Nano and Food

Nano: In Your Food, Around Your Food, In Your Home, and At Your Museum

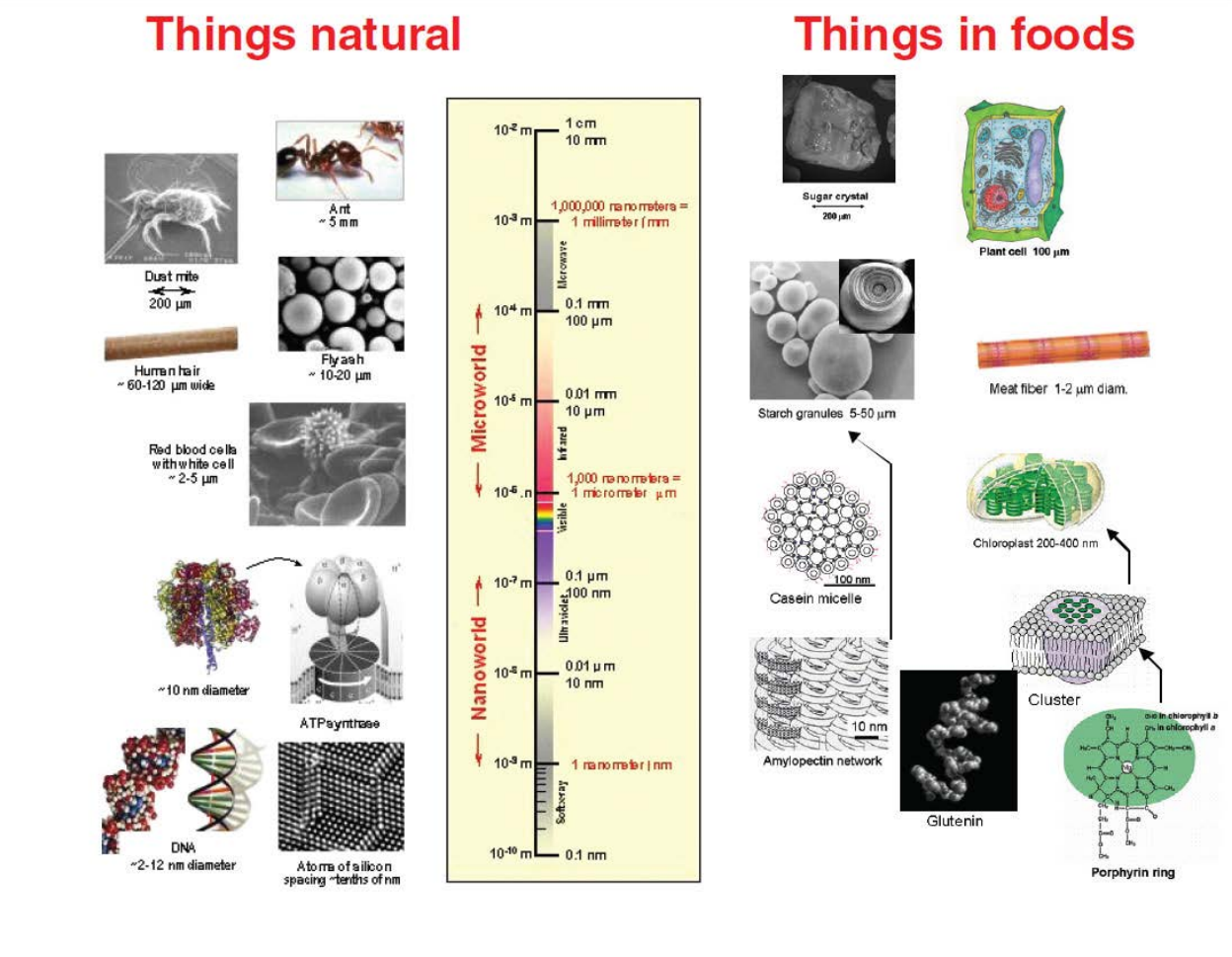
Helpful Links

Nano Consumer Databases

- Woodrow Wilson Center: nanoproject.org
- Nanotechnology in City Environments from ASU NICE.ASU.EDU

Advocacy Pages

- Nano Supermarket: Nanosupermarket.org
- As You Sow: asyousow.org/health_safety/gmosnano.shtml



From Nanotechnology in Food Products: Image Courtesy of Dr. Jose Miguel Aguilera and the U.S. Department of Energy

Potential

- Higher Absorption Rates/Controlled Release
- Enhanced Flavor (40 microns and less cannot be "sensed in the mouth")
- Improved bioavailability
- Smart Packaging – Tracking, Nanosensors, or fluorescent nanoparticles.
- Recyclable Packaging
- Nanoparticles for pesticides and fertilizers

Nanotechnology in Food Products: Workshop Summary. National Acadamies Press, 2009

A Bit More Specific Potential Nanotech

- Zinc Oxide Alginate Nanofilms as a food preservative: Food film (alginate) with anti-microbial properties.
- DNA Nano-Vaccines for Shrimp (white spot syndrome virus) with chitosan nanocapsules. Dispersed by ultrasound opening the capsules.
- Starch Nanoparticle Latex Binder—EcoSphere Biolatex to bind paper and cardboard. (On the market at McD's)
- Nutraceuticals: For example, omega fatty acid delivery. Smaller size probably means more absorbsion and increase water solubility (instead of oils and fats)

Risks

- Unanticipated Risks
- Nanotoxicity?
- Blood-brain barrier?

Nanotechnology in Food Products: Workshop Summary. National Acadamies Press, 2009

"The draft foods guidance [April 2012] alerts manufacturers to the potential impact of any significant manufacturing process change, including those involving nanotechnology, on the safety and regulatory status of food substances. This guidance describes the factors manufacturers should consider when determining whether a significant change in manufacturing process for a food substance already in the market:

- Affects the identity of the food substance;
- Affects the safety of the use of the food substance;
- Affects the regulatory status of the use of the food substance; and
- Warrants a regulatory submission to FDA.
- The draft foods guidance also recommends manufacturers consult with FDA regarding a significant change in manufacturing process for a food substance already in the market. "

http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/IngredientsAdditivesGRASPackaging/ucm300914.htm

Spending

- FDA Budget for Nanomaterials:

  FY 2012 Actual $13.6 million
  FY 2013 Estimated $16.5 million
  FY 2014 Proposed $16.8million

- USDA/NIFA/ARS are also part of the NNI

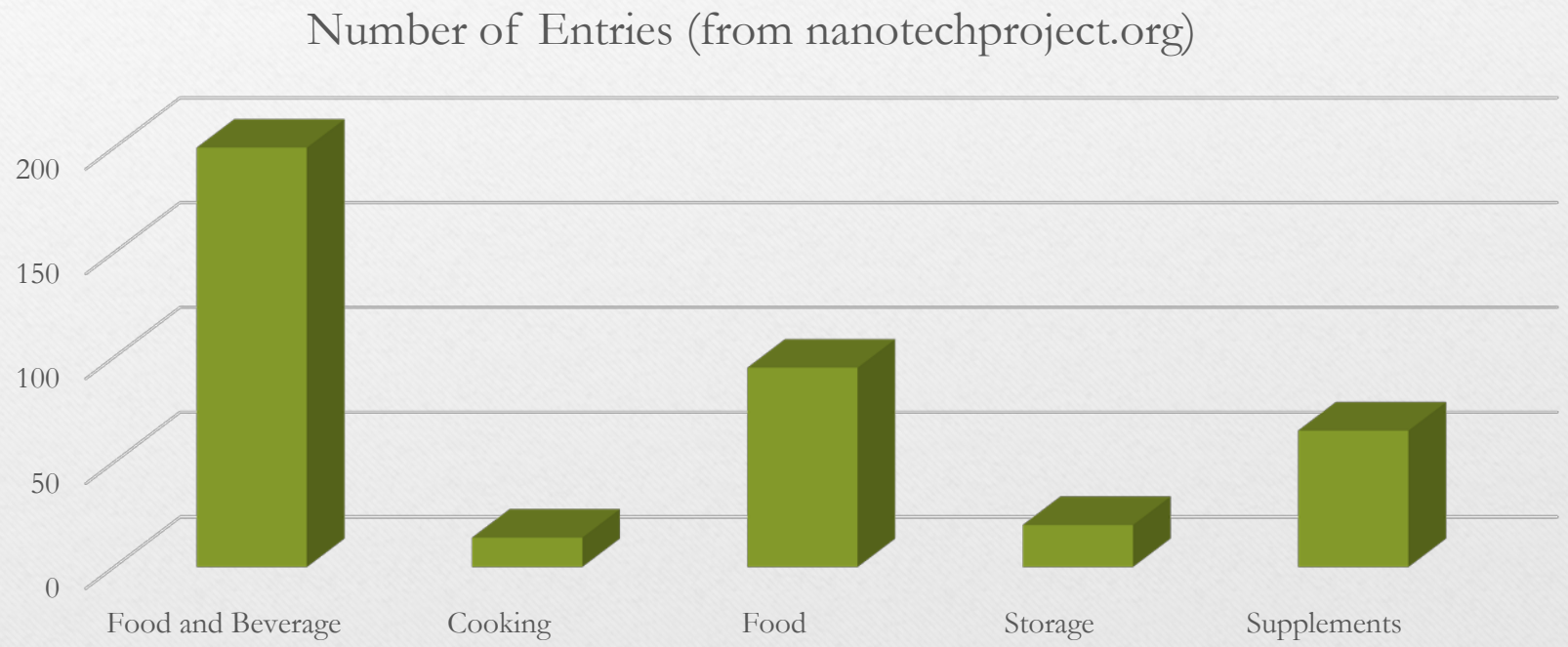
  FY 2012 Actual $18.3 million
  FY 2013 Estimated $18.3 million
  FY 2014 Proposed $20.3 million

- Department of State/OECD
- Total Funding for NNI Health and Safety: $88, $102, $105 Million

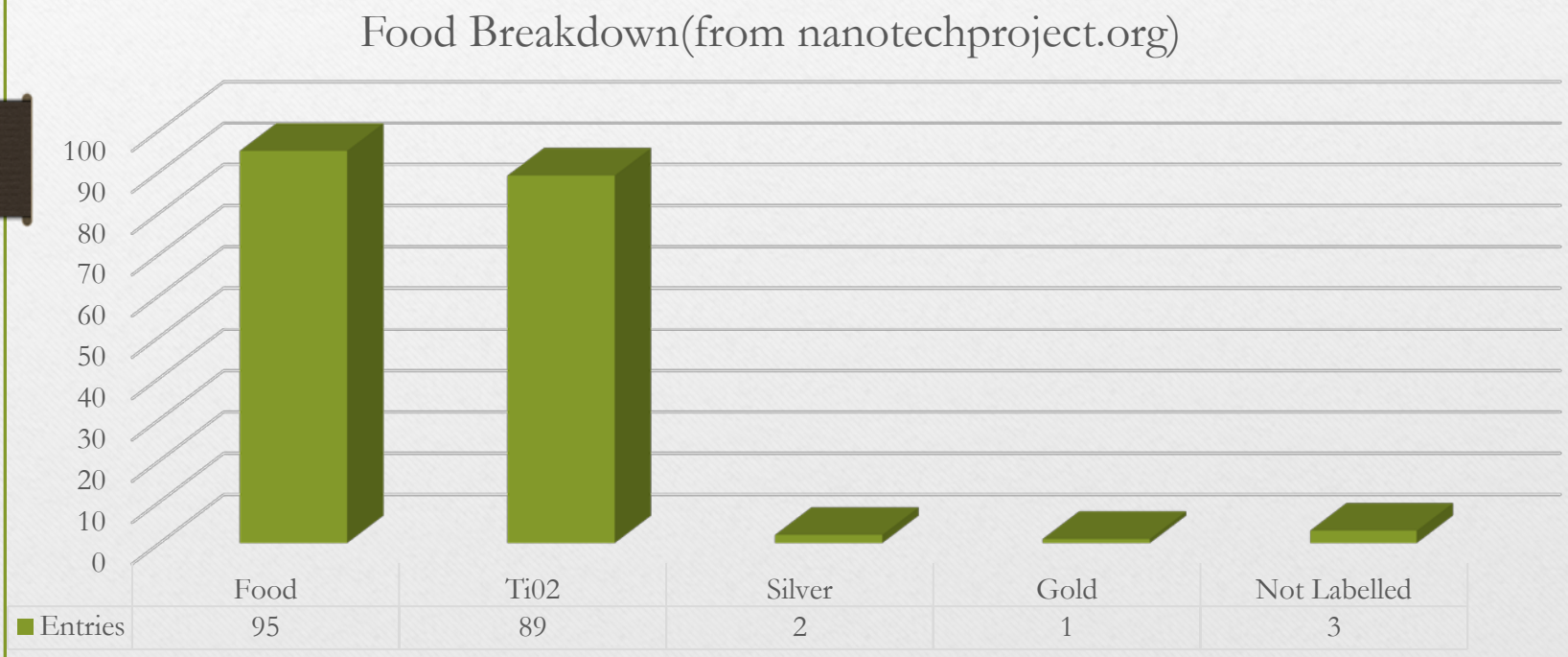
From NNI Federal Budget

Also, shout out to ASU and UCSB CNS

Quick Stats About Nano And Food

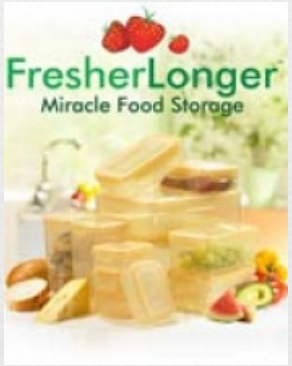


Quick Stats About Nano And Food



Nanosilver

- The Majority of Cooking and Storage Products
- Anti-Bacterial Properties
- Food storage
- Coatings on utensils – Silverware without much silver
- Supplements



Why is Titanium Dioxide in Food?

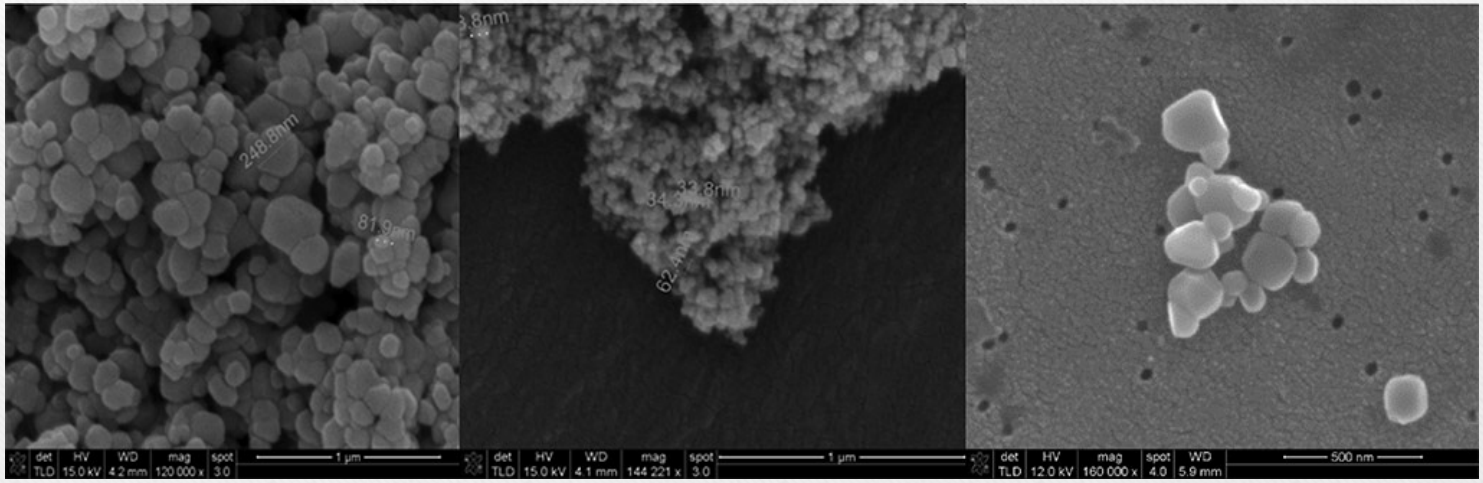
- We have been enslaved for control by future electromagnetic weapons and tasers. A solution of water and Titanium Dioxide will superheat in microseconds from directed energy weapons. Each human or animal is now a target!
- But the real explanation may be political control. When one considers the military effectiveness of this chemical, one begins to realize that we are being "magnetized" for control by future electromagnetic weapons and tasers.

Since this is obviously outlandish, I just was to reassure everyone that this was for humor, but someone actually wrote this.

Titanium Dioxide in Food

- Used as a whitener for almost a century

  (1821 – Discovered – Industrial production -1916)
- Indeterminate impact on human health when ingested:
- Donuts, Candy, Mayonaise, Cream Cheese



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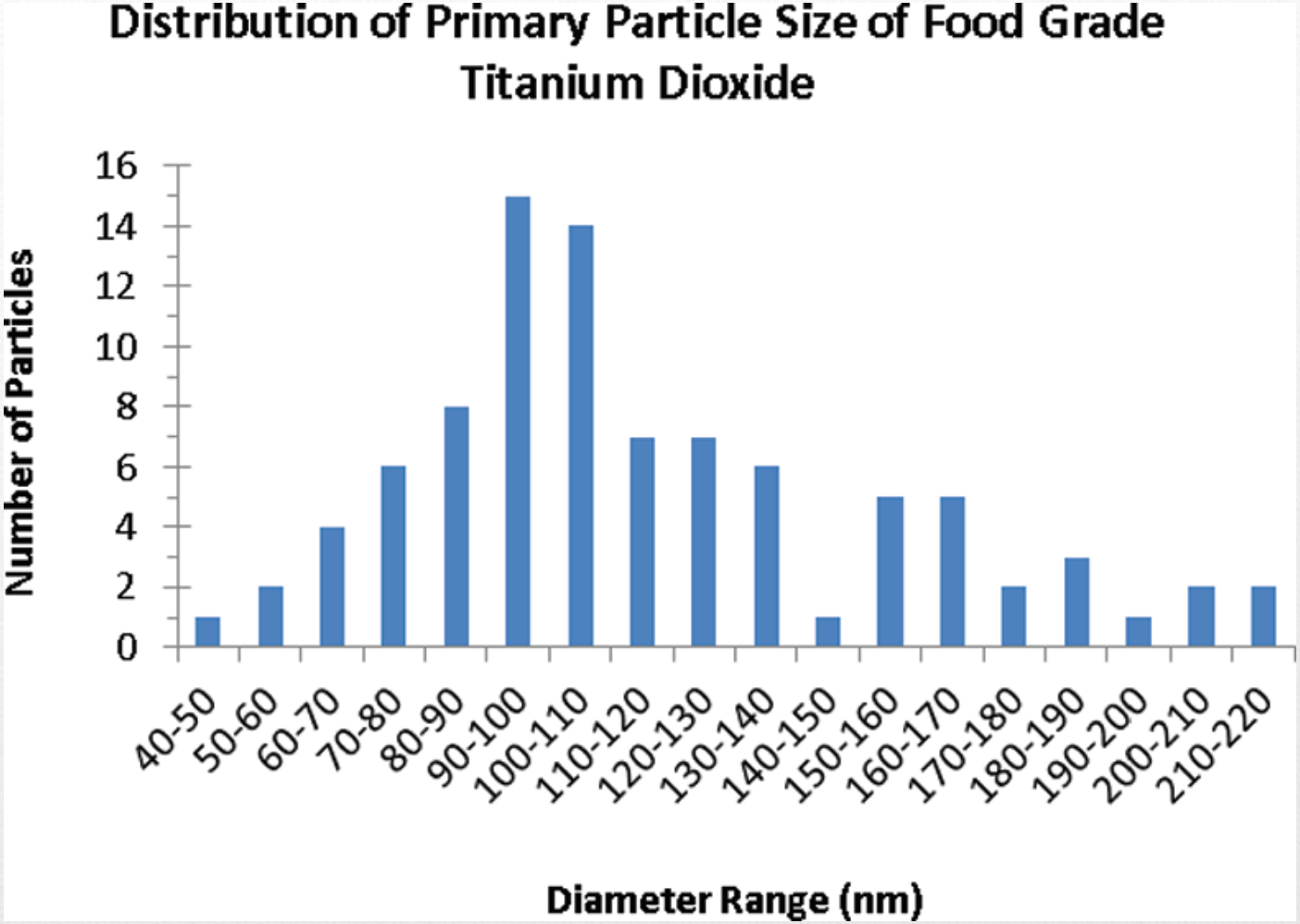

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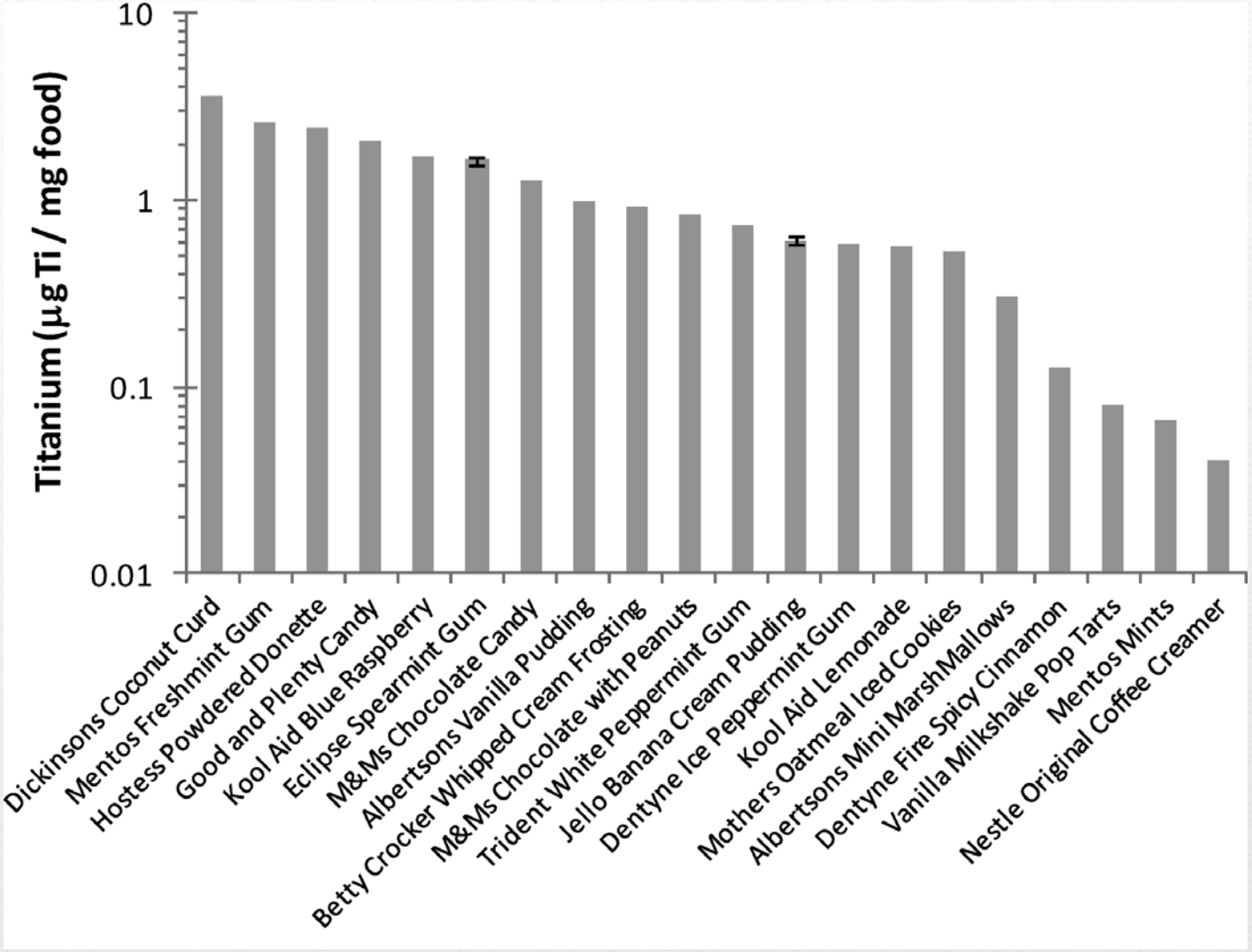

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Making A Donut Solar Cell

- http://www.youtube.com/watch?v=bVwzJEhMmD8

Let's Make Food!

- Make Your Own Gummy Worms
- Dessert: Raw Egg on Toast
- Sous Vide Egg
- Nano Crumble

Fun with Sodium Alginate

- What can you put in it?
- For Normal Spherification: Liquids or puree's with no calcium
- For Reverse Spherification: Liquids with Calcium (chocolates, milk products, etc)

Making Your Own Gummy Worms

What you need: (I can e-mail this to you if you want)

Materials	Equipment
For Gel	
For Gel: Sodium Alginate – "Algin" (a powdered seaweed extract) 3 grams Distilled Water 400 grams Food Dye	Immersion Blender Scale Small ramekin or cup for measuring the powder A Cup (with more volume than 500ml) Flat bottom container no smaller than 3" diameter, at least 500ml, and has a screw on top. Funnel or syringe Squeeze Bottle with screw top and narrow nozzle
For Calcium Bath (page 2)	
Warm Tap Water Calcium Gluconate 9-10 grams (Calcium chloride works, you can halve the amount of Calcium chloride)	5" or bigger diameter Bowl (a white or clear bowl works best) Paper towels (be clean!) Small ramekin or cup for measuring powder(dry!) Spoon

A Raw Egg for Dessert

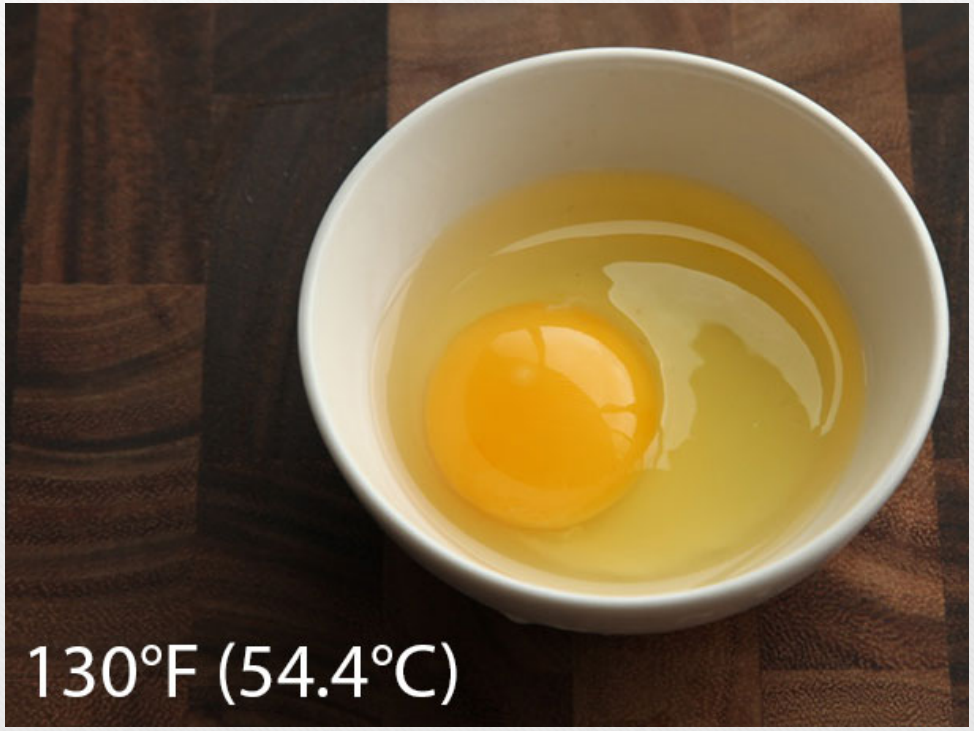
- Not really! Mango puree with greek yogurt on pound cake.
- http://www.molecularrecipes.com/spherification/
- 250 g (8.8 oz) of water
- 1.3 g sodium citrate
- 1.8 g sodium alginate (0.36%) (I used 3g)
- 250 g mango puree

This takes practice!!!

Proteins and Eggs

- What's nano about eggs?
- At specific temperatures, the proteins in eggs do specific things.
- Whites are 10% protein, 20% in yolk. (McGee's Keys to Good Cooking)
- Eggs contain 10 non-essential and 8 essential amino acids. (nbd.nal.usda.gov/ndb/)
- 40 different proteins in egg whites (Exploratorium.edu "Science of Eggs")
- Maintaining consistent temperatures and environments can be important in producing nano materials.

Eggs at Different Temps



www.seriouseats.com

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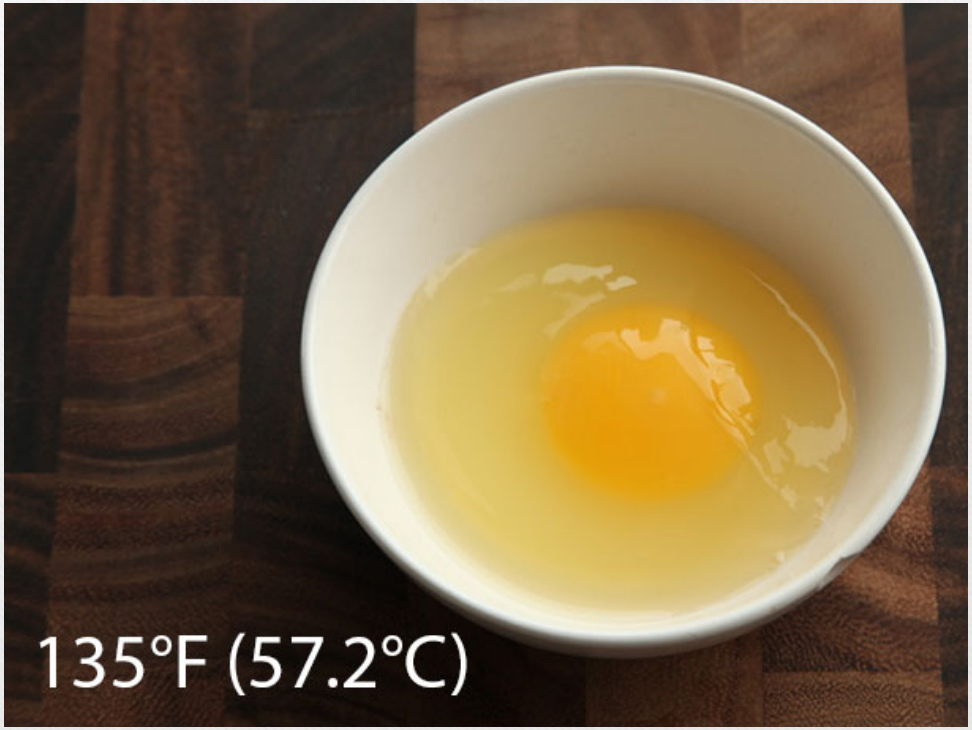

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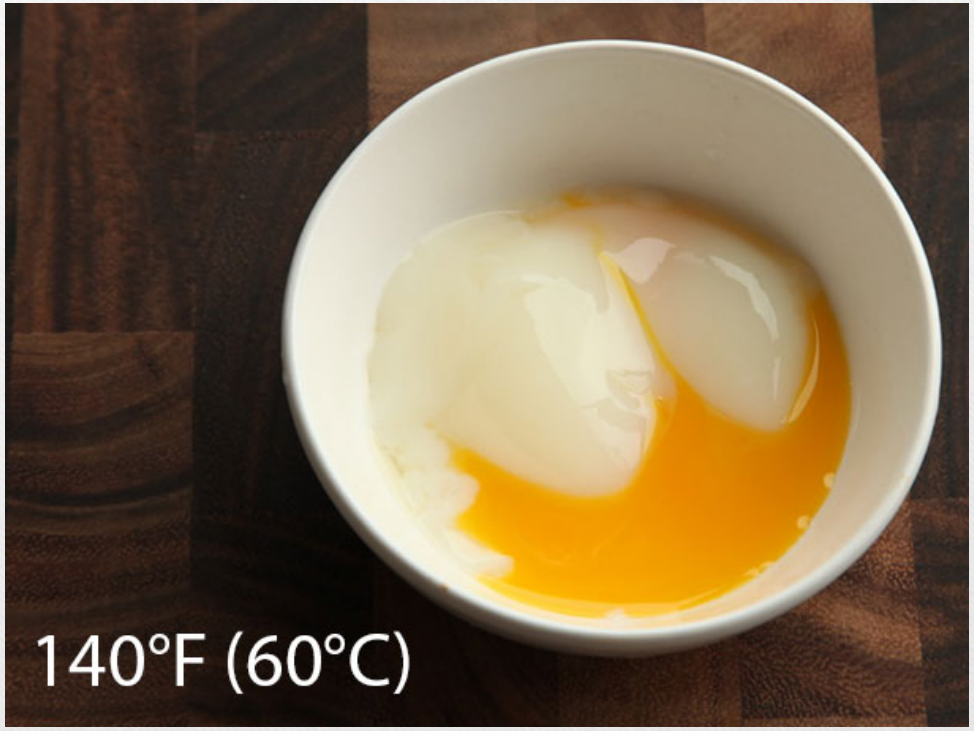

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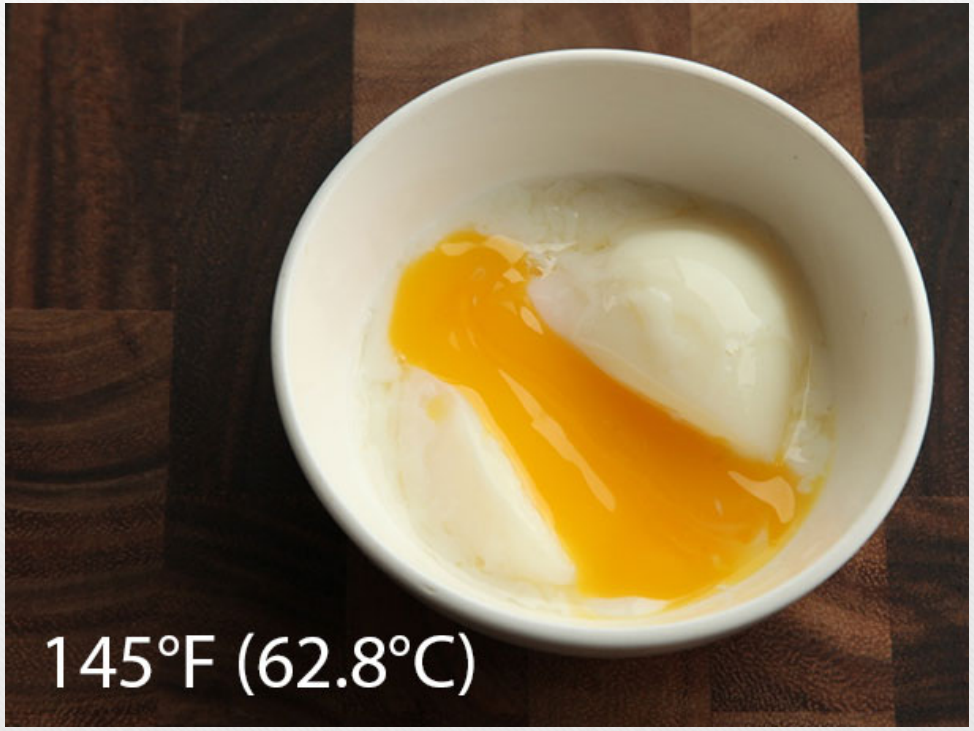

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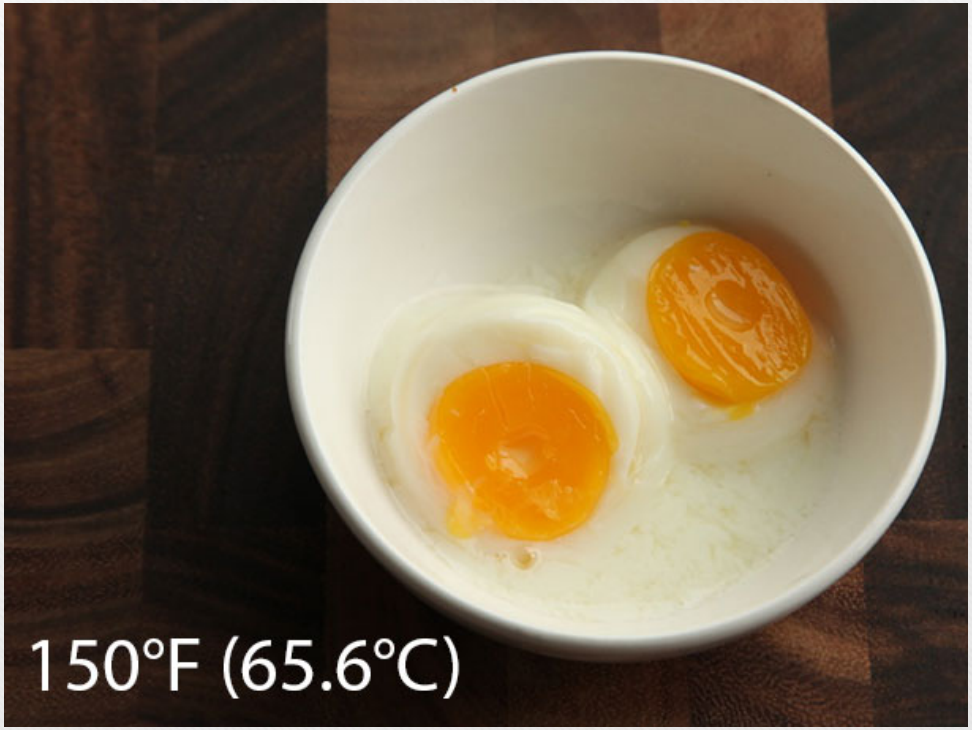

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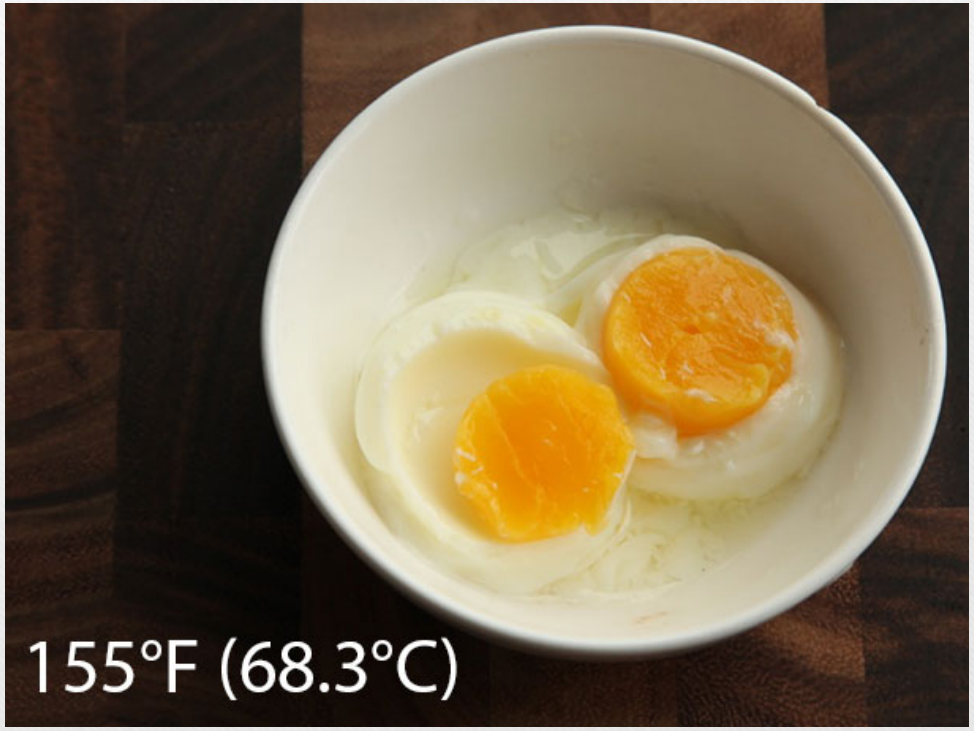

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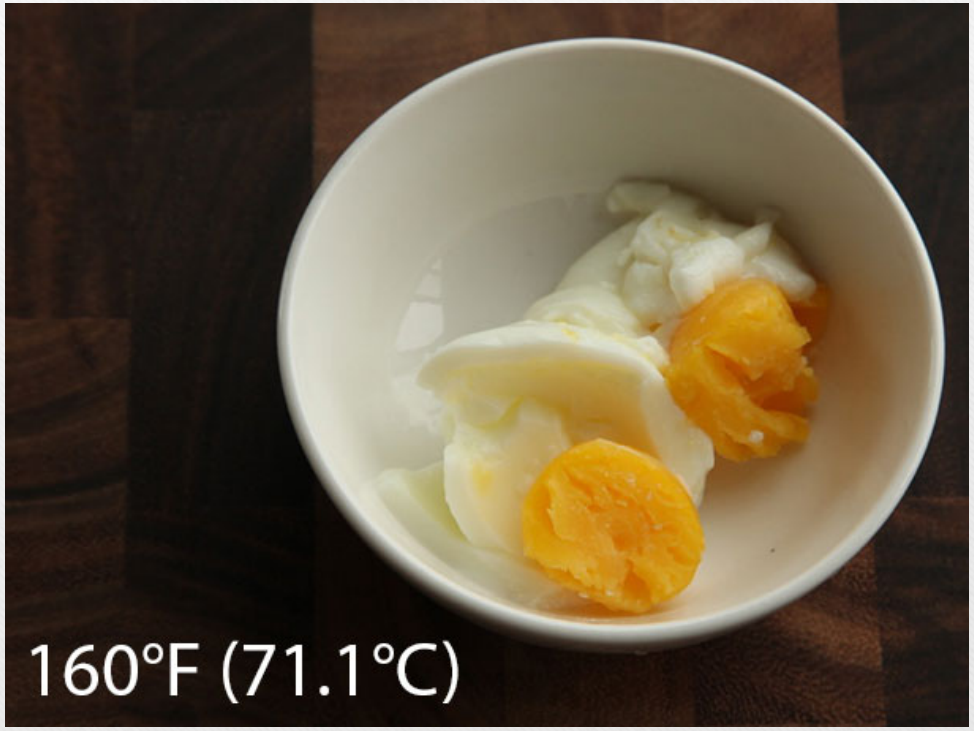

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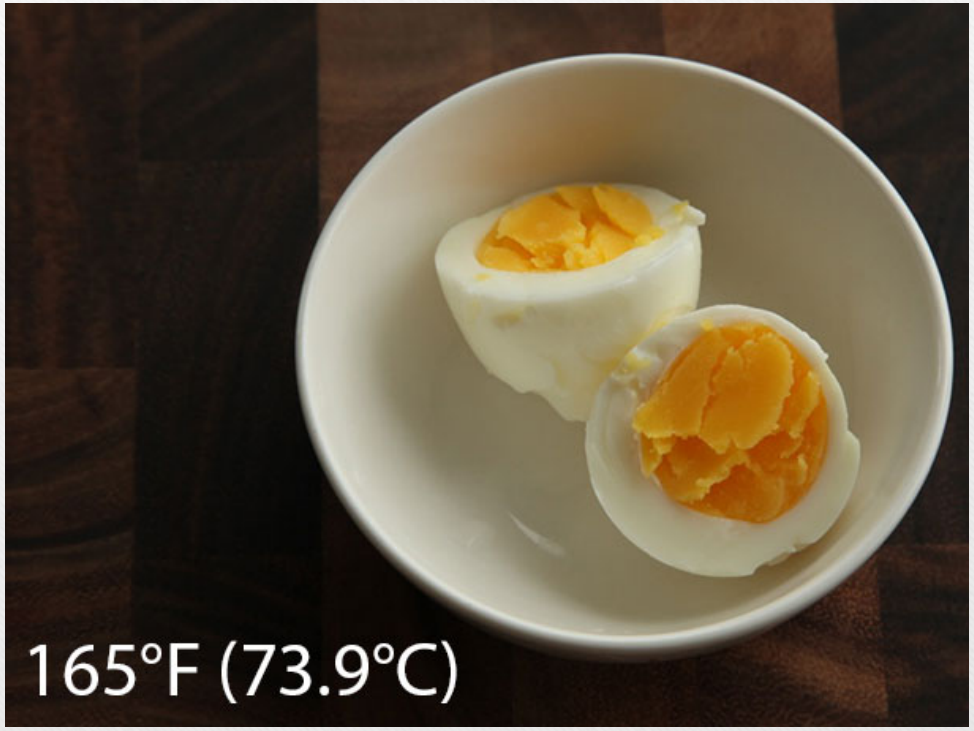

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Proteins and Eggs

- Let's see an egg at 147 F/63.8 C

And a Nano Crumble!
(Carrots and Perfect Yolk from Chefsteps.com)
Combine:

- Chopped Nasturtium (substitute Arugula!) Handful-ish
- Crumbled hazelnuts (freshly roasted if you can. 325 F for 15 minutes, cool a bit, then chop)
- Teaspoon-ish of grade B maple syrup, teaspoon-ish of hazelnut oil, and a pinch of salt in a bowl.

Top with an Egg Yolk Sous Vide in oil at 147 F/63.8 C

Thank You!

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