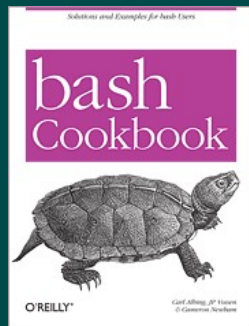
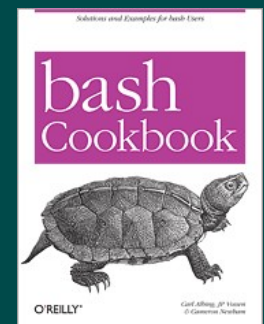


# What's New in Bash 4.x

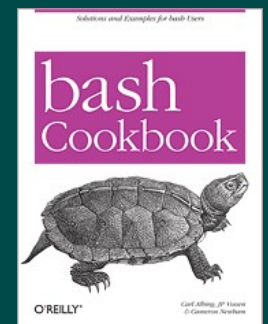


Carl Albing  
J.P. Vossen  
[bashcookbook.com](http://bashcookbook.com)



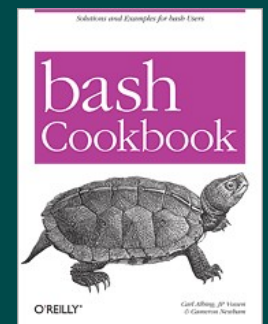
# Bash 4.0

- New Features
- Significant Features
- Not All Features
- Where to Get More Info



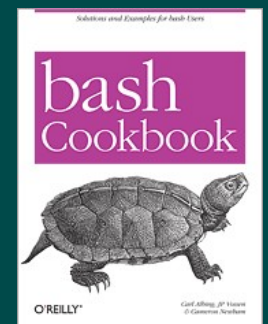
# associative arrays

- how to create
- delete
- assign values to
- expand them.



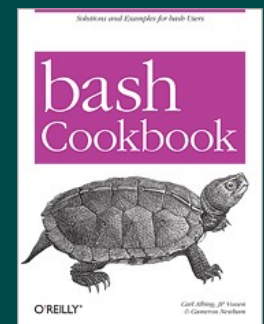
# `coproc' reserved word

- specifies a coprocess: an asynchronous command run with two pipes connected to the creating shell.



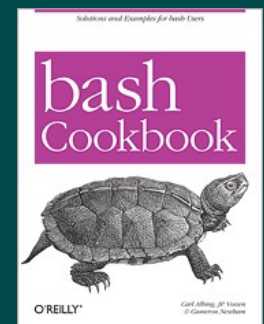
# Coproc

- can be named.
- The input and output file descriptors and the PID of the coprocess are available to the calling shell in variables with coproc-specific names.



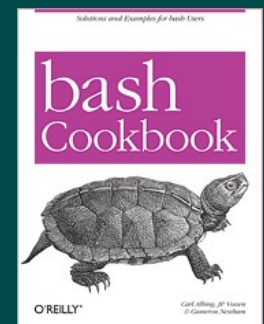
&>>

- new redirection operator
- appends the standard output and standard error to the named file.



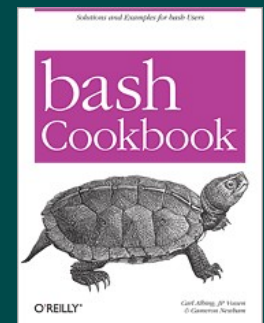
# `|&' now a synonym for `2>&1 |'

- Redirects the standard error for a command through a pipe.
- Doesn't fork process off with dangling pipe



# Case statement changes

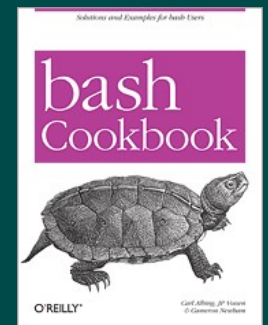
- `new `;&'`
  - execution continues with the action associated with the next pattern in the statement rather than terminating the command.
- `new `;;&'`
  - tests the next set of patterns after completing execution of the current action, rather than terminating the command.





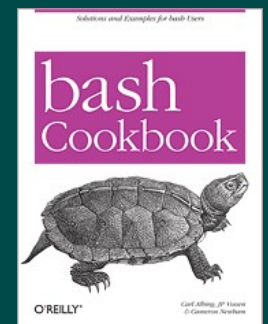
# new case-modifying word expansions:

- Uppercase (`^[^]`)
- lowercase (`,[,]`)
- They can work on either the first character or array element, or globally. They accept an optional shell pattern that determines which characters to modify. There is an optionally-configured feature to include capitalization operators.



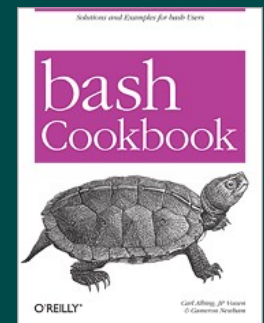
# `command\_not\_found\_handle`

- If a command is not found, the shell attempts to execute a shell function so named , supplying the command words as the function arguments.



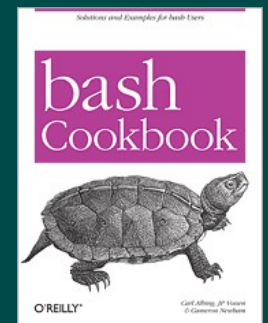
# new shell option: 'globstar' for '\*\*'

- When enabled, the globbing code treats '\*\*' specially -- it matches all directories (and files within them, when appropriate) recursively.



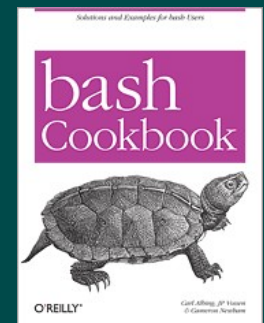
# Brace expansion {..}

- now allows zero-padding of expanded numeric values and will add the proper number of zeroes to make sure all values contain the same number of digits.



# The 'declare' options

- 'declare' is a builtin, takes options
- -l (convert value to lowercase upon assignment)
- -u (convert value to uppercase upon assignment)
- -c (optionally-configurable) option to capitalize a value at assignment.



# timeout on read

- use of fractional time
- use of zero (0) on -t option

