


























Manage and Launch Shells, REPLs & Applications

Description	Keystroke	Function	Note
Emacs Shells	Emacs provides multiple ways of executing shell commands or running programming language specialized shells and programming language REPL . <ul style="list-style-type: none">It provides multiple terminal emulators and shells. There's also several external packages that provide more. This page describe the commands available to start these shells, terminal emulators and REPLs inside Emacs buffer windows.		
Last updated on: 2025-08-29	Note that inside the term, ansi-term and vterm buffers, all Emacs keys are not always available: these major modes operate in to input modes: <ul style="list-style-type: none">shell input (char) mode: where the shell gets the keysEmacs input (line) mode: where Emacs key bindings are available. See 🔧 Shells/Terminals Comparisons for more information.		
Open this PDF file. See also: 🔗 Help/Info	<f11> z <f1>	(pel-help-pdf &optional OPEN-WEB-PAGE)	Open this 🔗 Shells local PDF. If the prefix argument (like C-u or M--) is used, then it opens the remote GitHub hosted raw PDF instead. If the pel-flip-help-pdf-arg user-option is set it's the other way around.
🔗 Customize PEL shell management control	<f11> z <f2>	(pel-customize-pel &optional OTHER-WINDOW)	Customize PEL shell support <ul style="list-style-type: none">If OTHER-WINDOW is non-nil (like C-u or M--) , open customize buffer in other window.
🔗 Customize Emacs shell & term control	<f11> z <f3>	(pel-customize-library &optional OTHER-WINDOW)	Customize Emacs shell group. <ul style="list-style-type: none">If OTHER-WINDOW is non-nil (like C-u or M--) , open customize buffer in other window.
🔗 Customize Emacs shell control	<f11> SPC SPC s <f3>	(pel-customize-library &optional OTHER-WINDOW)	Customize Emacs shell-mode support. <ul style="list-style-type: none">If OTHER-WINDOW is non-nil (use C-u), display in another window.
	<f12> <f3>		In shell-mode the <f12> <f3> key opens the shell customization group.
🔗 Customize Emacs shell control See also: 🔧 Shells/Terminals Comparisons	<f11> SPC SPC t <f3>	(pel-customize-library &optional OTHER-WINDOW)	Customize Emacs term-mode support. <ul style="list-style-type: none">If OTHER-WINDOW is non-nil (use C-u), display in another window.
	<f12> <f3>		In term-mode the <f12> <f3> key opens the term customization group. <ul style="list-style-type: none">⚠️ The key sequence is only available in term and ansi-term buffers when the buffer is operating in Emacs (line) input mode. Toggle to line input mode by typing C-c C-j.
Launch OS Application from Emacs	With the following command you can launch an operating system application that will run independently of Emacs.		
	<f11> A	(counsel-linux-app &optional ARG)	Launch a Linux desktop application, similar to Alt-<F2>. <ul style="list-style-type: none">When ARG is non-nil, ignore NoDisplay property in *.desktop files.
		📦 On Linux, requires the counsel external package. 🔧 PEL activates it when the pel-use-counsel user option is set to t .	
		(counsel-osx-app)	Launch a macOS application via ivy interface.
		📦 On macOS, requires the counselx-osx-app external package. 🔧 PEL activates it with pel-use-counsel-osx-app user option.	
List Emacs Child Processes	Emacs can run several synchronous and asynchronous processes as child processes.		
See also: 🔗 Help/Info	<ul style="list-style-type: none"><f11> z ?<f11> ? e C-p	(list-processes &optional QUERY-ONLY BUFFER)	Display a list of all processes that are Emacs sub-processes. <ul style="list-style-type: none">With optional argument (C-u) : only processes with the query-on-exit flag set are listed. Any process listed as exited or signalled is actually eliminated after the listing is made.
Run Commands in system shell	The following commands can be used to quickly execute an external command inside a system shell process and display the result inside an Emacs buffer. <ul style="list-style-type: none">Use these commands from buffer using any major modes. Also see: Executing Shell Commands in Emacs from Mastering Emacs .		
Run a shell command	<ul style="list-style-type: none">M-!• %-L	(shell-command COMMAND &optional OUTPUT-BUFFER ERROR-BUFFER)	Prompts for the command in the minibuffer, show the command output in the next window in the "Shell Command Output" buffer in Fundamental mode. Both stdout and stderr are shown. <ul style="list-style-type: none">To send stderr to another buffer set shell-command-default-error-buffer user-option.With C-u prefix, insert output in the current buffer.
Run a shell command as sudo	<f11> z !	(pel-shell-as-sudo)	Prompt for command, then sudo password and execute the command in a shell with sudo credentials. Print the results in the "Shell Command Output" buffer in Fundamental mode.
Run a shell command asynchronously	M-&	(async-shell-command COMMAND &optional OUTPUT-BUFFER ERROR-BUFFER)	Execute string COMMAND asynchronously in background. <ul style="list-style-type: none">Like 'shell-command', but adds '&' at end of COMMAND to execute it asynchronously.The output appears in the buffer "Async Shell Command". That buffer is in shell mode.
Run a command on a marked region <ul style="list-style-type: none">C-u : replace region with cmd output ★★	M- 	(shell-command-on-region START END COMMAND &optional OUTPUT-BUFFER REPLACE ERROR-BUFFER DISPLAY-ERROR-BUFFER)	Execute string COMMAND in inferior shell with region as input . <ul style="list-style-type: none">Normally display output (if any) in temp buffer "Shell Command Output";Prefix arg means replace the region with it. Return the exit code of COMMAND.Mark the region first. Then type M- . Emacs prompts for the command to run. 👉 To replace the region with the command output: type C-u M-
Open a shell or terminal buffer See 🔧 Shells/Terminals Comparisons	Several terminal-like shells are available. They can be grouped in 3 categories: <ol style="list-style-type: none">eshell. Pure Emacs shell with all commands implemented in Emacs Lisp. Supports Unix style commands in any Operating System. Also support evaluation of Lisp expressions. If you know Emacs Lisp this can be extremely useful.The other classical terminal and shells: shell, ansi-term and term. These all have pros and cons. They run slower than vterm but they are built-in. Of those, the ansi-term has more capabilities.There are others such as term and eat. See below.		
Open an eshell <ul style="list-style-type: none">Eshell manualMastering Eshell	<f11> z e	(eshell &optional ARG)	Open an eshell buffer. 👉 To open another eshell instance: use the C-u prefix <ul style="list-style-type: none">To open a numbered eshell: use the C-u number prefix
	Implementation: <ul style="list-style-type: none">eshell is implemented in Emacs Lisp and implements several Unix commands, making them available to OS that do not natively have them (like Windows). If a command is not implemented it runs the one found in PATH. Extra Features <ul style="list-style-type: none">Can redirect output into a buffer. The grep command output goes to a grep result buffer which can be used to open the various files.Support lisp commands. Supports <ul style="list-style-type: none">Cursor lateral cursor line beginning/end, kill, yank.command tab expansion, command line re-direction.Command history (and shows history item # in mini-buffer).Can run Python scripts. Limitations: <ul style="list-style-type: none">Meta-cursor word-move keys going left does not stop at the prompt.No bash alias, however eshell can remember its own aliases and will prompt for commands often ran & unfound.		
Open a shell in shell-mode See: 🔗 shell-mode	<f11> z s	(pel-shell)	Opens an inferior shell in the <i>current window</i> or moves point to the "shell" buffer already showing in one of the windows.
	Implementation <ul style="list-style-type: none">This is the PEL implementation which uses the built-in Emacs shell command and ensures it opens inside the current window, like term, ansi-term, ielm and vterm. 👉 On Emacs prior to 29.1, Emacs built-in shell commands creates a window in the <i>other</i> window. This is a surprising behaviour compared to the other inferior process commands and the PEL implementation fixes that. On Emacs 29.1 and later the shell command behaves properly (and so does pel-shell)The Emacs shell command is the oldest one. It uses the comint-mode, which makes it quite versatile. Emacs keys are possible, however the sub-process does not see the keys until <RET> is pressed making it unfit for programs that directly read the input. Supports <ul style="list-style-type: none">Can run multiple shell, each inside its own buffer/name.Meta-cursor word-move keys.Command history (but with Control Up/Down).Can run Python scripts. Can run Python REPL, REPL is OK, echo is OK, no Python colouring, but each command is colored.Can run Common-Lisp (clisp) REPL Limitations: <ul style="list-style-type: none">Clear screen does not work. directly but PEL provides the <f12> c or C-c M-o . See below.Not a good candidate for running UI applications such as top, htop, etc...		

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Open an ANSI term shell See: ⓘ term-mode	<f11> z a	(ansi-term PROGRAM &optional NEW-BUFFER-NAME)	⚠ Normally operates in character mode , in which up/down navigation and kill/yank is not possible. Change to line mode to do that: <ul style="list-style-type: none"> Use C-x C-j to change to line mode an allow movement, mark, saving. When done use C-c C-k to switch to character mode.
	Implementation <ul style="list-style-type: none"> Prompts for shell to use. Default is /bin/bash. Can use others. Opens in current window. A terminal emulator written in Emacs Lisp. Newer implementation than term. You can even run other editors within it (vi, emacs, others). But use character-mode. Specificities: <ul style="list-style-type: none"> C-x is mapped to term-escape-char Supports: <ul style="list-style-type: none"> Scroll up/down with M-<up>, M-<down> Is colouring, columns are aligned bash alias, bash tab expansion command line redirection clear screen, Command history Can run Python scripts. Running Python shell: REPL is OK, echo is OK Limitations: <ul style="list-style-type: none"> Natively runs in character mode, which does not allow movement nor saving. <up>, <down> cursor, C-n/C-p do not work as navigating: used as shell command history. Change to line mode (see above) to enable these. Not yet found a way to control prompt (PS1 setup of .bash_profile does not seem to be used).🐛 		
Open a term shell See: ⓘ term-mode	<f11> z t	(term PROGRAM)	Prompts for shell to use. Default is /bin/bash. Can use others. Opens in current window.
	Implementation: <p>Shell implemented in Emacs Lisp. The keys are sent directly to the sub-process, which means they are not interpreted by Emacs. Same access as normal shell: can use the bash alias, tab-autocomplete, clear screen, can use less and indirection, can execute python scripts. Can even run other terminal editors like vim, synaptic, etc...</p> Supports <ul style="list-style-type: none"> Cursor lateral cursor line beginning/end, kill, yank. Meta-cursor keys, but only in terminal Emacs, not in GUI Emacs. Is colouring, columns are aligned bash alias, bash tab expansion Command line redirection, Clear screen, Command history Can run Python scripts. Running Python shell: REPL is OK, echo is OK Limitations: <ul style="list-style-type: none"> In GUI Emacs: Meta-left/right cursor word move do not work. Use Esc-b and Esc-f here instead. Normal Emacs keystrokes does not always work, it depends on the programs that are executed from the shell. When it stops working, either use C-c b to switch to another buffer or exit the shell to gain control to Emacs keys in this buffer. Vertical cursor history works only with Control-Up and Control-Down Emacs keys with Meta do not work. The ones with Control do work. Can run top in the buffer, but then C-c does not stop it. To stop it split the buffer in 2, kill the buffer with C-x k, confirm, close the buffer. 		
Open a vterm shell See ⓘ vterm-mode	<f11> z v	(vterm &optional BUFFER-NAME)	Create a new vterm shell. A fast & full-featured *nix-compliant shell. 🍌 Although vterm is relatively new this is the fastest shell. Highly recommended.
	📦 Requires the vterm-mode external package and Emacs-libvterm (vterm) external package, the libvterm library. ⓘ PEL activates it when the pel-use-vterm user option is set to t <ul style="list-style-type: none"> On macOS that can be installed with Homebrew. Use C-c C-t to toggle the Vterm-Copy mode which allows navigation and text copy in the buffer. While the buffer is in Vterm mode you cannot use the PEL function keys as they are interpreted by the program running in the vterm shell. All other Emacs keys work. In Vterm-Copy the function keys are interpreted by Emacs so the PEL function key mappings do work. ⚠ vterm maximum scroll back size (the maximum number of lines the buffer can retain) is limited to 100000 lines. The value used is set by the vterm-max-scrollback user option which defaults to 1000. If you plan to use commands that print a long number of lines, you may want to change this value. ⚠ 🗿 When using this shell please first read the shell-side-configuration notes .		
Open a eat terminal emulator See ⓘ eat-mode	<f11> z f	(eat &optional PROGRAM ARG)	Start a new Eat terminal emulator in a buffer. <ul style="list-style-type: none"> Start a new Eat session, or switch to an already active session. Return the buffer selected (or created). With a non-numeric prefix ARG, create a new session. With a numeric prefix ARG (like C-u 42 <f11> z f), switch to the session with that number, or create it if it doesn't already exist. With double prefix argument ARG, ask for the program to run and run itin a newly created session. <ul style="list-style-type: none"> PROGRAM can be a shell command.
	📦 Requires the emacs-eat external package. ⓘ PEL activates it when the pel-use-emacs-eat user-option is set to t .		
Specialized REPL	You can run several read eval run loop programming shells in Emacs. <ul style="list-style-type: none"> Several of those REPLs, like ielm and run-python are part of Emacs. PEL makes the other available or adds some functionality to others when the corresponding pel-use- user option variable for the respective programming language is turned on (set to t). It is also possible to use shells to run other REPL programs directly from an embedded terminal shell like vterm (see above). The command for the Emacs Lisp REPL, ielm, is accessible via the pel:execute key prefix (<f11> z). The REPL for the other programming languages are accessible via the pel:repl key prefix (<f11> z r). All REPL commands are accessible via the <f12> z key binding of their respective major mode. 		
Start Shell See also: ⓘ L - Arc	<f11> z r C-a	(run-arc CMD)	Run an inferior Arc process, input and output via buffer “arc”. <ul style="list-style-type: none"> If there is a process already running in “arc”, switch to that buffer. With argument, allows you to edit the command line (default is value of ‘arc-program-name’). Runs the hook ‘inferior-arc-mode-hook’ (after the ‘comint-mode-hook’ is run). (Type h in the process buffer for a list of commands.)
<ul style="list-style-type: none"> From Arc buffer 	<f12> z		📦 Requires the arc-mode external package. ⓘ PEL activates this when the pel-use-arc user-options is set to t .
Emacs Lisp shell See also: ⓘ ⓘ L - Emacs Lisp	<ul style="list-style-type: none"> <f11> z l <f12> z 	(ielm)	Open the Interactive Emacs Lisp Mode buffer where you can interactively evaluate Emacs Lisp expressions, a REPL for Emacs Lisp. <ul style="list-style-type: none"> Switches to the buffer “ielm”, or creates it if it does not exist. <f12> z is only available in buffer in emacs-lisp-mode.
Open a Common Lisp REPL ⓘ pel-use-common-lisp must be on. See also: ⓘ ⓘ L - Common Lisp	<ul style="list-style-type: none"> <f11> z r L 	(pel-cl-repl &optional N)	Open or switch to Common-Lisp REPL buffer window. <ul style="list-style-type: none"> Use the Common Lisp REPL selected by the PEL user-options: <ul style="list-style-type: none"> SLY when `pel-used-sly' is on and `pel-clisp-ide' is set to sly, Slime when `pel-use-slime'is on and `pel-clisp-ide' is set to slime, the inferior lisp mode otherwise. The behaviour of the command is affected by the optional argument N: <ul style="list-style-type: none"> with no buffers running REPL: <ul style="list-style-type: none"> N is nil or absent: open REPL in current window N is positive: open REPL in other window N is negative: create new REPL in current window with 1 or more REPL already running (if more than 1, prompt for one) if selected buffer is inside an opened window: switch to that window if selected buffer is not in an opened window: <ul style="list-style-type: none"> N is nil or absent: open REPL in current window N is positive: open REPL in other window N is negative: create new REPL in current window.
<ul style="list-style-type: none"> From lisp-mode: 	<ul style="list-style-type: none"> <f12> z 		

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Elixir Shell :!Ex See also: ⌘L - Elixir	<f11> z r x	(alchemist-iex-run &optional ARG)	Start an !Ex process . <ul style="list-style-type: none"> Show the !Ex buffer if an !Ex process is already run. <div>  Requires the alchemist package and the Elixir programming language for your OS. </div> <div>  PEL activates it when pel-use-elixir and pel-use-alchemist user-options are both set to t. </div>
Start Erlang Shell See also: ⌘L - Erlang	• <f11> z r e • C-c C-z • <f12> z	(erlang-shell)	Start a new Erlang shell. <ul style="list-style-type: none"> The variable ‘erlang-shell-function’ decides which method to use, default is to start a new Erlang host. It is possible that, in the future, a new shell on an already running host will be started. C-c C-z starts the Erlang Shell from the Erlang Mode. <f11> z r starts it anytime, as long as it was installed. <div>  Under PEL this command is available only when the pel-use-erlang user option is set to t. </div>
Open a Forth shell See also: ⌘L - Forth • From Forth buffer:	<f11> z r f <f12> z	(run-forth)	Start an interactive forth session. <ul style="list-style-type: none"> Prompt for a Forth executable. <ul style="list-style-type: none"> gforth is a good free implementation. <ul style="list-style-type: none"> On macOS, you can install it with brew install gforth in a terminal shell. <ul style="list-style-type: none">  Notice that it is integrated with the Home-brew Emacs installation and it will upgrade your Homebre-based Emacs unless its pinned (in which case Homebrew won’t install gforth). <div>  Requires the forth-mode external package  PEL installs and activates when the pel-use-forth user option is t. It also requires a Forth interpreter (which must be installed separately) </div>
Start Haskell Shell See also: ⌘L - Haskell • From buffer	<f11> z r h <f12> z	(run-haskell)	Show the inferior-haskell buffer. Start the process if needed. <div>  Requires the haskell-mode and Haskell installed. </div> <div>  PEL activates this when the pel-use-haskell and the pel-use-haskell-mode user-options are set to t. </div>
Start Julia Shell See also: ⌘L - Julia • From Julia buffer:	<f11> z r j <f12> z	(julia-snail)	Start a Julia REPL and connect to it, or switch if one already exists. <ul style="list-style-type: none"> The following buffer-local variables control it: <ul style="list-style-type: none"> ‘julia-snail-repl-buffer’ (default: ‘julia’) ‘julia-snail-port’ (default: 10011) To create multiple REPLs, give these variables distinct values (e.g.: ‘julia my-project-1’ and 10012). <div>  Requires the julia-snail Emacs package and the Julia programming language installed. It also requires vterm (see above). </div> <div>  PEL activates this when the pel-use-julia user option is set to t. </div>
LFE Shell (Lisp Flavoured Erlang) • From LFE buffer:	<f11> z r C-l <f12> z	(run-lfe CMD)	Run an inferior LFE process, input and output via a buffer “inferior-lfe”. <ul style="list-style-type: none"> If ‘CMD’ is given, use it to start the shell, otherwise: ‘inferior-lfe-program’ ‘inferior-lfe-program-options’ -env TERM vt100. <div>  Requires the lfe-mode package and LFE (Lisp Flavoured Erlang) installed. </div> <div>  PEL activates this when the pel-use-lfe user option is set to t. </div>
Start OCaml Shell See also: • From OCaml buffer	<f11> z r o <f12> z	(run-ocaml)	Run an OCaml REPL process. I/O via buffer “OCaml”. <div>  Requires the tuareg external package. </div> <div>  PEL activates this when the pel-use-ocaml and the pel-use-tuareg user-options are set to t. </div>
Start Perl REPL See: ⌘L - Perl	<f11> z r P <f12> z	(perl-repl)	Run a Perl REPL in a “Perl-REPL” buffer. <div>  Requires the perl-repl external package  activated by perl-use-perl-repl user-option. </div> <ul style="list-style-type: none"> The perl-repl-file-path user option specifies the name of the Perl REPL program, which may optionally specify the explicit file path. <ul style="list-style-type: none"> PEL provides the perl-repl shell script which uses the Perl command line.
Start Python Shell See also: ⌘L Python • From Python buffer:	<f11> z r p <f12> z	(run-python &optional CMD DEDICATED SHOW)	Run an inferior Python process. <ul style="list-style-type: none"> Argument CMD defaults to ‘python-shell-calculate-command’ return value. When called interactively with ‘prefix-arg’, it allows the user to edit such value and choose whether the interpreter should be DEDICATED for the current buffer. When numeric prefix arg is other than 0 or 4 do not SHOW. For a given buffer and same values of DEDICATED, if a process is already running for it, it will do nothing. This means that if the current buffer is using a global process, the user is still able to switch it to use a dedicated one.
Start Chez Scheme Shell See also: • From Chez buffer	<f11> z r C-z <f12> z	(pel-chez-repl &optional N)	Run the Chez REPL in window specified by N. <ul style="list-style-type: none"> By default use the other window. If a numeric argument is specified, its value correspond to the direction of a numeric keypad: <div> <div>8</div> <div>4 6</div> <div>2</div> </div> That is: <ul style="list-style-type: none"> 8: up 4: left 6: right 2: down 0 and 5 identify the current window. <div> Requires the Chez Scheme installed.  PEL activates it when the pel-use-chez is set to t. </div>
Start Chibi Scheme Shell See also: • From Chibi buffer	<f11> z r C-i <f12> z	(pel-chibi-repl &optional N)	Run the Chibi REPL in window specified by N. <ul style="list-style-type: none"> See ‘pel-chez-repl’ for complete description. <div> Requires the Chibi Scheme installed.  PEL activates it when the pel-use-chibi is set to t. </div>
Start Chicken Scheme Shell See also: • From Chicken buffer	<f11> z r C-k <f12> z	(pel-chicken-repl &optional N)	Run the Chicken REPL in window specified by N. <ul style="list-style-type: none"> See ‘pel-chez-repl’ for complete description. <div> Requires the Chicken Scheme installed.  PEL activates it when the pel-use-chicken is set to t. </div>
Start Gambit Scheme Shell See also: ⌘L - Gambit Scheme • From Gambit buffer	<f11> z r C-b <f12> z	(pel-gambit-repl &optional N)	Run the Gambit Scheme REPL in window specified by N. <ul style="list-style-type: none"> See ‘pel-chez-repl’ for complete description. <div>  Requires the gambit.el file and Chicken Scheme installed.  PEL activates it when the pel-use-gambit is set to t. </div>
Start Gerbil Scheme Shell See also: ⌘L - Gerbil Scheme • From Gerbil buffer	<f11> z r C-e <f12> z	(pel-gerbil-repl &optional N)	Run the Gerbil REPL in window specified by N. <ul style="list-style-type: none"> See ‘pel-chez-repl’ for complete description. <div>  Requires the gerbil-mode external package and Gerbil Scheme installed.  PEL activates it when the pel-use-gerbil is set to t. </div>
Start Guile Shell • From Guile buffer	<f11> z r C-g <f12> z	(pel-guile-repl &optional N)	Run the Guile REPL in window specified by N. <ul style="list-style-type: none"> See ‘pel-chez-repl’ for complete description. <div> Requires Guile Scheme installed.  PEL activates it when the pel-use-guile is set to t. </div>
Start MIT/GNU Scheme Shell • From MIT/GNU Scheme buffer	<f11> z r C-m <f12> z	(pel-mit-scheme-repl &optional N)	Run the MIT/GNU Scheme REPL in window specified by N. <ul style="list-style-type: none"> See ‘pel-chez-repl’ for complete description. <div> Requires MIT/GNU Scheme Scheme installed.  PEL activates it when the pel-use-mit-scheme is set to t. </div>
Start Racket Shell See also: ⌘L - Racket	<f11> z r C-r	(pel-racket-repl &optional N)	Run the Racket REPL in window specified by N. <ul style="list-style-type: none"> See ‘pel-chez-repl’ for complete description.

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• From Racket buffer	<f12> z		📦 Requires the racket-mode external package and Racket installed. 🔗 PEL activates it when the pel-use-racket is set to t .
Start Scsh Scheme Shell	<f11> z r	(pel-scsh-repl & optional N)	Run the Scsh REPL in window specified by N. • See ‘pel-chez-repl’ for complete description.
• From Scsh buffer	<f12> z		Requires Scsh Scheme Scheme installed. 🔗 PEL activates it when the pel-use-scsh is set to t .

Shells — References

Topic & Link	Extra Notes
GNU Emacs - Running Shell Commands	
Eshell manual	
Difference between various emacs shells	
Difference between various emacs shells	
How to run multiple shells on Emacs	
EmacsWiki: Ansi Term	Quick overview
Emacswiki: Ansi Term Hints	Several hints
Copy/Paste in Ansi Term	Quick overview of the capability for cut/paste.
Launch GUI emacs from command line in OSX	This describes a solution on how to start the GUI emacs in OSX, but not in the background
How to launch GUI Emacs from command line in OSX?	This one describes the solution for handling it in the background
Run commands in background	Describes the & and the disown
Executing commands in background from bash scripts	
Pass command arguments to bash scripts	
explainshell.com	Online application where you can type a shell command: the app explains each argument. Very useful.