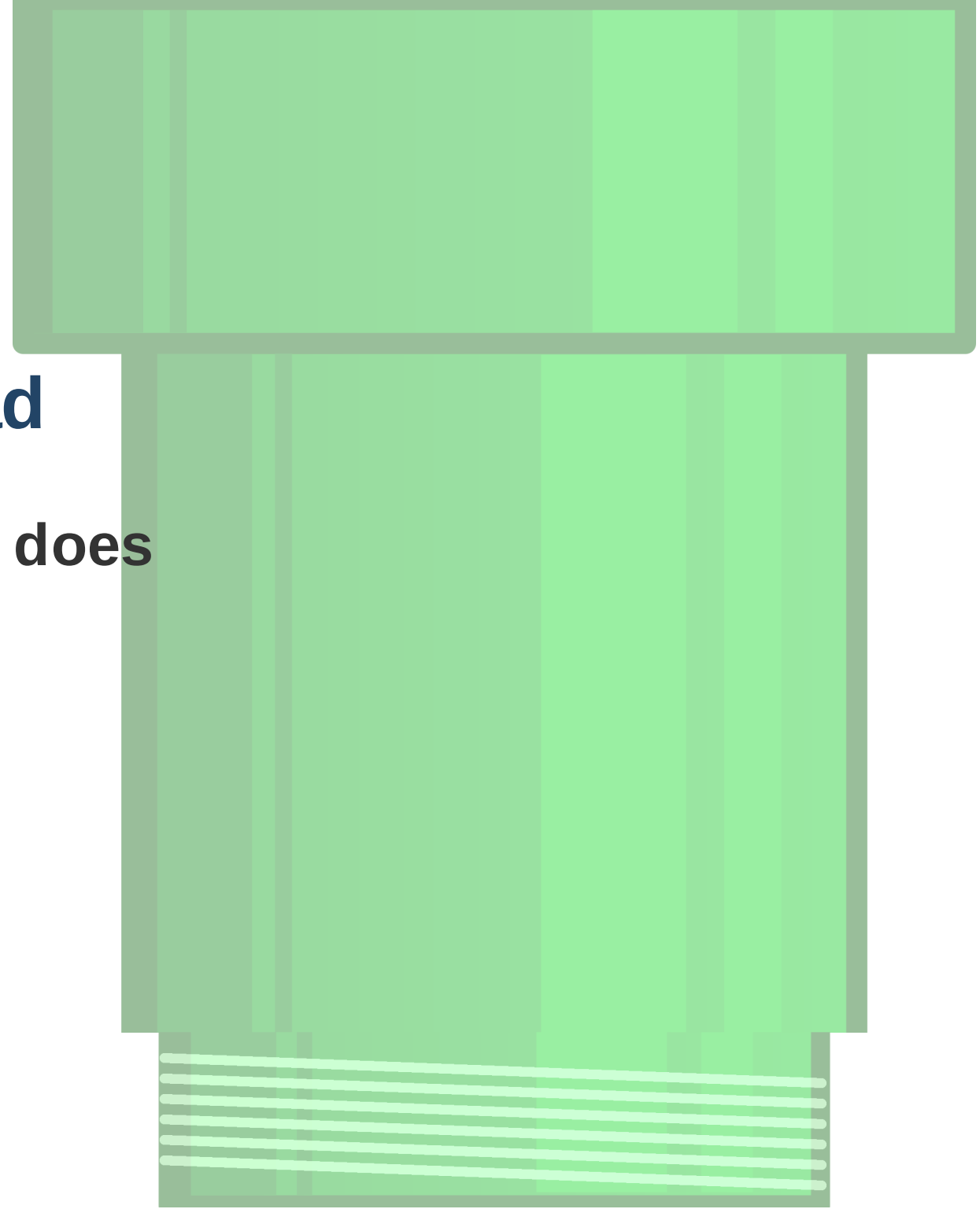

pipethread

It is what it does

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Tcl 2016

Introduction to POSIX Shell Pipes

Example 1

```
#! /usr/bin/env sh
cat /etc/passwd | wc -l
```

Example 2

```
( cat /etc/passwd ) | ( wc -l )
```

Introduction to POSIX Shell Pipes

Example 1

```
#! /usr/bin/env sh
cat /etc/passwd; echo test | wc -l
```

Example 2

```
( cat /etc/passwd; echo test ) | ( wc -l )
```

More Pipes in the POSIX Shell

Script:

```
#! /usr/bin/env sh

now="`date +%s`"
( echo $now ) | ( read line; echo $now; echo $line )
```

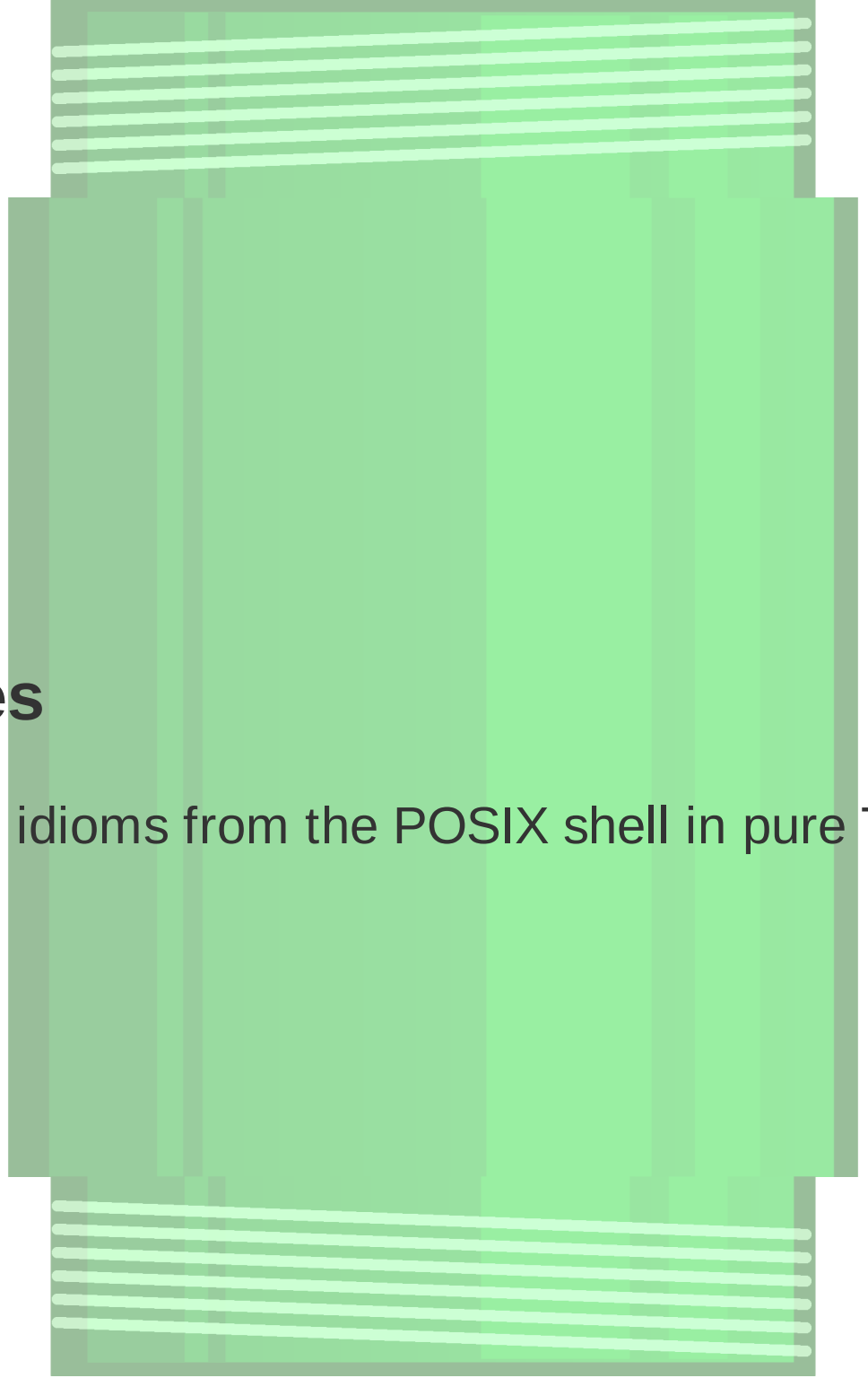
Output:

```
1479277948
1479277948
```

pipethread

It is what it does

Implements the same idioms from the POSIX shell in pure Tcl -- and more.



pipethread

```
#! /usr/bin/env tclsh

set now [clock seconds]
pipethread::pipe {
        puts $outchan $now
} | {
        gets $inchan line; puts $now; puts $line
}
```

Output:

```
1479277948
1479277948
```

Comparison

POSIX Shell:

```
now="`date +%s`"; ( echo $now ) | (
        read line; echo $now; echo $line
)
```

pipethread:

```
set now [clock seconds]; pipethread::pipe {
        puts $outchan $now
} | { gets $inchan line; puts $now; puts $line }
```

What's going on over on the pipethread side ?

- What are `$inchan` and `$outchan` ?
- Are there threads involved here ?

POSIX Shell: Multiprocessing

```
( echo hello ) | ( read salutation; echo $salutation )
^- process #1  ^ ^- process #2
                \-- pipe connecting stdout from
                    process #1 to stdin for process #2
```

pipethread: Multithreading

```
pipethread::pipe {
        # Thread #1
        puts $outchan hello
} | {; # <-- Pipe connecting $outchan
     ; #     from thread #1 to $inchan for thread #2

        # Thread #2
        gets $inchan salutation; puts $salutation
}
```

pipethread: inchan and outchan

POSIX shell has `stdin` and `stdout`, pipethread has `inchan` and `outchan`.

Simple !

Can you hear me `now` ?

POSIX Shell:

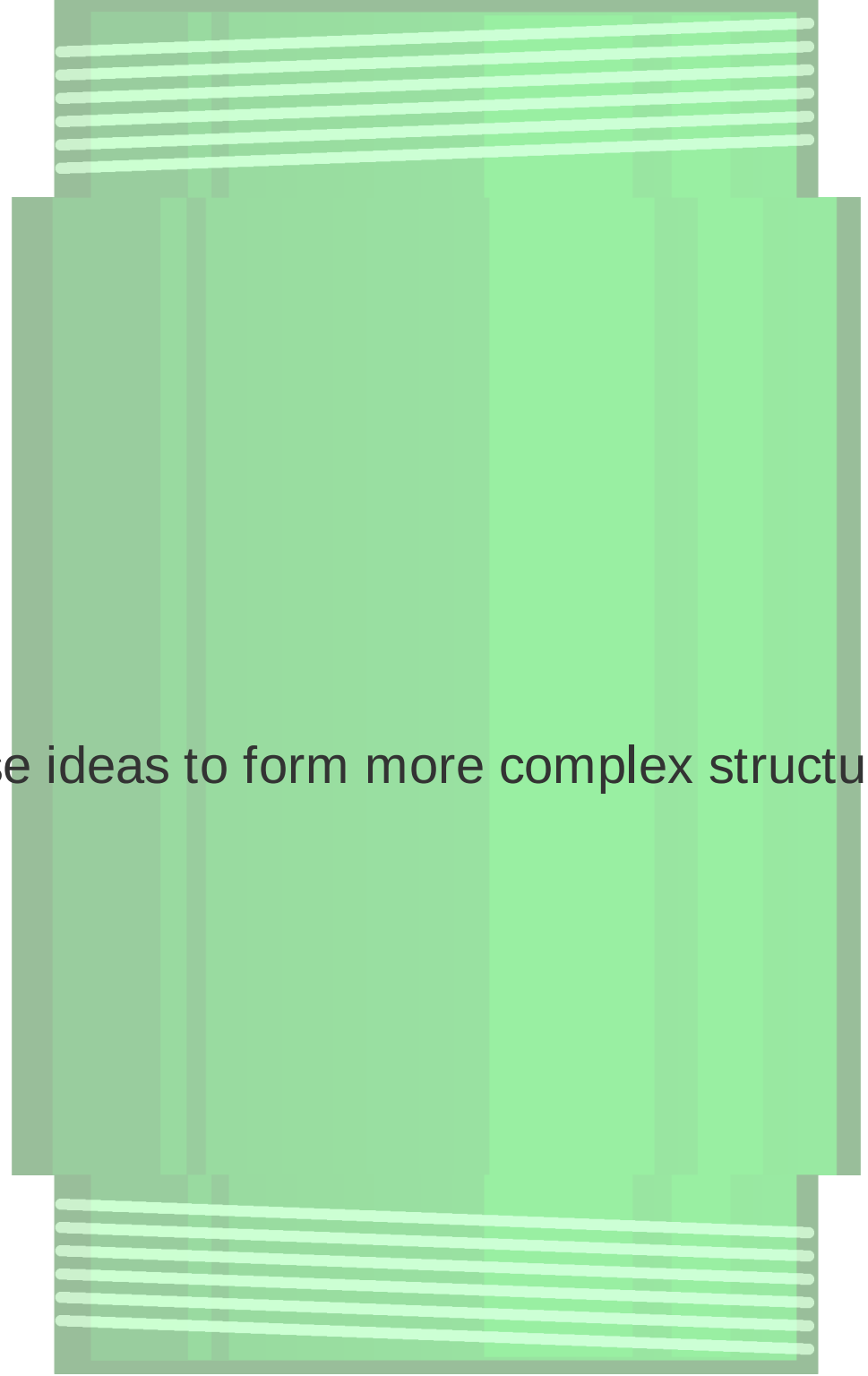
```
now="`date +%s`"; ( echo $now ) | (
        read line; echo $now; echo $line
)
```

pipethread:

```
set now [clock seconds]; pipethread::pipe {
        puts $outchan $now
} | { gets $inchan line; puts $now; puts $line }
```

Closure on this subject

The `now` variable is part of a closure. Kind of.



What now ?

We can combine these ideas to form more complex structures.

POSIX Shell

Script:

```
#! /usr/bin/env bash

number="-1"
cat /etc/passwd | while IFS='' read -r line; do
      number=`expr $number + 1`
      echo "$number:$line"
done | tac
```

Output:

```
32:polkitd:x:87:87:PolicyKit ...
31:pulse:x:65:65:User for Pul...
30:usbmux:x:52:83:User for us...
...
```

pipethread

Script:

```
#! /usr/bin/env bash

proc tac {inchan outchan} {
        set output [list]
        while {![eof $inchan]} {
                gets $inchan line
                set output [linsert $output 0 $line]
        }
        puts $outchan [join $output "\n"]
}

set number -1
pipethread::pipe exec cat /etc/passwd | foreach line {
        incr number
        puts $outchan "$number:$line"
} | tac
```

Case Studie

These contrived example

POSIX Shell

```
while true; do
        date +%s
        sleep 60
done | while read now; do
        for vmId in $(vmList); do
                if applicableSnapshot $vmId $now; then
                        echo takeSnapshot $vmId $now
                fi
        done
done | while read command vmId now; do
        takeSnapshot --vm $vmId --id $now
        echo uploadSnapshots $vmId
done | while read command vmId; do
        uploadSnapshots "${vmId}"
done
```

pipethread

```
pipethread::pipe {
        while true {
                puts $outchan [clock seconds]
                flush $outchan
                after 60000
        }
} | foreach now {
        foreach vmId [vmList] {
                if {[applicableSnapshot $vmId $now]} {
                        puts $outchan [list takeSnapshot $vmId $now]
                }
        }
} | foreach line {
        set vmId [lindex $line 1]
        takeSnapshots $vmId
        puts $outchan [list uploadSnapshot $vmId]
} | foreach line {
        set vmId [lindex $line 1]
        takeSnapshots $vmId
}
```

POSIX Shell

```
ceph --watch | while IFS='' read -r line; do
        # spend a lot of time parsing the data
done | while IFS='' read -r sql; do
        # Use "sqlite3" to update a database in
        # a single transaction
done
```

pipethread

```
sqlite3 db ...
pipethread::pipe exec ceph --watch | foreach line {
        # Parse the data -- now easier in Tcl
} | foreach infoDict {
        unset -nocomplain info
        array set info $infoDict
        db transaction {
                # Much easier to deal with SQL as a completely
                # different stage with a Tcl array
                db eval {...}
        }
}
```

Our princess is in another castle

pipethread supports a different kind of mode -- the asyncronous mode.

Asyncronous pipethread

```
proc newConnection {sock addr port} {
        pipethread::pipe -inchan $sock -outchan $sock \
            -async [list close $sock] -- foreach cmd {
                switch -exact -- $cmd {
                        "hello" {
                                puts $outchan "Hi !"
                        }
                        "quit" {
                                break
                        }
                }
        } | foreach line {
                puts $otuchan "[string length $line]:$line"
        }
}
socket -server newConnection 3030
vwait forever
```

One more thing...

```
pipethread::pipe -inchan $sock -outchan $sock {...} | {...}
```

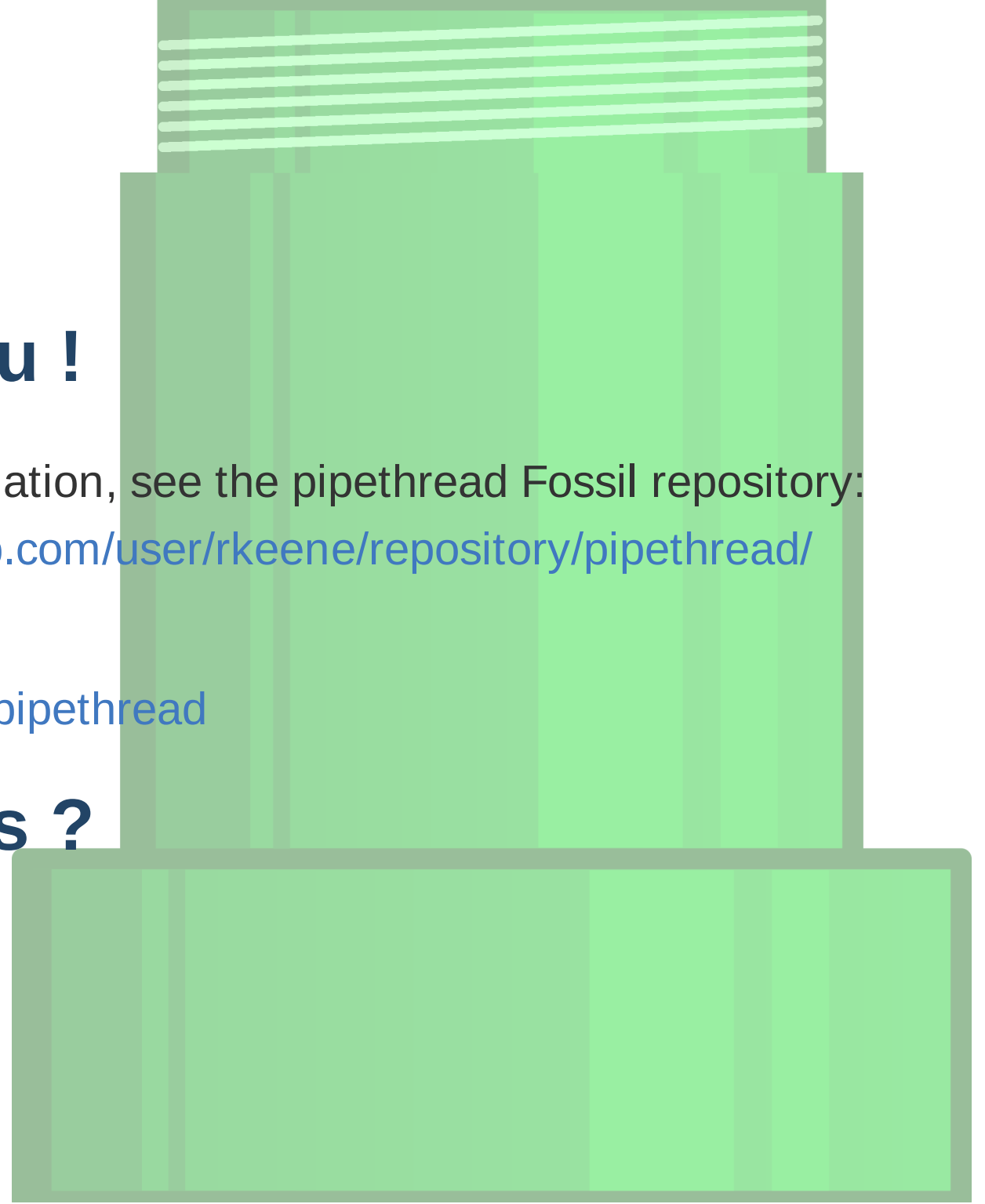
Looks simple... but threads can't share channels. 😕

One more thing, again...

A tale of two loops

```
pipethread::pipe {
        for {set idx 0} {1} {incr idx} {
                puts $outchan $idx
        }
} | foreach line {
        puts $line
        after 1000
}
```

Enter `pipethread::infiniteBuffer`



Thank You !

For more information, see the pipethread Fossil repository:

https://chiselapp.com/user/rkeene/repository/pipethread/

Wiki:

http://wiki.tcl.tk/pipethread

Questions ?