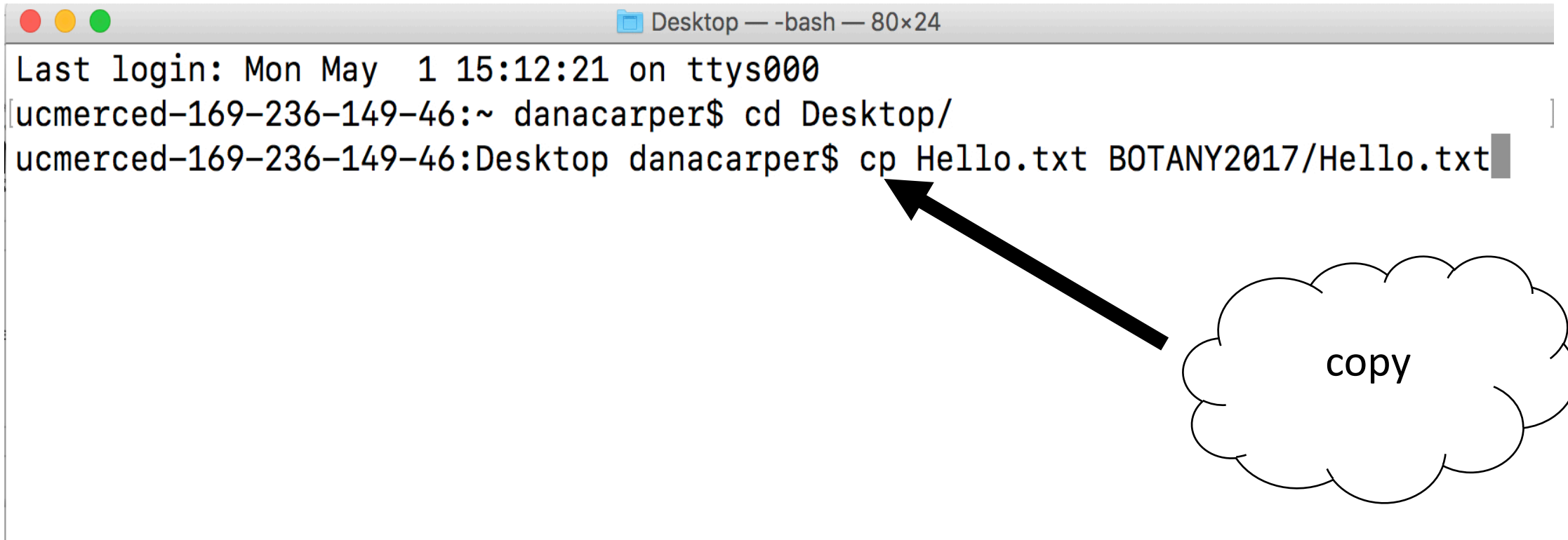


How do we create a new directory?

```
Desktop — -bash — 80x24
Last login: Mon May  1 12:55:46 on ttys000
[Danas-MacBook-Pro:~ danacarper$ cd Desktop/
[Danas-MacBook-Pro:Desktop danacarper$ mkdir BOTANY2017
```



How do we copy a file to that new folder?

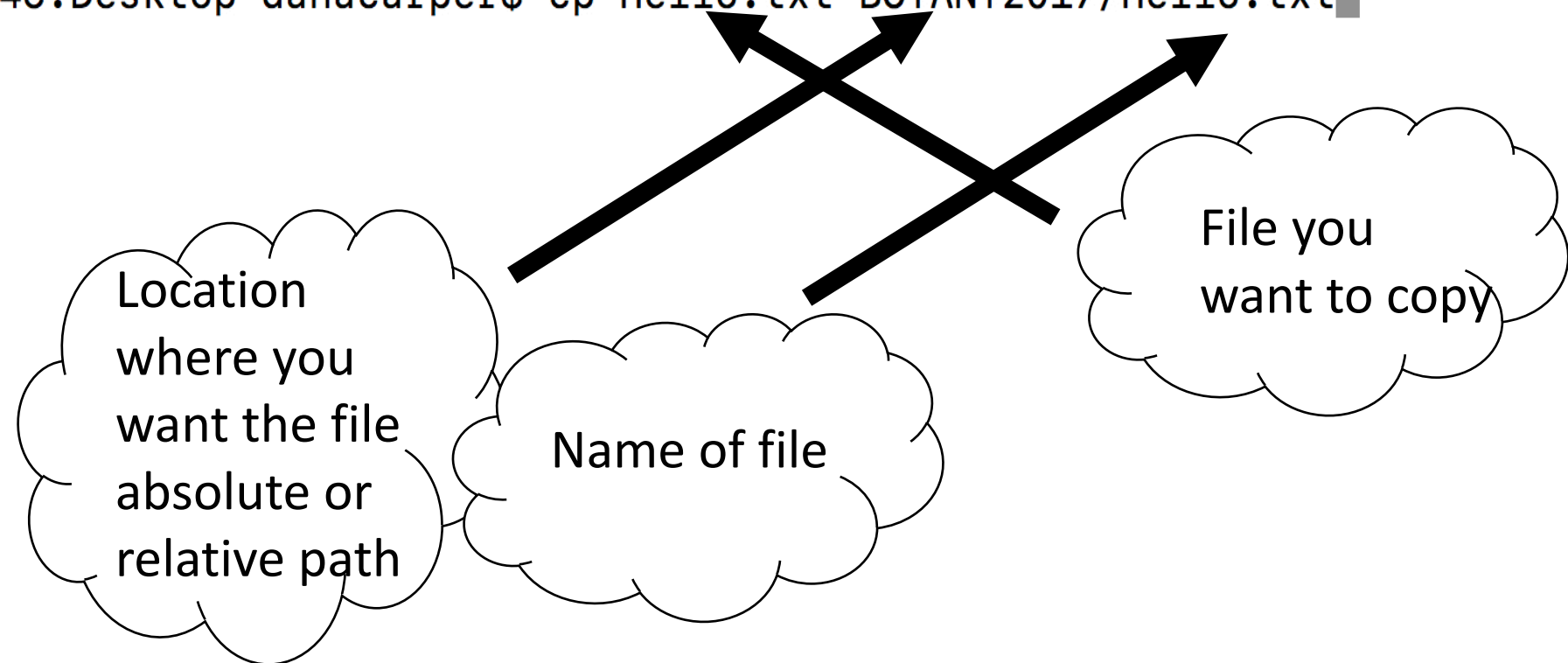


```
Desktop — -bash — 80x24
Last login: Mon May  1 15:12:21 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
ucmerced-169-236-149-46:Desktop danacarper$ cp Hello.txt BOTANY2017/Hello.txt
```

A diagram illustrating the copy command. A cloud shape labeled "copy" has an arrow pointing to the "cp" command in the terminal output.

How do we copy a file to that new folder?

```
Desktop — -bash — 80x24
Last login: Mon May  1 15:12:21 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
ucmerced-169-236-149-46:Desktop danacarper$ cp Hello.txt BOTANY2017/Hello.txt
```



What if we want to delete a file?

```
Desktop — -bash — 80x24
Last login: Mon May  1 15:13:12 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/
[ucmerced-169-236-149-46:Desktop danacarper$ rm BOTANY2017/Hello.txt
```

THIS CAN NOT BE UNDONE!!!!

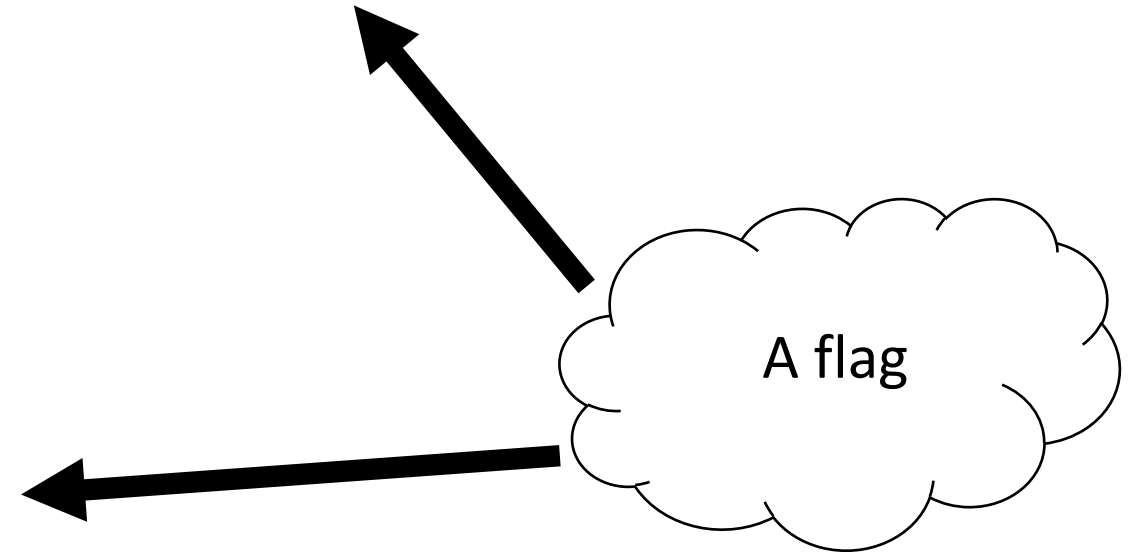


Remove or
delete

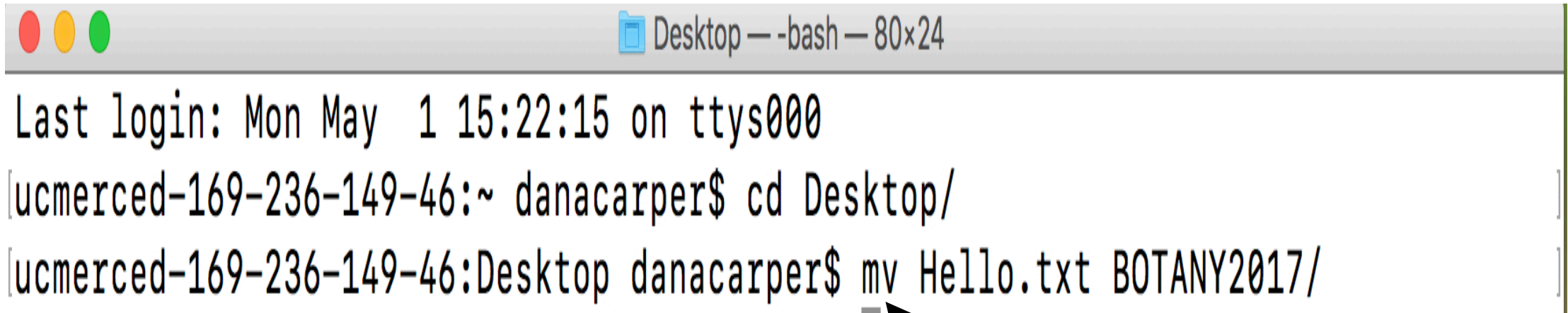
What if we want to delete a file and a folder?

```
Desktop — -bash — 80x24  
Last login: Mon May  1 15:22:15 on ttys000  
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/  
[ucmerced-169-236-149-46:Desktop danacarper$ rm -R BOTANY2017/
```

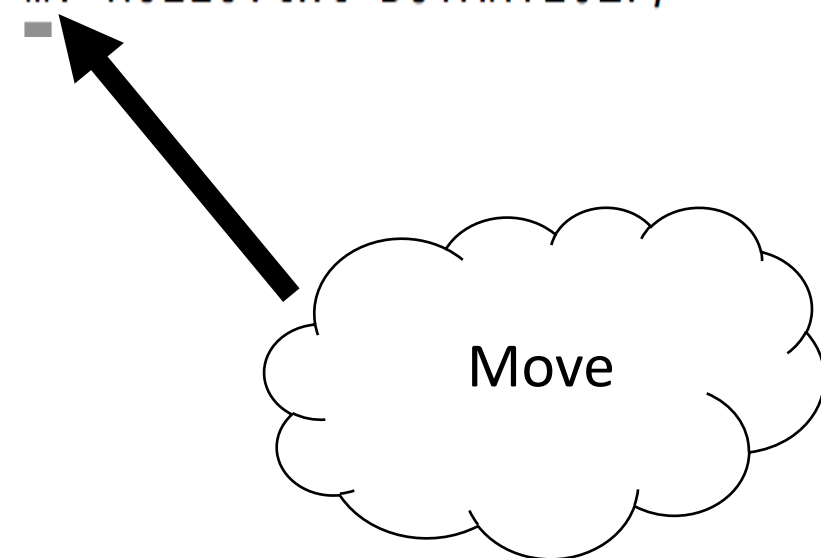
This is an option for a command



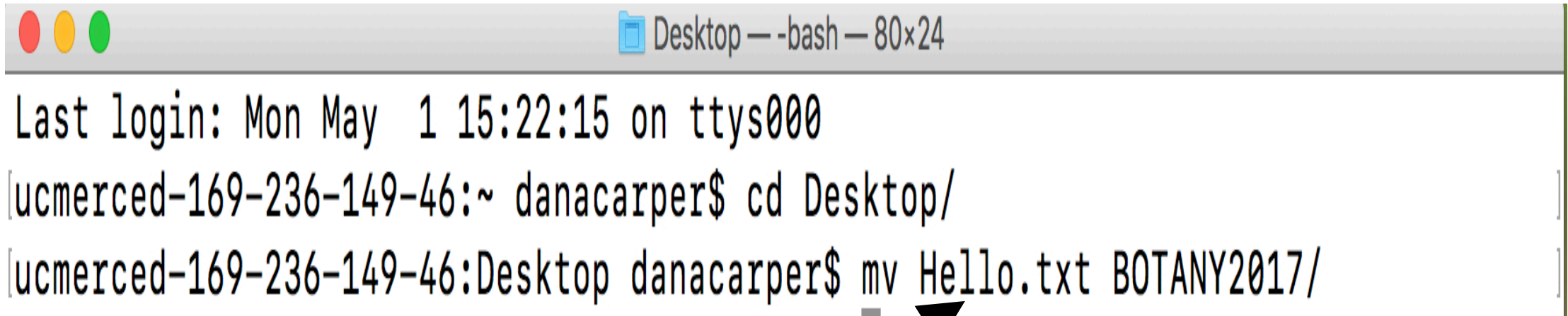
What if we want to move a file instead of copying it?



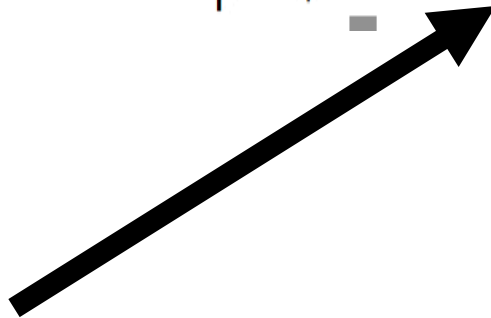
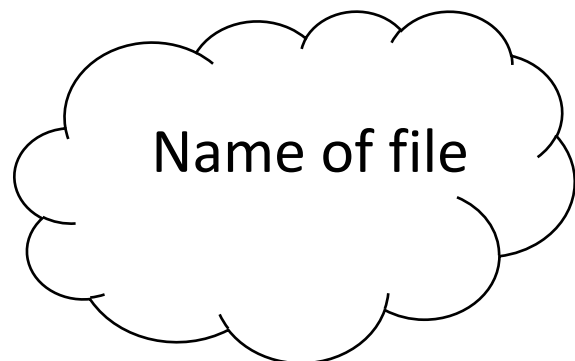
```
Desktop — -bash — 80x24  
Last login: Mon May  1 15:22:15 on ttys000  
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/  
[ucmerced-169-236-149-46:Desktop danacarper$ mv Hello.txt BOTANY2017/
```



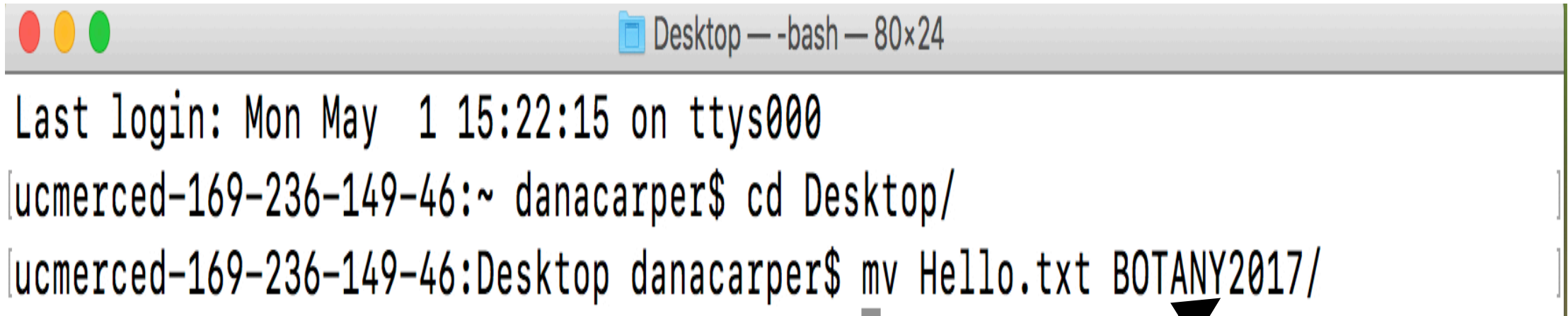
What if we want to move a file instead of copying it?



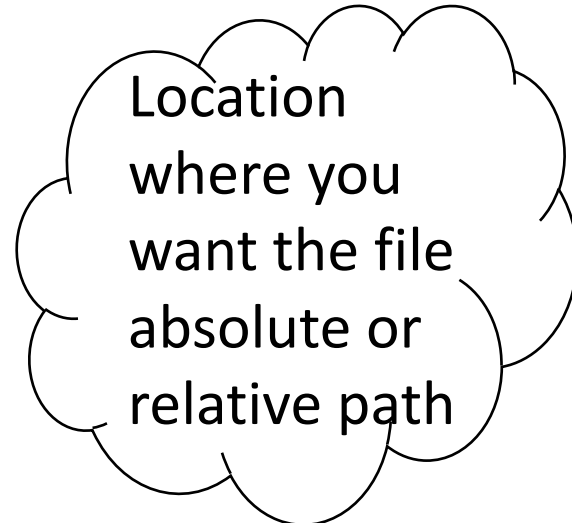
```
Desktop — -bash — 80x24  
Last login: Mon May  1 15:22:15 on ttys000  
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/  
[ucmerced-169-236-149-46:Desktop danacarper$ mv Hello.txt BOTANY2017/
```



What if we want to move a file instead of copying it?



```
Desktop — -bash — 80x24  
Last login: Mon May  1 15:22:15 on ttys000  
[ucmerced-169-236-149-46:~ danacarper$ cd Desktop/  
[ucmerced-169-236-149-46:Desktop danacarper$ mv Hello.txt BOTANY2017/
```



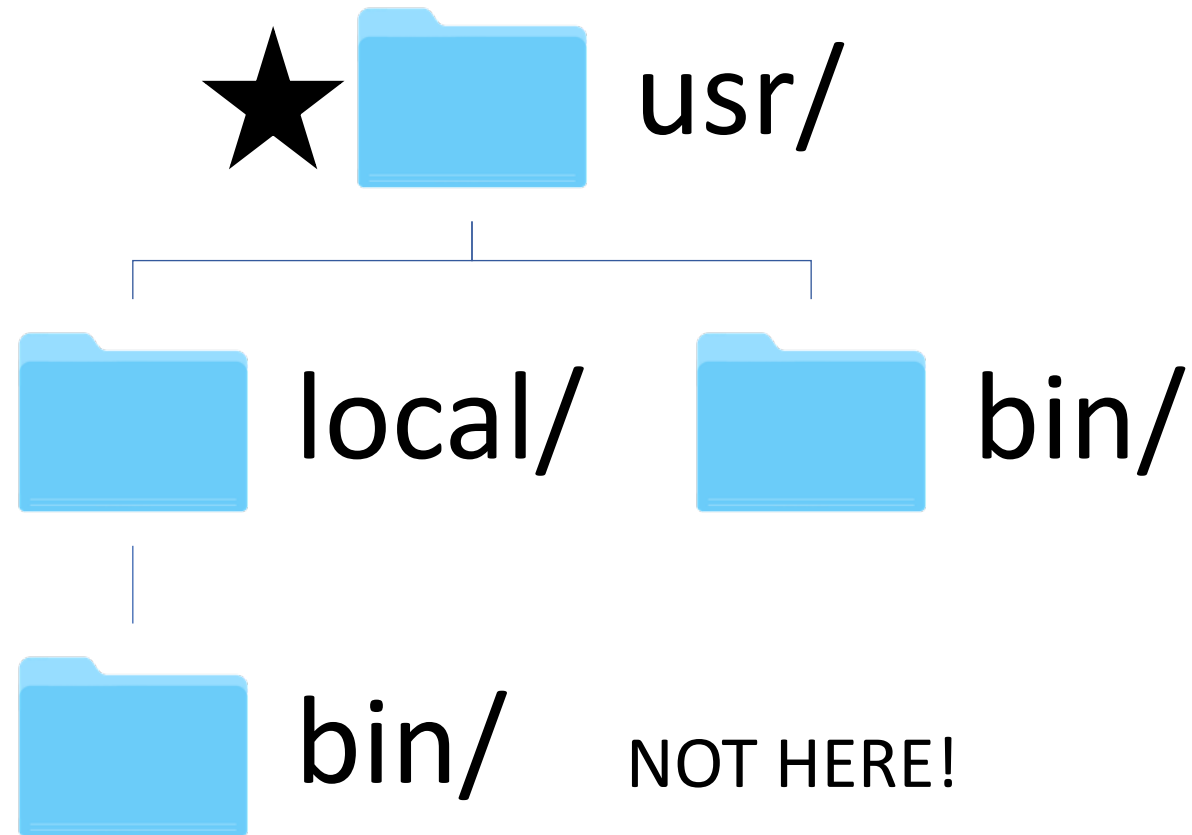
UNIX Ideas: PATH

How does the computer know commands?

- Computers need to know where to look for commands or new functions
- If you add a new function or command:
 - To be able to use it no matter what folder you are in it has to be in your \$PATH
 - A \$PATH is a list of folders the computer checks for a command or function
- Example \$PATH:
 - /usr/local/bin:/usr/local:/usr/bin
 - What does this mean?

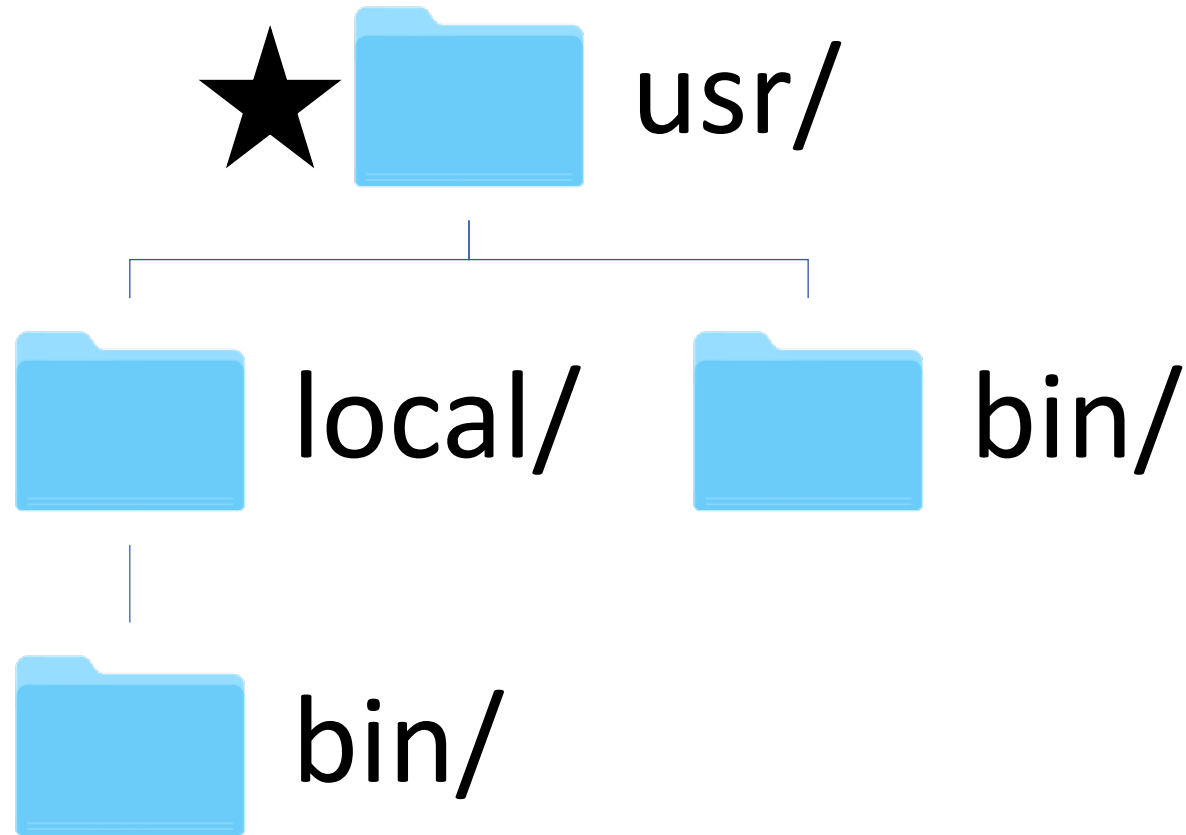
Example \$PATH:

/usr/local/bin:/usr/local:/usr/bin



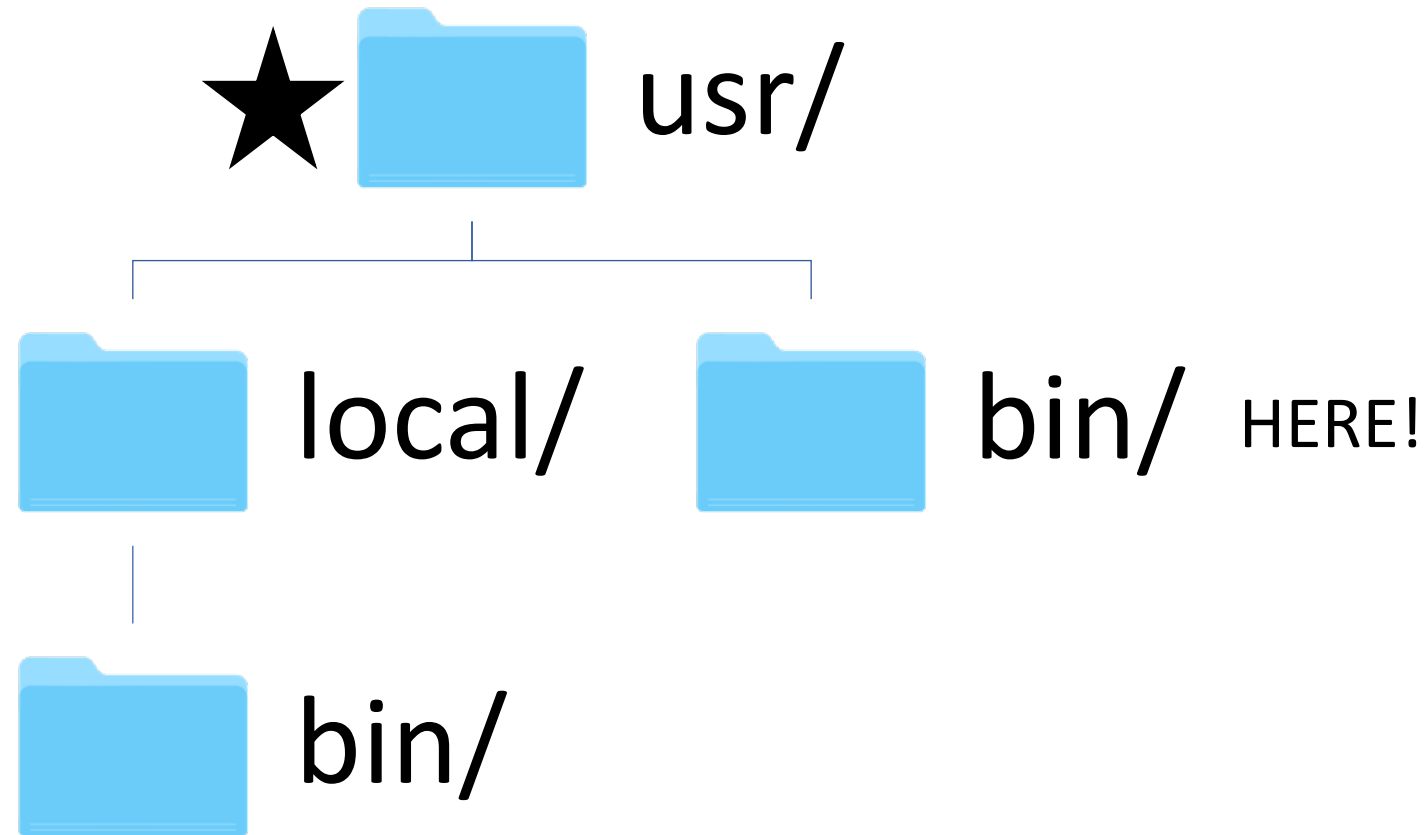
Example \$PATH:
/usr/local/bin:/usr/local:/usr/bin

NOT HERE!

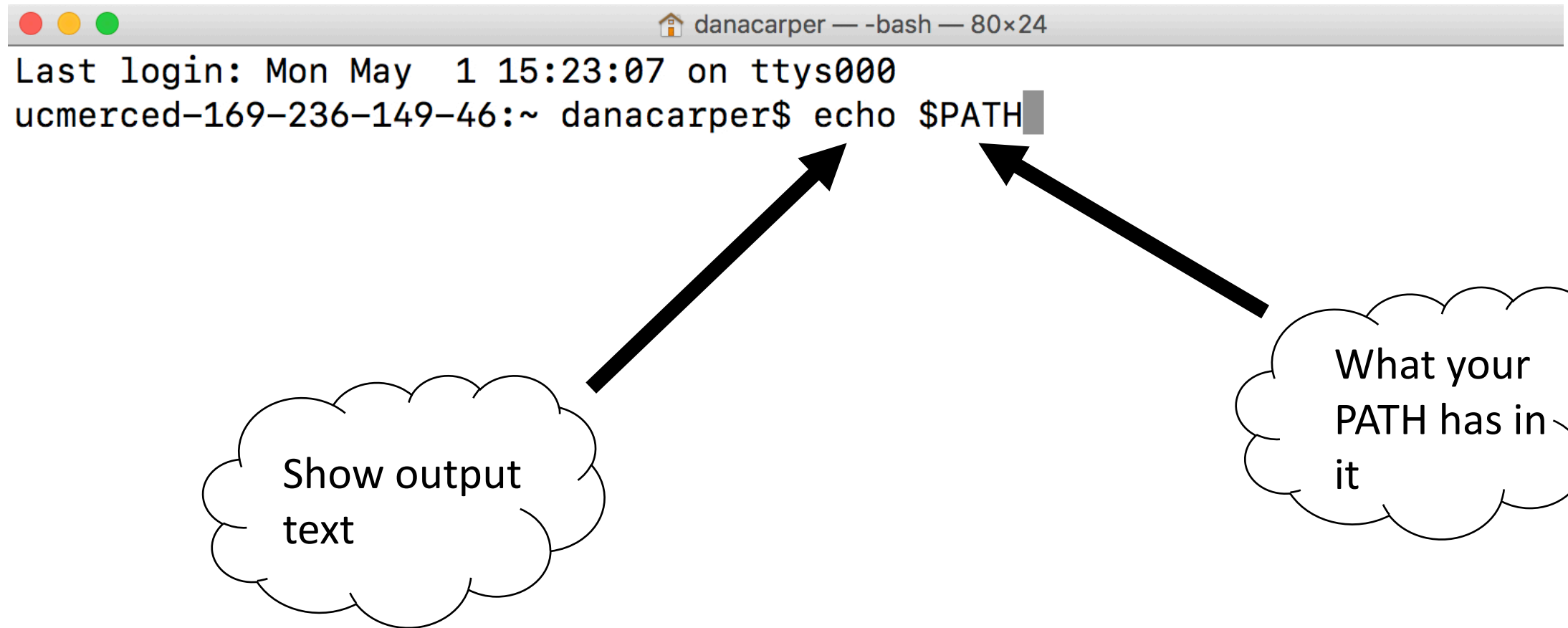


Example \$PATH:

/usr/local/bin:/usr/local:/usr/bin



Displaying your PATH



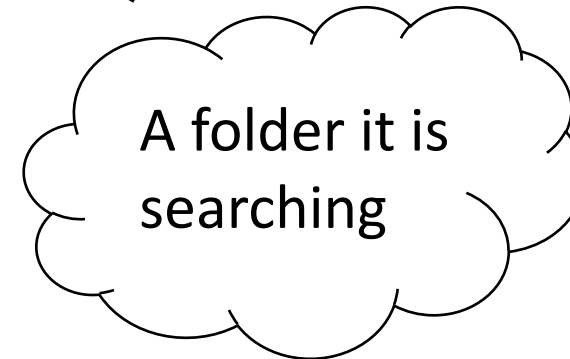
Displaying your PATH

```
Last login: Mon May  1 15:23:07 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ echo $PATH
/Users/danacarper/perl5/perlbrew/bin:/Users/danacarper/perl5/perlbrew/perls/perl
-5.22.0/bin:/usr/local/bin:/usr/bin:/bin:/usr/sbin:/sbin:/opt/X11/bin:/Users/dan
acarper/Bin
ucmerced-169-236-149-46:~ danacarper$
```

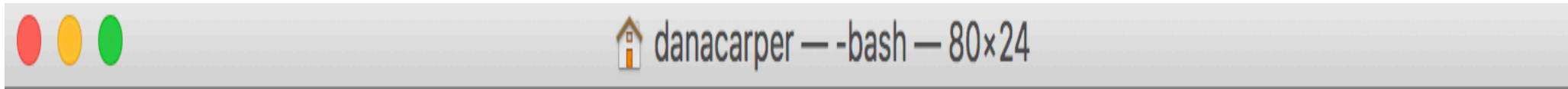
Output is a list of folders that it will search for commands, separated by :

Displaying your PATH

```
danacarper — -bash — 80x24
Last login: Mon May  1 15:23:07 on ttys000
ucmerced-169-236-149-46:~ danacarper$ echo $PATH
/Users/danacarper/perl5/perlbrew/bin:/Users/danacarper/perl5/perlbrew/perls/perl
-5.22.0/bin:/usr/local/bin:/usr/bin:/bin:/usr/sbin:/sbin:/opt/X11/bin:/Users/dan
acarper/Bin
ucmerced-169-236-149-46:~ danacarper$
```

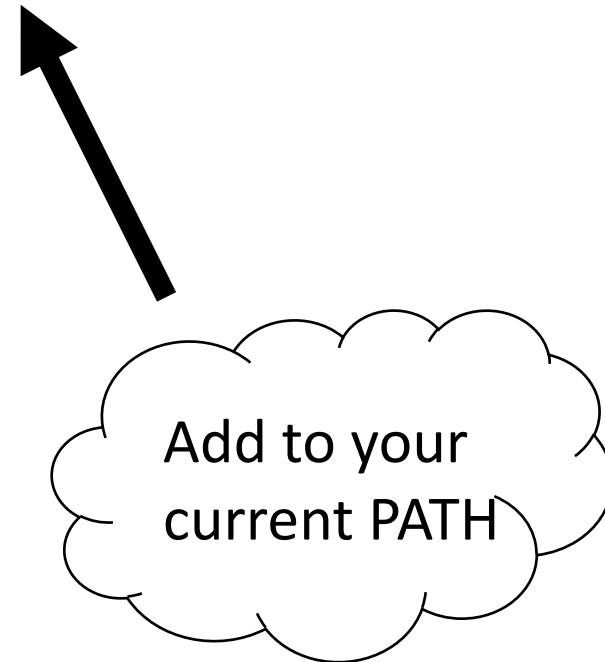


I have a new folder I want in my path

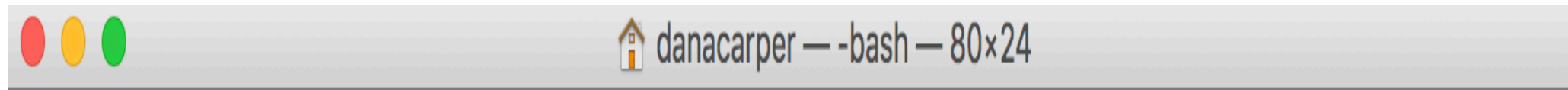


Last login: Mon May 1 16:19:52 on ttys001

ucmerced-169-236-149-46:~ danacarper\$ export PATH=\$PATH:/new/folder

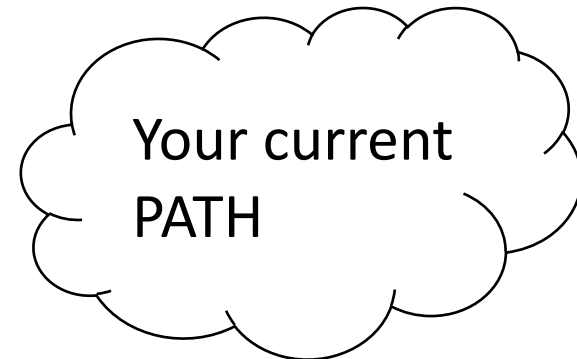
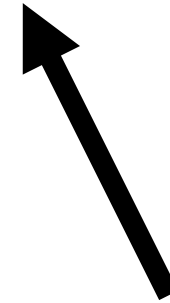


I have a new folder I want in my path

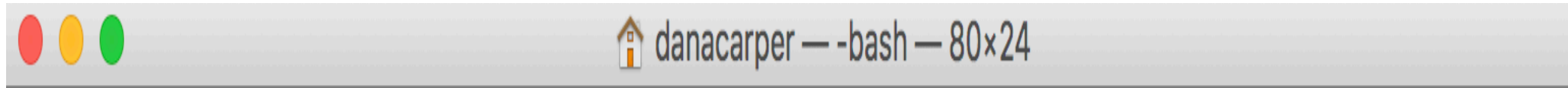


Last login: Mon May 1 16:19:52 on ttys001

ucmerced-169-236-149-46:~ danacarper\$ export PATH=\$PATH:/new/folder

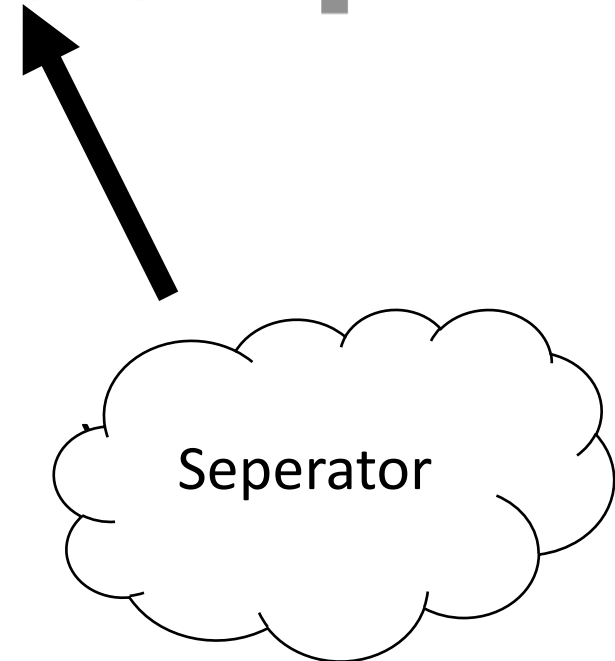


I have a new folder I want in my path

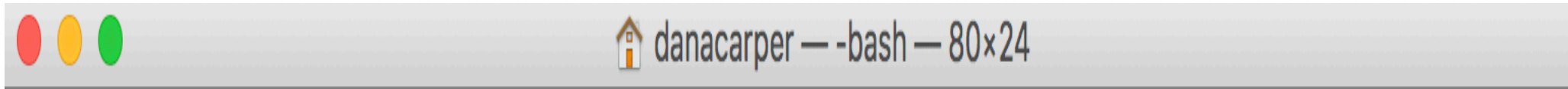


Last login: Mon May 1 16:19:52 on ttys001

ucmerced-169-236-149-46:~ danacarper\$ export PATH=\$PATH:/new/folder

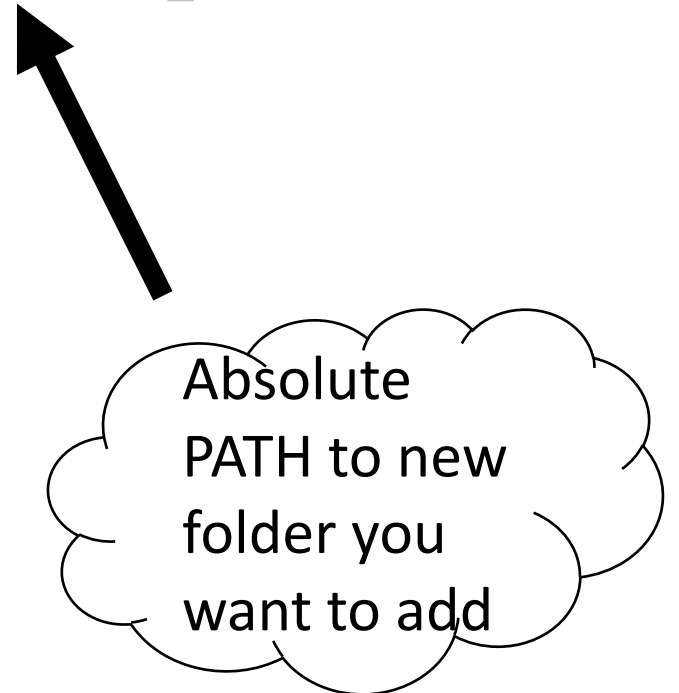


I have a new folder I want in my path

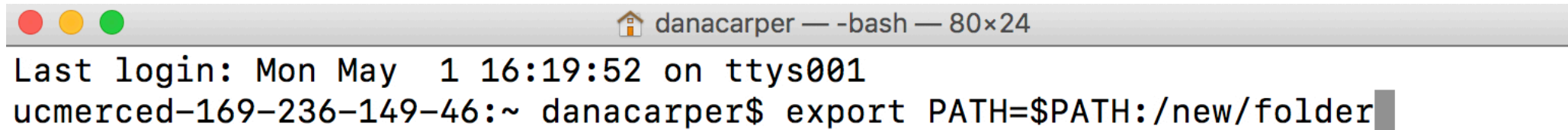


Last login: Mon May 1 16:19:52 on ttys001

ucmerced-169-236-149-46:~ danacarper\$ export PATH=\$PATH:/new/folder



Export \$PATH is not permanent

A screenshot of a macOS terminal window. The title bar at the top shows three colored window control buttons (red, yellow, green) on the left, and a home icon followed by the text 'danacarper — -bash — 80x24' on the right. The terminal content shows a login message: 'Last login: Mon May 1 16:19:52 on ttys001'. Below that, the prompt 'ucmerced-169-236-149-46:~ danacarper\$' is followed by the command 'export PATH=\$PATH:/new/folder' which has been entered and is followed by a black cursor block.

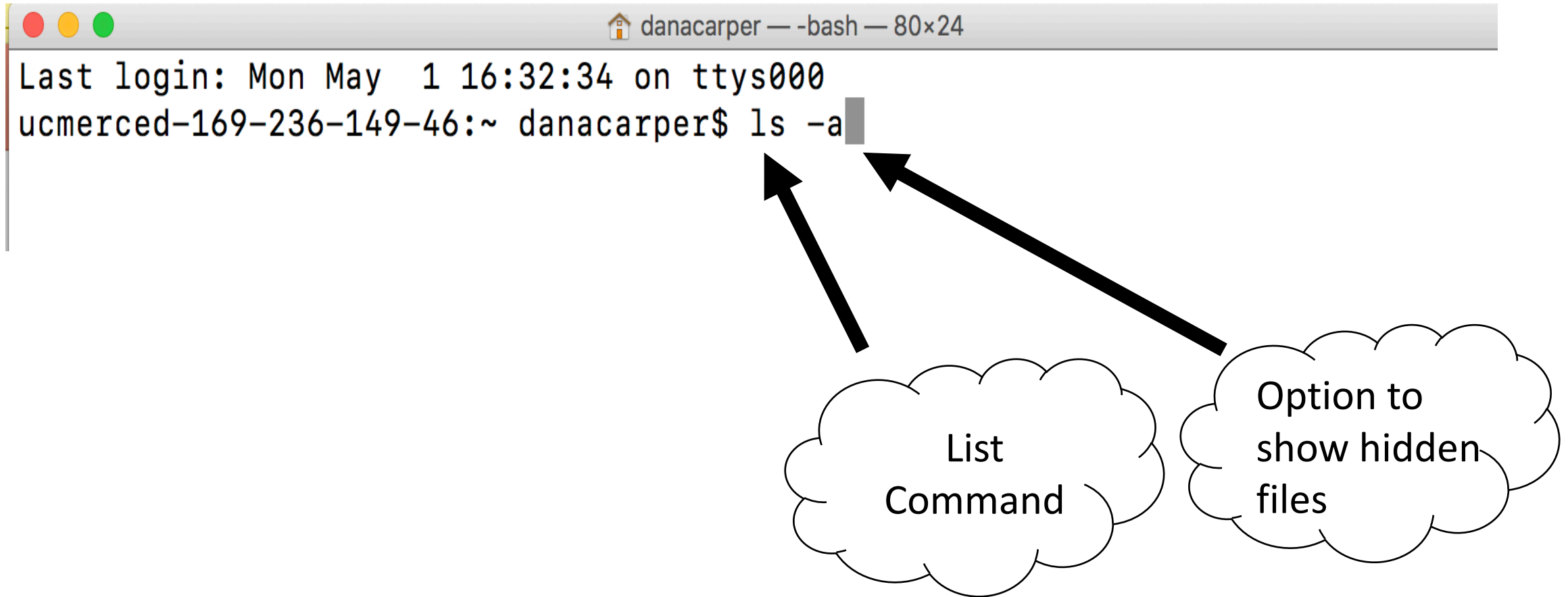
```
Last login: Mon May 1 16:19:52 on ttys001
ucmerced-169-236-149-46:~ danacarper$ export PATH=$PATH:/new/folder
```

This is only saved until you exit the terminal, when you re-open the terminal the new folder wont be a part of your PATH

How to permanently change your PATH

- Need to change `.bash_profile`
- A file containing your PATH
- Where is it? I have never seen a file named this!

Showing hidden files



Showing hidden files

```
danacarper — -bash — 80x24
Last login: Mon May  1 16:32:34 on ttys000
ucmerced-169-236-149-46:~ danacarper$ ls -a
.                .cups            Desktop
..              .dropbox         Documents
.CFUserTextEncoding .local          Downloads
.DS_Store       .matplotlib      Dropbox
.Rapp.history   .perlbrew        Library
.Rhistory       .python_history  Movies
.Trash          .rstudio-desktop Music
.bash_history   .subversion      Pictures
.bash_profile   Applications     Public
.bash_sessions Bin              perl5
.config         Creative Cloud Files
.cpan           Databases
ucmerced-169-236-149-46:~ danacarper$
```

Showing hidden files

```
danacarper — -bash — 80x24
Last login: Mon May  1 16:32:34 on ttys000
[ucmerced-169-236-149-46:~ danacarper$ ls -a
.                  .cups              Desktop
..                .dropbox           Documents
.CFUserTextEncoding .local            Downloads
.DS_Store         .matplotlib        Dropbox
.Rapp.history     .perlbrew          Library
.Rhistory         .python_history    Movies
.Trash            .rstudio-desktop   Music
.bash_history     .subversion        Pictures
.bash_profile     Applications        Public
.bash_sessions    Bin                perl5
.config           Creative Cloud Files
.cpan             Databases
ucmerced-169-236-149-46:~ danacarper$
```

Modifying .bash_profile

- Open in a text editor
 - Nano
 - Vim
 - Add `export PATH=$PATH:/new/folder`
- Or enter this in the terminal:
 - `echo 'export PATH=/usr/local/bin:$PATH' >> ~/.bash_profile`

