

*HSSP ESP*

**Cooking for Experimentalists - The Science of Food (S14039)**

July 11th - August 15th, 2019

1:05pm-1:55pm EDT

[S14039-teachers@esp.mit.edu](mailto:S14039-teachers@esp.mit.edu)

Clio Batali, [cbatali@mit.edu](mailto:cbatali@mit.edu)

Richard Colwell, [rcolwell@mit.edu](mailto:rcolwell@mit.edu)

Overview:

Learn about cooking and baking through the eyes of a materials engineer! Food and cooking is fundamentally based in disciplines like chemistry, biology, and materials science. Using delicious and hands-on activities, we will explore and explain the science that is at play when whipping cream, burning sugar, kneading dough, and more. Students will develop intuition in the kitchen as well as a foothold into cutting-edge research today using the lens of food.

Each day will be themed by a reaction or material class, and will feature a recipe (with room for improvisation/customization) that students will use to follow along with instruction and technical explanation. These will introduce concepts like density, miscibility, emulsions/meta-stability, and chemical reactions of macromolecules at an intuitive level using food and cooking case studies to motivate explanations. Every session will conclude with something that students can enjoy.

Altogether, these will relate the hands-on experiments we conduct together to real world science in order to spark further interest and intuitive understanding.

*No prior chemistry knowledge is needed, but students should come excited and willing to challenge themselves.*

## Schedule:

### Day 1: Phase Changes and Crystals

- Overview of the class structure
- Basic introduction of chemistry concepts (reactions, energy, macromolecules)
- Overview of solidification, the effects of cooling rates on structure, and how structure changes properties
- Lab(s) of the day: Homemade ice cream

### Day 2: Emulsions and Colloids

- Review of macromolecules
- Overview of stability and meta-stability
- Lab(s) of the day: Whipped cream, salad dressing

### Day 3: Gels

- Review of emulsions
- Basics of network solids and polymer properties
- Lab(s) of the day: Jello, \*bonus: homemade (popping) boba

### Day 4: Network Solids

- Review of microstructures and resulting material properties
- Lab(s) of the day: Pizza dough

### Day 5: Chemical Reactions of Burning

- Overview of pyrolysis and the Maillard reaction, effects on properties
- Lab(s) of the day: S'mores (roasted marshmallows)

### Day 6: Class Review

- Fun surprise activity and discussion!