

# Domain-Specific Languages



Κατερίνα Καμπράνη | The Uncomfortable

[www.kkstudio.gr/#the-uncomfortable/files/238-025.jpg](http://www.kkstudio.gr/#the-uncomfortable/files/238-025.jpg)

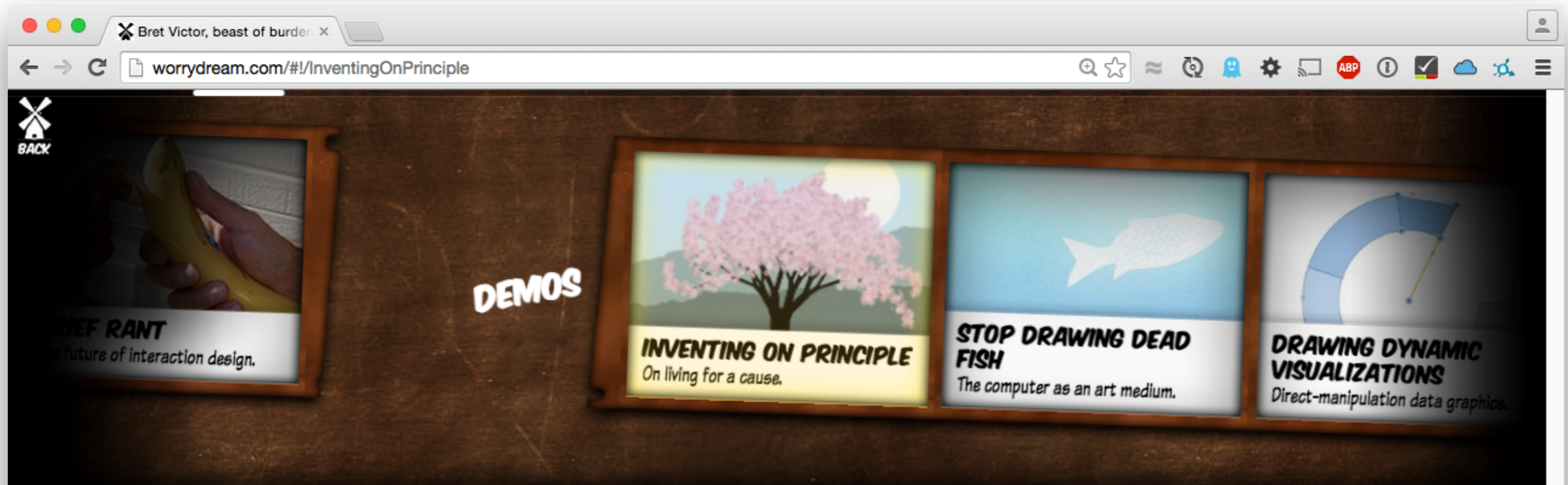
[T]he fundamental principles of designing for people: (1) provide a good conceptual model and (2) make things visible. — The Design of Everyday Things , *Donald A. Norman*

[E]very large scale programming project involves the design, use, and implementation of a special-purpose programming language, with its own data concepts and primitive operations, specifically oriented to that particular project.

— Hints on Programming Language Design, C. A. R. “Tony” Hoare

# Inventing on Principle

Brett Victor





A studio is:

1. People

2. Process

3. Place

All work in progress is public.

# Exercise: Set up our studio

## Discussion space

everyone can see each other's face

## Discussion + presentation space

everyone can see each other's face

everyone (except presenter) can see the side screen and front board

## Work space

space for each person to write or work on a computer

no need to see boards easily, but it might be nice to use the boards

## Easy set-up and recovery

should take no more than two minutes for all of us to set-up / reset  
(perhaps after some practice :)

# Discussion Rules

- Everyone should participate equally
- Give your attention to the person who is speaking
- Yes, and... (build on discussion)
- Ben usually takes notes and talks last
- ...

# The plan



# This course is two half-courses

A tour of  
DSL design &  
implementation  
techniques

*breadth*

Project

*depth*

	Monday	Wednesday	
(0)	08 · 29 (no class)	DSLs: What, why, and how?	08 · 31 What is a DSL? Due: Sunday 9/4 at 11:59pm Critique: Tuesday 9/6 at 11:59pm
(1)	09 · 05 What is a DSL?	Fluency	09 · 07 Language design Due: Wednesday 9/14 at 11:59pm Critique: Friday 9/16 at 11:59pm
(2)	09 · 12 Finding problems, ignoring solutions class meets at the Hive	Language design	09 · 14 Project ideas Due: Wednesday 9/21 at 11:59pm Critique: Friday 9/23 at 11:59pm
(3)	09 · 19 Getting up and running in Scala	Scala tour	09 · 21 Practice Scala Due: Wednesday 9/28 at 11:59pm Critique: Friday 9/30 at 11:59pm
(4)	09 · 26 Internal DSLs in Scala	Lab: internal control flow	09 · 28 Internal DSL: regular expressions Due: Wednesday 10/5 at 11:59pm Critique: Friday 10/7 at 11:59pm
(5)	10 · 03 External DSLs in Scala language architecture & parser combinators	Extensibility: traits	10 · 05 Language design: Piconot Due: Friday 10/14 at 5:00pm Critique: Friday 10/21 at 11:59pm
(6)	10 · 10 Extensibility: the Expression Problem	Common patterns in DSLs	10 · 12 Project pitch Due: Sunday 10/23 at 11:59pm Critique: Tuesday 10/25 at 11:59pm
(7)	10 · 17 Fall Break (no class)	Lessons and plans	10 · 19
(8)	10 · 24 critique	studio	10 · 26 Project: description and plan & repositories Due: Sunday 10/30 at 11:59pm Critique: Tuesday 11/1 at 11:59pm
(9)	10 · 31 critique	studio	11 · 02 Project: design and implementation Due / notebook: Sunday 11/6 at 11:59pm Critique: Tuesday 11/8 at 11:59pm
(10)	11 · 07 critique	studio	11 · 09 Project: prototype Due / notebook: Sunday 11/13 at 11:59pm Critique: Tuesday 11/15 at 11:59pm
(11)	11 · 14 critique	studio	11 · 16 Project: preliminary evaluation Due / notebook: Sunday 11/20 at 11:59pm Critique: Tuesday 11/22 at 11:59pm
(12)	11 · 21 critique	Logos	11 · 23
(13)	11 · 28 critique	studio	11 · 30 Notebook: Sunday 12/4 at 11:59pm Critique: Tuesday 12/6 at 11:59pm
(14)	12 · 05 critique	The end?!	12 · 07 Project: final product and writeup Due: Friday 12/9 at 11:59pm Project: demo / presentation Wednesday 12/14, 2-5pm



# Skills



Scala

GitHub

Testing

Build system (sbt)

# Concepts

Language design  
Parsing  
Semantic models  
Software engineering  
Extensibility  
...

# Skills

Scala  
GitHub  
Testing  
Build system (sbt)

# Philosophies

People first

Programming *as* language design

How does language influence thought?

The end of PLs

# Concepts

Language design

Parsing

Semantic models

Software engineering

Extensibility

...

# Skills

Scala

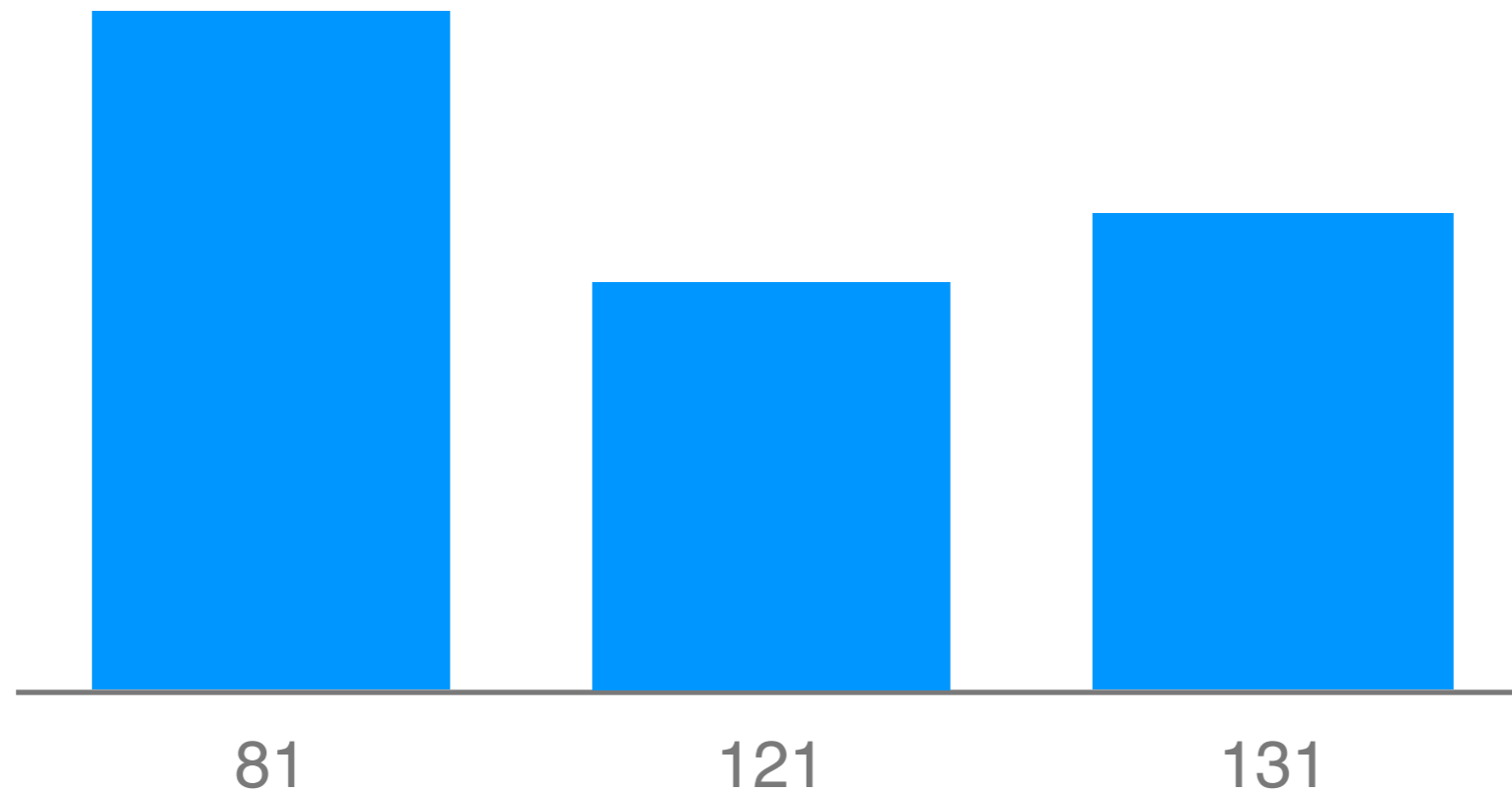
GitHub

Testing

Build system (sbt)

$$111 = \frac{1}{3} \bullet (81 + 121 + 131)$$

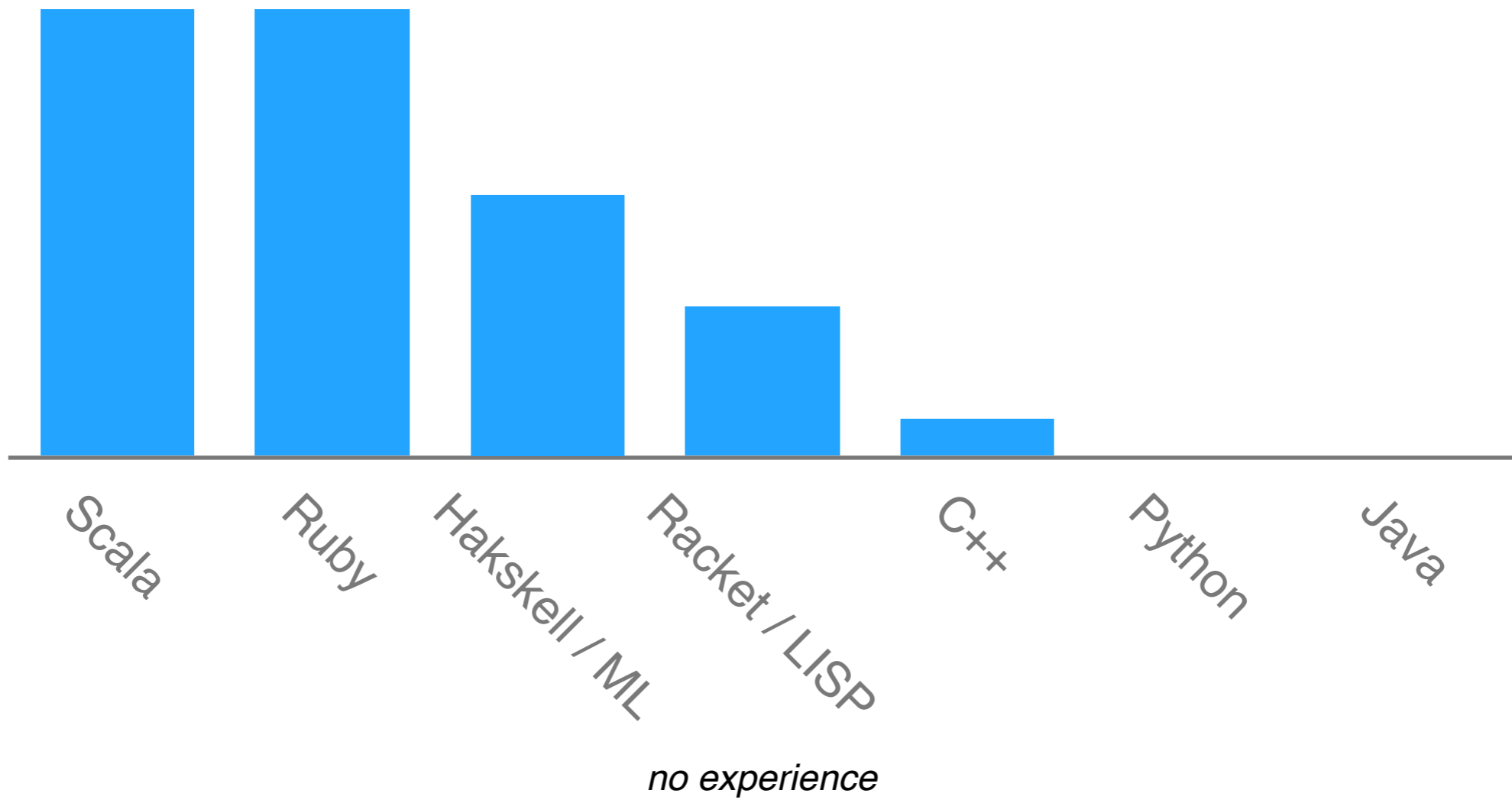
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have taken or are currently enrolled in the course

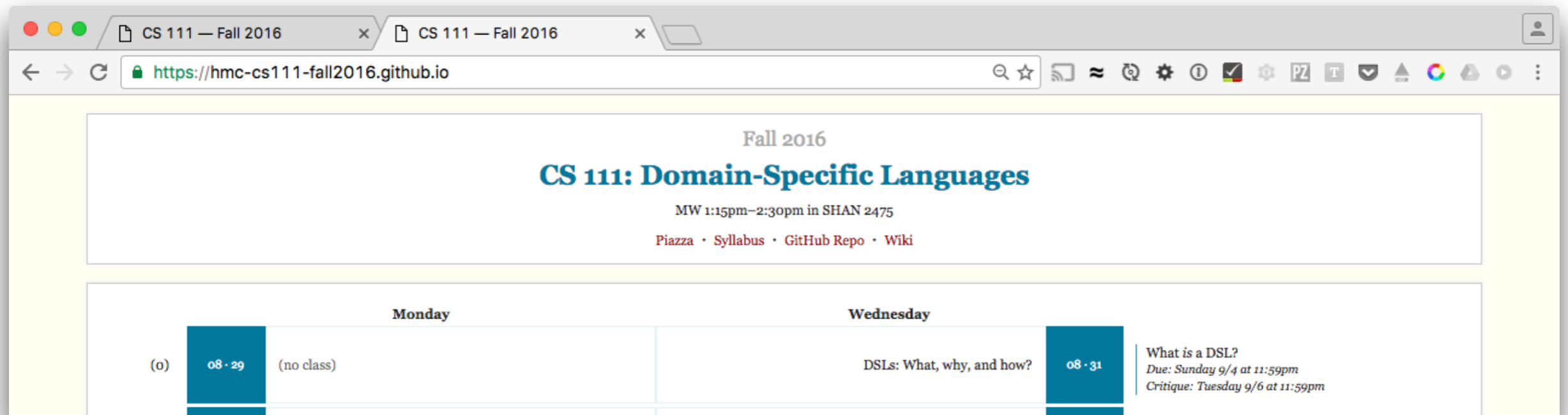
# Scala as a lens

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# Soundbite syllabus

or is it “soundbyte”?



- One-stop shop: [www.cs.hmc.edu/cs111](http://www.cs.hmc.edu/cs111) schedule, assignments, repository, syllabus, etc.
- We'll communicate in-person, on Piazza, or on GitHub. not over email
- Come to class and participate fully.
- Concentrate more on problems than solutions.

# A typical week

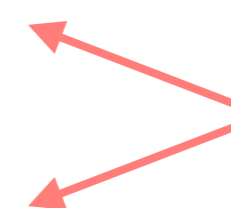
6-9 hours / week  
outside of class

Class on Monday and Wednesday

we'll need a scribe each day — sign up on the Wiki

Assignment due Wednesday at 11:59pm

except this week!  
(Sun / Tues)



Critique due Friday at 11:59pm

treat your critique partner as your collaborator

New assignment available no later than Wednesday evening

Office hours in Olin 1279

Open-door, plus TBD (probably on Monday / Tuesday / Friday)



# Important places

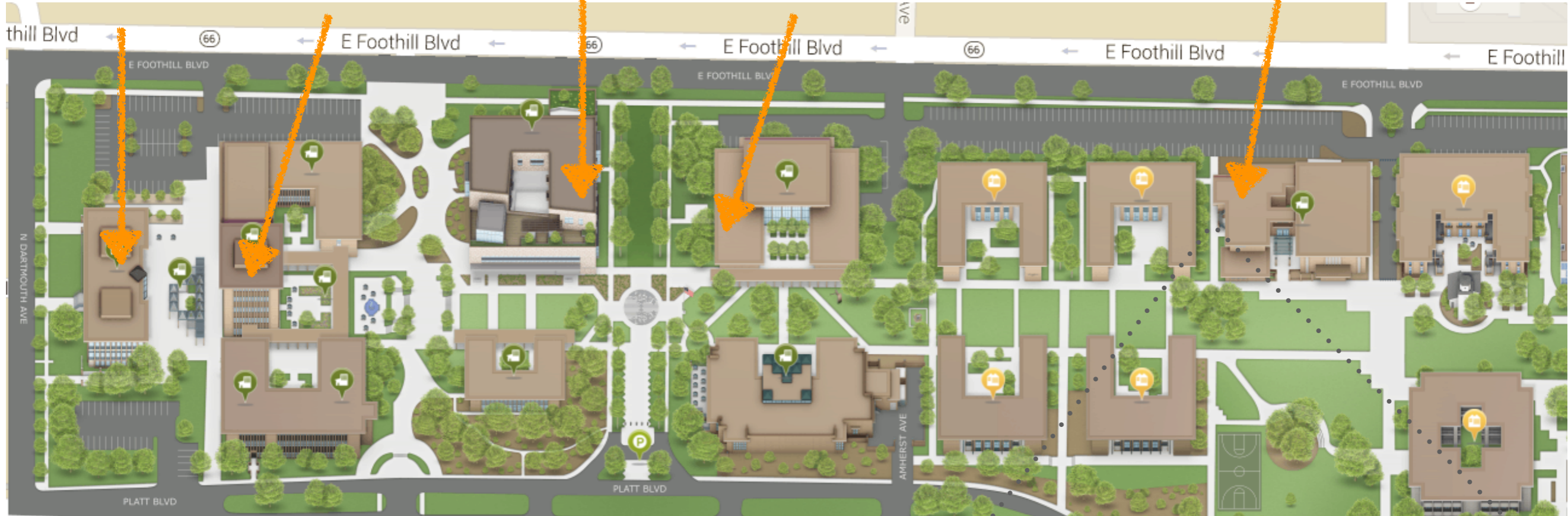
Olin  
(Colleen)

Sprague  
(CIS)

SHAN

Platt  
(F&M)

LAC



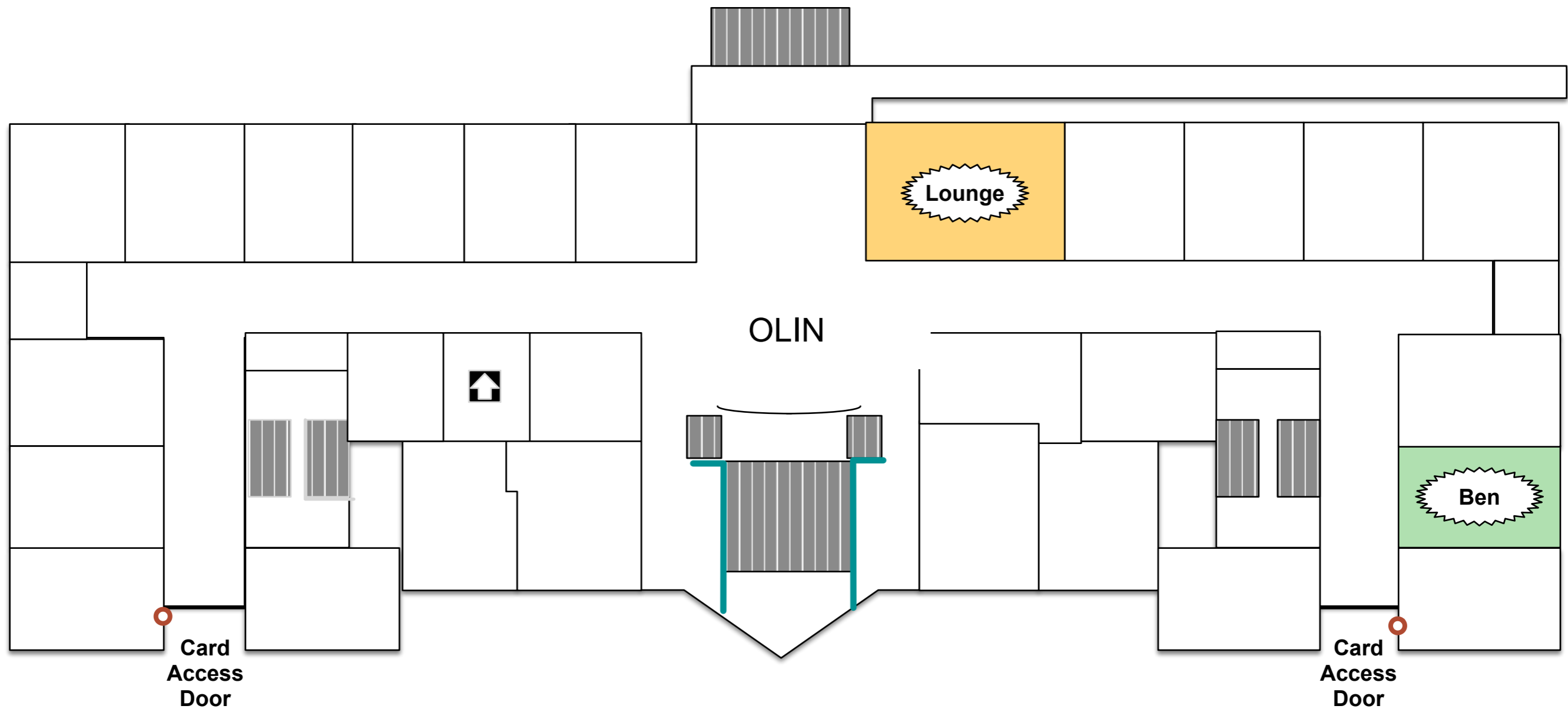
**Access to the LAC building: F&M**

**Access to the LAC computers: CIS**

See also: [www.hmc.edu/map/](http://www.hmc.edu/map/)



# Map to Ben's office—Olin 1279



Olin is the west-most building at HMC.

Ben's office is in the northeast corner of the building.

# Grading

More details next week

**Participation: 20%**

critiques • in-class discussion • class writeup(s)

**Assignments: 40%**

**Project: 40%**

there will be milestones, but it's mostly on you

Key point

The primary responsibility is  
**yours.**

# Music Maker

Emily Blatter — DSLs Fall 2014

The screenshot shows a Microsoft Excel spreadsheet titled "batman.xls". The ribbon is set to "Home", and the "Font" group is active. The spreadsheet contains the following data:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1																													
2																													
3																													
4																													
5																													
6																													
7																													
8	na	na								na	na										na	na							
9			na	na				na	na				na	na							na	na							
10				na	na								na	na										na	na				
11																													
12																													
13																													
14																													

The status bar at the bottom shows "Normal View", "Ready", and "Sum=0".

# Before Monday

- **Activate your Piazza account**  
all communication happens in-person, on Piazza, or on GitHub  
(not email)
- **Join our GitHub organization**
- **Assignment 1**  
submission due Sunday  
critique due next Tuesday  
all the details are in the assignment  
ask questions on Piazza!
- **Sign up to scribe a class**
- **Restore the room**