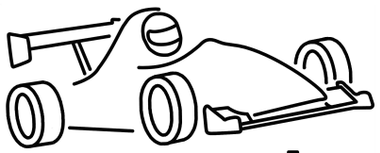
Programming Language Trends

Paul Butcher



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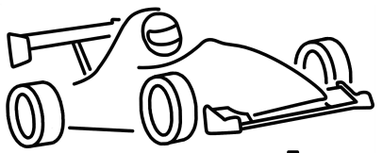

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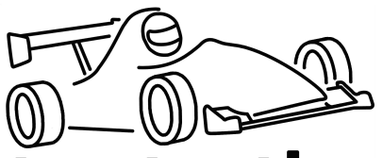
- Programming languages evolve over time
- Evolution happens in “jumps”
- The last “jump” was in the mid-1990s
- Another big change is coming



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Some history…

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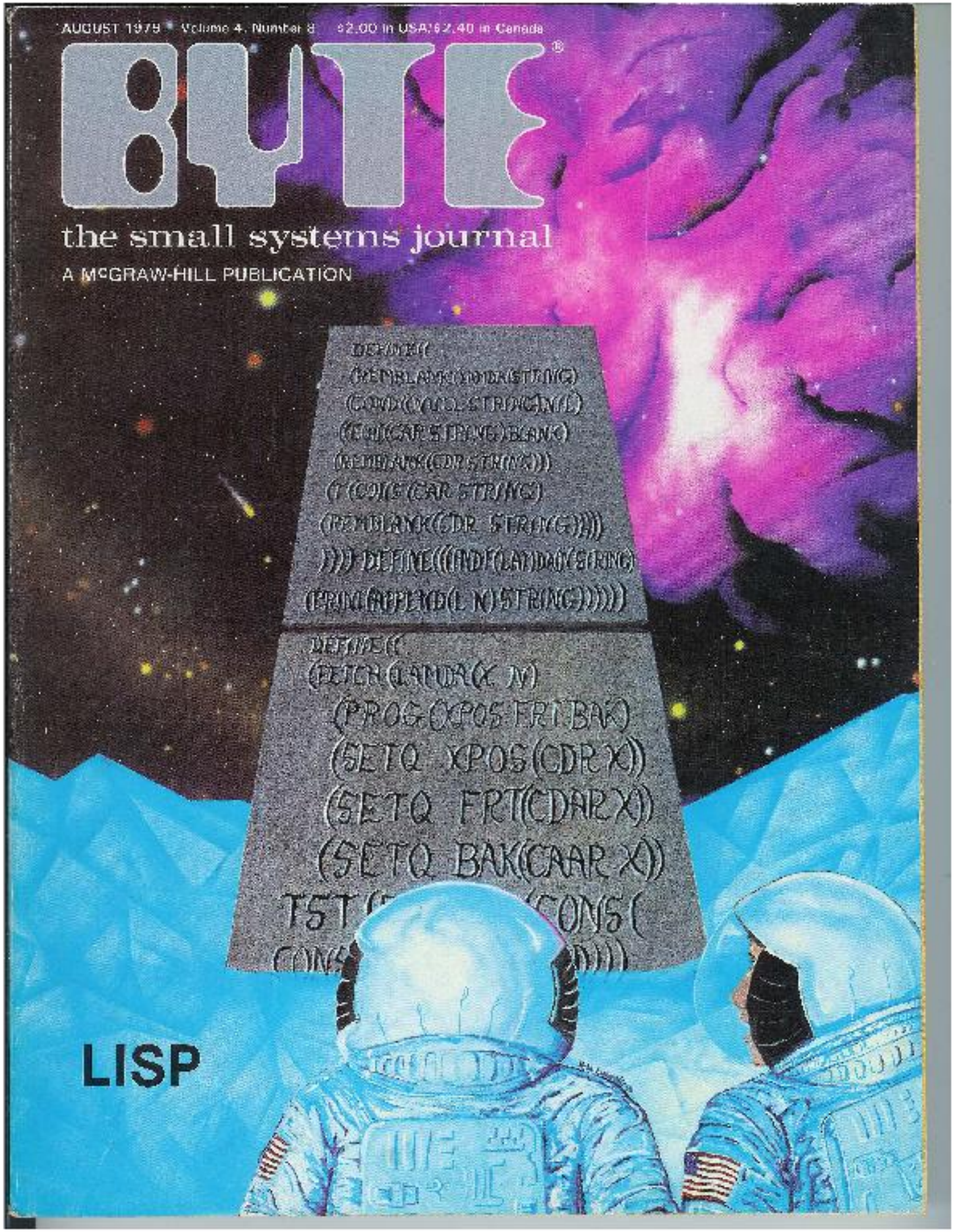
1979



1980

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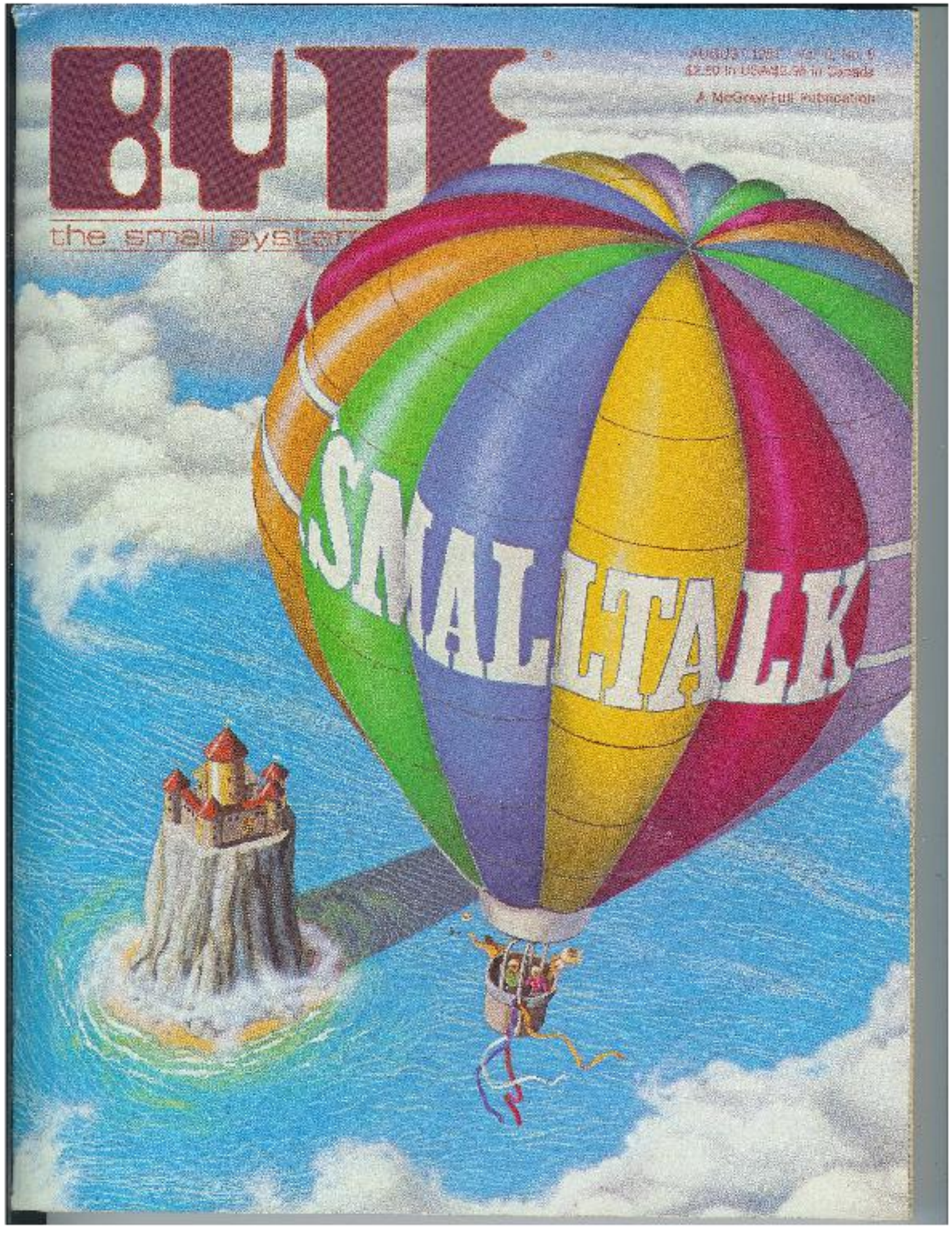
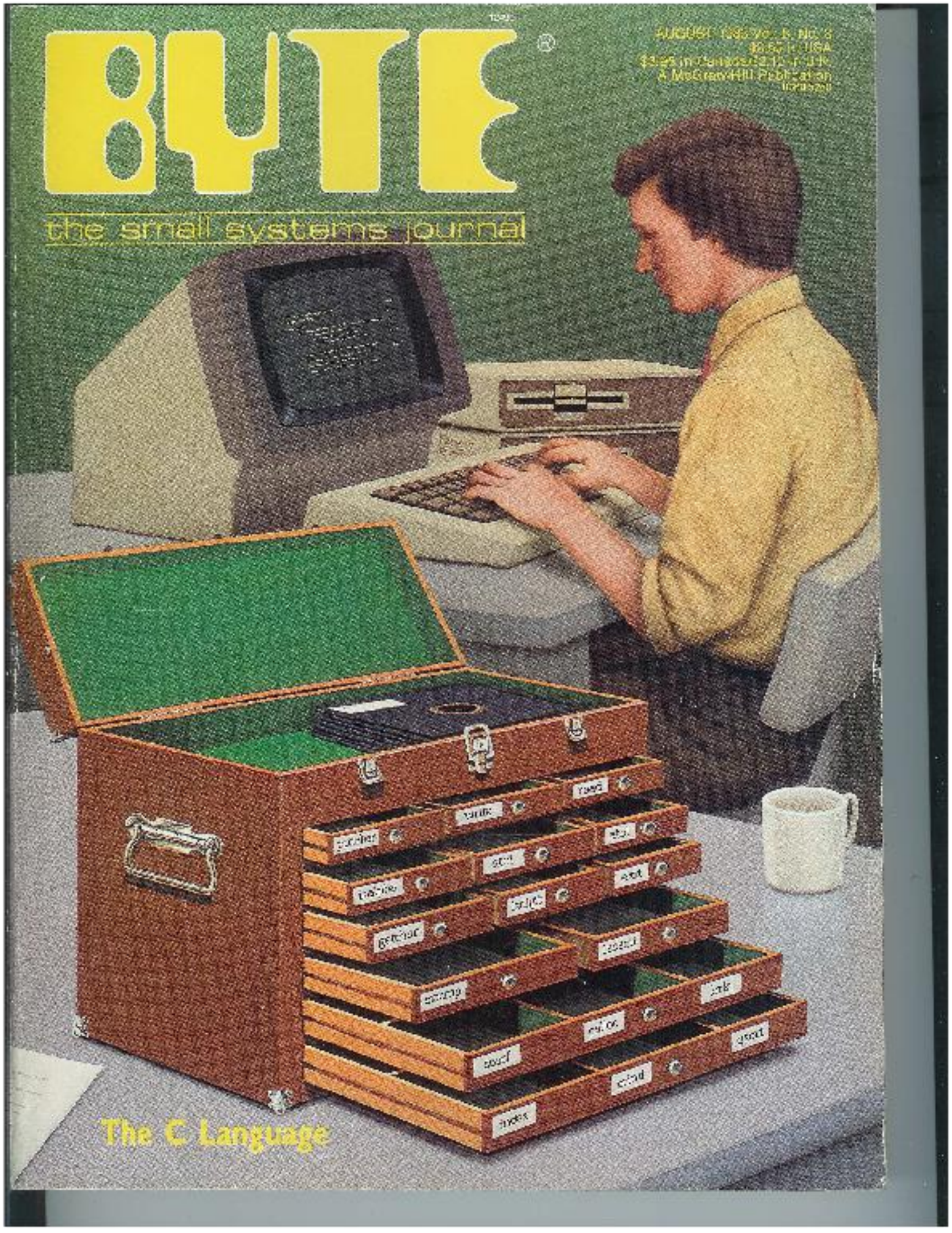
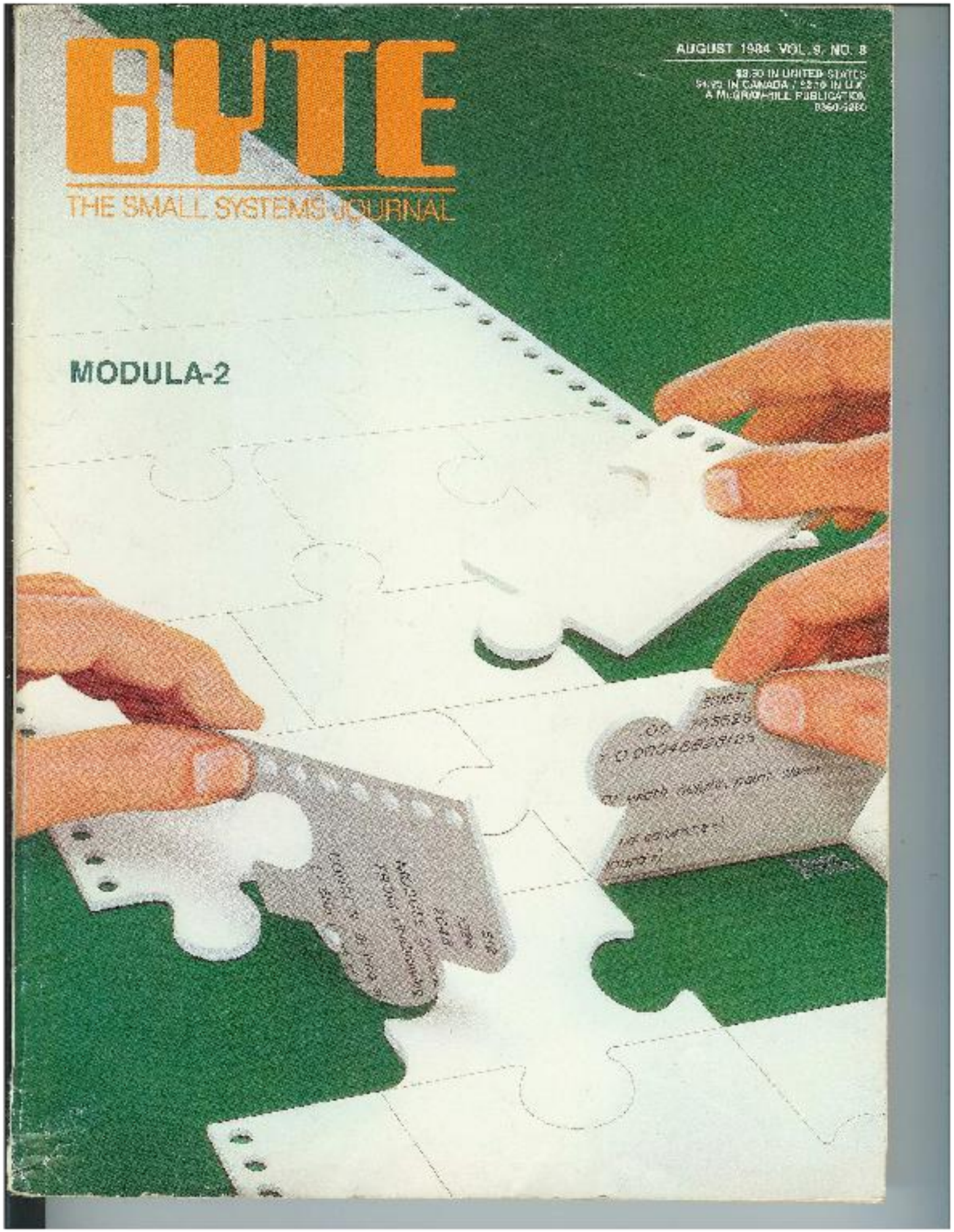
1981



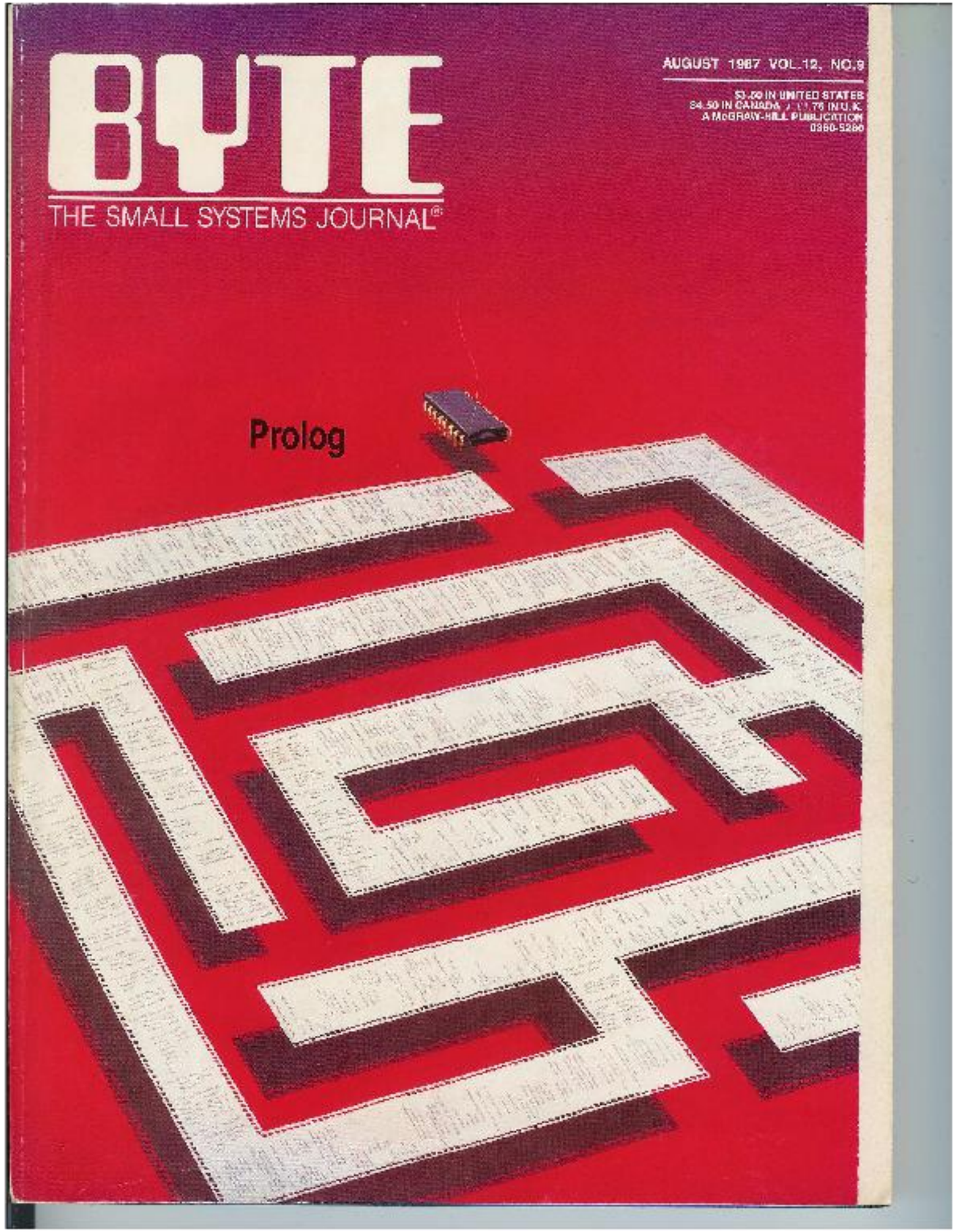
1983



1984

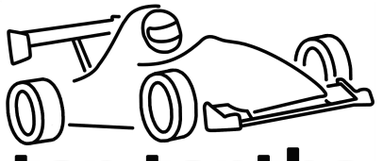


1987



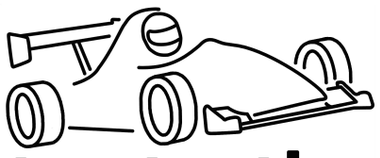
1988

Feb 2016	Feb 2015	Change	Programming Language	Ratings	Change
1	2	▲	Java	21.145%	+5.80%
2	1	▼	C	15.594%	-0.89%
3	3		C++	6.907%	+0.29%
4	5	▲	C#	4.400%	-1.34%
5	8	▲	Python	4.180%	+1.30%
6	7	▲	PHP	2.770%	-0.40%
7	9	▲	Visual Basic .NET	2.454%	+0.43%
8	12	⇈	Perl	2.251%	+0.86%
9	6	▼	JavaScript	2.201%	-1.31%
10	11	▲	Delphi/Object Pascal	2.163%	+0.59%



TIOBE Index for February 2016

Programming Language	2016	2011	2006	2001	1996	1991	1986
Java	1	1	1	3	30	-	-
C	2	2	2	1	1	1	1
C++	3	3	3	2	2	2	8
C#	4	5	6	10	-	-	-
Python	5	6	7	26	15	-	-
PHP	6	4	4	21	-	-	-
JavaScript	7	10	9	7	32	-	-
Visual Basic .NET	8	191	-	-	-	-	-
Objective-C	9	8	43	-	-	-	-
Perl	10	7	5	4	3	-	-
Ada	25	22	15	17	6	9	3
Lisp	26	13	13	19	5	3	2



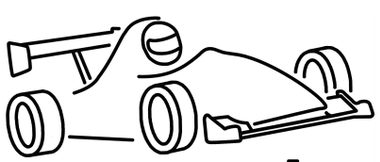
TIOBE Long Term History

When the language was created

1	JavaScript	(1995)
2	Java	(1995)
3	PHP	(1995)
4	Python	(1991)
5	C#	(2000)
5	C++	(1985)
5	Ruby	(1995)
8	CSS	(1996)
9	C	(1972)
10	Objective-C	(1983)

Something big happened in the mid-1990s!

(The Web)

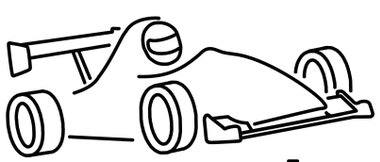


RedMonk Rankings June 2015

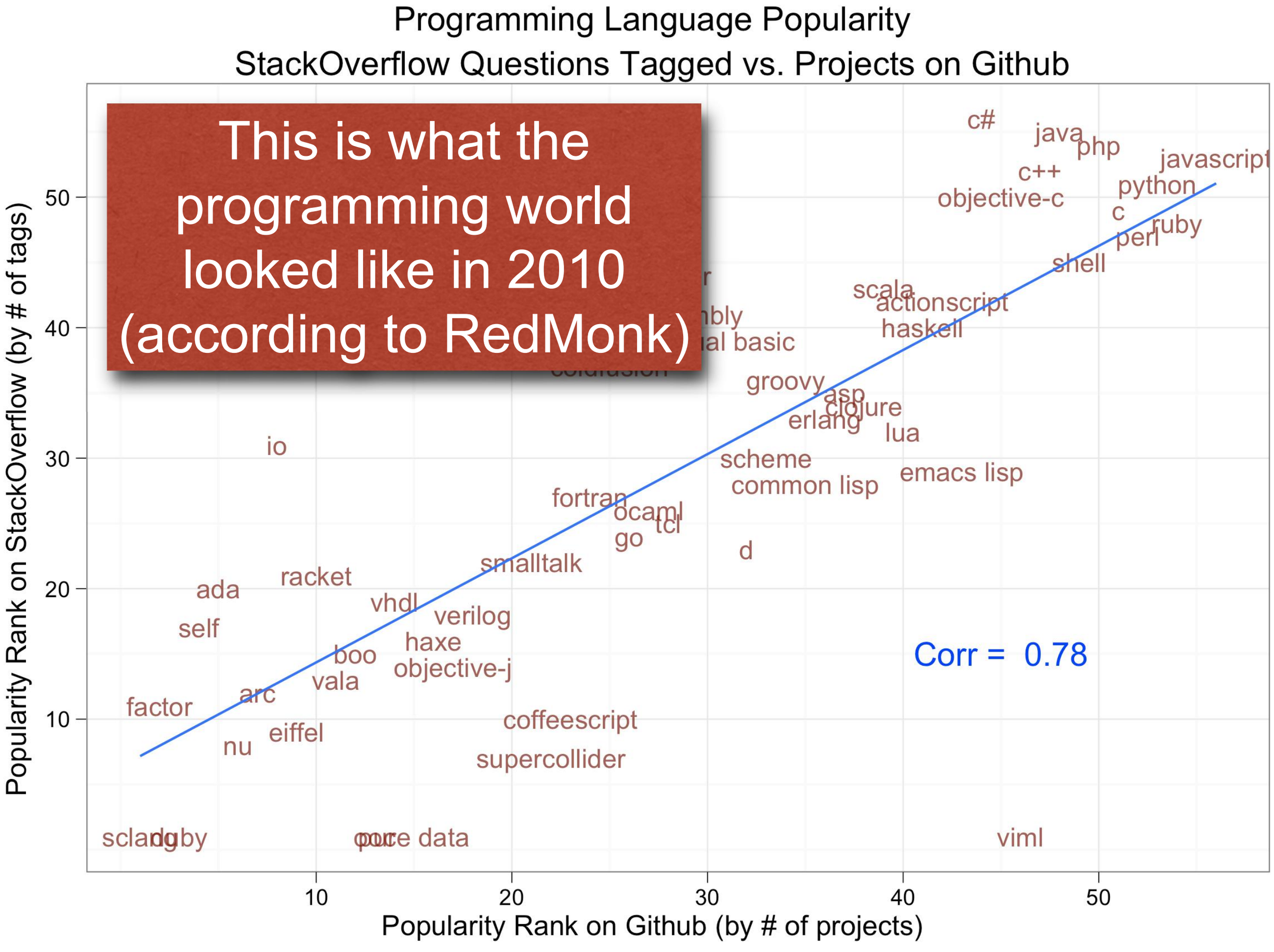
11	Perl	(1987)
11	Shell	(1971)
13	R	(1993)
14	Scala	(2004)
15	Go	(2009)
15	Haskell	(1990)
17	Matlab	(1984)
18	Swift	(2014)
19	Clojure	(2007)
19	Groovy	(2003)
19	Visual Basic	(1964/2001)

Something big is happening again

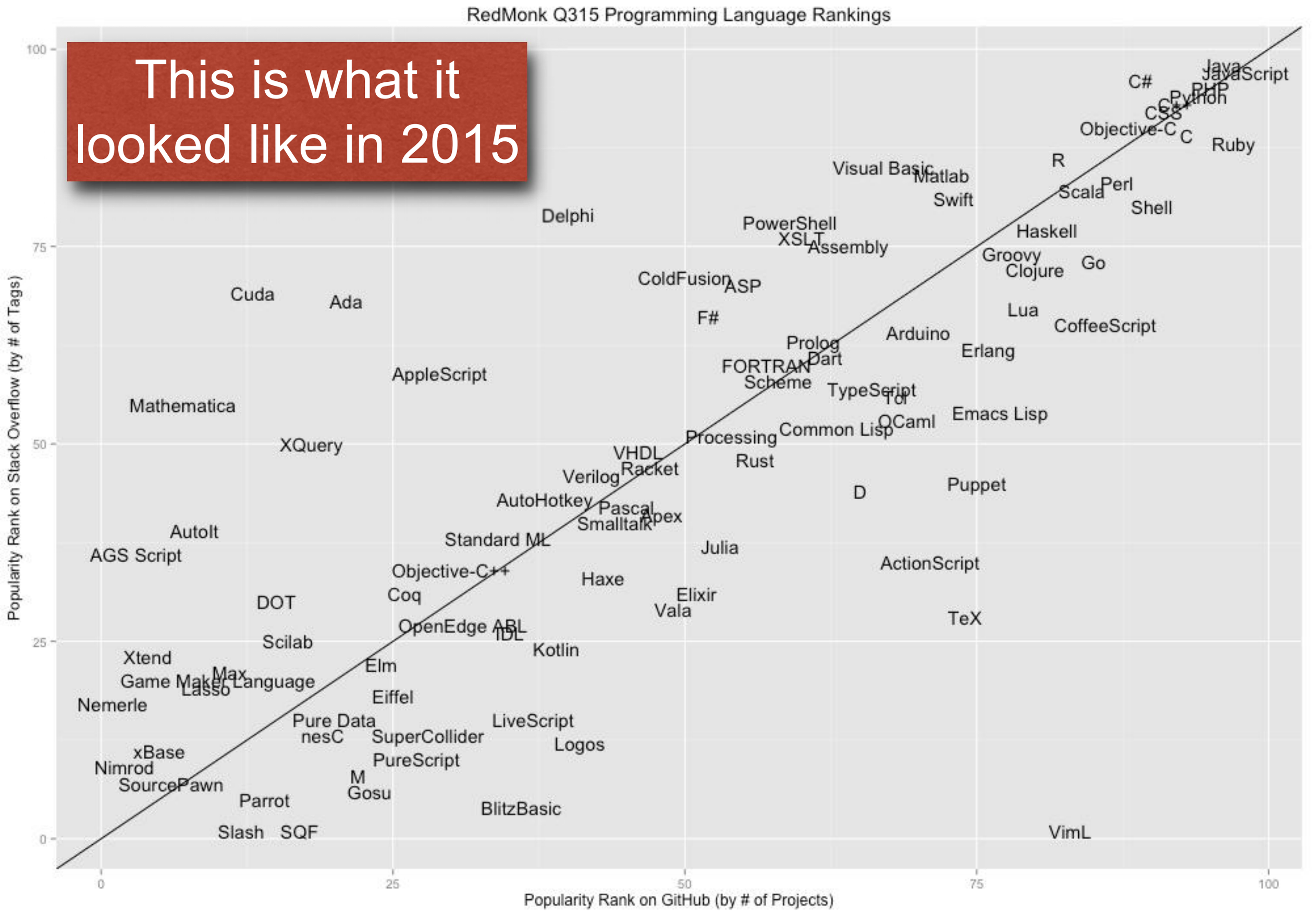
(but what is it?)



RedMonk Rankings June 2015


Programming Language Popularity
StackOverflow Questions Tagged vs. Projects on Github
This is what the programming world looked like in 2010 (according to RedMonk)
Popularity Rank on StackOverflow (by # of tags)
Popularity Rank on Github (by # of projects)
Corr = 0.78
c#
java
php
javascript
c++
python
objective-c
c
ruby
perl
shell
scala
actionscript
haskell
groovy
asp
clojure
erlang
lua
scheme
common lisp
emacs lisp
fortran
ocaml
tcl
go
d
smalltalk
racket
ada
vhdl
verilog
self
haxe
boo
objective-j
vala
arc
factor
coffeescript
eiffel
nu
supercollider
io
viml
10
20
30
40
50

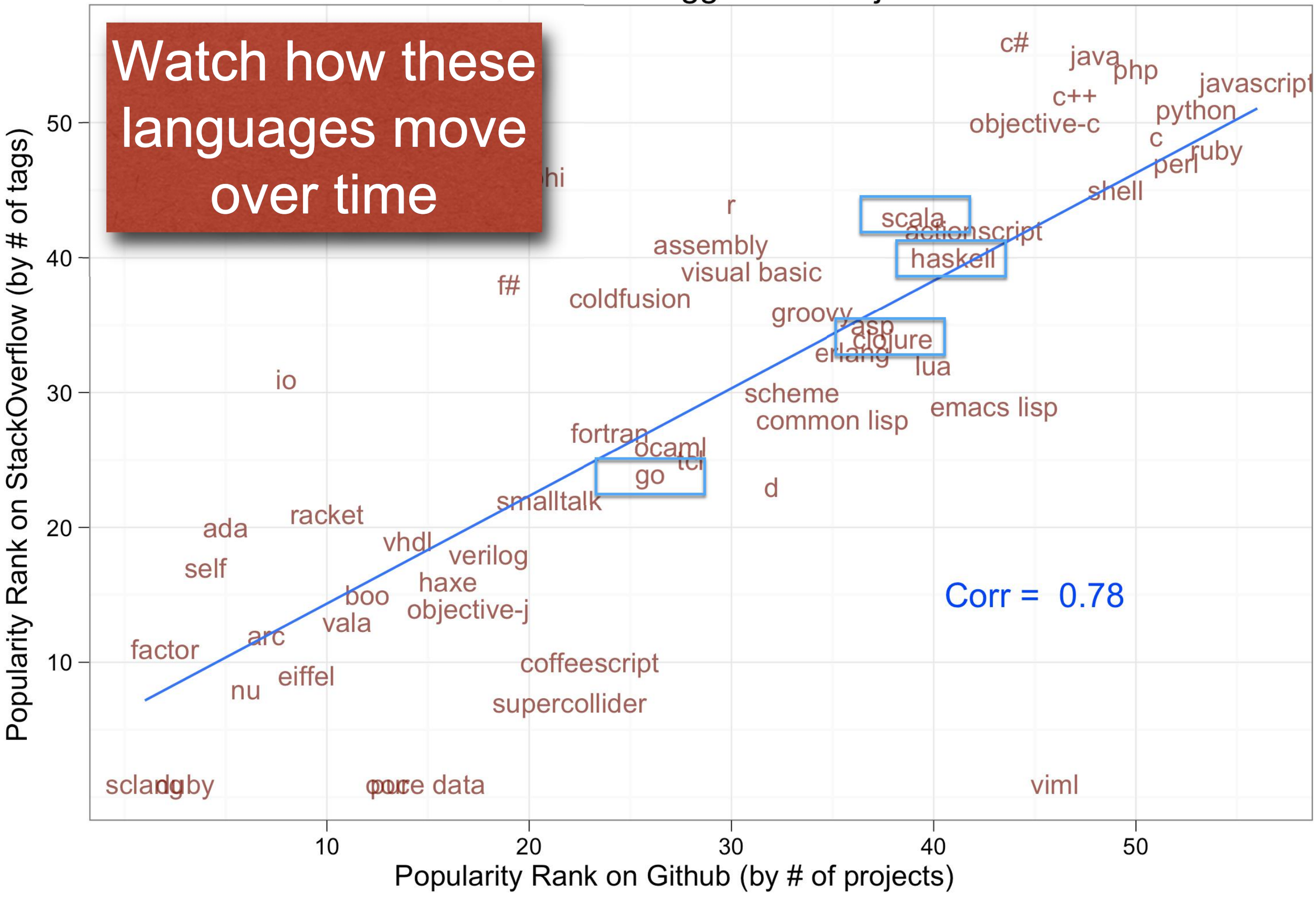
This is what it looked like in 2015



Programming Language Popularity

StackOverflow Questions Tagged vs. Projects on Github

Watch how these languages move over time



RedMonk Q315 Programming Language Rankings

RedMonk

Popularity Rank on Stack Overflow (by # of Tags)

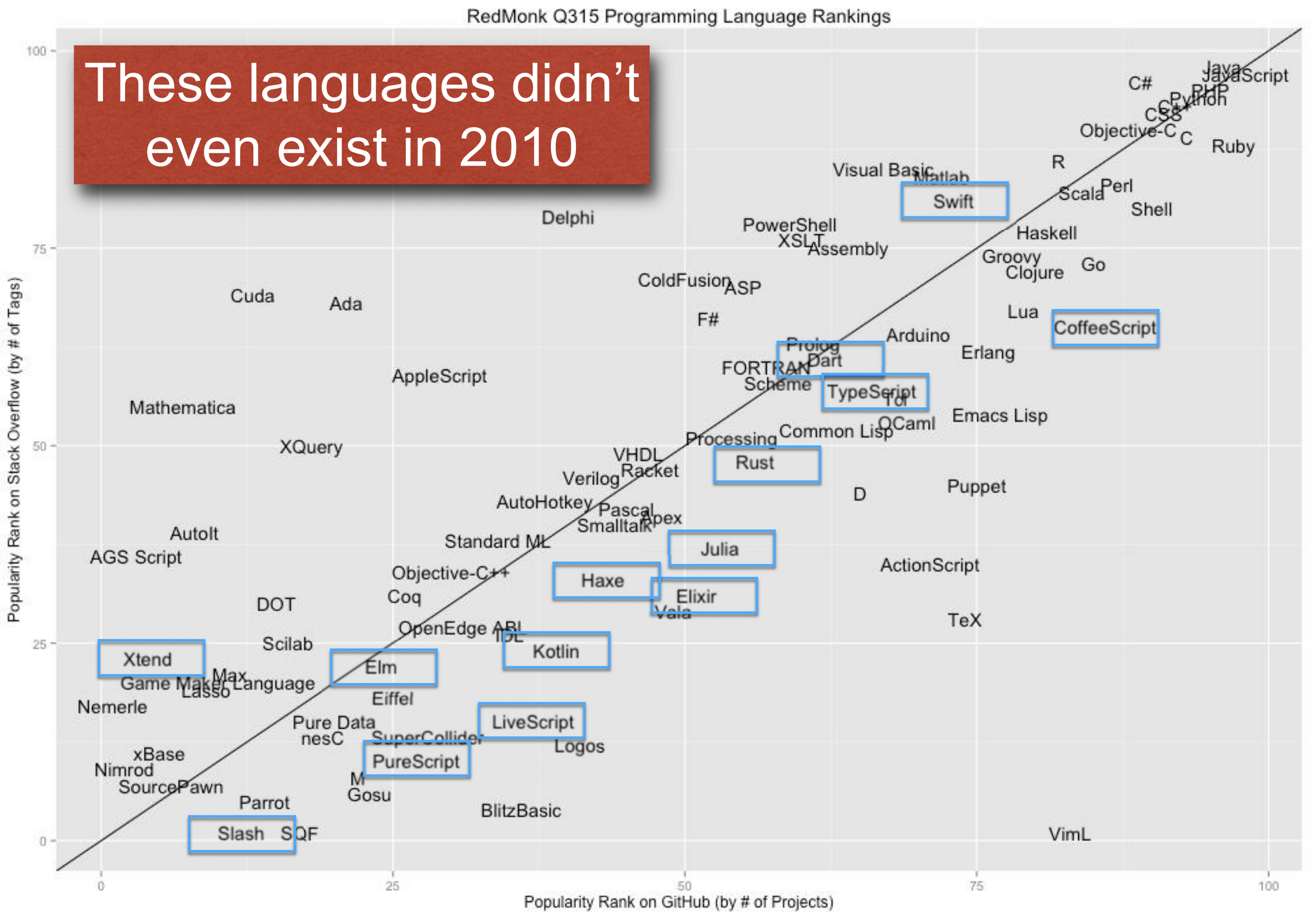
Popularity Rank on GitHub (by # of Projects)

100
75
50
25
0

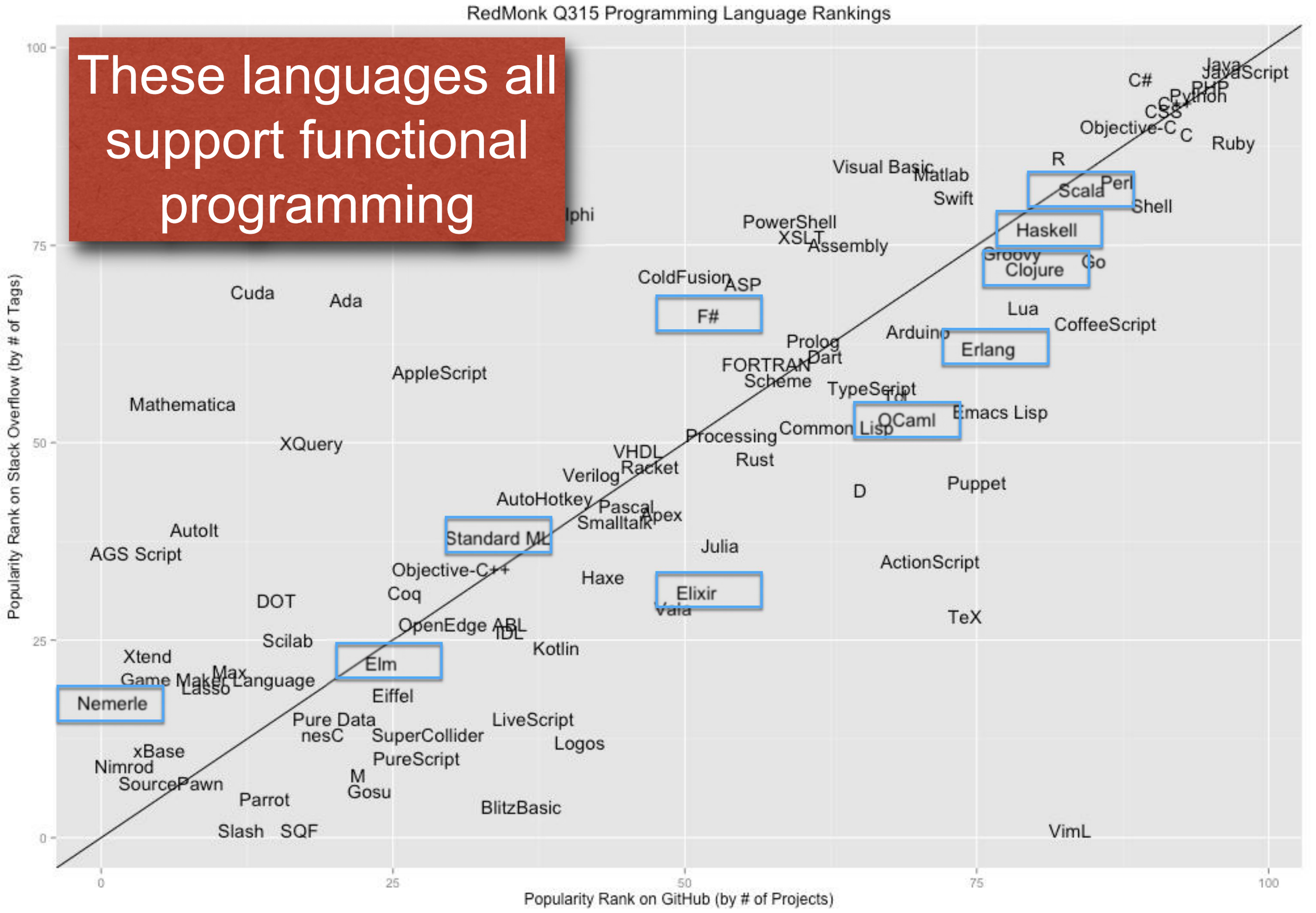
0
25
50
75
100

SQL
XML
Delphi
Cuda
Ada
AppleScript
Mathematica
XQuery
AutoIt
AGS Script
DOT
Scilab
Xtend
Max
Game Maker Language
Lasso
Nemerle
xBase
Nimrod
SourcePawn
Parrot
Slash
SQF
Visual Basic
Matlab
Swift
PowerShell
XSLT
Assembly
ColdFusion
ASP
F#
Prolog
Dart
FORTRAN
Scheme
TypeScript
Tcl
Arduino
Erlang
Lua
CoffeeScript
Processing
Common Lisp
OCaml
Emacs Lisp
VHDL
Racket
Rust
Verilog
AutoHotkey
Pascal
Apex
Smalltalk
Standard ML
Julia
ActionScript
Objective-C++
Haxe
Coq
Elixir
Vala
TeX
OpenEdge ABL
TDL
Kotlin
Elm
Eiffel
Pure Data
nesC
SuperCollider
LiveScript
Logos
PureScript
M
Gosu
BlitzBasic
VimL
Java
JavaScript
C#
PHP
Python
C++
CSS
Objective-C
C
Ruby
R
Perl
Scala
Shell
Haskell
Groovy
Clojure
Go
Puppet
D

These languages didn't even exist in 2010

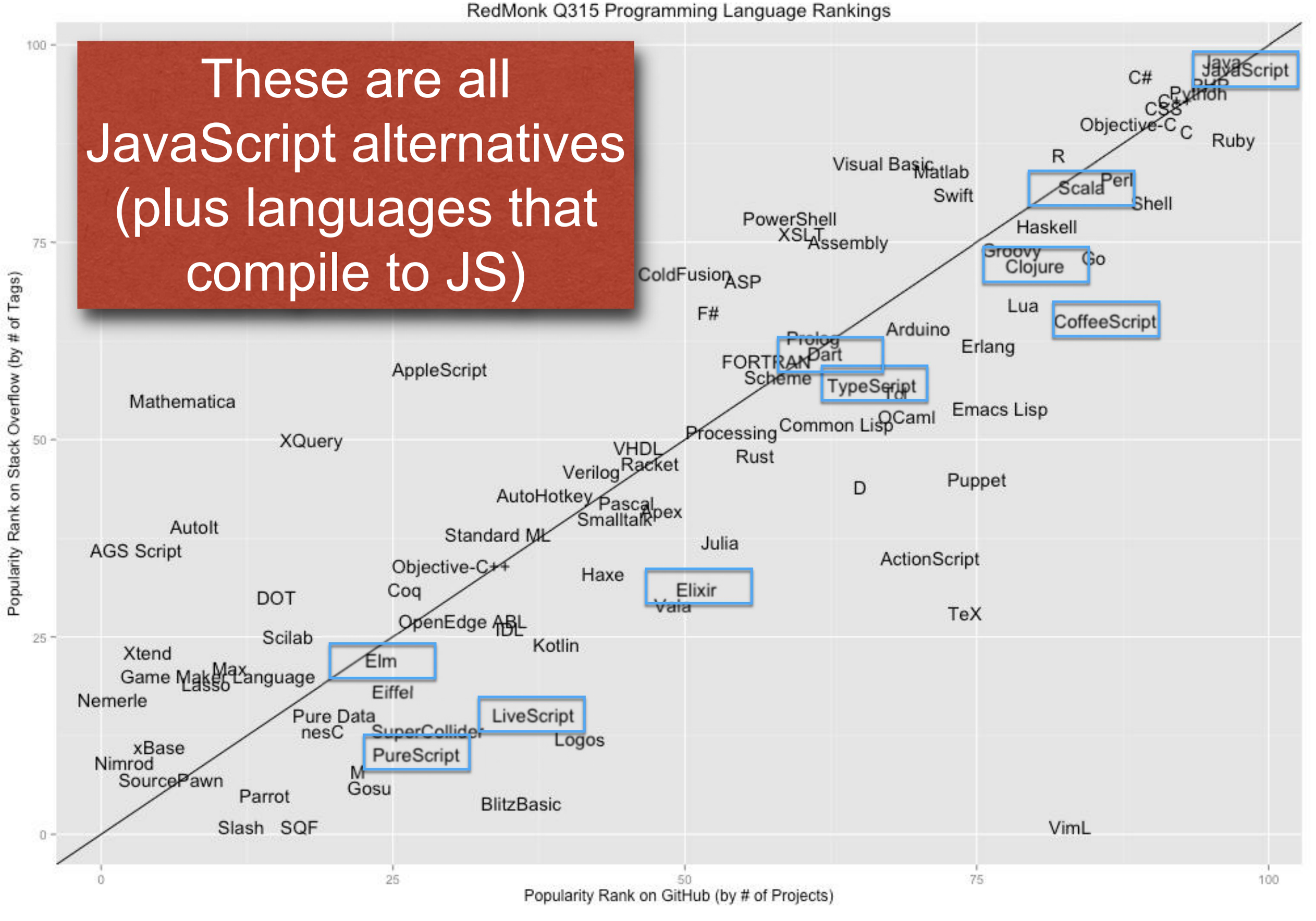


These languages all support functional programming



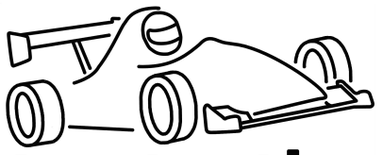
These are all JavaScript alternatives

These are all JavaScript alternatives (plus languages that compile to JS)



These all support parallelism or concurrency

- Client-side Web programming
- Functional programming
- Concurrent/Parallel programming



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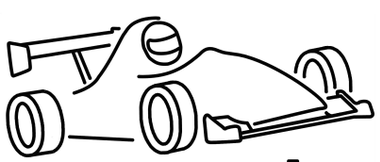
Sequential Sum in Java

```
public int sum(int[] numbers)
{
  int accumulator = 0;
  for (int n: numbers)
    accumulator += n;
  return accumulator;
}
```



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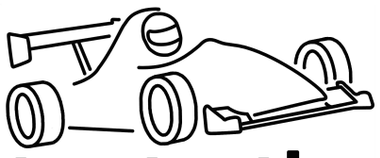
Sequential Sum in Clojure

```
(defn sum [numbers]
  (reduce + numbers))
```



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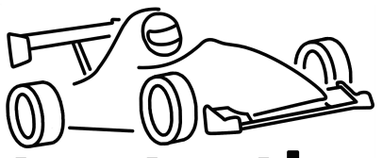
Parallel Sum in Clojure

```
(defn sum [numbers]
  (fold + numbers))
```



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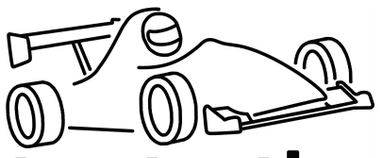
Parallel Word Count in Java

```
public class WordCount {

  private static final int NUM_COUNTERS = 4;

  public static void main(String[] args) throws Exception {
    ArrayBlockingQueue<Page> queue = new ArrayBlockingQueue<Page>(100);
    ConcurrentHashMap<String, Integer> counts = new ConcurrentHashMap<String, Integer>();
    ExecutorService executor = Executors.newCachedThreadPool();

    for (int i = 0; i < NUM_COUNTERS; ++i)
      executor.execute(new Counter(queue, counts));
    Thread parser = new Thread(new Parser(queue));
    parser.start();
    parser.join();
    for (int i = 0; i < NUM_COUNTERS; ++i)
      queue.put(new PoisonPill());
    executor.shutdown();
    executor.awaitTermination(10L, TimeUnit.MINUTES);
  }
}
```



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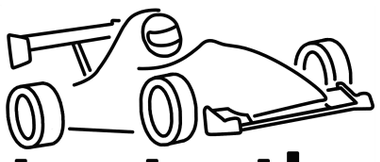
Parallel Word Count in Java (continued)

```
class Parser implements Runnable {

  private BlockingQueue<Page> queue;

  public Parser(BlockingQueue<Page> queue) {
    this.queue = queue;
  }

  public void run() {
    try {
      Iterable<Page> pages = new Pages(100000, "enwiki.xml");
      for (Page page: pages)
        queue.put(page);
    } catch (Exception e) { e.printStackTrace(); }
  }
}
```



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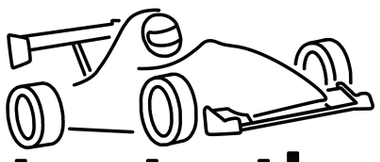
Parallel Word Count in Java (continued)

```
class Counter implements Runnable {

  private BlockingQueue<Page> queue;
  private ConcurrentMap<String, Integer> counts;
  private HashMap<String, Integer> localCounts;

  public Counter(BlockingQueue<Page> queue,
                 ConcurrentMap<String, Integer> counts) {
    this.queue = queue;
    this.counts = counts;
    localCounts = new HashMap<String, Integer>();
  }

  public void run() {
    try {
      while(true) {
        Page page = queue.take();
        if (page.isPoisonPill())
          break;
        Iterable<String> words = new Words(page.getText());
        for (String word: words)
          countWord(word);
      }
      mergeCounts();
    } catch (Exception e) { e.printStackTrace(); }
  }
```



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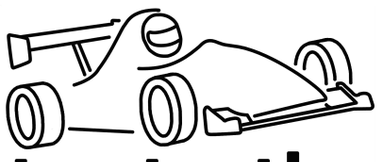
Parallel Word Count in Java (continued)

```
private void countWord(String word) {
  Integer currentCount = localCounts.get(word);
  if (currentCount == null)
    localCounts.put(word, 1);
  else
    localCounts.put(word, currentCount + 1);
}

private void mergeCounts() {
  for (Map.Entry<String, Integer> e: localCounts.entrySet()) {
    String word = e.getKey();
    Integer count = e.getValue();
    while (true) {
      Integer currentCount = counts.get(word);
      if (currentCount == null) {
        if (counts.putIfAbsent(word, count) == null)
          break;
      } else if (counts.replace(word, currentCount, currentCount + count)) {
        break;
      }
    }
  }
}
```



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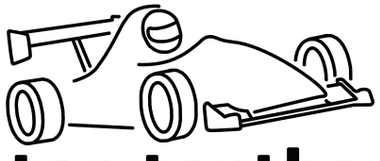
Parallel Word Count in Clojure

```
(defn count-words-sequential [pages]
  (frequencies (mapcat get-words pages)))

(defn count-words [pages]
  (reduce (partial merge-with +)
    (pmap count-words-sequential (partition-all 100 pages))))

(defn -main [& args]
  (count-words (take 100000 (get-pages "enwiki.xml"))))
```



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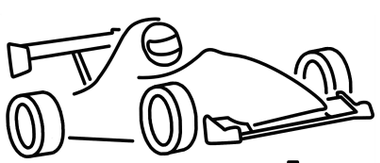
Which language will “win”?

?



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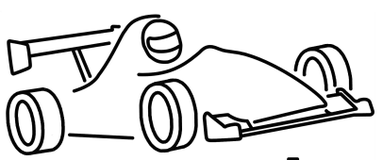
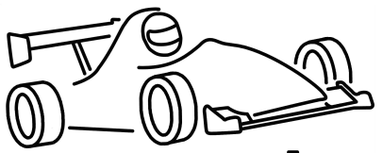
What does this mean for you?

- Learn a new language
- Learn another new language
- Learn **functional programming**
- Learn **concurrent/parallel programming**





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