Programming Language

Instructor:
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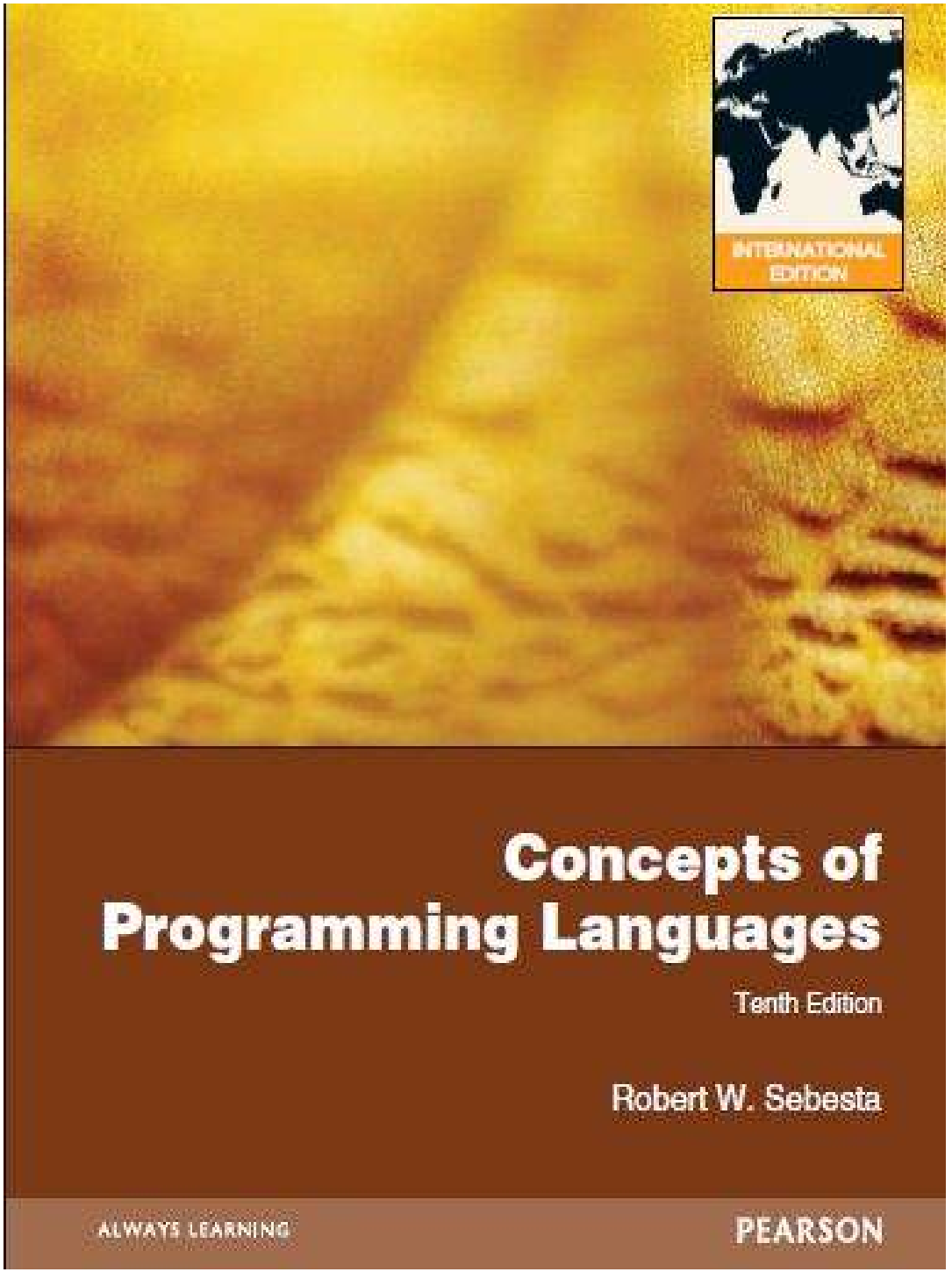


Why to learn it?

過去學習程式語言都被認為是要「解決問題」，讓程式跑的更快，所以矽谷的工程師們不斷想要突破，但是 Google 暑期程式設計課程的主管 Carol Smith 及UC Berkeley 教授 Armando Fox 都認為學習程式語言應該是要讓工具「為你所用」，創造自己的工具，讓工具做你想要的事。

另外，軟體工程師也在美國 Business Insider 的 「2014 百大最佳工作」拿下第一名，平均年薪 90,060 美金（約 270 萬台幣），而第二名的電腦系統分析師也有79,680美金，工作機會也日漸增多，是炙手可熱的職位。而程式語言百百種，Javascript、Java、Python、C、C++，學哪一種賺最多呢？美國的 msgooroo 網站則分析了 2014 上半年超過 150 萬則的人才招募廣告，發現奪下收入最高與需求量最大的程式語言是 Java，也許這個可以成為你學寫程式的理由。

[Ref] http://www.techbang.com/posts/20052-digital-literacy-is-the-key-to-the-future-but-do-we-really-know-how-to-use-it

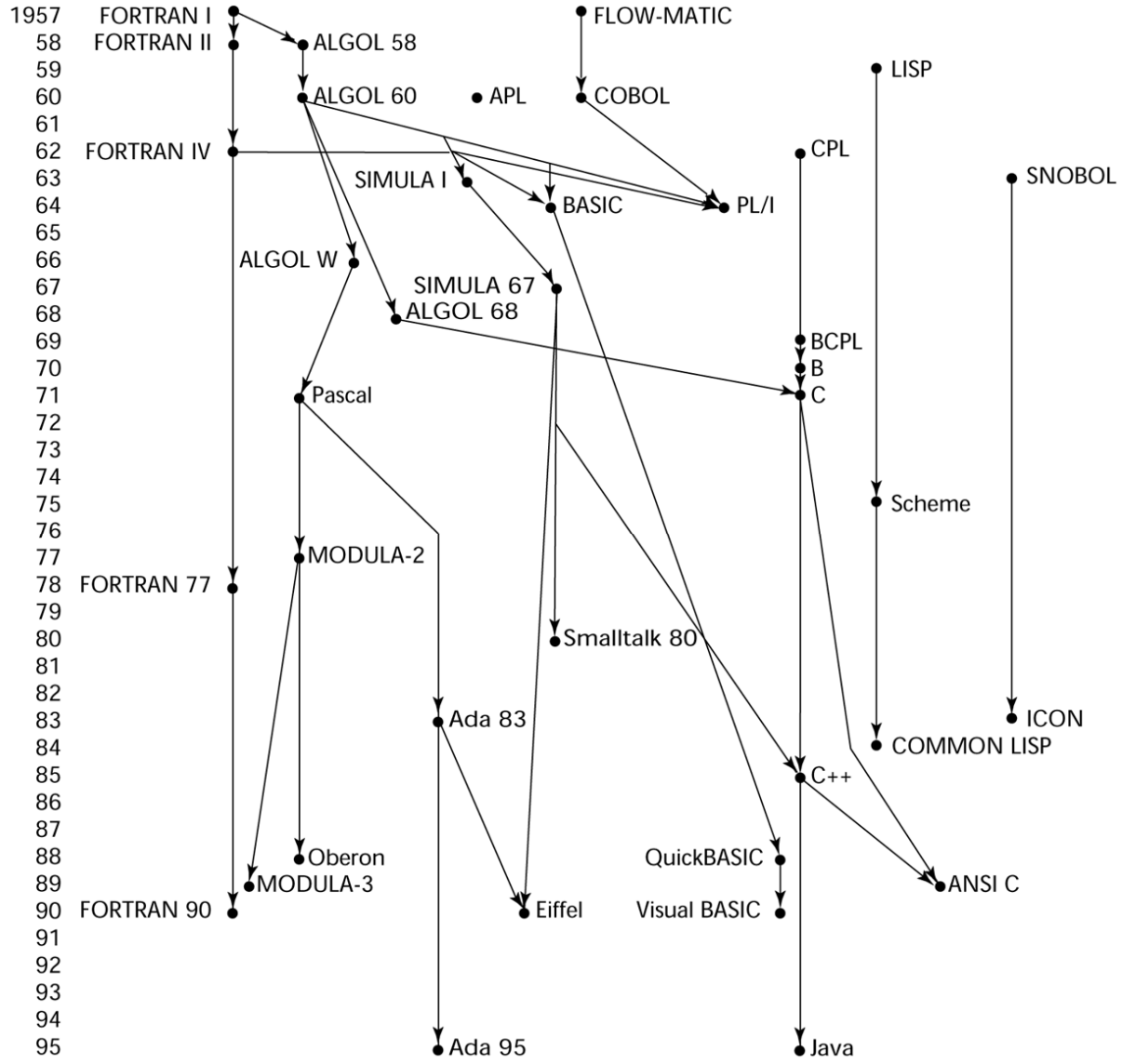
What's Programming Language ?

- Programming languages are used for controlling the behavior of a machine (often a computer).
- Like natural languages, programming languages conform to rules for syntax and semantics.

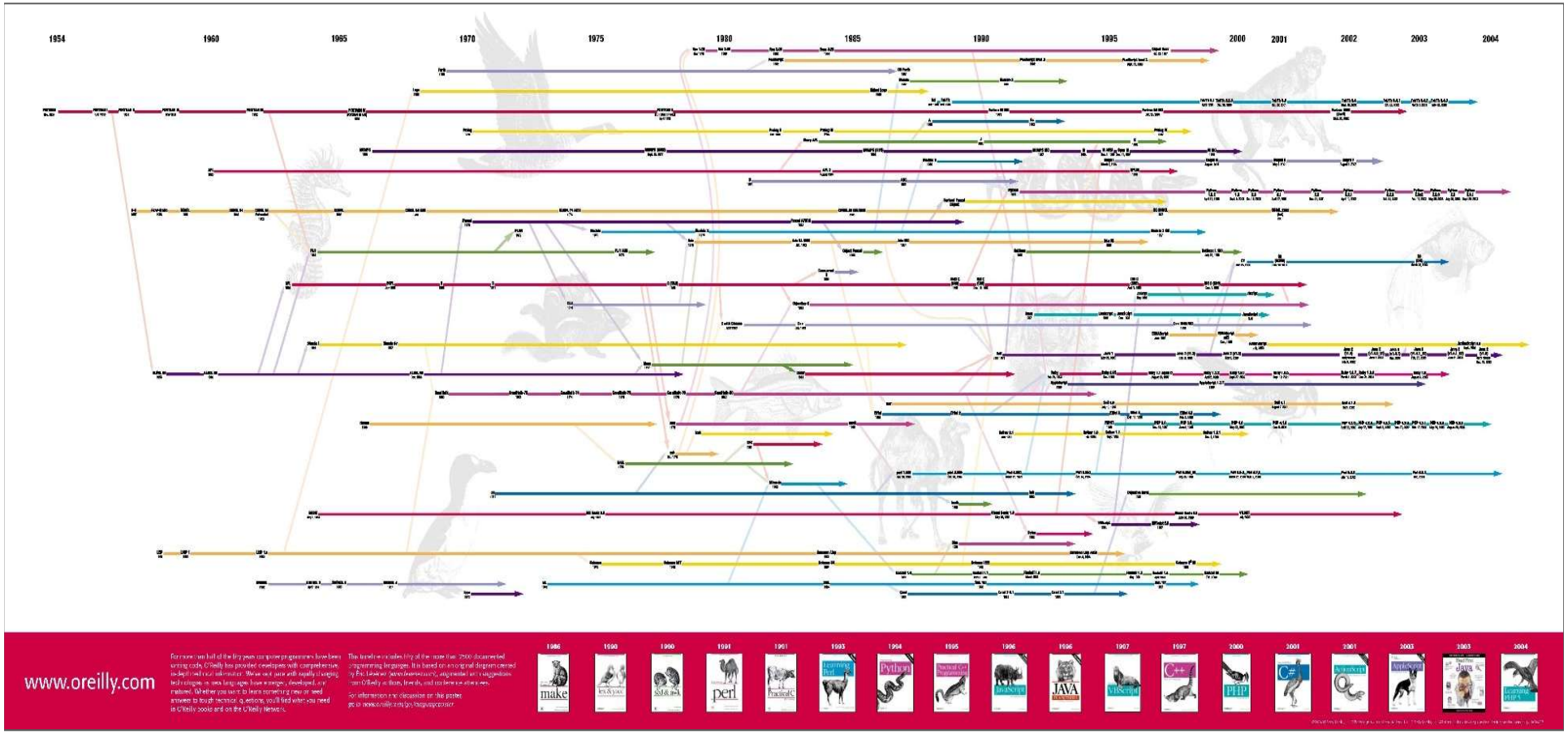
Syntax vs Semantics

- Syntax + Semantics ➔ language's definition
- **Syntax**: the form or structure of the expressions, statements, and program units
- **Semantics**: the meaning of the expressions, statements, and program units
- e.g. `while (Boolean_expr) statement`

History of Programming Language



History of Programming Language



[Ref] http://oreilly.com/news/graphics/prog_lang_poster.pdf

How Many Programming Languages Exist?

- There are thousands of programming languages and new ones are created every year.
- Few languages ever become sufficiently popular that they are used by more than a few people, but professional programmers may use dozens of languages in a career.

Popular Programming Languages

- TIOBE Programming Community index.
- To check whether your programming skills are up to date.
- To make a strategic decision about what programming language should be adopted when starting to build a new software system.

Feb 2014	Feb 2013	Change	Programming Language	Ratings	Change
1	2	↑	C	18.334%	+1.25%
2	1	↓	Java	17.316%	-1.07%
3	3		Objective-C	11.341%	+1.54%
4	4		C++	6.892%	-1.87%
5	5		C#	6.450%	-0.23%
6	6		PHP	4.219%	-0.85%
7	8	↑	(Visual) Basic	2.759%	-1.89%
8	7	↓	Python	2.157%	-2.79%
9	11	↑	JavaScript	1.929%	+0.51%
10	12	↑	Visual Basic .NET	1.798%	+0.79%
11	16	⇈	Transact-SQL	1.667%	+0.89%
12	10	↓	Ruby	0.924%	-0.83%
13	9	⇊	Perl	0.887%	-1.36%
14	18	⇈	MATLAB	0.641%	-0.01%
15	22	⇈	PL/SQL	0.604%	-0.00%
16	47	⇈	F#	0.591%	+0.42%
17	14	↓	Pascal	0.551%	-0.38%
18	36	⇈	D	0.529%	+0.23%
19	13	⇊	Lisp	0.523%	-0.42%
20	15	⇊	Delphi/Object Pascal	0.522%	-0.36%

[Ref] http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

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Feb 2015	Feb 2014	Change	Programming Language	Ratings	Change
1	1		C	16.488%	-1.85%
2	2		Java	15.345%	-1.97%
3	4	↑	C++	6.612%	-0.28%
4	3	↓	Objective-C	6.024%	-5.32%
5	5		C#	5.738%	-0.71%
6	9	↑	JavaScript	3.514%	+1.58%
7	6	↓	PHP	3.170%	-1.05%
8	8		Python	2.882%	+0.72%
9	10	↑	Visual Basic .NET	2.026%	+0.23%
10	-	⇈	Visual Basic	1.718%	+1.72%
11	20	⇈	Delphi/Object Pascal	1.574%	+1.05%
12	13	↑	Perl	1.390%	+0.50%
13	15	↑	PL/SQL	1.263%	+0.66%
14	16	↑	F#	1.179%	+0.59%
15	11	⇊	Transact-SQL	1.124%	-0.54%
16	30	⇈	ABAP	1.048%	+0.69%
17	14	↓	MATLAB	1.033%	+0.39%
18	44	⇈	R	0.963%	+0.71%
19	17	↓	Pascal	0.960%	+0.41%
20	12	⇊	Ruby	0.873%	-0.05%

[Ref] http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

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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%
11	20	⇈	Ruby	2.053%	+1.18%
12	10	↓	Visual Basic	1.855%	+0.14%
13	26	⇈	Assembly language	1.828%	+1.08%
14	4	⇊	Objective-C	1.403%	-4.62%
15	30	⇈	D	1.391%	+0.77%
16	27	⇈	Swift	1.375%	+0.65%
17	18	↑	R	1.192%	+0.23%
18	17	↓	MATLAB	1.091%	+0.06%
19	13	⇊	PL/SQL	1.062%	-0.20%
20	33	⇈	Groovy	1.012%	+0.51%

[Ref] http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

Popular Programming Languages

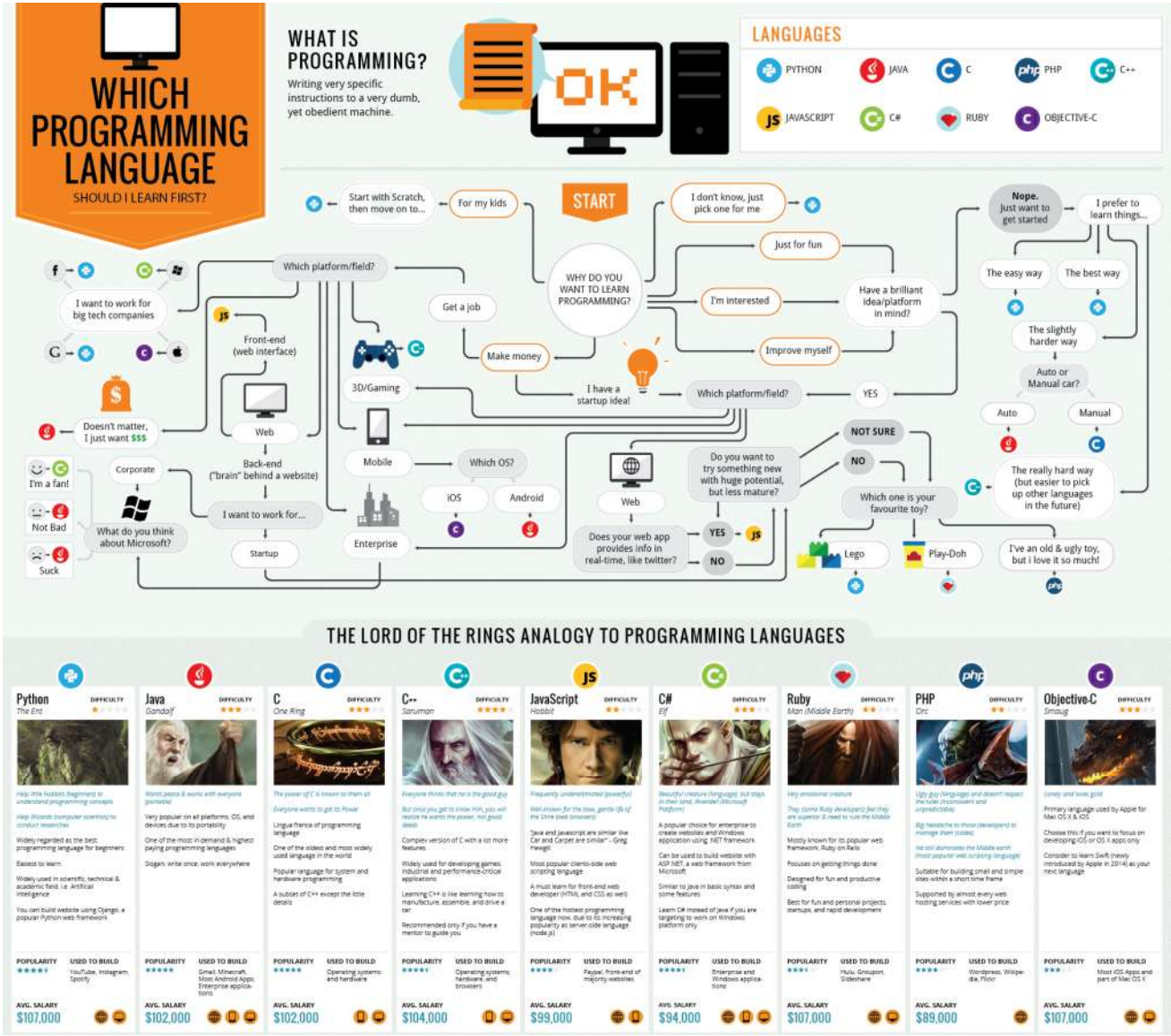
- The hall of fame award is given to the programming language that has the highest rise in ratings in a year.

Year	Winner
2015	Java
2014	JavaScript
2013	Transact-SQL
2012	Objective-C
2011	Objective-C
2010	Python
2009	Go
2008	C
2007	Python
2006	Ruby
2005	Java
2004	PHP
2003	C++

[Ref]
http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

Which Language to Learn?

[Ref] http://share.inside.com.tw/posts/13387



Goals of This Course

- Learn the fundamental topics and issues in design/implementation of programming language.
- Understand the trade-offs between different programming language features.
- Learn new programming languages by your own.

Syllabus

Date	Course
2/22	Syllabus + Overview
2/29	228 Vacation
3/7	Introduction + Find your partner for final presentation (5~6 members for each team)
3/14	Syntax and Semantics
3/21	Lexical and Syntax Analysis + Quiz 1
3/28	Perl Regular Expressions, Matching and Substitutions + HW1 (2 weeks)
4/4	Spring Vacation
4/11	Functional Programming Languages (LISP) + HW2 (2 weeks)
4/18	Logic Programming Languages (Prolog) + HW3 (2 weeks)
4/25	Names, binding and scopes + Quiz 2

Syllabus (Cont.)

Date	Course
5/2	Data types + HW4 (2 weeks)
5/9	Abstract Data Types and Encapsulation Constructs
5/16	Subprograms Concurrency+ HW5 (2 weeks)
5/23	Expressions and Assignment Statements Statement-Level Control Structures + Quiz 3
5/30	Final Presentation (6 teams)
6/6	Final Presentation (6 teams)
6/13	Final Presentation (6 teams)
6/20	Final Presentation (6 teams)
6/27	Final Exam

25 minutes for each team, 4~5 minutes for each member.

Contributors of Programming Languages

- 約翰· 巴科斯，發明了Fortran。
- 阿蘭· 庫珀，開發了Visual Basic。
- 艾茲格· 迪傑斯特拉，開創了正確運用程式語言(proper programming)的框架。
- 詹姆斯· 高斯林，開發了Oak，該語言為Java的先驅。
- 安德斯· 海爾斯伯格，開發了Turbo Pascal、Delphi，以及C#。
- 葛麗絲· 霍普，開發了Flow-Matic，該語言對COBOL造成了影響。
- 肯尼斯· 艾佛森，開發了APL，並與Roger Hui合作開發了J。
- 比爾· 喬伊，發明了vi，BSD Unix的前期作者，以及SunOS的發起人，該作業系統後來改名為Solaris。
- 艾倫· 凱，開創了物件導向程式語言，以及Smalltalk的發起人。
- Brian Kernighan，與丹尼斯· 里奇合著第一本C程式設計語言的書籍，同時也是AWK與AMPL程式設計語言的共同作者。
- 約翰· 麥卡錫，發明了LISP。
- 約翰· 馮· 諾伊曼，作業系統概念的發起者。
- 丹尼斯· 里奇，發明了C。
- 比雅尼· 史特勞斯特魯普，開發了C++。
- 肯· 湯普遜，發明了Unix。
- 尼克勞斯· 維爾特，發明了Pascal與Modula。
- 拉里· 沃爾，創造了Perl與Perl 6。
- 吉多· 范羅蘇姆，創造了Python。

TA

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Grading

- 5 Homework: 45%
- 3 Quiz: 15%
- Final exam: 25 %
- Final Presentation: 15 %
- Bonus: 0~10 points in Final Score
  - Course Q & A: 0~5 points
  - Moodle Q & A: 0~5 points

Course Q&A

- Office hour
  - Instructor: By an appointment @ R65B08
  - TA: By an appointment @ R65601
- Take attendance? 

- Food? 

- Zzz…?

- Late submission of HW? 
- Discussion is encouraged, but plagiarism is not allowed !
  - Do not use the codes on webpages without modification !

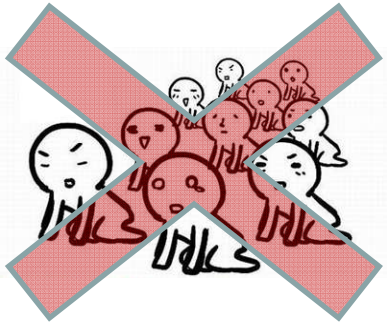
Be Responsible for Yourself

- Cheating or plagiarism will result in zero score

  ➔ final score=0

- Under 60 ?

  ➔ See you next year ~



Four Paradigms of High-Level Programming Languages

- Imperative Language
- Functional Language
- Logical Language
- Object-Oriented Language