# Why Clojure?

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# Agenda

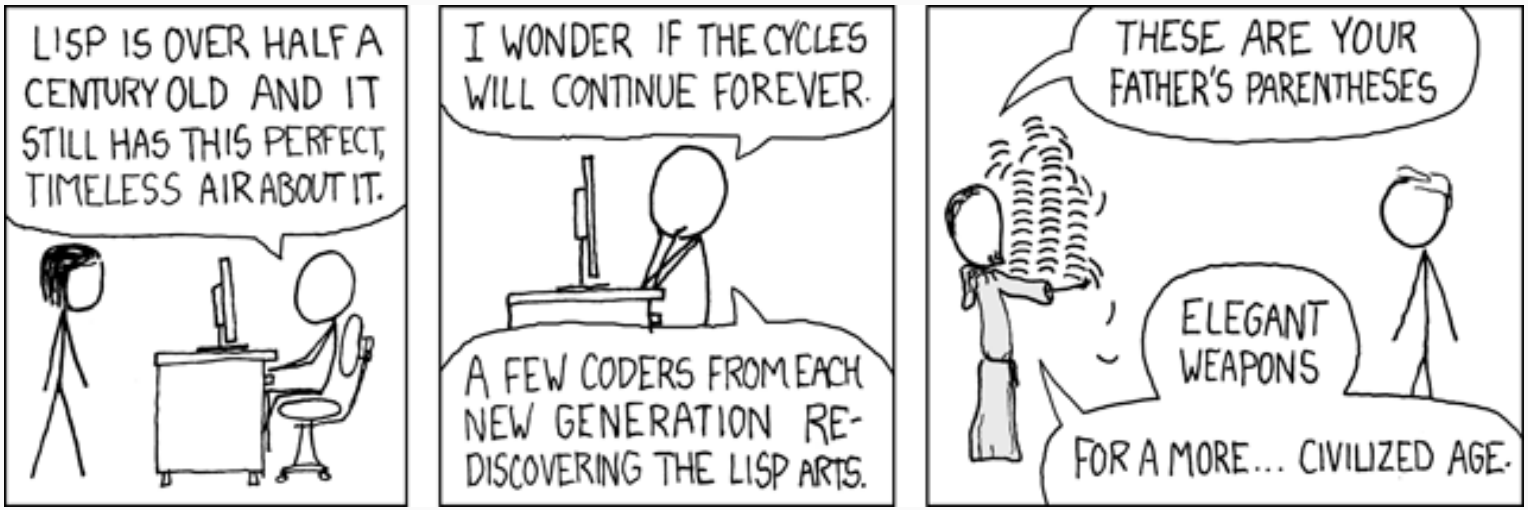
- Why Clojure is great:
  - It is a Lisp
  - Data-oriented
  - Embraces functional programming
  - JVM + JavaScript runtime
- Demo:
  - Figwheel + Devcards + Reagent

# Clojure is a Lisp

# What is so great about Lisp?

*"The most powerful programming language is Lisp. If you don't know Lisp (or its variant, Scheme), you don't know what it means for a programming language to be powerful and elegant. Once you learn Lisp, you will see what is lacking in most other languages." — Richard Stallman*

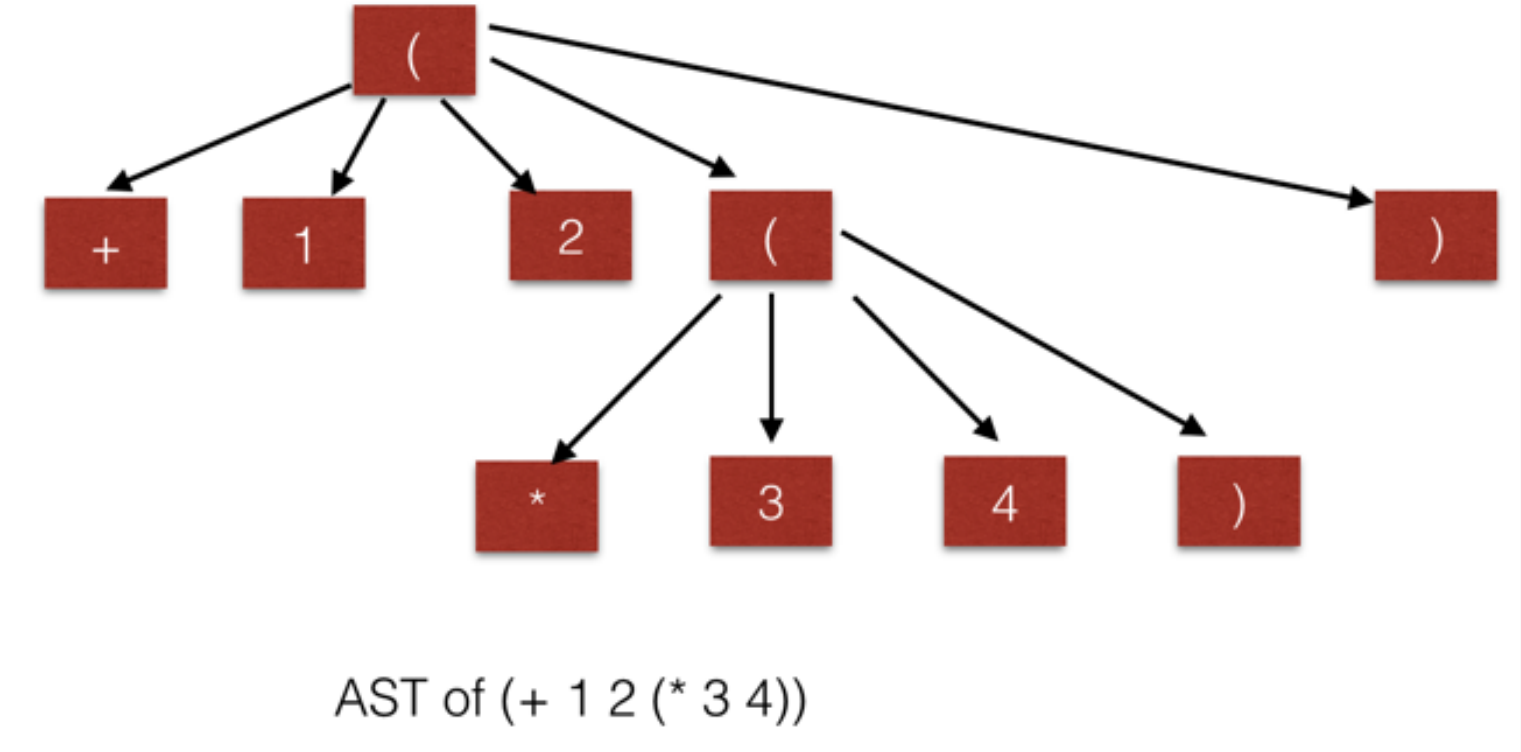
# Parentheses




(http://xkcd.com/297/)

# Parentheses

```
(+ 1 2 (* 3 4))
```




AST of (+ 1 2 (* 3 4))

# Almost all syntax

| | |
|---|---|
| Lists | ‘(1 2 3), ‘(fred kees piet) |
| Vectors | [1 2 3 4 5], [fred kees piet] |
| Maps | {:a 1, :b 2, :b 3}, {1 kees 2 piet} |
| Sets | #{1 2 3} |
| Code | (+ 1 2 3) ;; => 6 |
| Special forms | def if quote let . . . |
| Naming | (def n 10) |
| Lambda | (def plus-two (fn [a] (+ a 2))) |
| | (plus-two 2) ;; => 4 |
| Quote | ‘(+ 1 2 3) ;; => (+ 1 2 3) |

- Code is data and data is code (homoiconicity)

# Manipulating the AST

```
(defmacro unless [pred a b]
  `(if (not ~pred) ~a ~b))

;; Usage:
(unless false
 (println "Will print")
 (println "Will not print"))

;; Macro expansion:
(if (not false)
 (println "Will print")
 (println "Will not print"))
```

# Programmable programming language

- unless impossible to implement as function
- Second expression is not evaluated!
- "programmable programming language"
- Lisp can build any abstraction at all if you can define syntax and semantics for it.
- Clojure has idiomatic ways for doing things and a small core (no Lisp Curse)

# Clojure is data oriented

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*"It is better to have 100 functions operate on one data structure than 10 functions on 10 data structures."*
*— Alan Perlis*

# Clojure is data oriented

**Rich Hickey time**

`https://youtu.be/VSdnJDO-xdg?t=49m8s`

# Clojure embraces functional programming

# Functional programming

- End of Moore's law
- More cores
- Distributed
- Parallelism and concurrency
- How can we adapt our programming practices to this future?
- Parallelism and concurrency (impossibly) hard in some languages

# Root of the problem

- "Non-determinism caused by concurrent threads accessing shared mutable state."- Martin Odersky

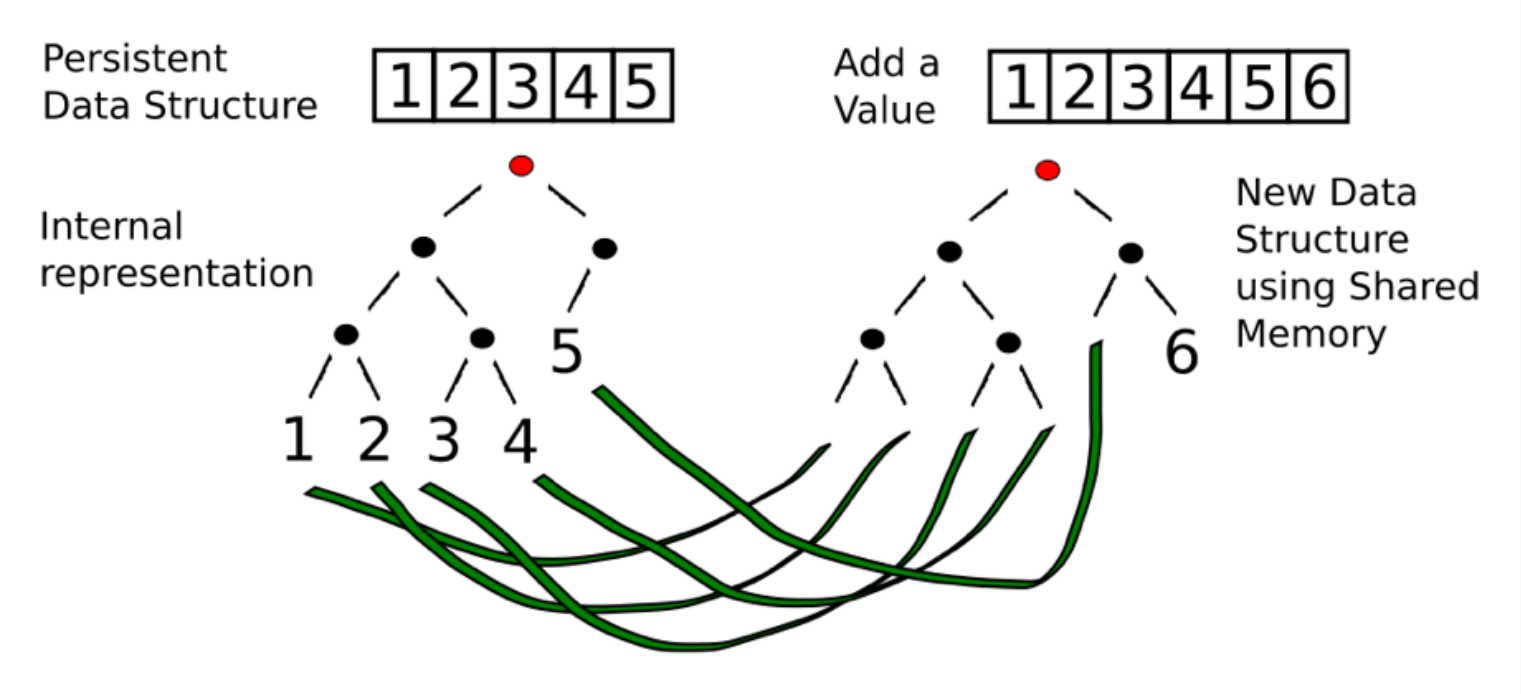
```
var x = 0
async { x = x + 1 }
async { x = x * 2 }
// Can give 0, 1, 2
```

(Martin Odersky, "Working Hard to Keep It Simple" - OSCON Java 2011)

# Functional programming

- Parallel processing is a fact
- No mutable state means no problem
- Imperatively we think in variables and blocks of memory that change over time
- Functionally we think in space: I construct this, then that, then third things out of that
- Recursion
- Pure functions are clearer to reason about

# Immutable data structures - Structural sharing




- Algorithms ensure expected performance characteristics of data structure

# Runs on JVM and JavaScript runtime

# JVM and JavaScript

- Boring is good
- Clojure and ClojureScript embrace host platforms
- Sequences implement the expected interfaces
- Interop with host

# Demo

## Figwheel and Reagent

...

# Learn more

- Rich Hickey - Clojure, Made Simple:
  `https://youtu.be/VSdnJDO-xdg`
- Derek Slager - ClojureScript for Skeptics:
  `https://youtu.be/gsffg5xxFQI`
- Rich Hickey talks collection: `http://bit.ly/1KQNzBr`
- Bret Victor - Inventing on Principle:
  `https://vimeo.com/36579366`
- Setting up Clojure:
  `http://braveclojure.com/getting-started/`

# Exercises

- http://www.4clojure.com/problems
- http://clojurekoans.com
- https://projecteuler.net