

# Welcome to 20.109(Sp16) !

Laboratory fundamentals of biological engineering

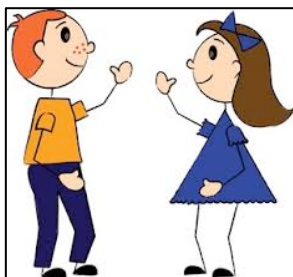
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# Outline



- EHS training
- Let's get to know each other
- What will 20.109 teach you?
- How will the semester unfold?
- How will each lab day unfold?
- Lab tour: your first protocol!
- ... and on to M1D1 !

# The pillars of 20.109



- **Authentic science**
  - elements of design, unknown outcomes



- Focus on **communicating** your science
  - written & oral, in homework and assignments, a lot of feedback

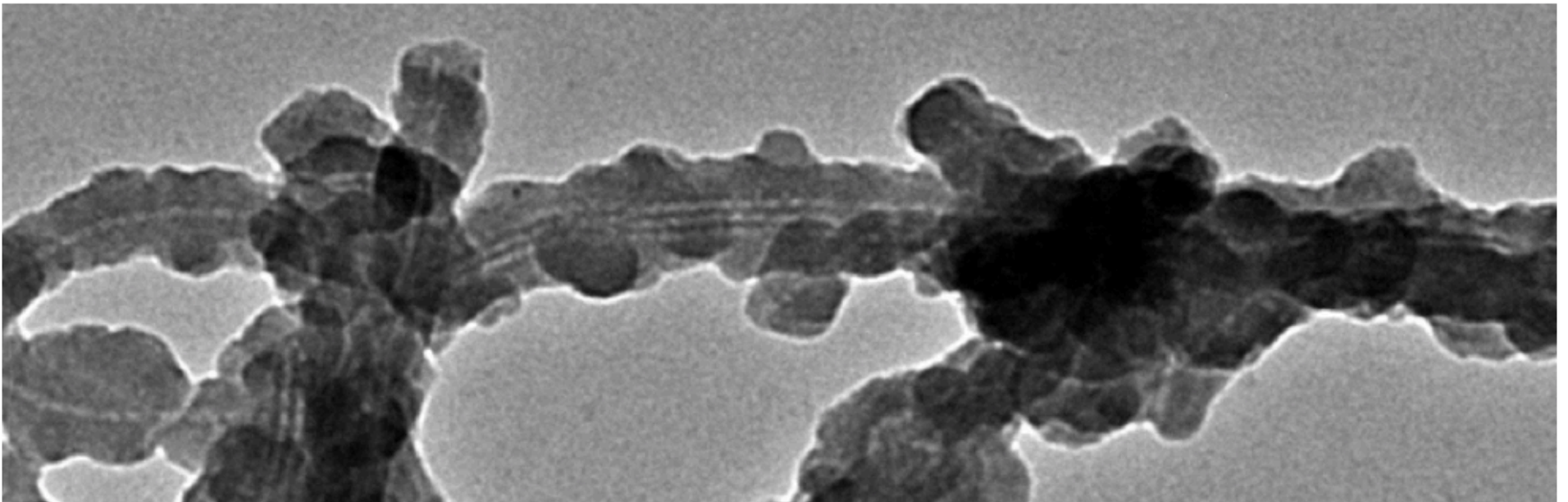


- **Collaboration**
  - work in pairs
  - some assignments are individually completed
  - class-wide collaboration (for data acquisition and analysis)
  - punctuality
  - integrity (*personal* reflections)
  - We faculty love being there for you: **turn to us with questions!**

The wiki is your best friend

[http://engineerbiology.org/wiki/20.109\(S16\)](http://engineerbiology.org/wiki/20.109(S16))

## 20.109(S16): Laboratory Fundamentals of Biological Engineering



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# The wiki will help you with **time management**

In particular, check assiduously

- Schedule
- Assignments
- Homework tabs

2	3	T/W Mar 15/16	LDS 	Western and prepare damaged DNA	Homework due Protein engineering mini-presentation due Tue/Wed, Mar 15/16 at 10 pm
2	4	R/F Mar 17/18		Journal club I	Journal club I slides due Thu/Fri, Mar 17/18 at 1 pm
		T/W Mar 22/23		Spring vacation	
		R/F Mar 24/25		Spring vacation	
2	5	T/W Mar 29/30	LDS 	Cell preparation	<b>Lab quiz</b> Homework due Protein engineering final report due Mon, Mar 28 at 5 pm
2	6	R/F Mar 31 / Apr 1	LDS 	DNA repair assays	Homework due
2	7	T/W Apr 5/6	LDS 	Flow cytometry and paper discussion	Homework due
2	8	R/F Apr 7/8	NLL 	Journal club II	Journal club II slides due Thu/Fri, Apr 7/8 at 1 pm
2	9	T/W Apr 12/13	NLL 	Data analysis	<b>Lab quiz</b> Homework due

# 20.109 assignments

Module	Assignment	% final grade	Due date
1	Protein engineering summary	15	03/12 (draft) and 03/28
1	Mini-presentation	5	03/16
2	Journal club presentation	10	03/18 or 04/08
2	System engineering research article	25	04/18
3	Research proposal presentation	20	05/11
3	Biomaterials engineering mini-report	5	05/06
all	Lab notebook	3	1 day per module
all	Quizzes	7	2 per module
all	Homework	7	Almost daily
all	Participation and blog	3	Before last day of module

individual : 60%

team: 40%

# Homework

- Only 7% of final grade?!
- Give it your best:
  - never gratuitous, building blocks toward big-point assignment
  - a lot of feedback will prove very helpful
  - great tool to keep ahead of the game and pace your work

# Lab notebook in Evernote

- Set up an account: evernote.com
- Entitle your notebook “20.109(S16)\_YourName”
- Share with Jing, Leslie & Maxine: jgzhang@mit.edu, lesliemm@, jonas\_m@

The screenshot displays the Evernote Premium interface. The main window shows a notebook titled "20.109 (Maxine)". The content includes a PCR program and a sequence viewer.

**PCR program (still called NK1) < 2 hours: started at 11:00am**

- 94 °C 4 minutes
- 94 °C 1 minute
- 51 °C 1 minute
- 72 °C 1 minute (extension ~ 1 min / kb and GFP is ~ 700 bp)
- repeat steps 2-4 25 times (25 times is standard)
- 72 °C 10 minutes
- 4 °C forever

**Sequence Viewer: Maxine151223\_pMax-BFP-MCS.gb**

Sequence	Start	Length	End	ORF	Tm	%GC	Linear	
1688	4166	795<2>	893<2>	1687<0>	---	---	47%	<input checked="" type="checkbox"/> Dam/Dcm

Feature	Direction	Type	Location ↓
▶ PCMV IE	>>>	promoter	1..798
Fseq_pMaxEGFP	>>>	misc_feature	795..814
Chimeric intron	>>>	intron	811..946
MCS1	>>>	misc_feature	947..978
nonsense insert	>>>	misc_feature	979..1578
MCS2	>>>	misc_feature	1579..1610






# A typical day in 20.109

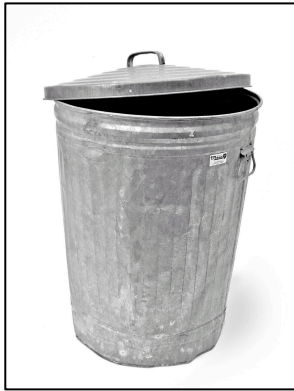


- Hand in homework
- Quiz (on lectures and labs) ~ 15 min
  - M1D1, M1D4, M1D8, M2D5, M2D9, M3D3, and M3D5
- Prelab interactive presentation ~ 15-45 min
- Lab
- Electronic lab notebook entries
- Q&A all afternoon long

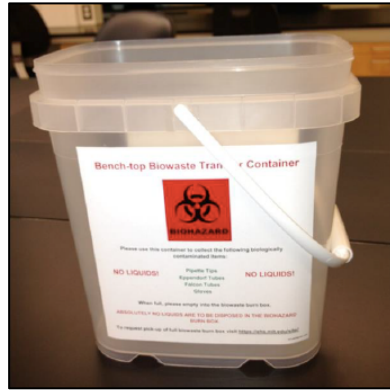
# Personal protective equipment (PPE)

item	worn (BE guidelines)
<p>gloves</p> 	<ul style="list-style-type: none"><li>- when working with chemical or biological materials</li><li>➤ change when entering tissue culture room!</li></ul> <p><b>always</b></p>
<p>lab coat</p> 	<ul style="list-style-type: none"><li>- when working with chemical or biological materials</li><li>➤ change when entering tissue culture room!</li></ul> <p><b>always</b></p>
<p>goggles</p> 	<ul style="list-style-type: none"><li>- when handling large quantities of powder or liquid due to chance of <b>splash</b></li><li>- when using ethanol burners</li><li>- in conjunction with face shield at UV transilluminator</li></ul>

# Waste disposal refresher



regular trash can



benchtop waste



sharps container



liquid waste vacuum flask

no liquids!

paper towels  
(plastic wrappers)

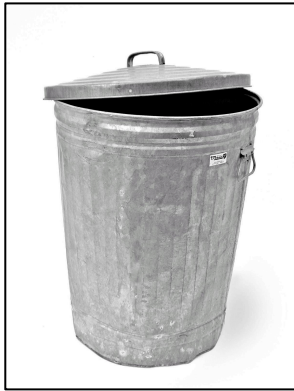
NO food wrapper  
NO gloves

gloves  
pipet tips  
ependorf tubes

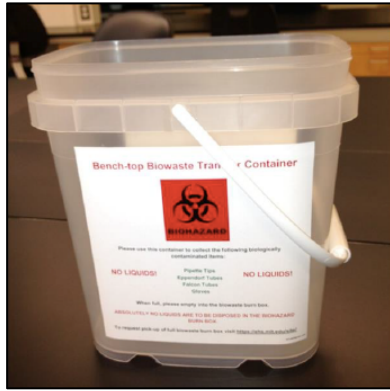
long plastic pipets  
kimwipes

needles  
razor blades  
glass vials  
glass Pasteur pipets

# Waste disposal refresher



regular trash can



benchtop waste



sharps container



liquid waste vacuum flask



biowaste box

agar plates  
gels

# Today

- Find partner and bench / team color
- Orientation (no need for lab notebook)
  - [http://engineerbiology.org/wiki/20.109\(S16\)Lab\\_tour](http://engineerbiology.org/wiki/20.109(S16)Lab_tour)



# For Friday

- Respond to poll on best office hours times
- Find homework:
  - [http://engineerbiology.org/wiki/20.109\(S16\):Homework](http://engineerbiology.org/wiki/20.109(S16):Homework)
  - Lab notebook in Evernote
  - Be ready for orientation quiz
  - EHS training
  - Tell us more about yourself