Haskell

What is Haskell?

a typed, lazy, purely functional language

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- Everything must make sense at compile time
  - Unlike JavaScript where f(x) with f=undefined will not complain until you actually evaluate f(x)
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- Removes whole classes of bugs
- Address bugs early vs. after they have been triggered
  - Prevent weird errors from creeping up on you
  - Important for safety, security, and compositionally
- Easier to optimize and write faster code
  - You can remove your typeof checks; compiler can do fast things. V8 relies on types to makes things fast!

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- Support for high-order, first-class functions
- Meaning of programs centered around:
  - evaluating expressions
  - not executing instructions

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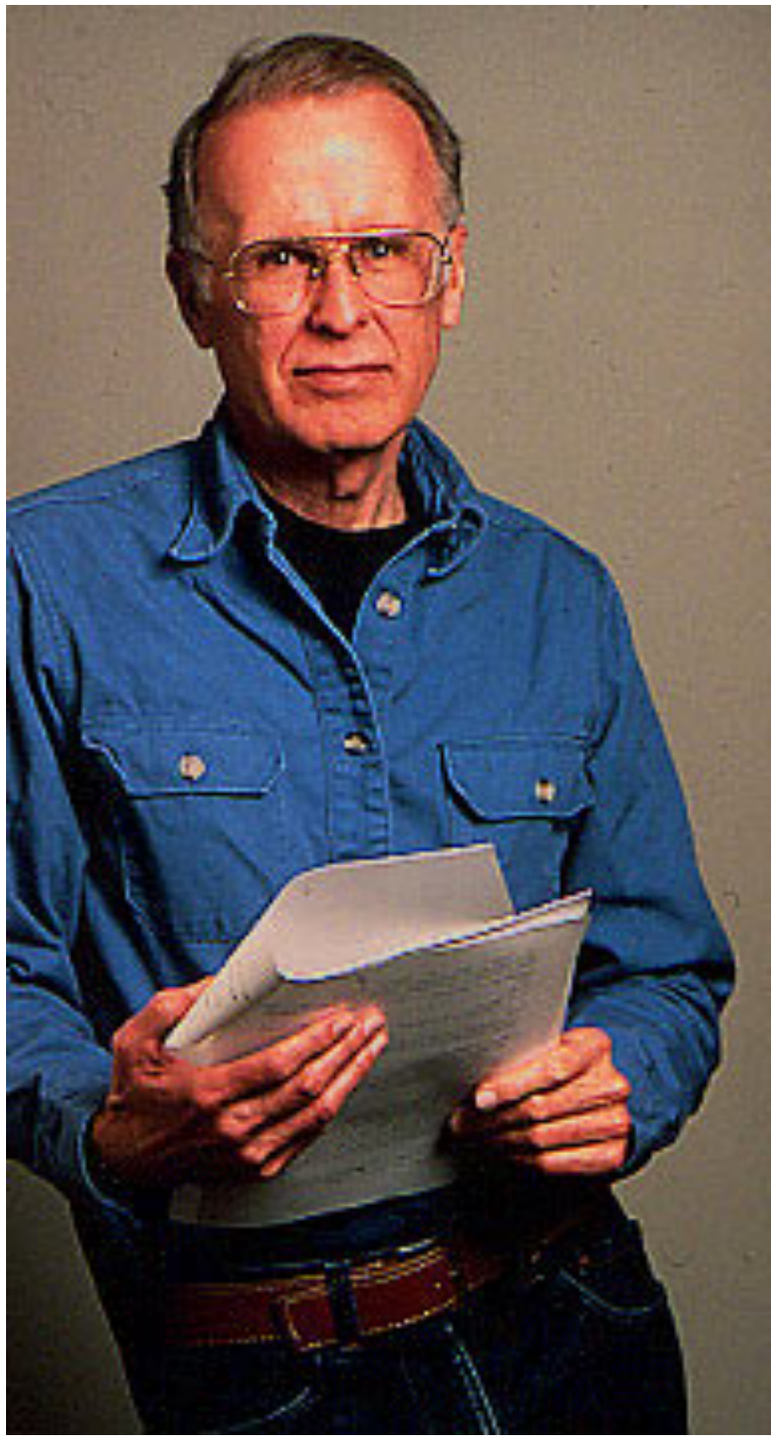
- Everything is immutable: mutation is a side-effect!
- What does it mean for an expression to not have side-effects?
  - In a scope where x_1, ..., x_n are defined, all occurrences of e (where $FV(e) = \{x_1, ..., x_n\}$) have the same value

Why is this cool?

Don’t take it from me, take it from Backus



Why is this cool?

- Algebraic laws: equational reasoning & optimizations
  - Can always replace things that are equal, λ calculus!
- Easier to think about
  - e.g., don't need to worry if x changed after calling f
- Parallelism
  - Can evaluate expressions in parallel!

Haskell is lazy

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- You don't evaluate an expression until its result is absolutely necessary: in contrast to JavaScript
  - Remember: call-by-name
- Haskell's evaluation strategy is called call-by-need
  - Because of the other properties: you actually only evaluate an expression once and cache the result
  - Can you cache results in JavaScript? A: yes, B: no

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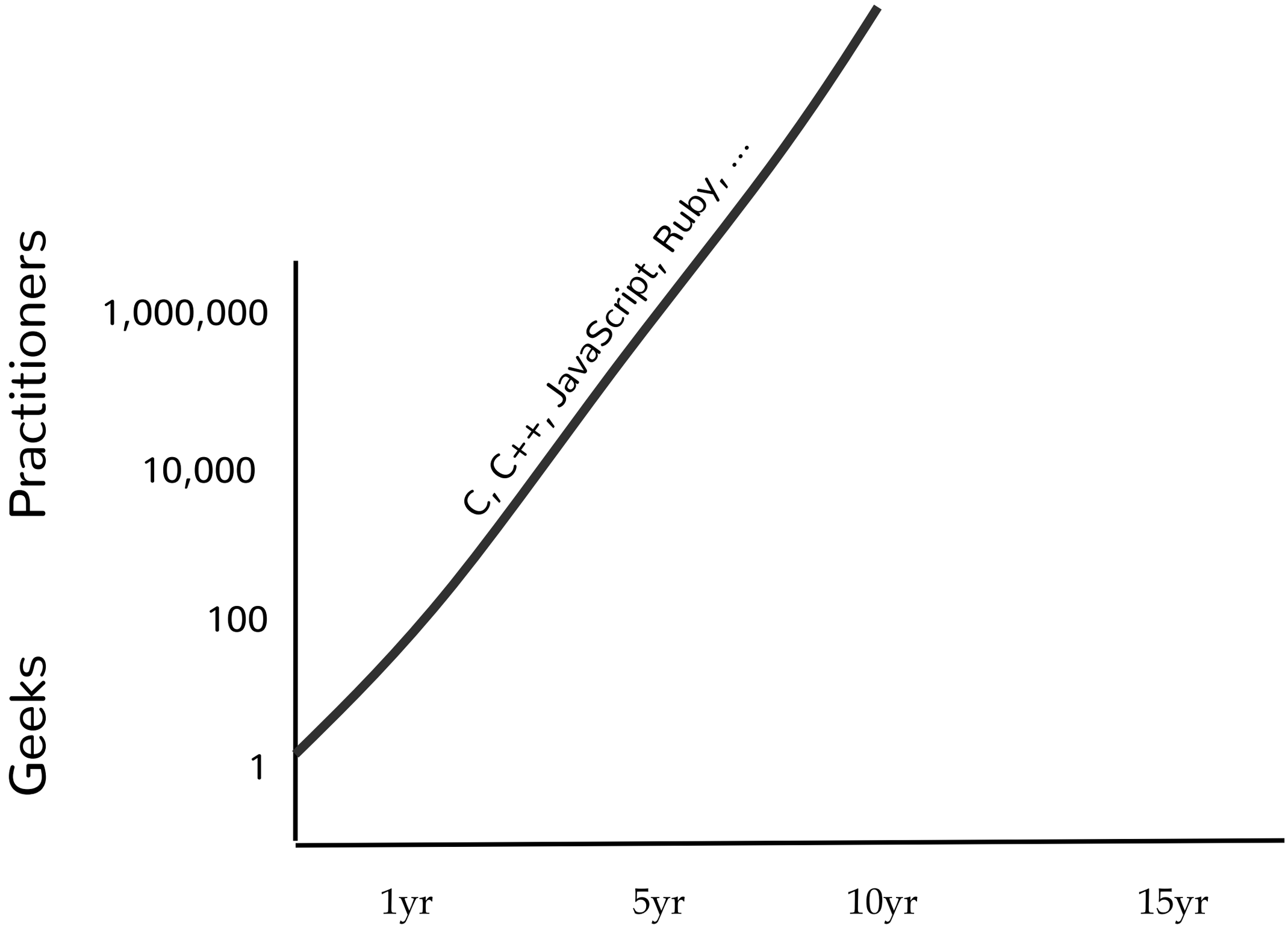
- Can define your own control structures using functions
  - E.g., defining if-then-else is much easier in Haskell and can be done naturally
  - Less so in JavaScript, why?
- Can define infinite data structures
  - E.g., infinite lists, trees, etc.
  - Can solve general problem and then project solution

Haskell is a committee language

Why is this interesting? [SPJ]



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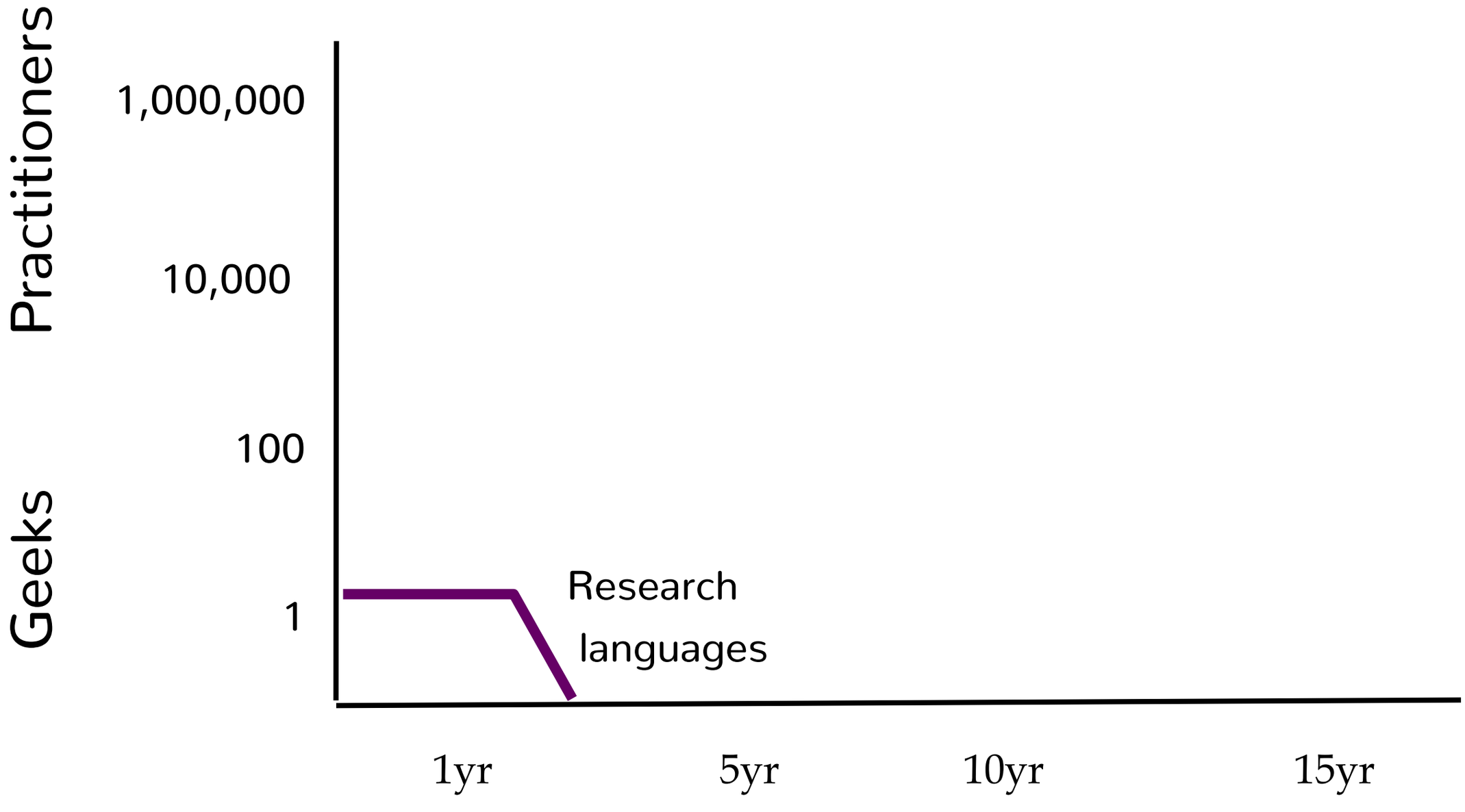

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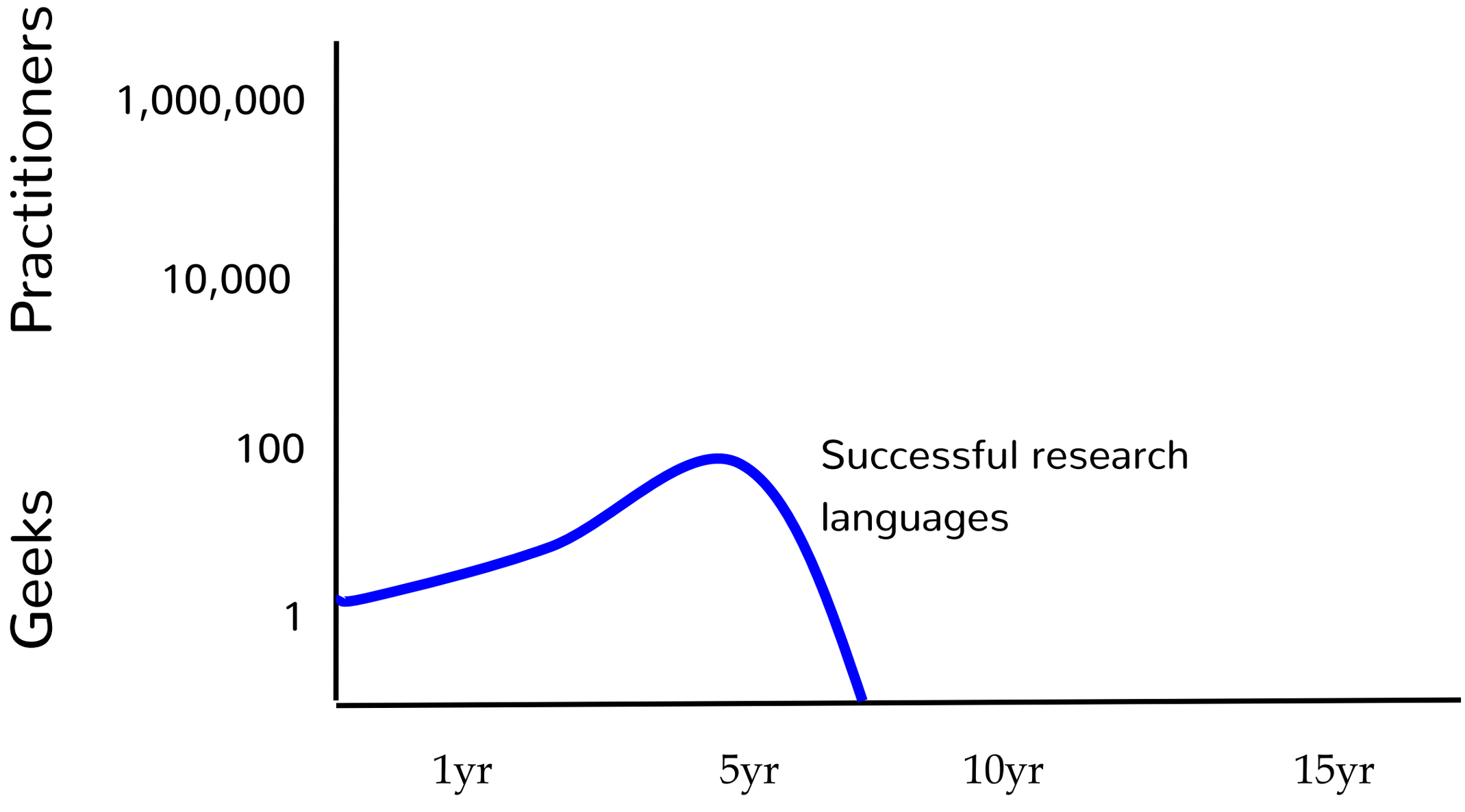

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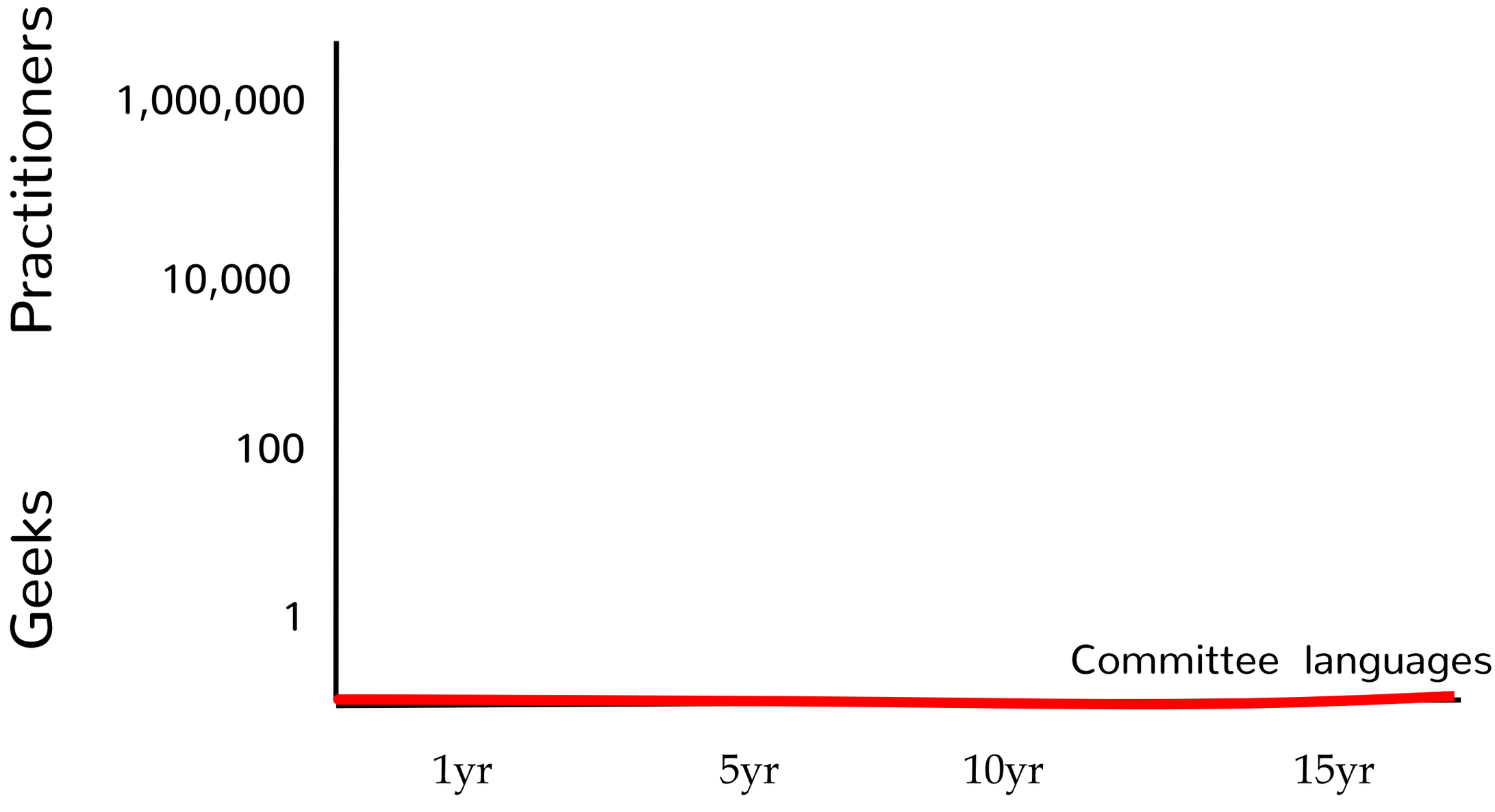

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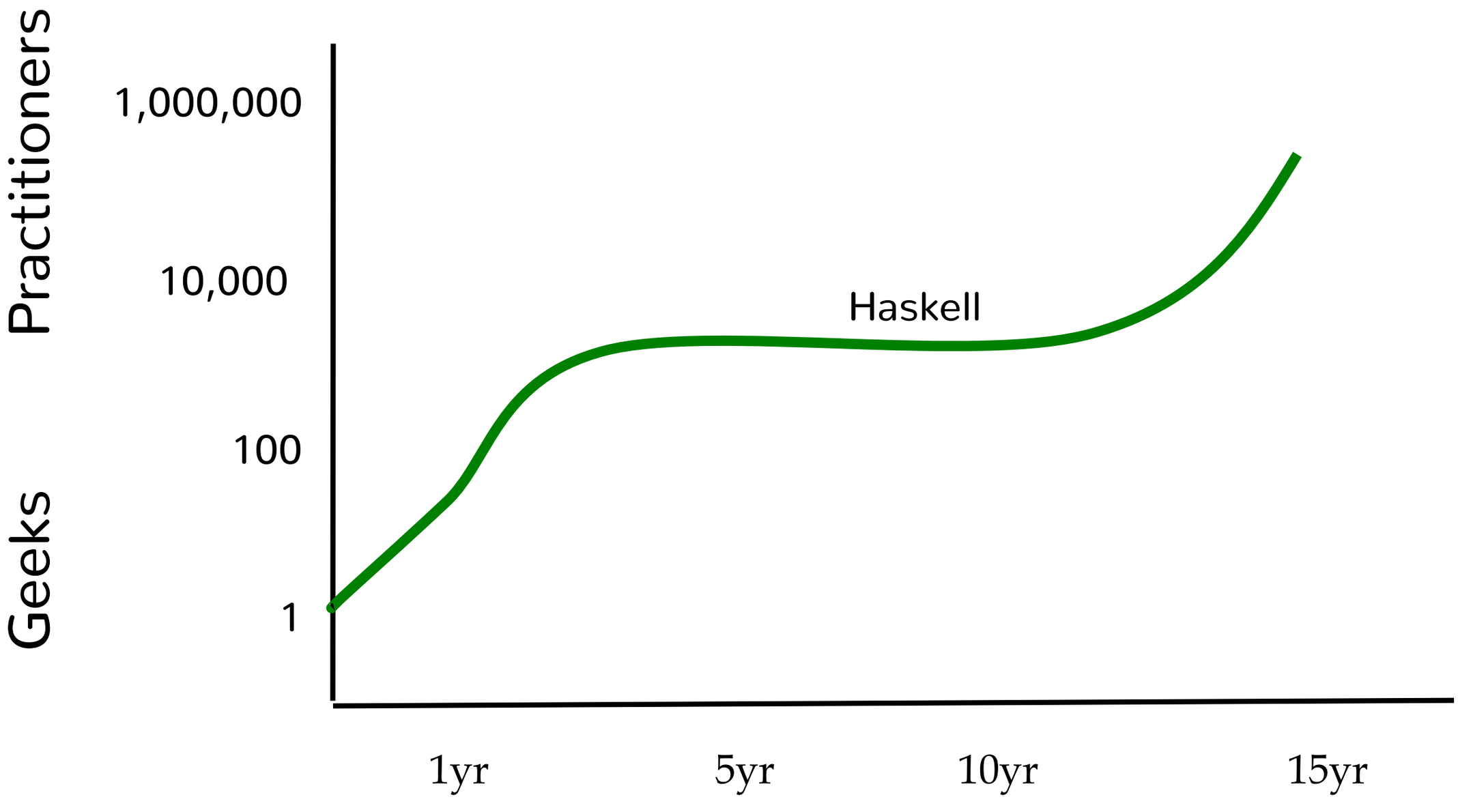

goto intro.hs