THANK YOU

WHAT IS NEXT?

(A FRIENDLY GUIDE TO CHOOSING YOUR NEXT LANGUAGE)

OCTOBER 2017

Disclaimer:

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IRISH-ISMS AHEAD

CRAIC, EEJIT, ETC ARE TOTALLY OK WORDS

- Eejit – an idiot or a fool, but more often it’s used in an affectionate (yet still mocking!) manner.
- Cop on - common sense
- Give out - complaint

THIS IS BACON

DELPHI

VB.NET

C# (SOME JS WHEN JQUERY WAS NEW, SOME JAVA)

F# / C# <- STARTED LEARNING FP WOO!

SCALA

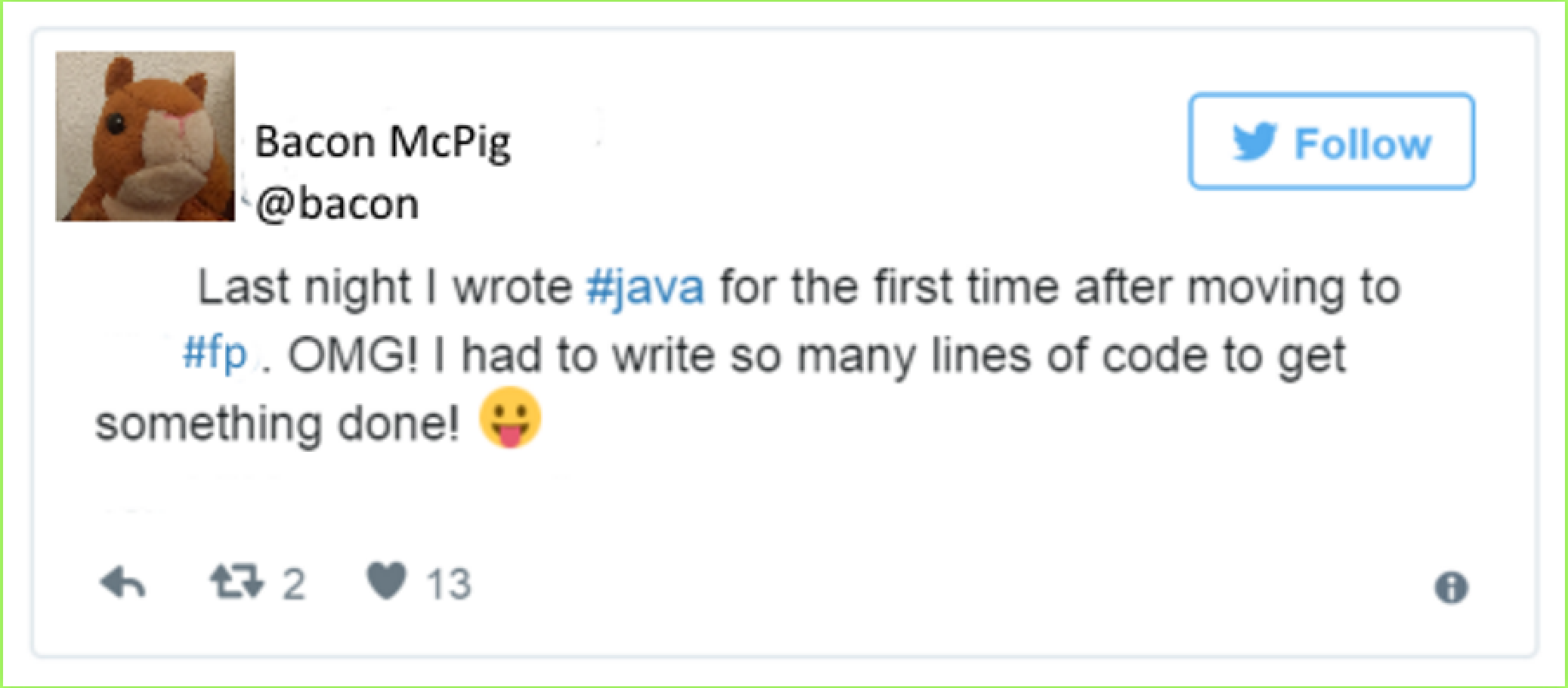
REFERENTIAL TRANSPARENCY

LESS MUTABLE STATE!!

NO EXCEPTIONS FOR FLOW CONTROL!!

.. AND MORE

BACON'S FRIENDS FELT AWKWARD



Bacon McPig
@bacon

Last night I wrote #java for the first time after moving to #fp . OMG! I had to write so many lines of code to get something done! 😛

2 13

BACON'S FP

- **Typed** FP
- FP everywhere
- Aspiring to purity / Total functions

PROBLEMS WITH FP AS BACON UNDERSTANDS IT

- Dependency management
- Type tetris
- Complicated concepts

... is it worth it?... is it the best way?

BACON DREAMS OF WELL STRUCTURED PROGRAMS

Well-structured software is easy to write and to debug, and provides a collection of modules that can be reused to reduce future programming costs. [Why FP matters. John Hughes]

MEET OOOOO

- Works with Bacon
- Shipping is everything
- Curious about functional approach

"FUNCTIONAL PROGRAMMING HAS EMERGED SINCE THE MID-2000S AS AN ATTRACTIVE BASIS FOR SOFTWARE CONSTRUCTION. ONE REASON IS THE INCREASING IMPORTANCE OF PARALLELISM AND DISTRIBUTION IN COMPUTING." ODERSKY, ROMPF APRIL 2014

"...ESPECIALLY ITS (SCALA) FOCUS ON PRAGMATIC CHOICES THAT UNIFY TRADITIONALLY DISPARATE PROGRAMMING-LANGUAGE PHILOSOPHIES (SUCH AS OBJECT-ORIENTED AND FUNCTIONAL PROGRAMMING)

ODERSKY, ROMPF APRIL 2014

SOLID LOOKS A LOT LIKE FP WHEN YOU SQUINT

FROM THE PL DESIGNERS

Scala is very much about better component oriented programming for the Java platform. Although we do a good job of object oriented programming which is very nice in F#, we haven't thought to make fundamental improvements at the component level, in a sense. We are quite happy to say "You are making components? OK, make it a .NET component". Don Syme - March 2009

"...[Scala] focus on pragmatic choices that unify traditionally disparate programming-language philosophies (such as object-oriented and functional programming). The key lesson is these philosophies need not be contradictory in practice.

[Odersky, Rompf - April 2014]

Regarding functional and object-oriented programming, one fundamental choice is where to define pieces of functionality (...) ...and Scala gives programmers the choice.

— *[Odersky, Rompf - April 2014]*

Choice also involves responsibility, and in many cases novice Scala programmers need guidance to develop an intuitive sense of how to structure programs effectively.

[Odersky, Rompf - April 2014]

When Oooo and Bacon talk, they often disagree and call each other names

DOING + THINKING

WE BUILD SYSTEMS WITH:

LANGUAGE(S)

TOOLS: LIBRARIES, FRAMEWORKS

CONTEXT: USERS AND COMMUNITY

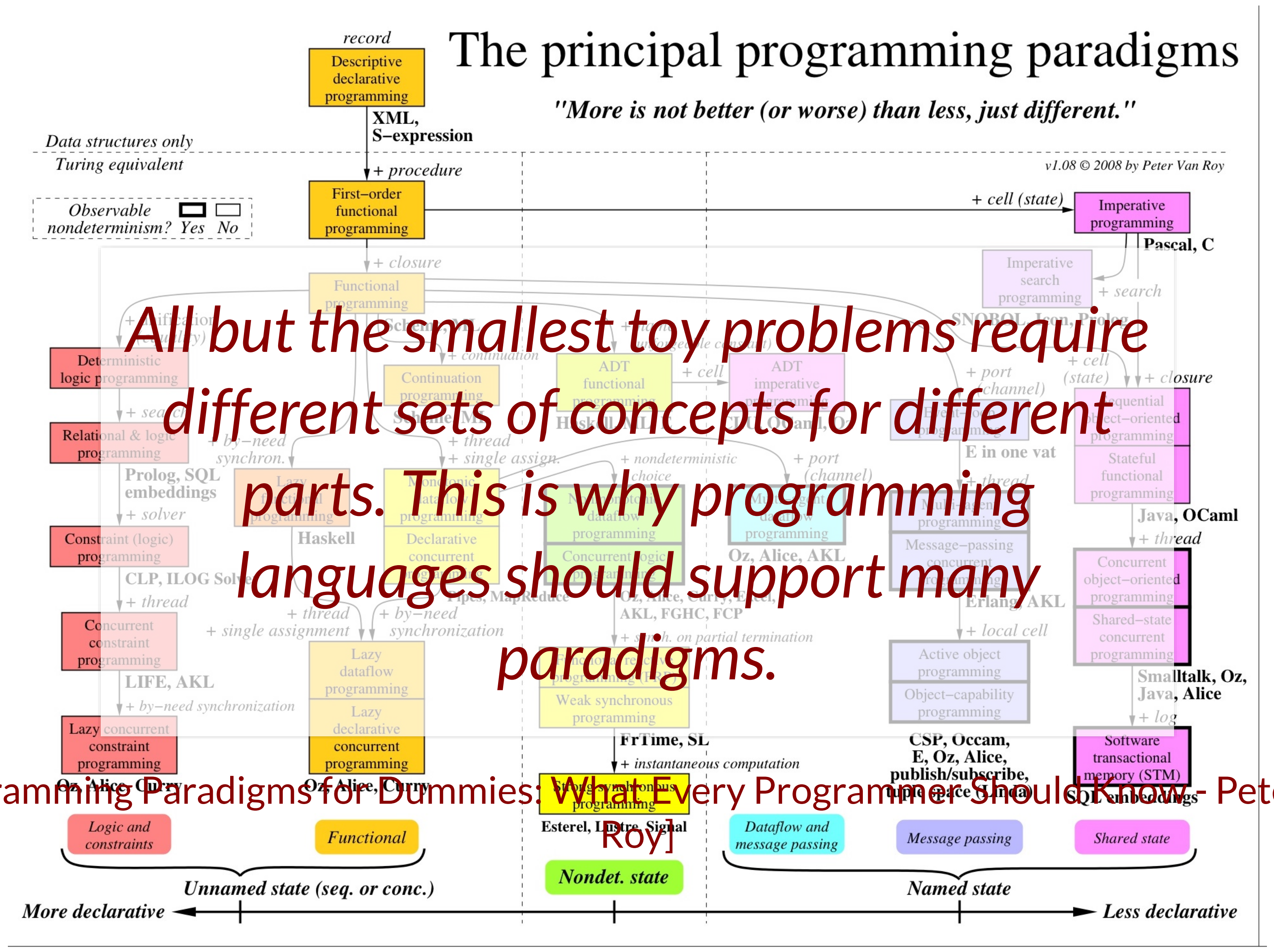
~CONTEXT~ BELIEFS MATTERS

- Paradigms and how they interact
- Paradigms and how they shift

A PROGRAMMING PARADIGM

...is an approach to programming a computer based on a mathematical theory or a coherent set of principles.

[Programming Paradigms for Dummies: What Every Programmer Should Know - Peter Van Roy]


The principal programming paradigms
"More is not better (or worse) than less, just different."
v1.08 © 2008 by Peter Van Roy
Descriptive declarative programming
XML, S-expression
First-order functional programming
Imperative programming
Pascal, C
Deterministic logic programming
Relational & logic programming
Prolog, SQL embeddings
Constraint (logic) programming
Concurrent constraint programming
LIFE, AKL
Lazy concurrent constraint programming
Oz, Alice, Curry
Haskell
Java, OCaml
Smalltalk, Oz, Java, Alice
Software transactional memory (STM)
SQL embeddings
Strong synchronous programming
Esterel, Lustre, Signal
CSP, Occam, E, Oz, Alice, publish/subscribe, tuple space (Linda)
Logic and constraints
Functional
Nondet. state
Dataflow and message passing
Message passing
Shared state
Unnamed state (seq. or conc.)
Named state
More declarative
Less declarative

All but the smallest toy problems require different sets of concepts for different parts. This is why programming languages should support many paradigms.

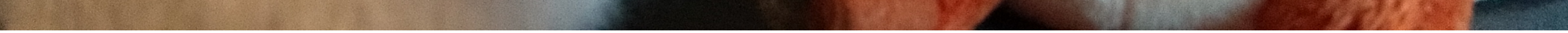
[Programming Paradigms for Dummies: What Every Programmer Should Know - Peter Van Roy]

A language should ideally support many concepts in a well-factored way, so that the programmer can choose the right concepts whenever they are needed without being encumbered by the others.

[Programming Paradigms for Dummies: What Every Programmer Should Know - Peter Van Roy]

...it is certainly not true that there is one "best" paradigm

[Programming Paradigms for Dummies: What Every Programmer Should Know - Peter Van Roy]



If the need for pervasive modifications manifests itself, we can take this as a sign that there is a new concept waiting to be discovered

[Programming Paradigms for Dummies: What Every Programmer Should Know - Peter Van Roy]

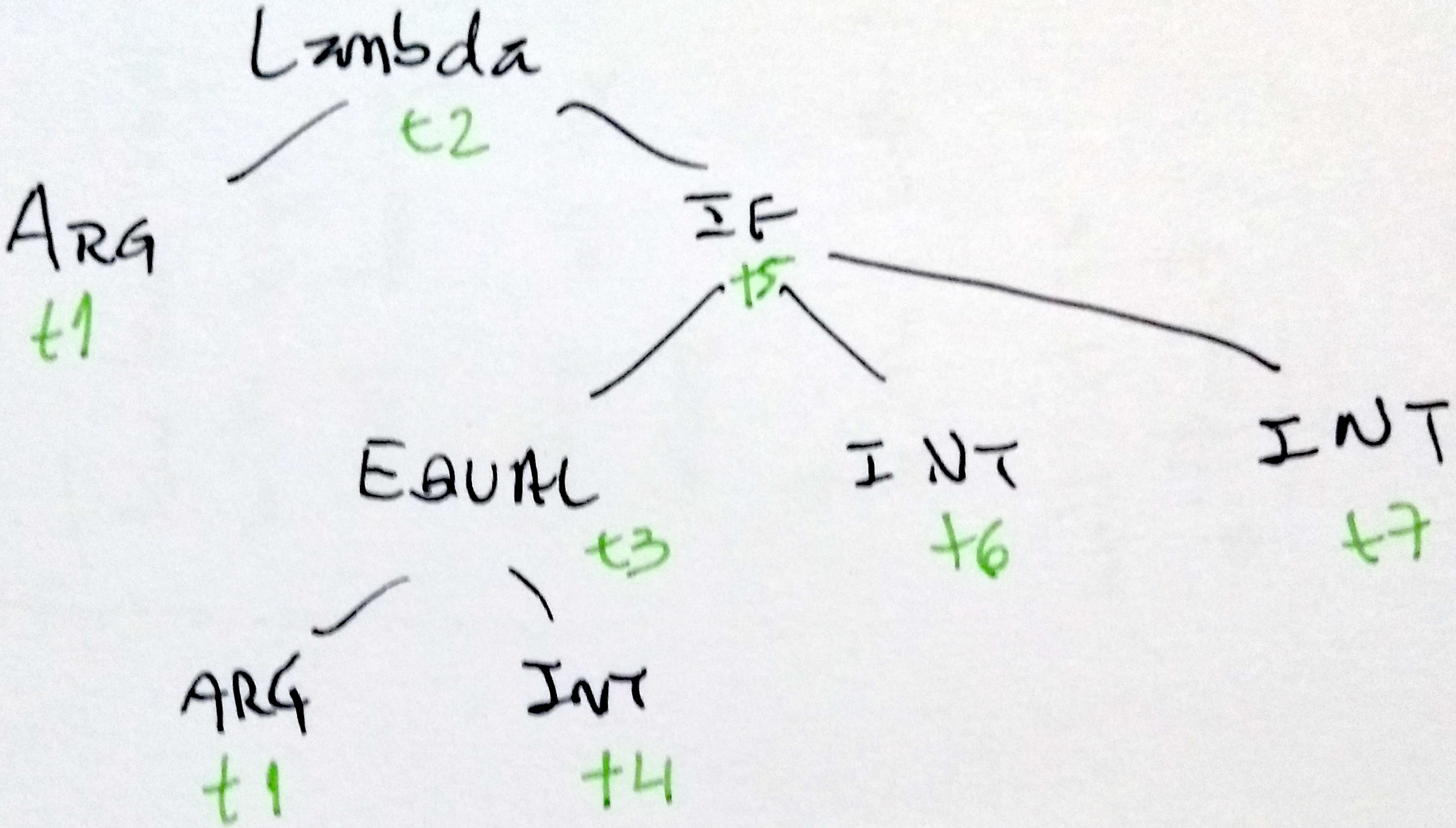
TYPE INFERENCE

```
let myfn bla =
        if bla = 0 then 0 else 42
```

```
// int -> int
let myfn bla =
        if bla = 0 then 0 else 42
```

```
let simpleFuncAst = LAMBDA(ARG "bla",
                    IF(EQUAL(
                        ARG("bla"), INT(0)),
                        INT(0),
                        INT(42)
                    ))

```


Lambda
t2
Arg
t1
IF
t5
EQUAL
t3
INT
t6
INT
t7
ARG
t1
INT
t4

```
1:   (Unbound "😺_1" === Unbound "😺_2")
2:   (Unbound "😺_2" === Bound "INT")
3:   (Unbound "😺_3" === Bound "BOOL")
4:   (Unbound "😺_4" === Bound "INT")
5:   (Unbound "😺_4" === Unbound "😺_6")
6:   (Unbound "😺_5" === Bound "INT")
7:   (Unbound "😺_5"=== Unbound "😺_6")
8:   (Unbound "😺_7" === Unbound "😺_1" -> Unbound "😺_6")
```

RESULTS

```
[("😺2", "INT"); ("😺3", "BOOL"); ("😺4", "INT"); ("😺5", "INT"); ("😺1", "INT"); ("😺6", "INT"); ("😺_7", "INT->INT")]
```

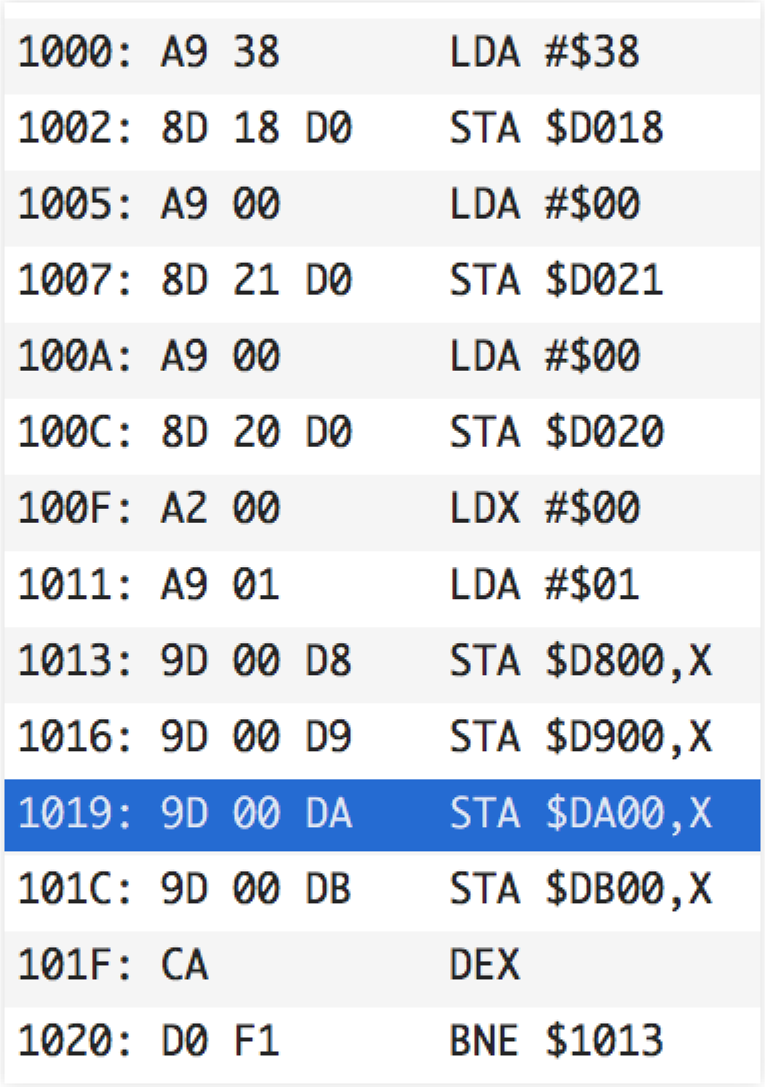
ASI64

Why write 6502 assembly when you can inline it in Racket?

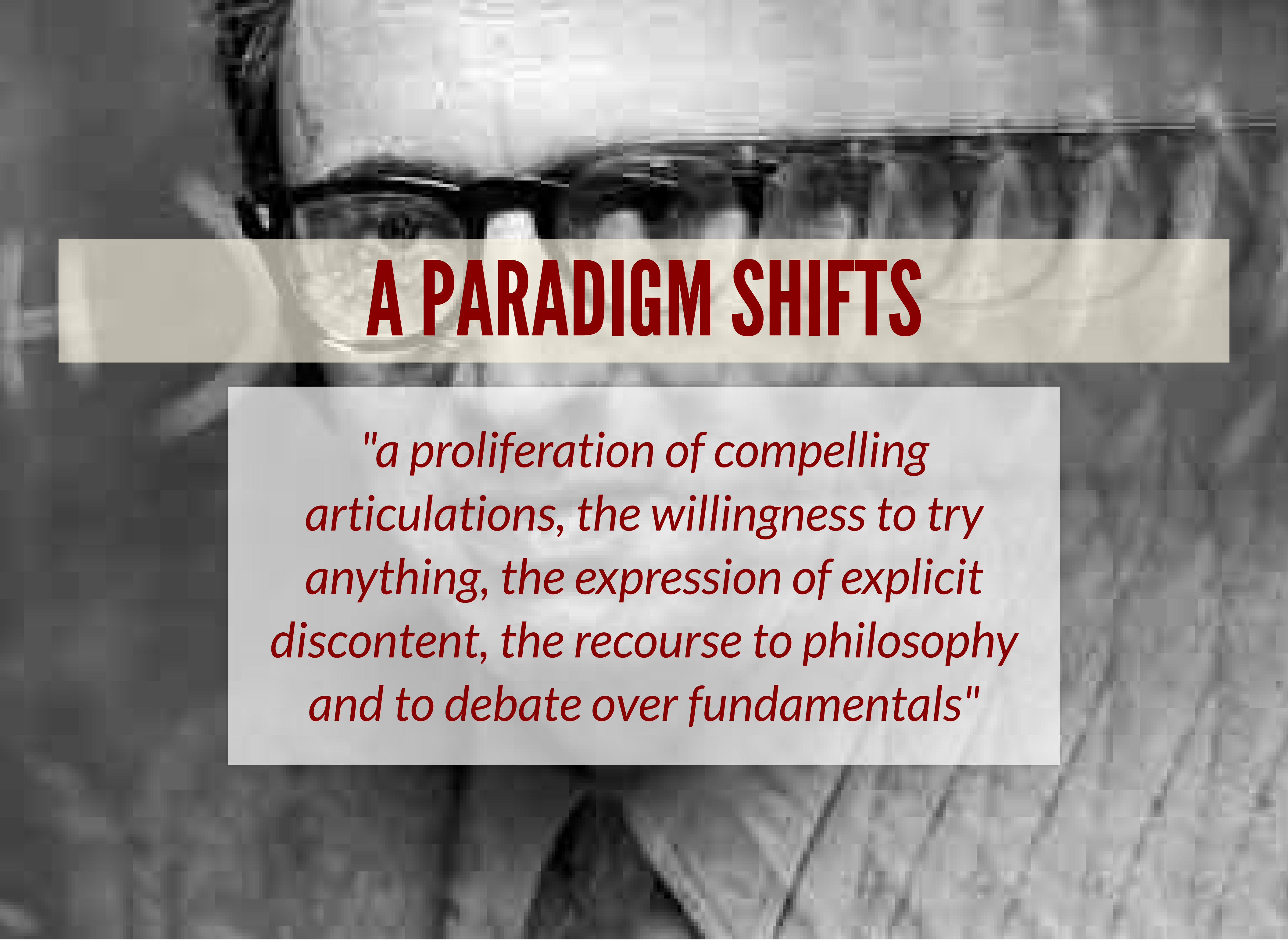
https://github.com/pezipink/asi64

```
(define (clear-screen start character)
  {     ldx @0
        lda @character
 :loop  (for ([i '(0 1 2 3)])
           {sta (+ start (* i $100)) x})
        dex
        bne loop-   })

```



```
1000: A9 38       LDA #$38
1002: 8D 18 D0    STA $D018
1005: A9 00       LDA #$00
1007: 8D 21 D0    STA $D021
100A: A9 00       LDA #$00
100C: 8D 20 D0    STA $D020
100F: A2 00       LDX #$00
1011: A9 01       LDA #$01
1013: 9D 00 D8    STA $D800,X
1016: 9D 00 D9    STA $D900,X
1019: 9D 00 DA    STA $DA00,X
101C: 9D 00 DB    STA $DB00,X
101F: CA          DEX
1020: D0 F1       BNE $1013
```



A PARADIGM SHIFTS

"a proliferation of compelling articulations, the willingness to try anything, the expression of explicit discontent, the recourse to philosophy and to debate over fundamentals"

Many langauges adding features generally associated with functional programming:

- lambdas
- functional data structures
- pattern matching, etc

C++, Java, C#

The decision to reject one paradigm is always simultaneously the decision to accept another, and the judgment leading to that decision involves the comparison of both paradigms with nature and with each other.

Kuhn, Thomas S.. The Structure of Scientific Revolutions: 50th Anniversary Edition (p. 78). University of Chicago Press. Kindle Edition.

It is, I think, particularly in periods of acknowledged crisis that scientists have turned to philosophical analysis as a device for unlocking the riddles of their field. Scientists have not generally needed or wanted to be philosophers.

Kuhn, Thomas S.. The Structure of Scientific Revolutions: 50th Anniversary Edition (p. 88). University of Chicago Press. Kindle Edition.

"... two scientific schools disagree about what is a problem and what a solution, they will inevitably talk through each other when debating the relative merits of their respective paradigms."

Kuhn, Thomas S.. The Structure of Scientific Revolutions: 50th Anniversary Edition (p. 109). University of Chicago Press. Kindle Edition.

"He argued that competing paradigms are "incommensurable": that is to say, there exists no objective way of assessing their relative merits."

Kuhn, Thomas S.. The Structure of Scientific Revolutions: 50th Anniversary Edition (p. 109). University of Chicago Press. Kindle Edition.

ARE WE SCIENTISTS?

Almost always the people who achieve these fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change .

Kuhn, Thomas S.. The Structure of Scientific Revolutions: 50th Anniversary Edition (p. 90). University of Chicago Press. Kindle Edition.

ALL THIS HAS HAPPENED BEFORE AND IT WILL HAPPEN AGAIN

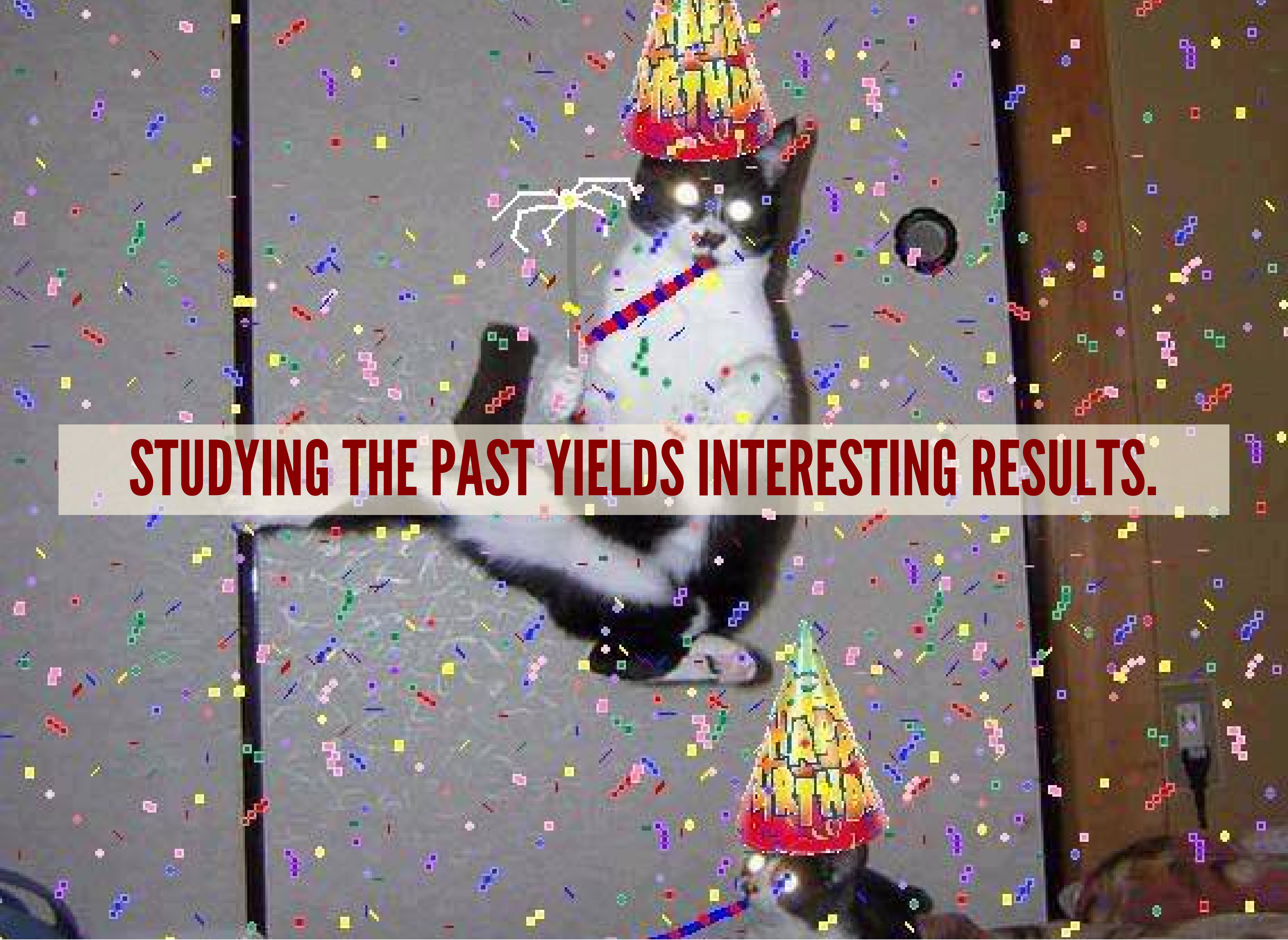
1978 Turing Award lecture by Floyd

To the designer of programming languages, I say: unless you can support the paradigms I use when I program, or at least support my extending your language into one that does support my programming methods, I don't need your shiny new languages; like an old car or house, the old language has limitations that I have learned to live with

To the teacher of programming, even more, I say: identify the paradigms you use, as fully as you can, then teach them explicitly. They will serve your students when Fortran has replaced Latin and Sanskrit as the archetypal dead language.

to the serious programmer: spend a part of your working day examining and refining your own methods. Even though programmers are always struggling to meet some future or past dead-line, methodological abstraction is a wise long term investment.

PEOPLE ARE PART OF THE CONTEXT, MAKE THEM PART OF YOUR CONTEXT



STUDYING THE PAST YIELDS INTERESTING RESULTS.

CHANGING BELIEFS IS A PERSONAL JOURNEY.

THANKS TO:

ROSS MCKINLAY

CHRIS MEIKLEJOHN

EDWIN BRADY

JUAN MANUEL SERRANO

TOMAS PETRICEK

AND OTHERS

THANK YOU

ANDREA MAGNORSKY

@SILVERSPOON

SOURCES | REFERENCES

PAPERS

- Programming Paradigms for Dummies: What Every Programmer Should Know - Peter Van Roy
- The paradigms of programming
- The next 700 programming languages by Peter Landin
- Why Functional Programming Matters by John Hughes
- Joe Armstrong Thesis

ARTICLES, POSTS, VIDEOS

- A punchcard ate my programme by Walt Mankowski
- Clojure spec
- Lenses in F#
- F# Don Syme
- Programming paradigm
- The expression problem

IMAGES

- Animal party link
- Tea ceremony japan link
- Cats with hats link