

Fall 2013

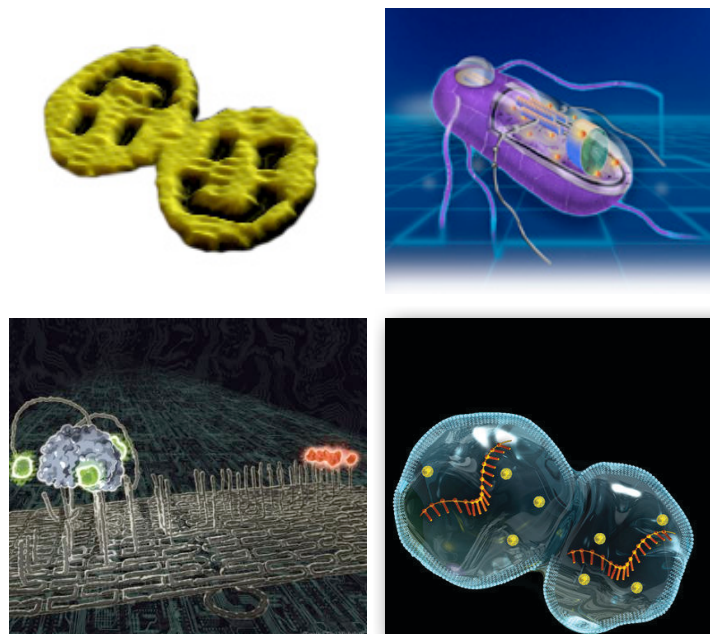
Systems Biology 204:



# Biomolecular Engineering and Synthetic Biology

## Synopsis

A course focusing on the rational design, construction, and applications of nucleic acid and protein-based synthetic molecular and cellular machinery and systems. Students are mentored to produce substantial term projects, which are tailored to each student's strengths and interests.



## Instructors

George Church, William Shih, Pamela Silver, Peng Yin

## Guest lecturers

Jeremy Gunawardena, Gäel McGill, Dave Mooney  
Srivatsan Raman, Jack Szostak, Jeff Way

## Logistics

Meeting time: Mon. Wed. 2:00 pm - 3:30 pm

Location: Room 521, Wyss Institute, 3 Blackfan Circle, Boston

Contact: Adam Marblestone (Teaching fellow) [adam.h.marblestone@gmail.com](mailto:adam.h.marblestone@gmail.com)

Peng Yin (Professor) [py@hms.harvard.edu](mailto:py@hms.harvard.edu)

## Syllabus

| Day / Date   | Lecturer               | Title                                                                                                 |
|--------------|------------------------|-------------------------------------------------------------------------------------------------------|
| Wed. Sep. 4  | William Shih           | Biomolecular primitives                                                                               |
| Mon. Sep. 9  | William Shih           | Software demo: nanoEngineer for nanostructure visualization                                           |
| Wed. Sep. 11 | William Shih, Peng Yin | DNA origami and DNA bricks                                                                            |
| Mon. Sep. 16 | William Shih           | Software demo: caDNAno for DNA origami design                                                         |
| Wed. Sep. 18 | Peng Yin               | Synthetic DNA circuits                                                                                |
| Mon. Sep. 23 | Peng Yin               | Dynamic DNA machines                                                                                  |
| Wed. Sep. 25 | Peng Yin               | Software demo: Sequence designer/molecular compiler                                                   |
| Mon. Sep. 30 | Srivatsan Raman        | Computational protein design                                                                          |
| Wed. Oct. 2  | Srivatsan Raman        | Software demo: Scientific discovery games for biomolecular design                                     |
| Mon. Oct. 7  | William Shih           | Application of nucleic acid nanotechnology 1: Single molecule biophysics tools, drug delivery, NMR    |
| Wed. Oct. 9  | Peng Yin               | Application of nucleic acid nanotechnology 2: Sensing, imaging, synthetic regulation, nanofabrication |
| Wed. Oct. 16 | Pam Silver             | Synthetic circuits in prokaryotes                                                                     |
| Mon. Oct. 21 | Pam Silver             | Synthetic circuits in eukaryotes                                                                      |
| Wed. Oct. 23 | Jeff Way               | Metabolic engineering                                                                                 |
| Mon. Oct. 28 | Jack Szostak           | Protocell design                                                                                      |
| Wed. Oct. 30 | Jeremy Gunawardena     | Modeling biological systems                                                                           |
| Mon. Nov. 4  | George Church          | Genome engineering: new codes, new amino acids, multi-virus resistance                                |
| Wed. Nov. 6  | George Church          | Homologous recombination, gene therapy, tissue engineering, evolution                                 |
| Wed. Nov. 13 | William Shih           | Directed molecular evolution                                                                          |
| Wed. Nov. 20 | Gael McGill            | Exploring Hollywood's tools for biovisualization                                                      |
| Mon. Nov. 25 | Dave Mooney            | Polymers as therapeutic cancer vaccines                                                               |
| Mon. Dec. 2  | Students               | Final project presentation                                                                            |
| Wed. Oct. 4  | Students               | Final project presentations                                                                           |

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