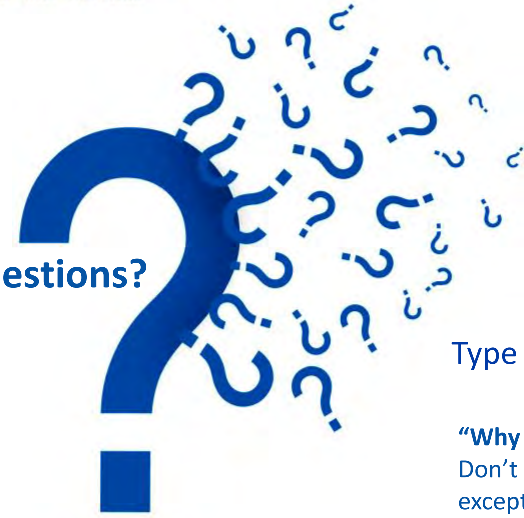

Have Questions?

Type them into questions box!

“Why am I muted?”
Don’t worry. Everyone is muted except the presenter and host. Thank you and enjoy the show.

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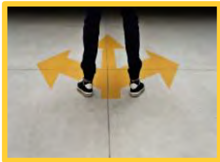
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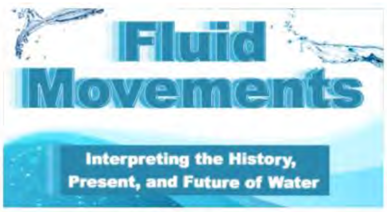

Date: Thursday, January 21, 2021 @ 2-3pm ET
Speakers: Jahnavi Phalkey, Science Gallery Bengaluru and Jesse Smith, Science History Institute
Moderator: Daryl Boudreaux, Principal, Boudreaux & Associates LLC

Register for Free!

What You Will Learn:

- The history of water quality analysis and the various scales of water protection that have emerged in the United States over the past 200 years
- The challenges, limitations, and opportunities of more ontological approaches to the interpretation of water for public audiences
- Why museums and galleries should interpret water not as a singular material that preexists its understanding by scientific or indigenous knowledge, but rather as a multiplicity made by and bound up in systems of bodies, practice, power, and places

Co-produced with: Science History Institute and *Chemical & Engineering News*

Date: Thursday, January 28, 2021 @ 2-3:30pm ET
Speakers: Katrina Knauer, BioCellection Inc. and Philippe Reutenauer, Léa Nature
Moderator: Peter Boul, Aramco Americas

Register for Free!

What You Will Learn:

- Challenges in recycling of plastics and scaling new depolymerization technologies
- Chemical pathways for breaking down single-use plastics with an emphasis on polyethylene
- Synthesis of new polymers from chemically recycled monomers
- How food companies can modify their relationship towards plastics to face the public concerns linked to plastic packaging
- Mechanical recycling and its limitations and the emerging solutions for chemical recycling

Co-produced with: ACS Division of Polymer Chemistry

Date: Thursday, February 4, 2021 @ 2-3pm ET
Speaker: Jayshree Seth, 3M
Moderator: Glenn Ruskin, American Chemical Society

Register for Free!

What You Will Learn:

- What the world thinks of science during the global pandemic and if skepticism gone up or down
- What the global public cares about the most as it relates to science
- What specific actions can we all take to advocate for science

Co-produced with: ACS External Affairs & Communications

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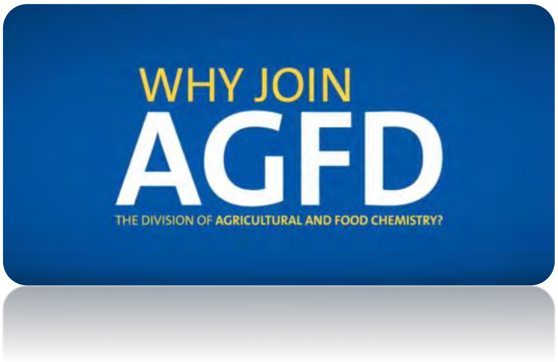
10

ACS Division of Agricultural & Food Chemistry

ACS Technical Division
Agricultural & Food Chemistry (AGFD)



AGFD brings together persons particularly interested in the chemistry of agricultural and food products, both raw and finished; to foster programs of general papers and symposia on special topics dealing with this field of chemistry; to promote such other activities as will stimulate activity in and emphasize the importance of research in agricultural and food chemistry.

Find out more about the ACS AGFD! http://agfd.sites.acs.org
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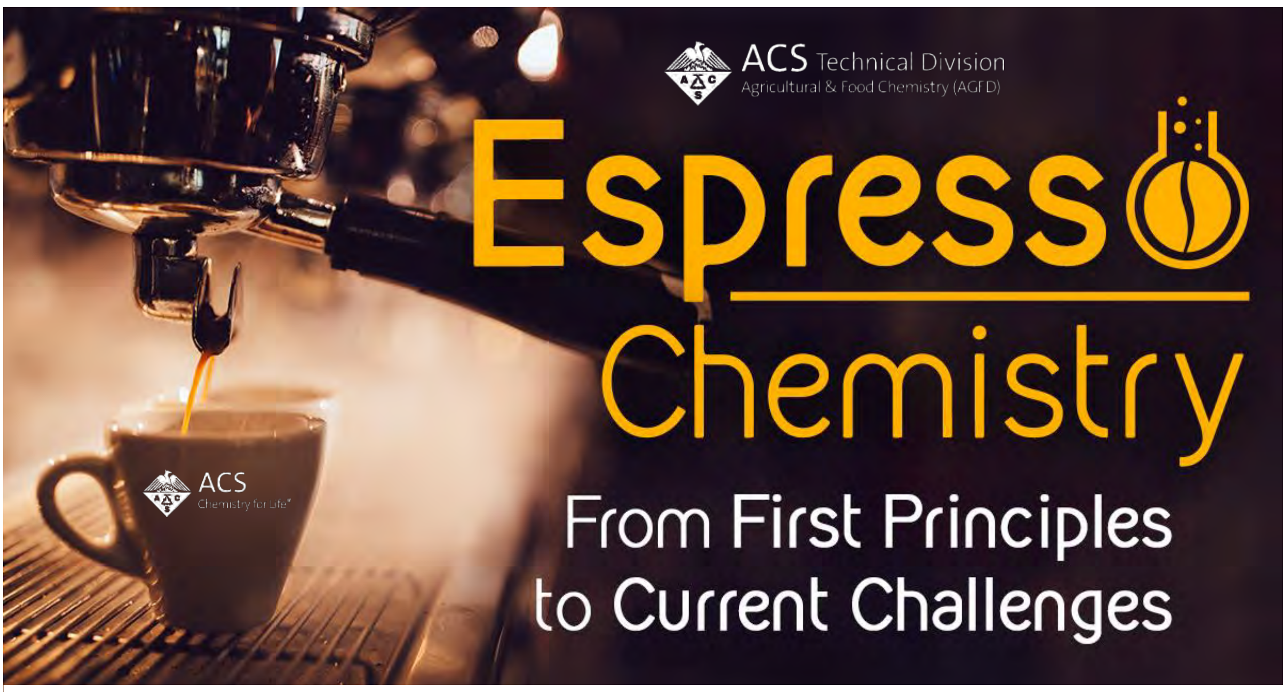
AGFD Application for Membership: https://agfd.sites.acs.org/agfdapplication.htm

11



THIS ACS WEBINAR WILL BEGIN SHORTLY...

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Espresso Chemistry: From First Principles to Current Challenges

Christopher Hendon
Assistant Professor, Department of Chemistry and Biochemistry, University of Oregon

Brian Guthrie
Corporate Research Fellow, Cargill

Presentation slides are available now! The edited recording will be made available as soon as possible.

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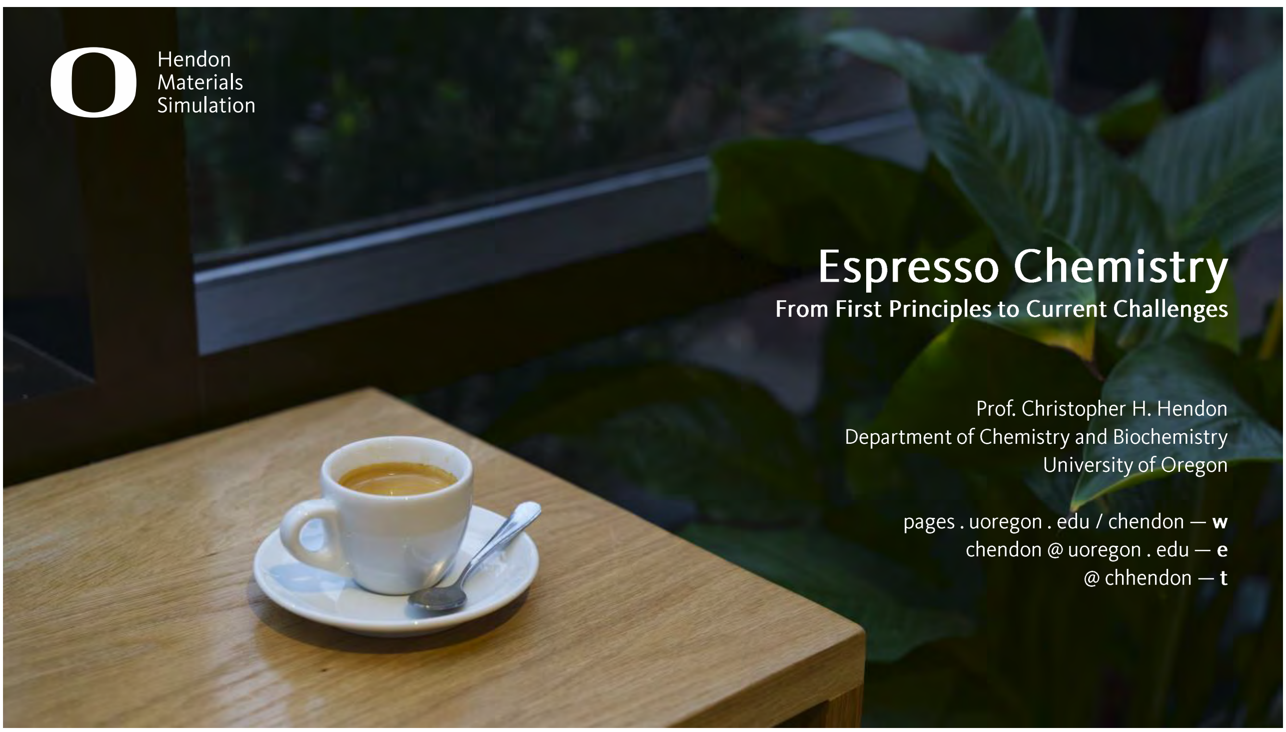


Bath, United Kingdom
Founded in 3
15


The Roman Baths
16

Boston, Massachusetts

Founded in 1630

17

Hendon Materials Simulation

Hendon Materials Simulation — 2020

Jenna Mancuso
Photoactive MOFs and chemical kinetics

Austin Mroz
Machine learning and materials theory

Khoa Le
Conductive MOFs

Josh Davis
Water dissociation and solid/liquid interfaces

XSEDE
Extreme Science and Engineering Discovery Environment

Jack Yang
Molecular redox and inorganic complexes

Lillian Payne
Large scale MOF screening

Sarah Peabody
Molecular pKa and solvation entropy

Natalie Fontillas
Structure-function relationships

20

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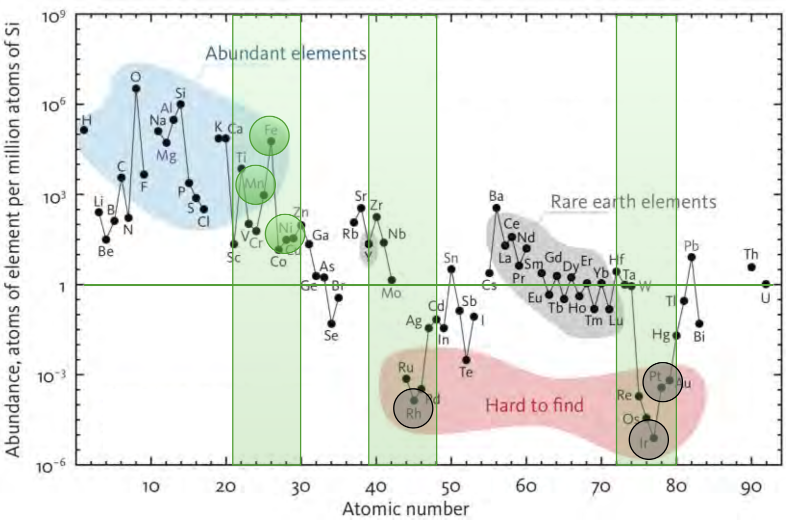
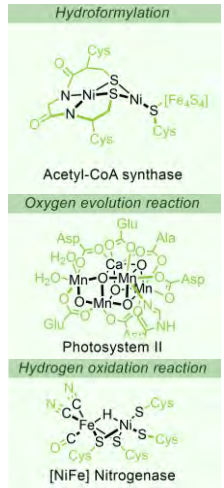
Nature catalyzes "industrial" reactions using metalloenzymes



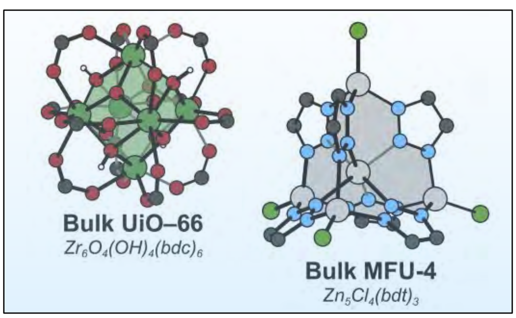


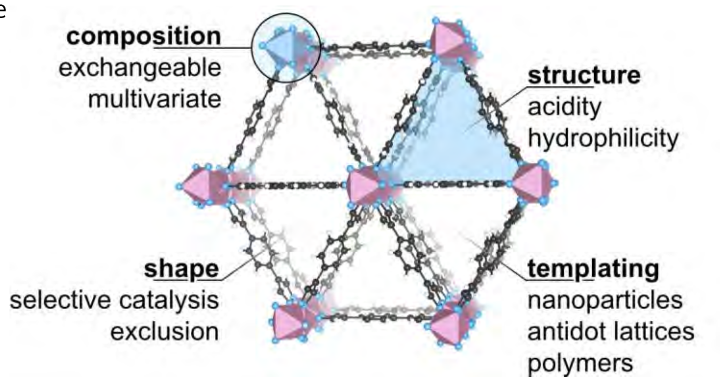
21

Metal-organic frameworks: static structures or dynamic crystals?

A useful family of materials. But they seem to vibrate and feature more local disorder than we first assumed.

Implications for catalysis and material stability





J. Am. Chem. Soc., **2020**, *142*, 19291

22

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Apologies if there is a topic we don't have time for

American Chemical Society overview talk on coffee
ACS Webinar, "Coffee: A Chemical and Physical Perspective"
This is a "general-overview-of-coffee" talk, please check it out!

Re:Co talk on cooling coffee (green and roasted) came online
SCAA Symposium YouTube Channel, "Cryogenics: Facts and Fiction"

Tamper Tantrum on the physics of particle migrations
Tamper Tantrum, "A Taste of Physics" — *The Brazil Nut Effect*

Water For Coffee 2.0
Establish Media, "Physical and Chemical Considerations in the Production of Coffee"

Coffee plants make nice house plants.
Here is mine, **Jean-Paul**

23

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ACS Webinar, "Coffee: A Chemical and Physical Perspective"
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Tamper Tantrum, "A Taste of Physics" — *The Brazil Nut Effect*

Water For Coffee 2.0
Establish Media, "Physical and Chemical Considerations in the Production of Coffee"

Trader Joes sells coffee
Note that there are not one plant...~10 !

24

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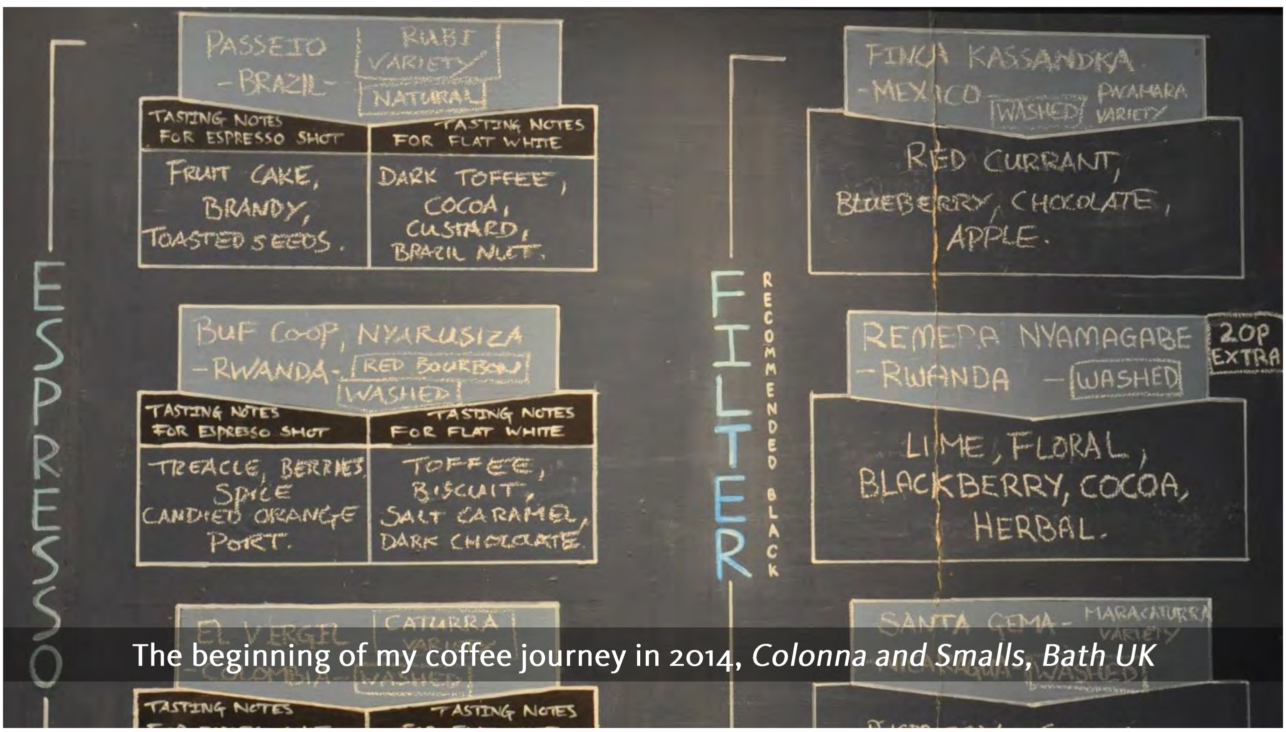
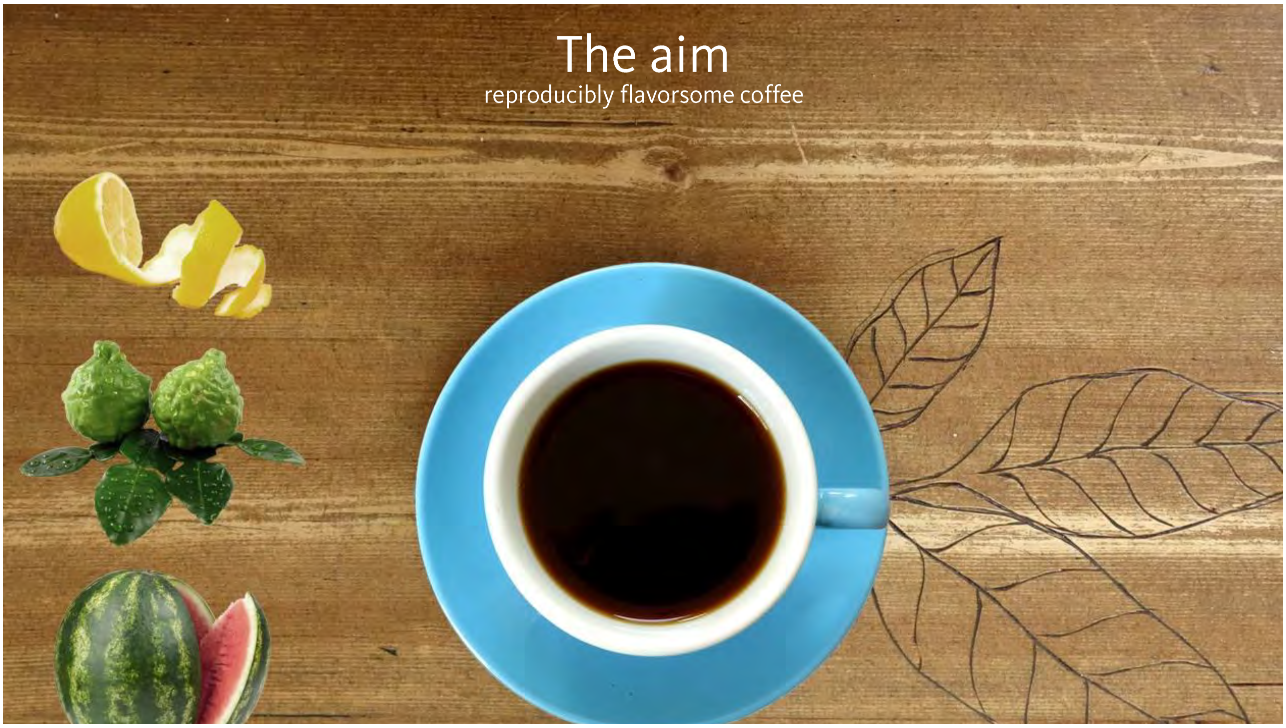
Coffee literature folder now hosted on

pages . uoregon . edu / chendon / coffee_literature

1963 Tetrahedron, Diketone synthesis -- smokey flavors.pdf	23-Dec-2019 11:27 933K
1964 Tetrahedron, Volatiles in coffee.pdf	23-Dec-2019 11:27 1.0M
1968 Chem. Rev., Chemicals in tobacco and smoke.pdf	23-Dec-2019 18:07 6.3M
1979 Chem. Sens. Flavour, The misuse of "sour" and "bitter".pdf	23-Dec-2019 11:27 1.0M
1987 J. Appl. Bact., Effect of salt on growing bacteria.pdf	23-Dec-2019 19:12 777K
1988 Food Chem., Chemicals in blackberry juice.pdf	23-Dec-2019 11:27 321K
1990 J. Agric. Food Chem., Rio defect.pdf	23-Dec-2019 18:07 918K
1991 J. Sens. Stud., Chemistry of maple syrup.pdf	23-Dec-2019 11:27 848K
1992 Z. Lebensm. Unters. Forsch., Headspace freshness of roasted coffee.pdf	07-Jan-2020 22:10 597K
1995 Sens. Act. B, Sensors to sniff meat freshness.pdf	07-Jan-2020 22:10 446K



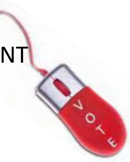
The beginning of my coffee journey in 2014, *Colonna and Smalls, Bath UK*


The aim
reproducibly flavorsome coffee


The occasional outcome
something not so tasty
Fazer
SALMIAKKI

Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



Which is the largest contributor to a quality cup of coffee?

- Roast
- Water chemistry
- Equipment
- Quality of the green
- Country of Origen

29

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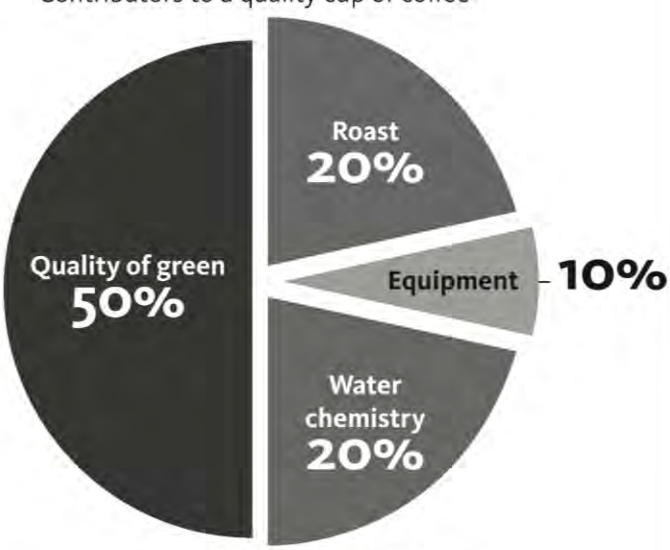
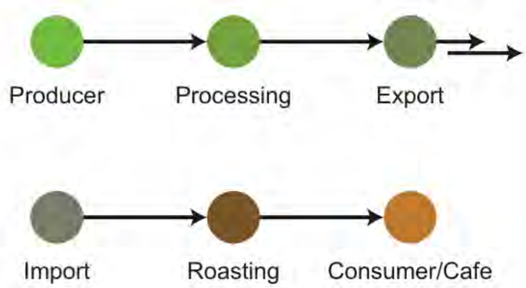
Contributors to a quality cup of coffee*



* Of course something could go wrong at every stage of brewing.

The coffee supply chain

An extremely simplified version



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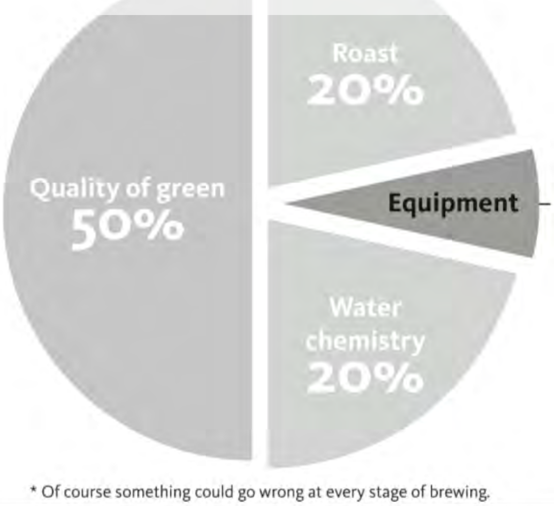
You can spend any amount of money of coffee equipment

The NASA $1.6M space cup



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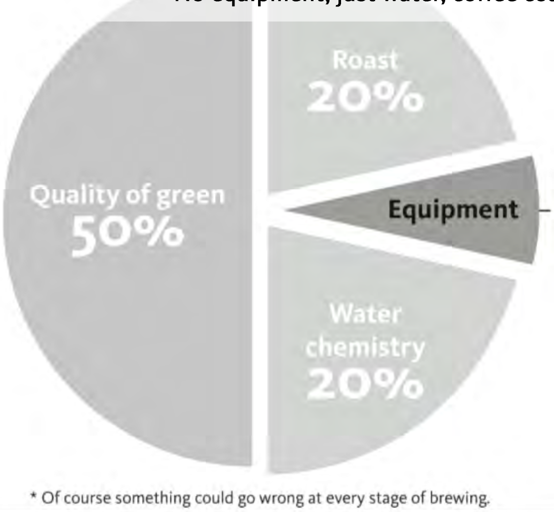
Coffee is graded on the cupping table

No equipment, just water, coffee coarsely ground, and a spoon + 4 min brew time



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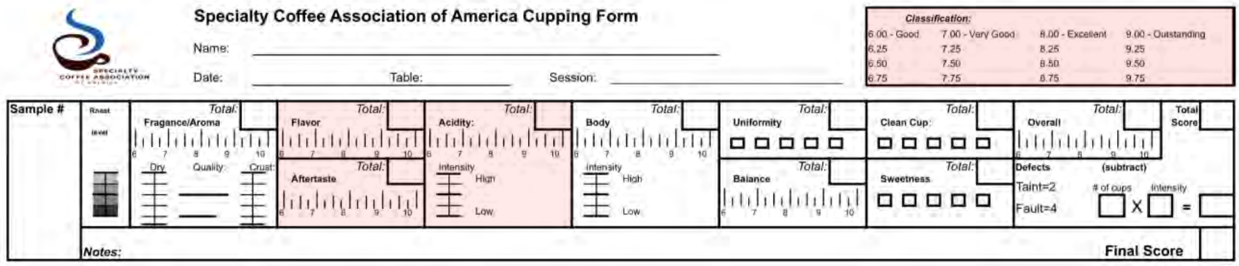

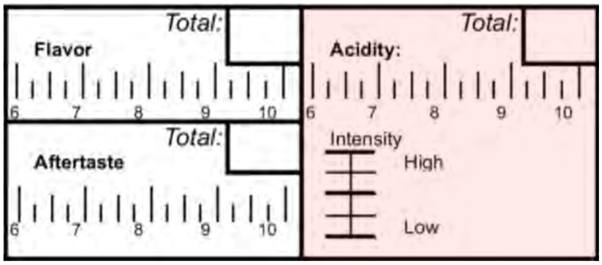

The cited papers suggest that:

33

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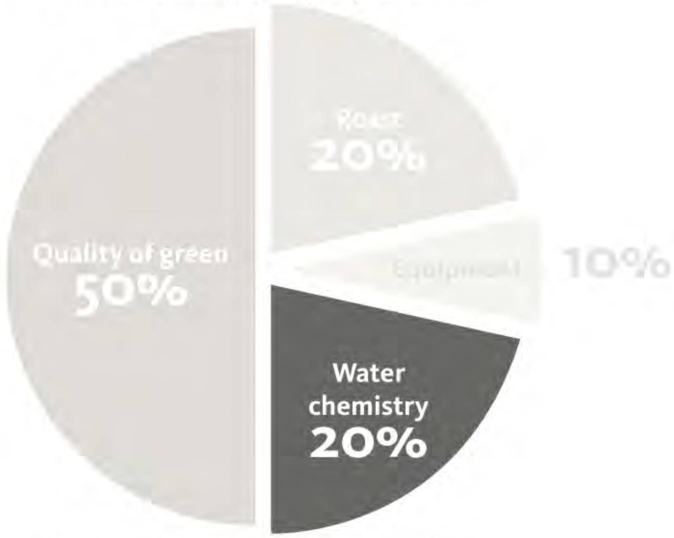
Contributors to a quality cup of coffee*



* Of course something could go wrong at every stage of brewing.

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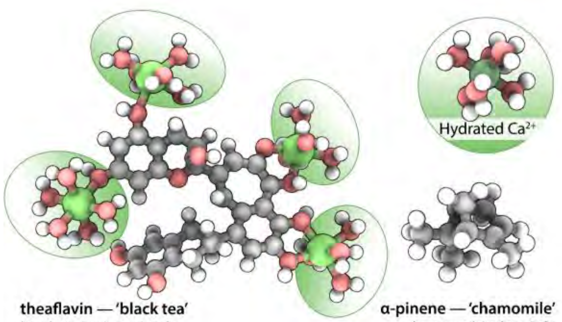
Water For ~~Coffee~~ Espresso?

Cations increase ionic strength of water

Cations (+) extract flavor



theaflavin — 'black tea' binds to hydrated Ca^{2+} through oxygen

α-pinene — 'chamomile' does not bind to Ca^{2+} α-pinene is non-polar

Anions (–) structure flavor

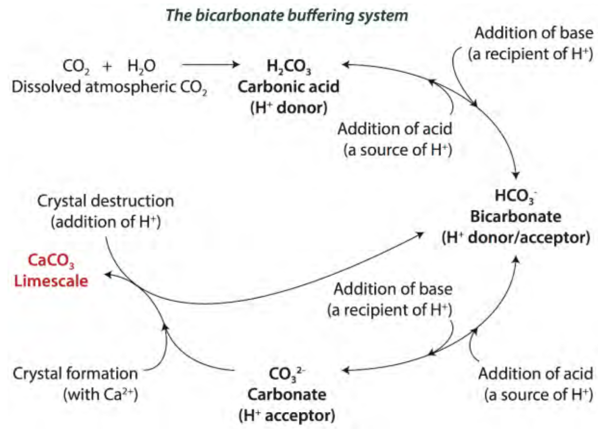
Hendon Materials Simulation

Water For ~~Coffee~~ Espresso?

Buffers structure the perceived acids in coffee drinks

Cations (+) extract flavor

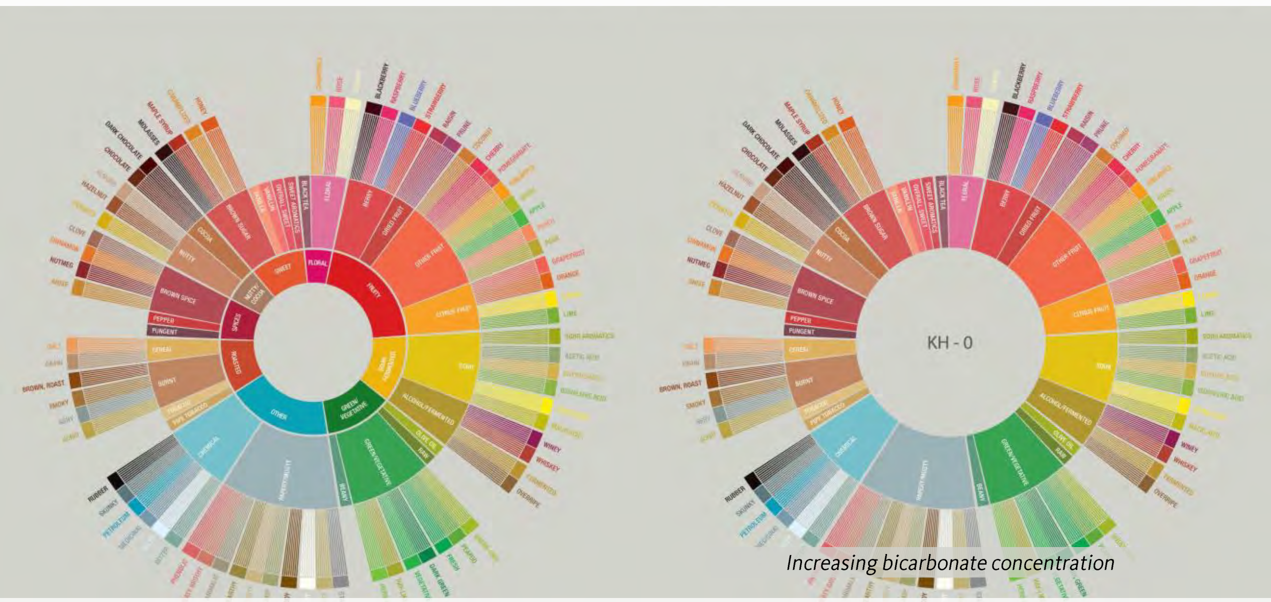
Anions (–) structure flavor



J. Agric. Food Chem., **2014**, *62*, 4947 Water For Coffee, **2021**

37

(Positive) flavors in coffee are strongly affected by buffers

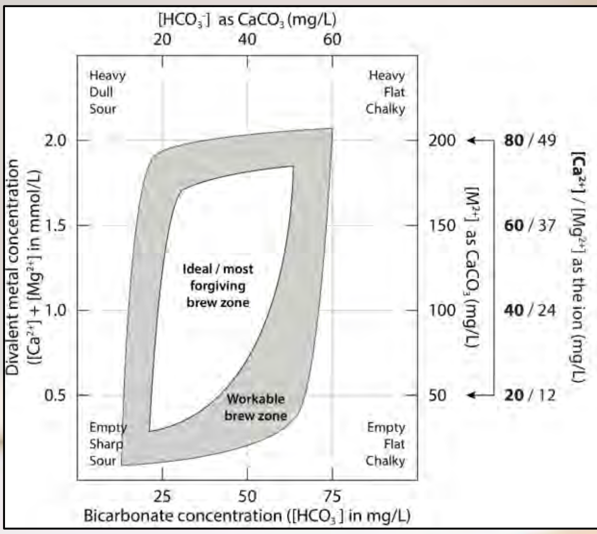


https://worldcoffeeresearch.org/work/sensory-lexicon/ *J. Food Sci.*, **2016**, *81*, S2997

38

"Ideal" brew water

An empirical water chemistry chart developed in collaboration with Colonna Coffee, UK



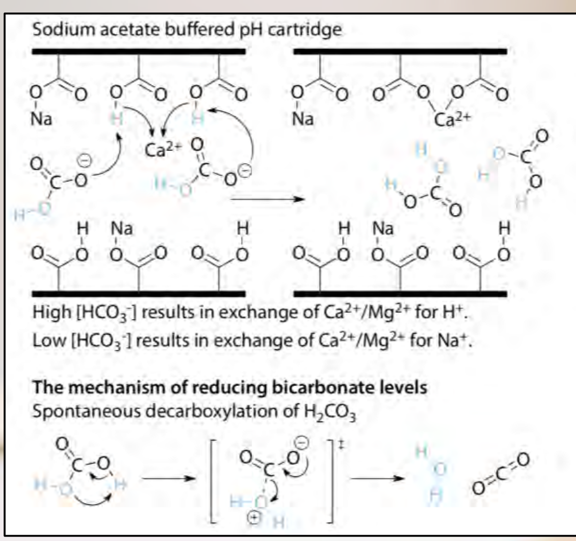
Ion exchange resin cartridges
Products like Peak Water, the Brita Filter, Soma, etc.

But ion exchange resins are complicated.

39

Ion exchange resins

A complicated landscape



Ion exchange resin cartridges
Products like Peak Water, the Brita Filter, Soma, etc.

But ion exchange resins are complicated.

40

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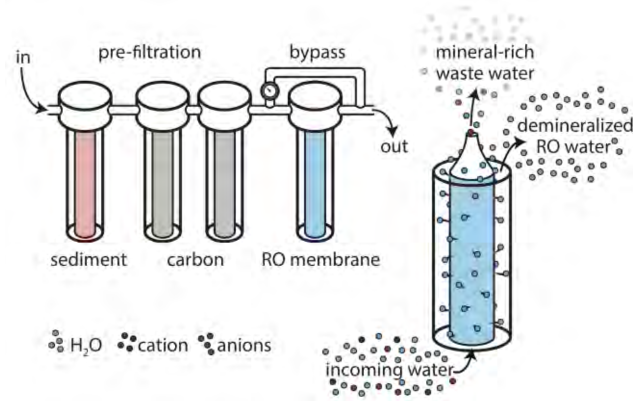
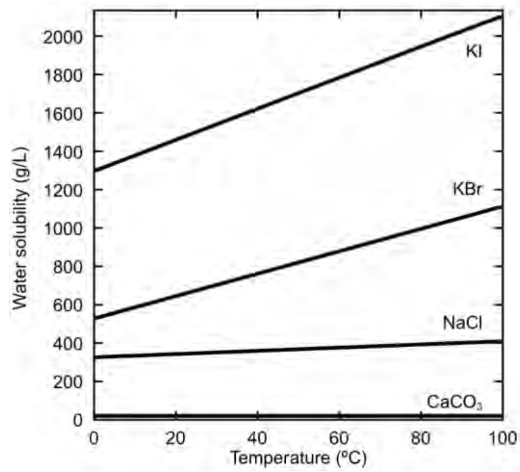
A comment on remineralization cartridges

solubility considerations





41

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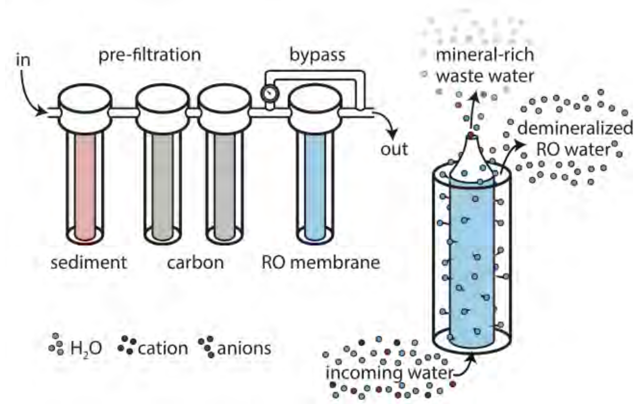
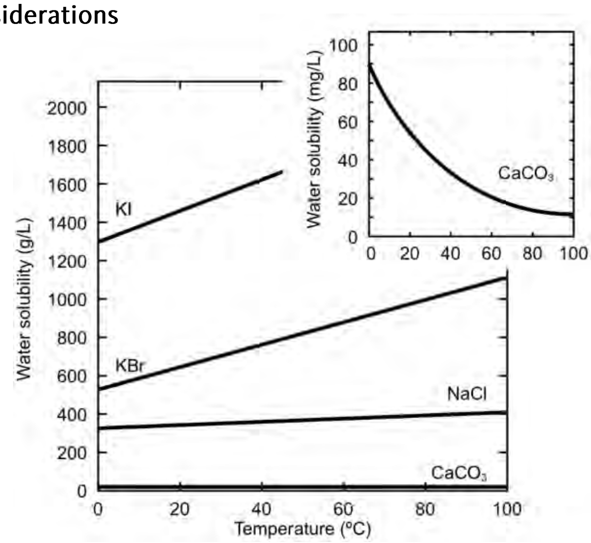
A comment on remineralization cartridges

solubility considerations





42

A thought on espresso vs. filter water

let's consider water containing 50 mg/L HCO_3^-

20% extraction from 20 g of coffee

4 g of solvated coffee stuff

Espresso

40 mL water

VS.

Filter

400 mL water

Hendon Materials Simulation

A thought on espresso vs. filter water

let's consider water containing 50 mg/L HCO_3^-

20% extraction from 20 g of coffee

4 g of solvated coffee stuff

Espresso

40 mL water

HCO_3^- mass =

0.04 L * 50 mg

2 mg of HCO_3^-

VS.

Filter

400 mL water

Hendon Materials Simulation

A thought on espresso vs. filter water

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20% extraction from 20 g of coffee

4 g of solvated coffee stuff

Espresso		Filter
40 mL water		400 mL water
HCO_3^- mass =	VS.	HCO_3^- mass =
0.04 L * 50 mg		0.4 L * 50 mg
2 mg of HCO_3^-		**20 mg of HCO_3^-**

45

Hendon Materials Simulation

A thought on espresso vs. filter water

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20% extraction from 20 g of coffee

4 g of solvated coffee stuff

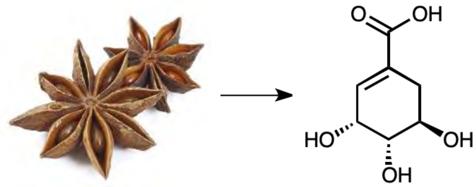
Espresso		Filter
40 mL water		400 mL water
HCO_3^- mass =	VS.	HCO_3^- mass =
0.04 L * 50 mg		0.4 L * 50 mg
2 mg of HCO_3^-		**20 mg of HCO_3^-**

If you have hard water you should make smaller drinks

ESPRESSO!

46

Extremely high (quantitative) extraction yield of shikimic acid



Shikimic acid is a precursor to some anti-cancer drugs

Figure S1: Extraction of star anise using an espresso machine.

Hendon Materials Simulation

The definition of espresso

according to the Specialty Coffee Association

An espresso is a **25–35 mL** (ca. 20–30 g) beverage **prepared from 7–9 g of ground coffee** made with **water heated to 92 – 95 °C,** forced through the granular bed under **9–10 bar of static water pressure** and a total flow **time of 20–30 s**.

- Nobody really makes espresso any more
  - Examples:
    - The Double Rizzi Banga – Upwards of 26 g of coffee, producing a < 30 mL beverage
    - The Single Espresso — **Half of a shot** prepared on an 18 – 20 g dose of coffee.

Espresso is more than just a *ratio*

7 g basket
- Traditional “espresso” basket
- **Stepped.**

15, 18, 20, 22 g baskets
- Modern “espresso” basket
- **Cylindrical.**

49

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50

Espresso roasts are typically "darker"

higher pressure, short extraction times, a need to get more out of the coffee than just organic acids.

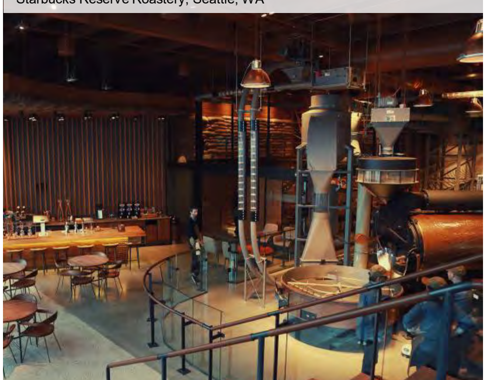
Typical filter coffee developments

Typical espresso coffee developments

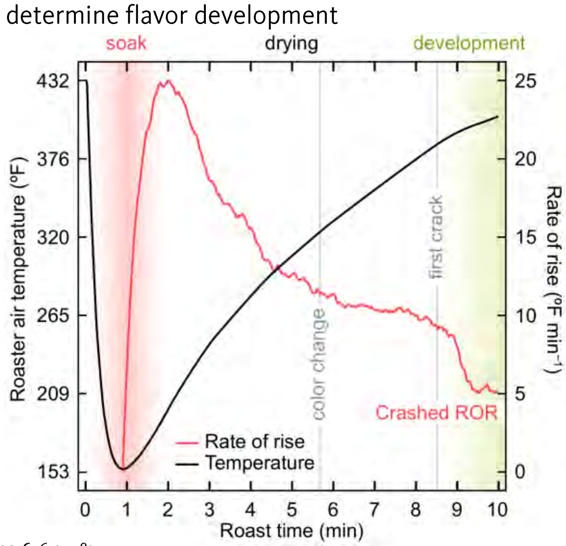
The roast profile

Kinetics: Gradient and time determine flavor development

Starbucks Reserve Roastery, Seattle, WA



https://sprudge.com/starbucks-roastery-tasting-room-seattle-66800.html



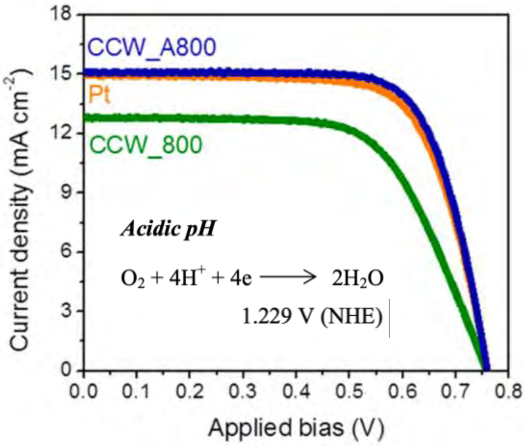
Sci. Rep., **2016**, *6*, 24483

Hendon Materials Simulation

Dark* roasted coffee is a good O_2 reduction catalyst

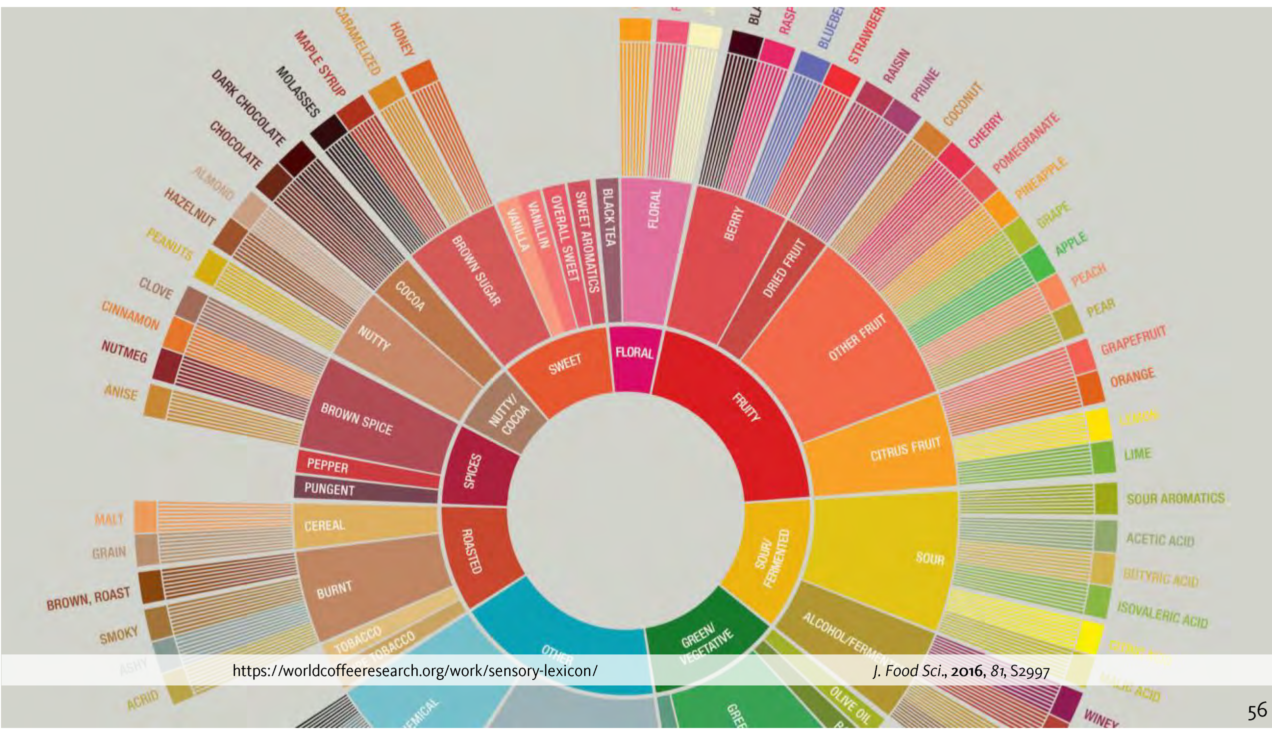
***dark = 800 °C, $ZnCl_2$, Ar**

Figure 1. Scheme of coffee waste-derived hierarchical nitrogen-doped porous carbon synthesis.



ACS. Appl. Mater. Interfaces, **2017**, *9*, 41303

53



https://worldcoffeeresearch.org/work/sensory-lexicon/

J. Food Sci., **2016**, *81*, S2997

56

Hendon Materials Simulation

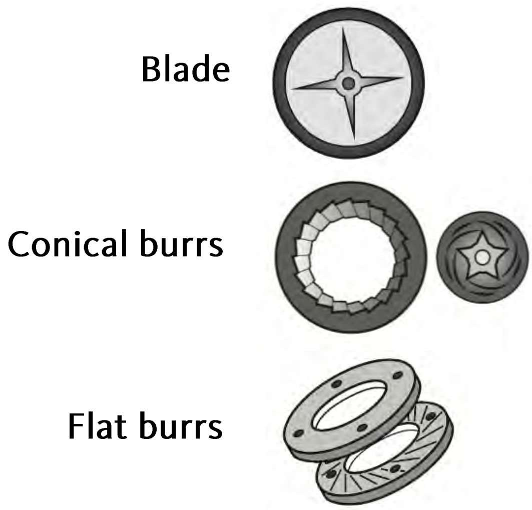
Grinding

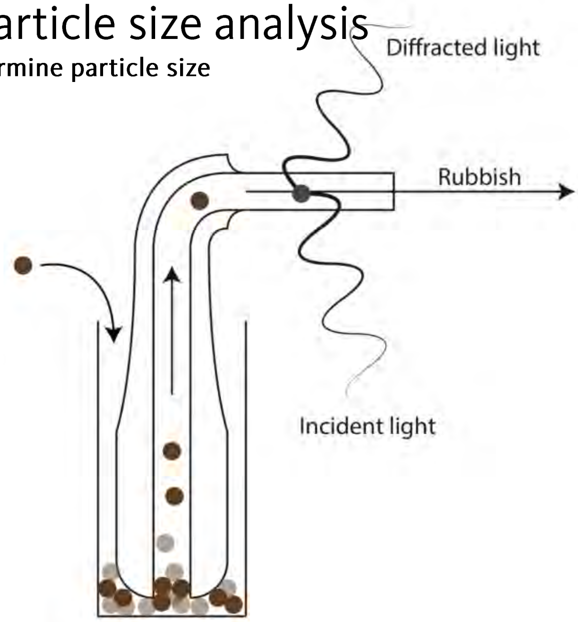
57

Hendon Materials Simulation

Laser diffraction particle size analysis

A process to determine particle size





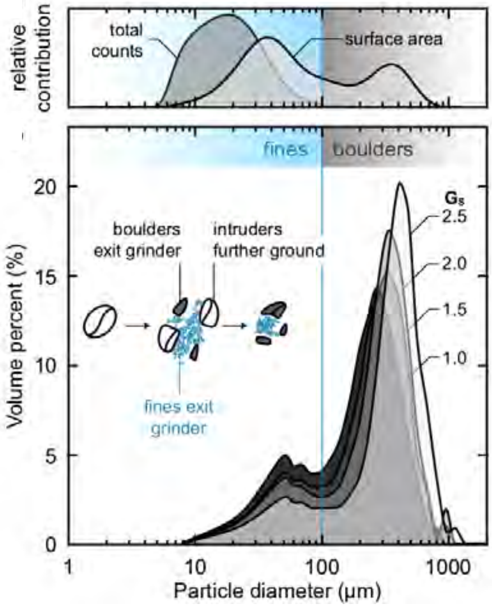
Hendon Materials Simulation

Laser Diffraction in Colonna and Smalls

Beckman Coulter lent us an instrument (and a guy to operate it) for a day

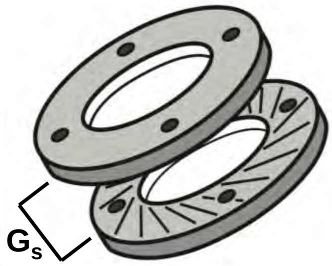
60

Hendon Materials Simulation



The effect of changing grind setting

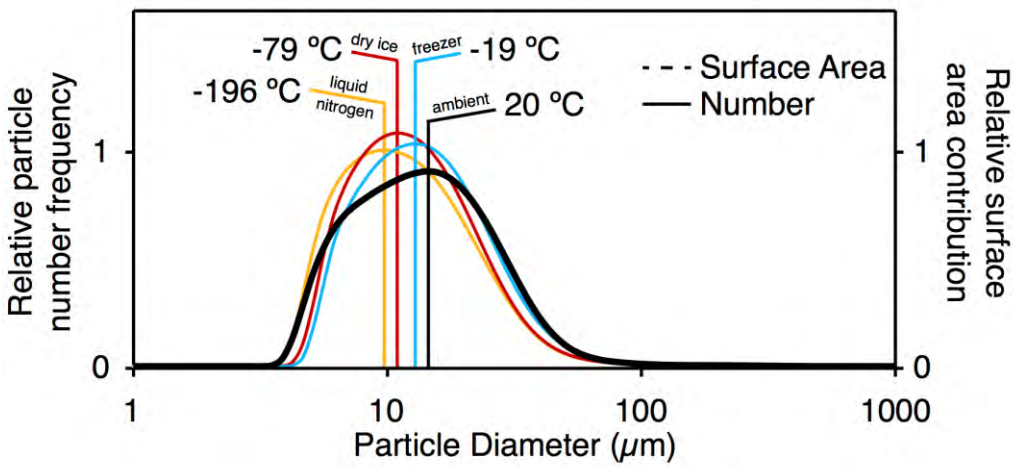
Grinding finer make more fine particulates, and small large particulates



Sci. Rep., **2016**, *6*, 24483

Hendon Materials Simulation

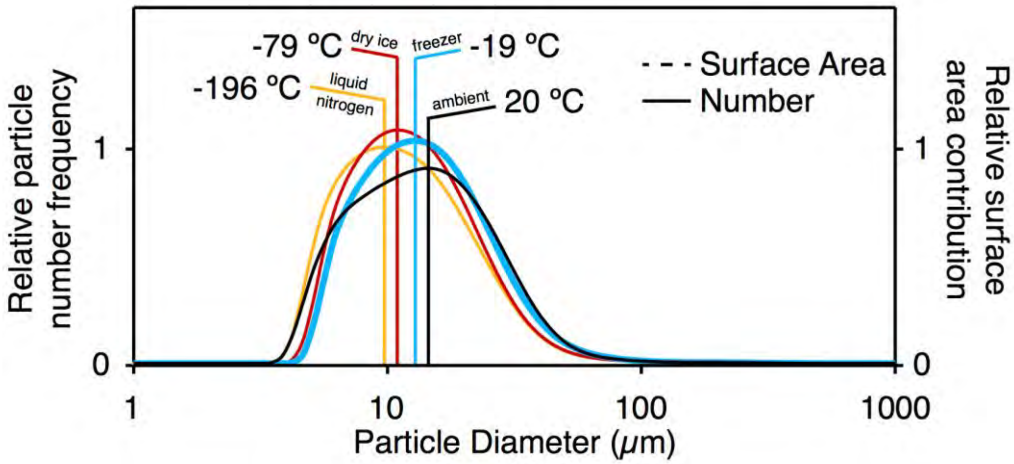
Cooling coffee before grinding augments the fine particle sizes



Sci. Rep., **2016**, *6*, 24483

Hendon Materials Simulation

Cooling coffee before grinding augments the fine particle sizes

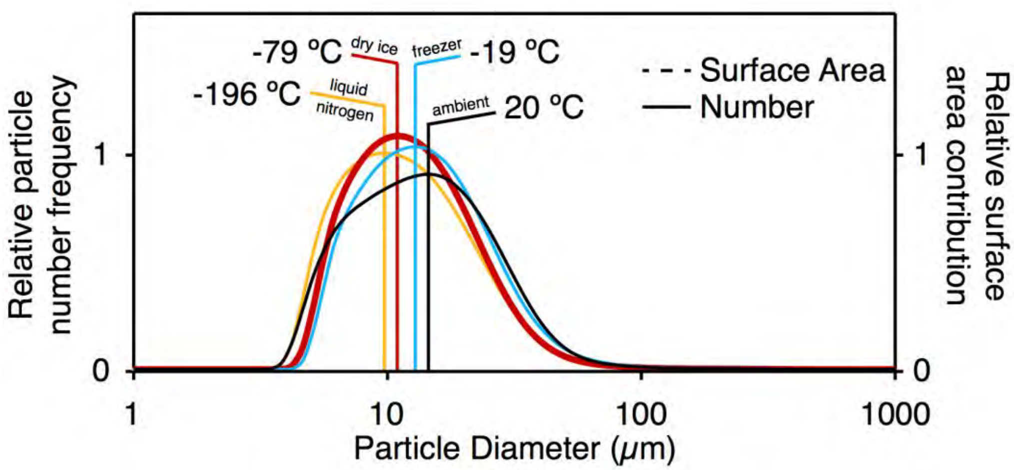


Sci. Rep., **2016**, *6*, 24483

63

Hendon Materials Simulation

Cooling coffee before grinding augments the fine particle sizes

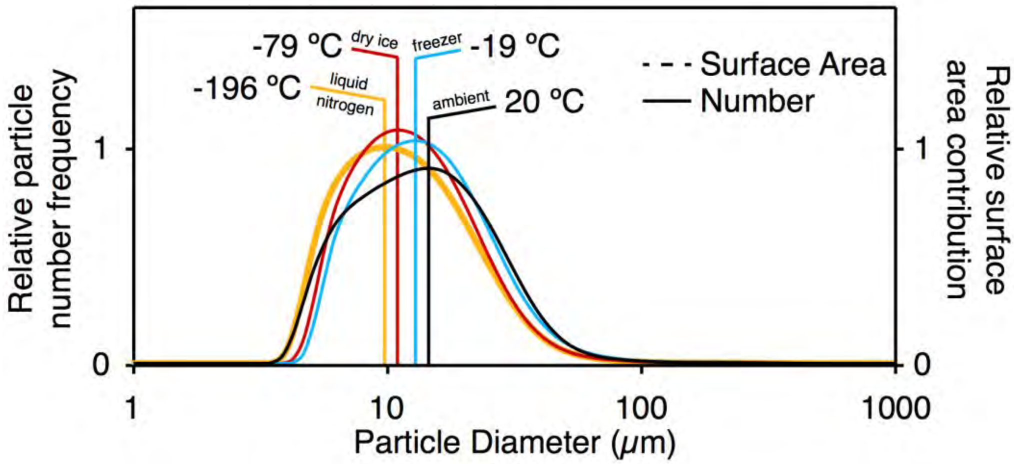


Sci. Rep., **2016**, *6*, 24483

64

Hendon Materials Simulation

Cooling coffee before grinding augments the fine particle sizes



Sci. Rep., **2016**, *6*, 24483

65

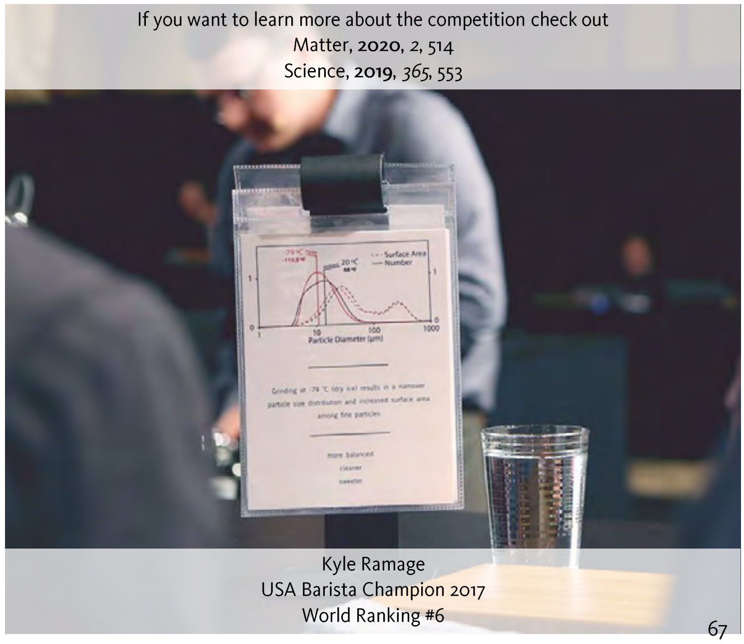
Hendon Materials Simulation

Some cafes and coffee enthusiasts have adopted freezing coffee.

66

Hendon Materials Simulation

Sevens
ONA Coffee
Sydney, Australia



If you want to learn more about the competition check out
Matter, **2020**, *2*, 514
Science, **2019**, *365*, 553

Kyle Ramage
USA Barista Champion 2017
World Ranking #6

67

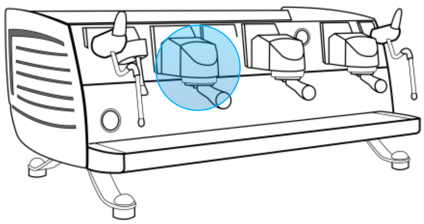
Hendon Materials Simulation

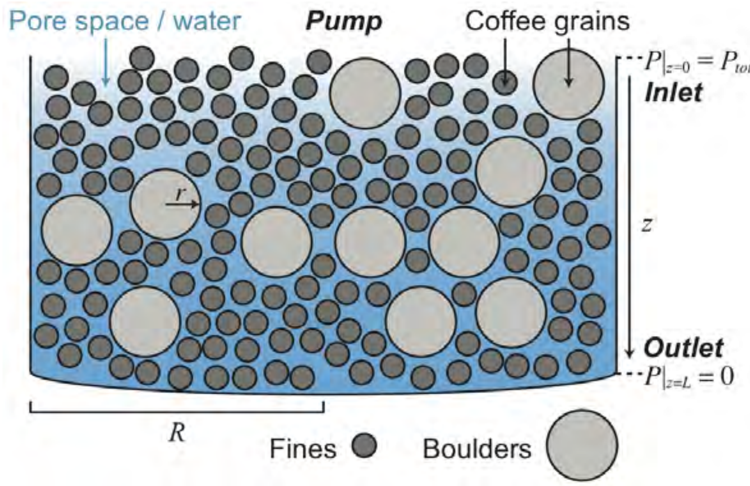
Brewing

68

Hendon Materials Simulation

Development of a numerical model for extraction from a granular bed





Matter, **2020**, *2*, 63

Hendon Materials Simulation

Early studies of extraction and isolation of rates

The exceptional work of Spiro

J. Sci. Food Agric. 1984, **35**, 915–924

The Kinetics and Mechanism of Caffeine Infusion from Coffee: The Effect of Particle Size

Michael Spiro and Robert M. Selwood

J. Sci. Food Agric. 1984, **35**, 925–930

The Kinetics and Mechanism of Caffeine Infusion from Coffee: Hydrodynamic Aspects

Michael Spiro and Caroline M. Page

J. Sci. Food Agric. 1985, **36**, 871–876

The Kinetics and Mechanism of Caffeine Infusion from Coffee: the Effect of Roasting

Michael Spiro and Julia E. Hunter

J Sci Food Agric 1989, **46**, 349–356

The Kinetics and Mechanism of Caffeine Infusion from Coffee: The Hindrance Factor in Intra-bean Diffusion

Michael Spiro, Ralf Toumi and Mangayetkarasy Kandiah

J Sci Food Agric 1993, **61**, 371–373

Modelling the Aqueous Extraction of Soluble Substances from Ground Roast Coffee

Michael Spiro

70

Hendon Materials Simulation

The ongoing problem of quantifying what is extracted

- Brix-type measurement is used to quantify solvated mass. Works well for wine!

But for coffee?

TABLE 2

$$z = a + bx + cy + dx^2 + ey^2 + fxy$$

wherein
a = −7.27705E+02
b = −8.72678E−01
c = 5.46065E+02
d = 9.20185E−04
e = −4.68197E−01
f = 6.648126E−01 and
x = temp
y = nD
z = % TDS

US Patent 8,239,144

72

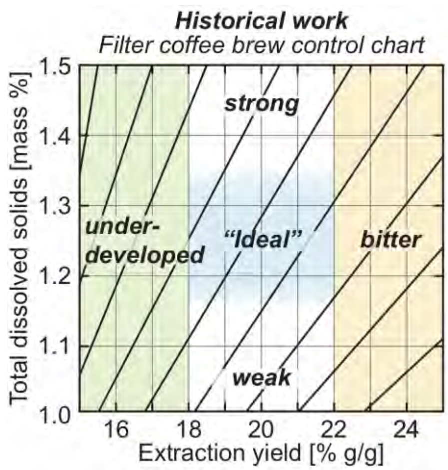
Hendon Materials Simulation

Extraction yield and total dissolved solids

cumulative measurement of solvated mass

$$\text{Extraction yield} = \frac{\text{Coffee mass solvated in the cup}}{\text{Dry coffee mass used to brew}}$$

$$\text{Total dissolved solids} = \frac{\text{Coffee mass solvated in the cup}}{\text{Total mass of beverage}}$$



73

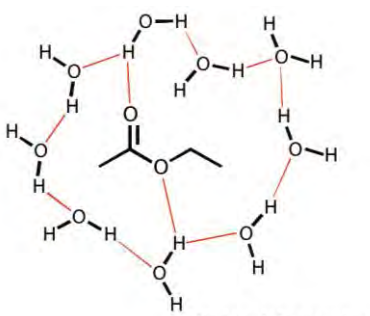
The refractive index of pure water at 25 °C

1.333

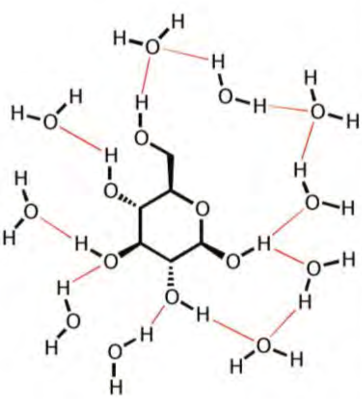
we are operating with very minor changes in refractive index.

The refractive index is proportional to bulk liquid density

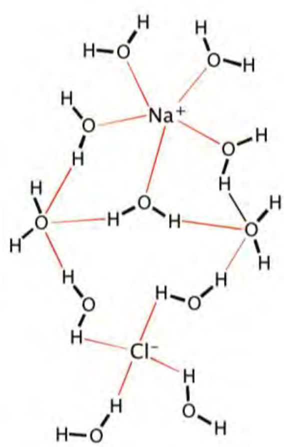
shown in increasing density ->



ethyl acetate in water



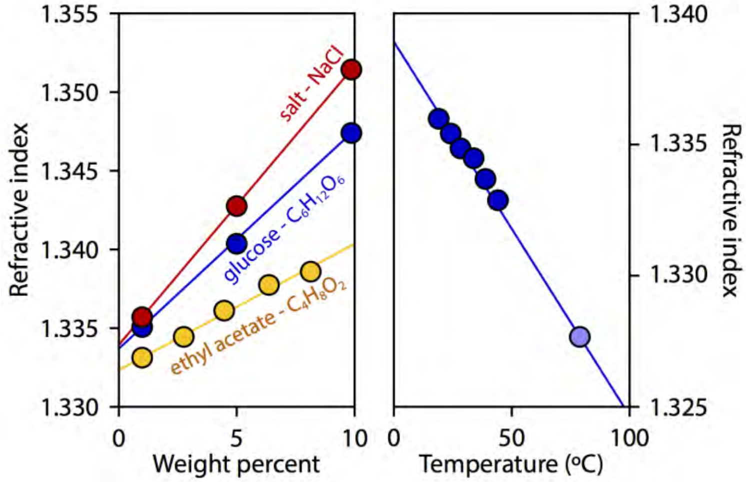
sugar in water



salt in water

Hendon Materials Simulation

The refractive index is compound dependent!



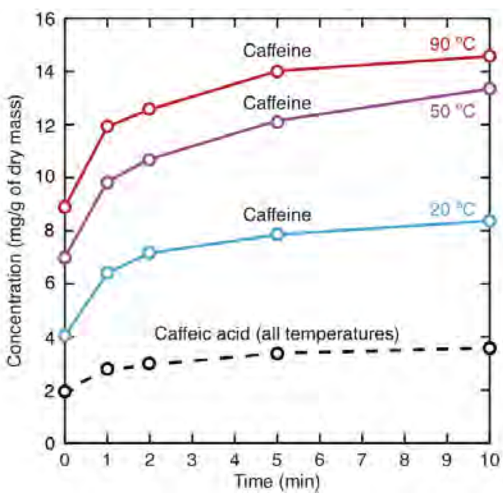
J. Chem. Eng. Data, **2015**, *60*, 2827

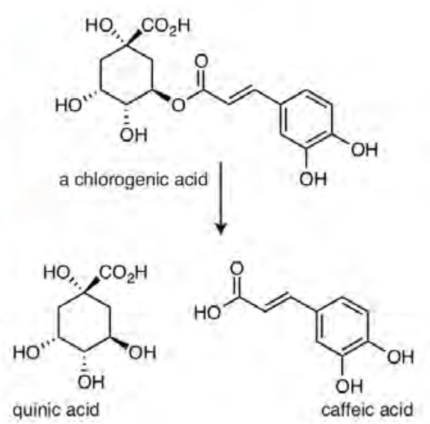
76

Hendon Materials Simulation

Experimental kinetics

isolating temperature and molecular dissolution rates





Hendon Materials Simulation

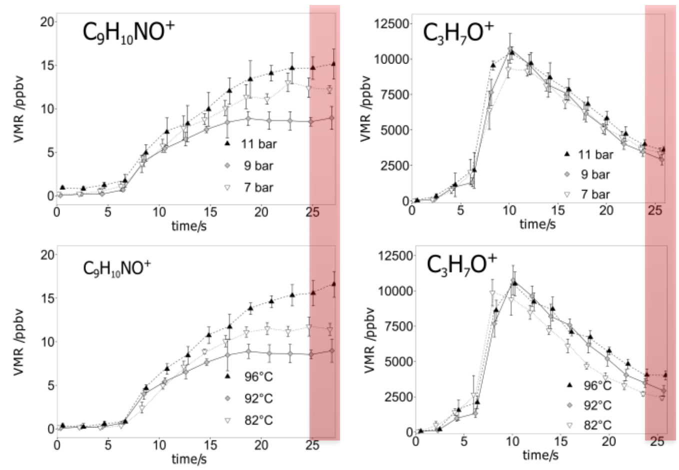
Kinetics of espresso extraction

A nice demonstration that the composition of a shot changes over time

Divide detectable compounds into families based on polarity

Both temperature and pressure change the composition of a shot at ~30s by ~50% for non-polar things.

Less obvious for polar compounds.

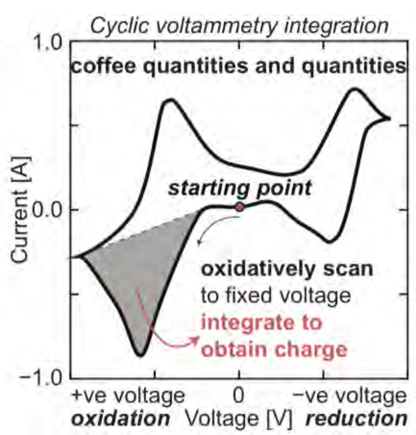


Int. J. Mass Spec., **2016**, *401*, 22

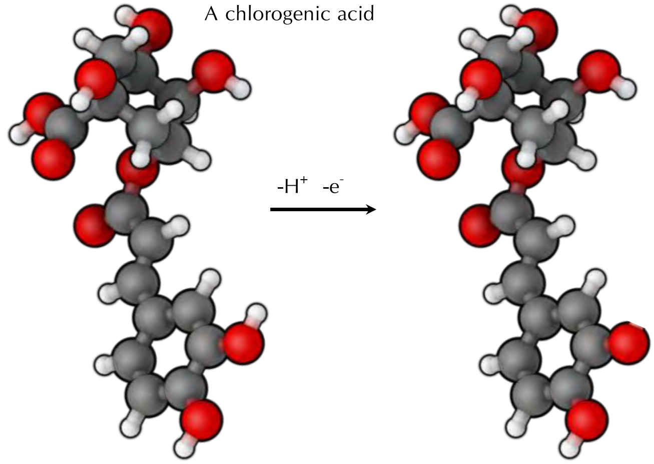
Hendon Materials Simulation

Our recently funded Coffee Science Foundation proposal

A proposal to move away from refractive index



A chlorogenic acid



Int. J. Electrochem. Sci., **2016**, *11*, 2854

Our recently funded Coffee Science Foundation proposal

A proposal to move away from refractive index

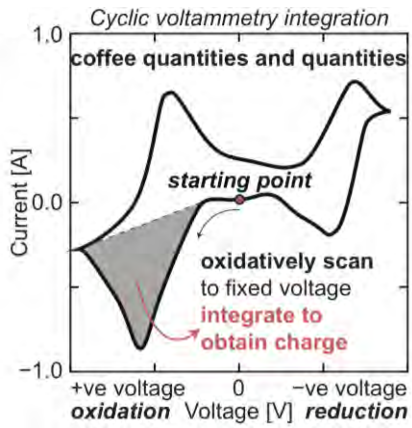


Table 2. Total chlorogenic acids (CGAs) content in different brand of coffees determined by DPV and HPLC methods

Brand of coffee	CGAs (total)-DPV[a]	CGAs (total)-HPLC[b]
C. Arabica, Rio Minas, Brazil (green bean)	7451	7370
C. Arabica, Rio Minas, Brazil (roasted bean)	2630	2613
C. Robusta, Cherry, India (green bean)	9115	9112
C. Robusta, Cherry, India (roasted bean)	2852	2826
Flatscher Olimpia (ground coffee, 100 % Arabica)	4101	3932
Franck Quatemala (ground coffee, 100 % Arabica)	3574	3519
Nescafé Classic (instant coffee)	3283	3203
Nescafé Espresso (instant coffee)	3229	3185
Jacobs Monarch (instant coffee)	3203	3149
Jacobs Intense (instant coffee)	3465	3462

Results represent mean value of three independent measurements (n =3)
[a]- values determined by DPV, total CGAs content was expressed as 5-CQA equivalent (mg 5-CQAE/100 g of coffee)
[b]- values determined by HPLC, total CGAs content were sum of individual CGAs content and expressed as mg CGAs/100 g of coffee

Chlorogenic acid content is thought to contribute to taste perception

Int. J. Electrochem. Sci., **2016**, *11*, 2854

Model parameterization

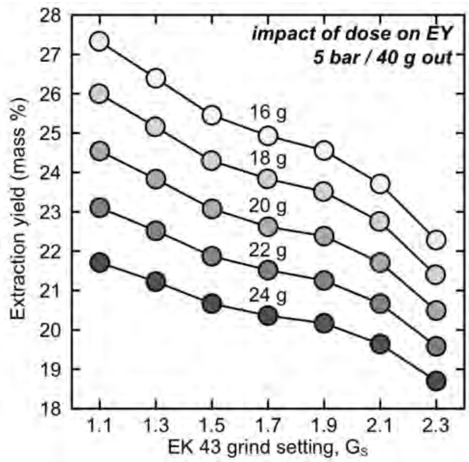
Most coffee professionals rely on a refractive index measurement that is then related to a coffee mass by some mathematical function

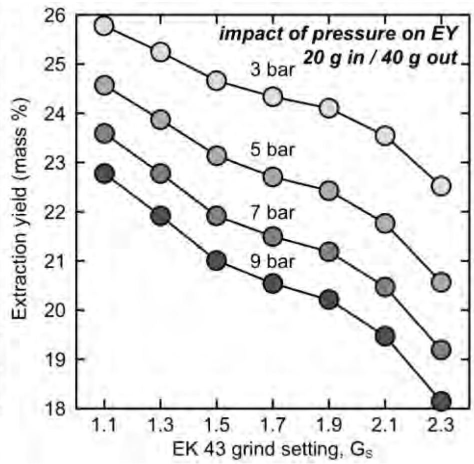
$$G = kc_s(c_s - c_l)(c_{sat} - c_l)$$

$$D_s = 6.25\times10^{-10}\mathrm{m}^2/\mathrm{s}, \quad k = 6\times10^{-7}\mathrm{m}^7\mathrm{kg}^{-2}\mathrm{s}^{-1}.$$

Hendon Materials Simulation

Predicting espresso extractions using relevant variables



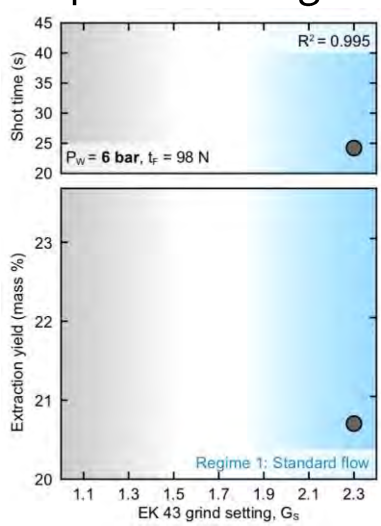


Increasing mass of coffee used in the brew decreases the mass of coffee solvated

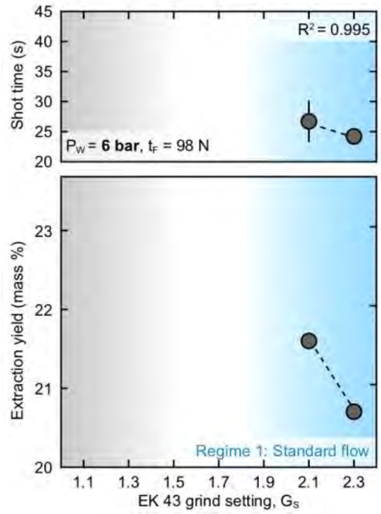
Increasing pressure decreases the mass extracted per gram of coffee used

Hendon Materials Simulation

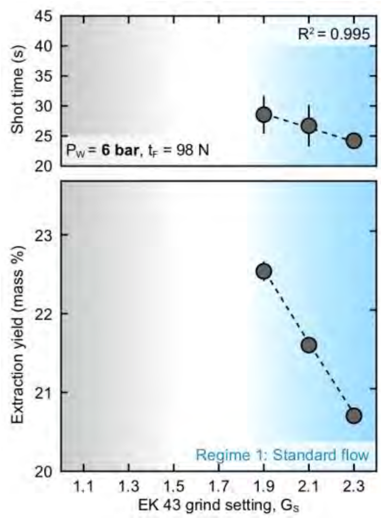
The curious problem of grinding finer



The curious problem of grinding finer

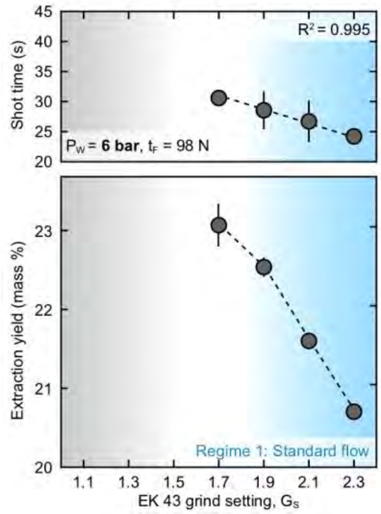


The curious problem of grinding finer



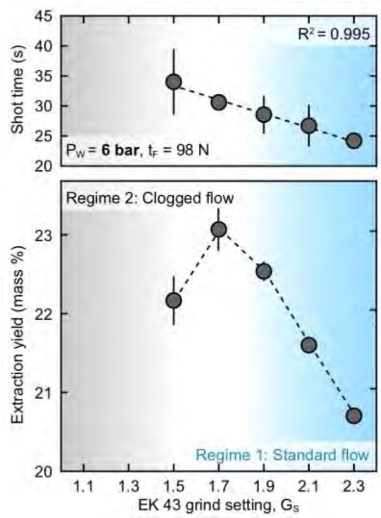
Hendon Materials Simulation

The curious problem of grinding finer



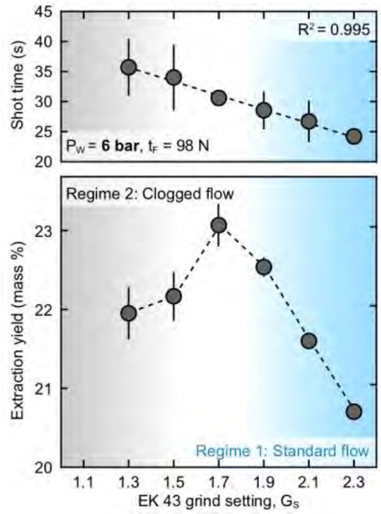
Hendon Materials Simulation

The curious problem of grinding finer



Hendon Materials Simulation

The curious problem of grinding finer



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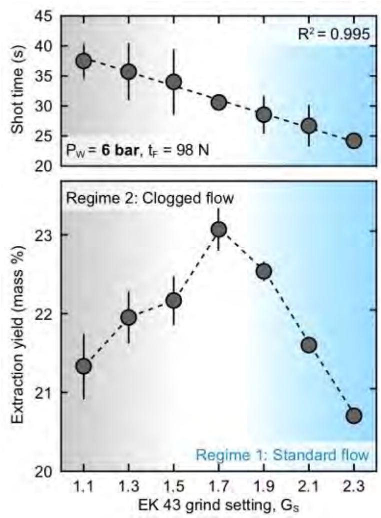
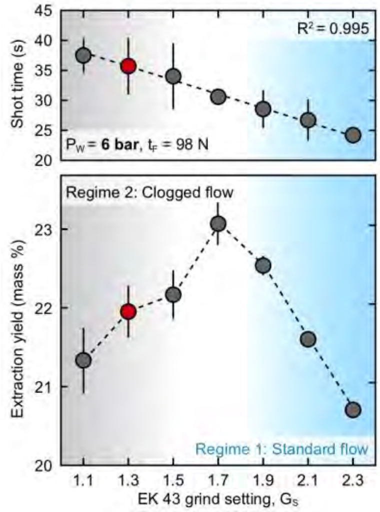
The curious problem of grinding finer

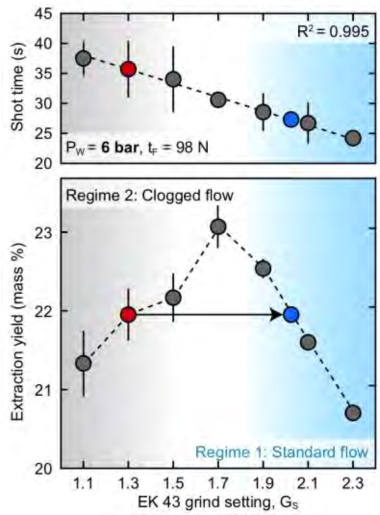


The curious problem of grinding finer



Hendon Materials Simulation

The curious problem of grinding finer



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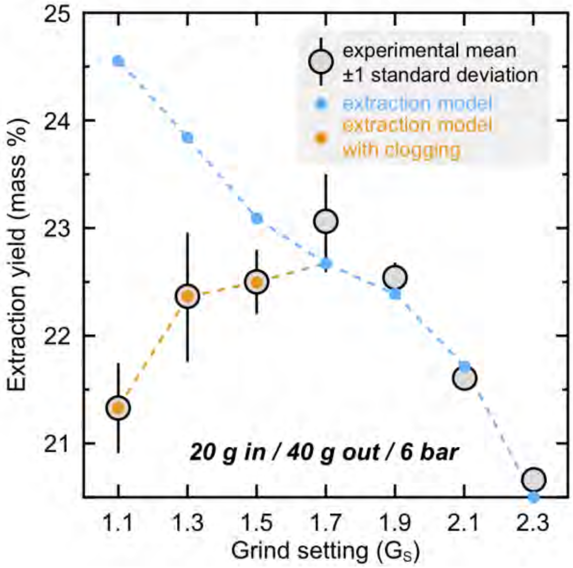


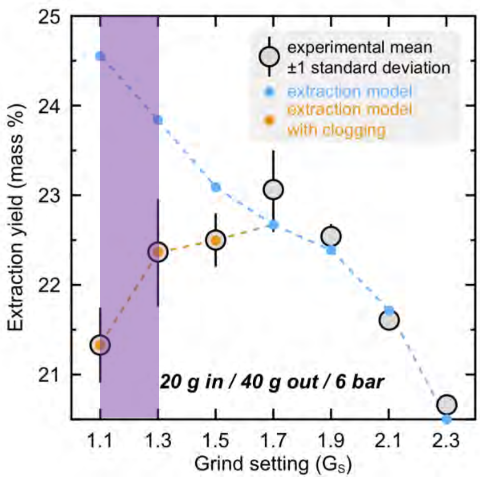
Volcano shape due to uneven contact of water to coffee particles in the bed.

“Channeling"

Hendon Materials Simulation

22%…

a25%+b24%+c23%…n15%…+y0%



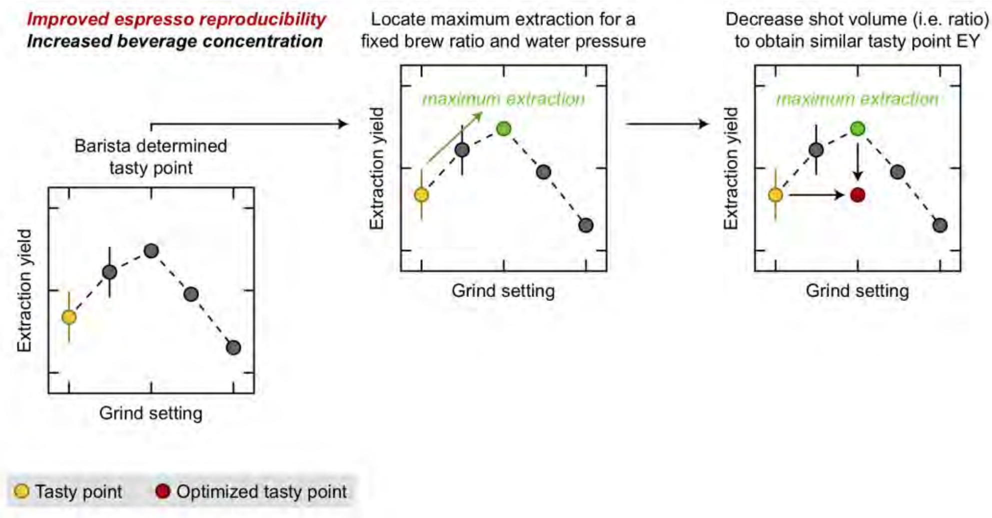
Critical populations on fines causing inhomogeneous extraction.

Grinder dependent, so you’ll have to calibrate this yourself!

93

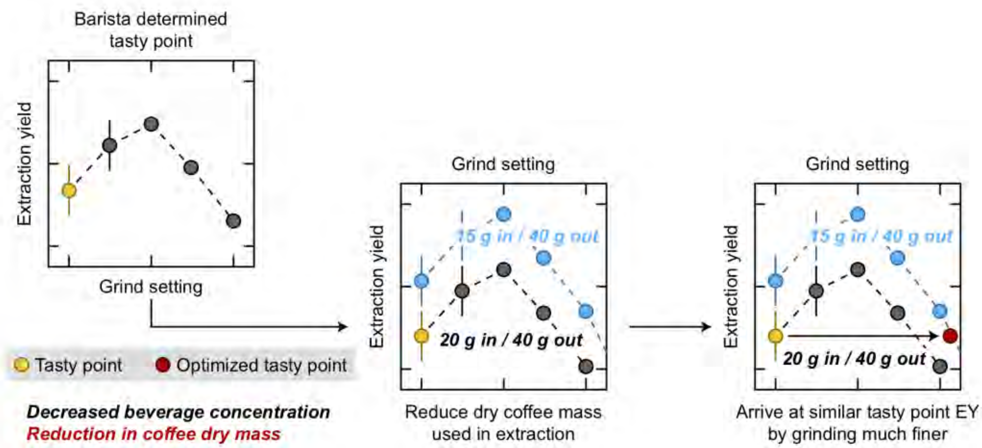
Hendon Materials Simulation

Optimizing espresso for reproducibility



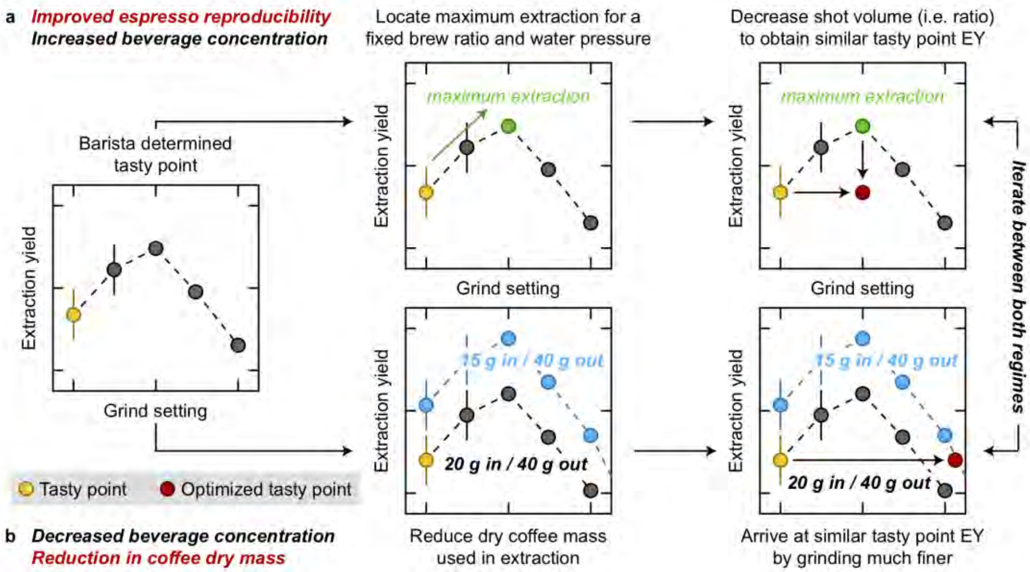
Hendon Materials Simulation

Optimizing espresso for reproducibility



Hendon Materials Simulation

Iterate between the two with minimum volume determined.



Hendon Materials Simulation

A case study of these turbo shots

Tailored Coffee Roasters, Eugene, OR

Shop sells 27,850 espresso drinks per year (a small store)
Coffee wholesale value is $26.4 /kg on average

20 g = $0.528 of coffee dry mass
15 g = $0.396 of coffee dry mass
Savings per shot $0.132

Total savings per year $3,676 USD

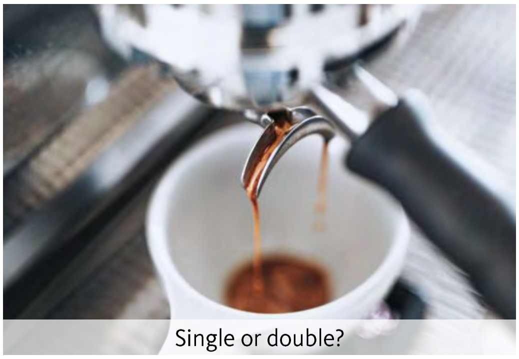
Café that does 500 drinks per day (182,500 per year) saves $24,000

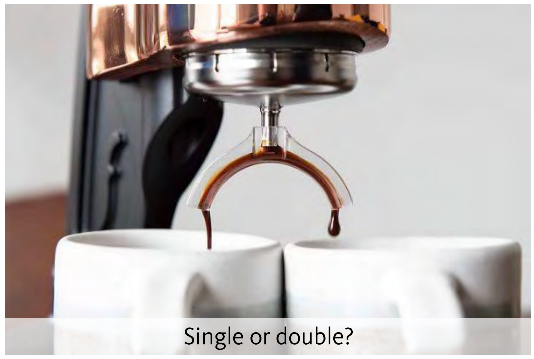
97

Hendon Materials Simulation

Take home messages

- Espresso is a brew method, not a well-defined drink.
  - The language of single and double espresso is convoluted by divergent paradigms in coffee brewing.


Single or double?

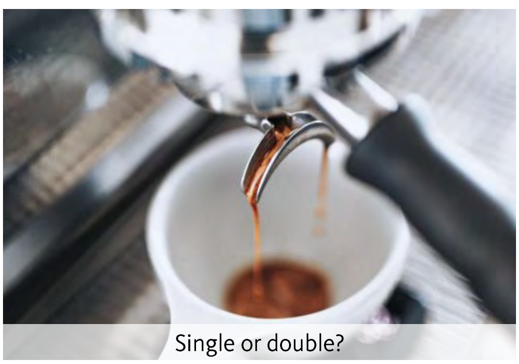

Single or double?

98

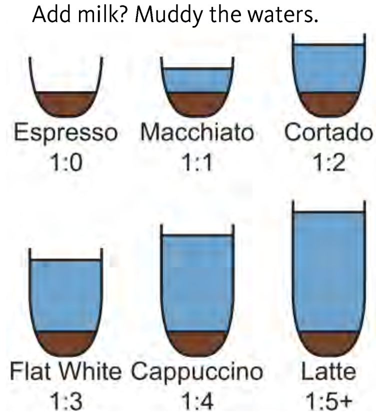
Hendon Materials Simulation

Take home messages

- Espresso is a brew method, not a well-defined drink.
  - The language of single and double espresso is convoluted by divergent paradigms in coffee brewing.


Single or double?

Add milk? Muddy the waters.



99

Hendon Materials Simulation

Take home messages

- Espresso is a brew method, not a well-defined drink.
  - The language of single and double espresso is convoluted by divergent paradigms in coffee brewing.
- Shot time depends on grind size and water pressure, and to a lesser extend coffee type and temperature.
  - Using time to quantify reproducibility is hence problematic, as it is one piece in a complex PDE.

100

Hendon Materials Simulation

Take home messages

- Espresso is a brew method, not a well-defined drink.
  - The language of single and double espresso is convoluted by divergent paradigms in coffee brewing.
- Shot time depends on grind size and water pressure, and to a lesser extend coffee type and temperature.
  - Using time to quantify reproducibility is hence problematic, as it is one piece in a complex PDE.
- Kinetic experiments reveal that standard metrics for assessing “qualities” do not apply to espresso, or probably coffee in general.
  - Yet another use for electrochemistry?

101

Hendon Materials Simulation

Some actionable information

Brew recipe: **60 g of coffee / L**
The most common mistake in home brewing is using too little coffee and extracting for too long
"Coarse" grind (French Press, 4 min)
"Medium" grind (pour over, 2.5 min)
"Fine" grind (Aeropress, 1.25 min)

Water chemistry: **Start with RO/DI/Milli-Q water**
Keep bicarbonate below 50 mg/L
0.25 g/L $MgSO_4.7H_2O$ (epsom salt)
~25 ppm Mg^{2+} as Mg^{2+}

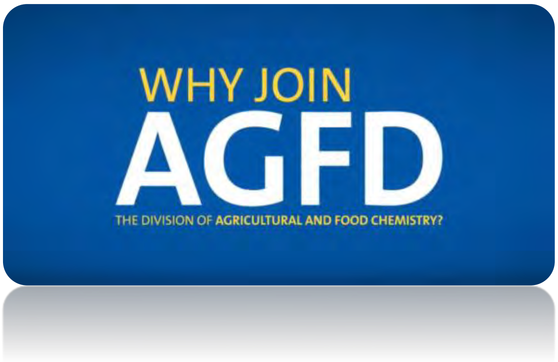
0.05 g/L $NaHCO_3$ (baking soda)
~35 ppm HCO_3^- as HCO_3^-

Coffee preference: *VERY APPROXIMATELY*
Acidic = East Africa (*Kenya*)
Chocolate and nuts = South/Central America (*Brazil*)
Low acid = Hawaii, India, Vietnam, Sumatra, and basically any "darker" roast

103

ACS Division of Agricultural & Food Chemistry

ACS Technical Division
Agricultural & Food Chemistry (AGFD)



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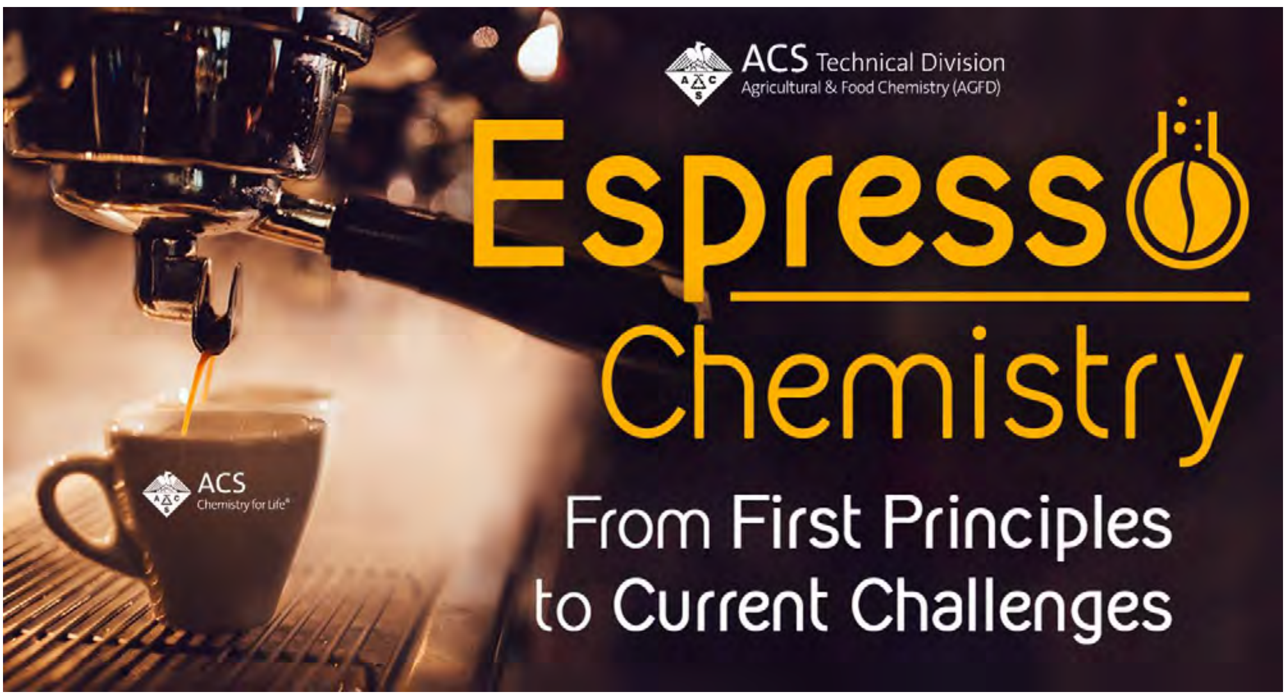
104



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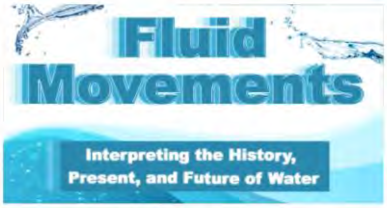

Date: Thursday, January 21, 2021 @ 2-3pm ET
Speakers: Jahnavi Phalkey, Science Gallery Bengaluru and Jesse Smith, Science History Institute
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- The history of water quality analysis and the various scales of water protection that have emerged in the United States over the past 200 years
- The challenges, limitations, and opportunities of more ontological approaches to the interpretation of water for public audiences
- Why museums and galleries should interpret water not as a singular material that preexists its understanding by scientific or indigenous knowledge, but rather as a multiplicity made by and bound up in systems of bodies, practice, power, and places

Co-produced with: Science History Institute and *Chemical & Engineering News*

Date: Thursday, January 28, 2021 @ 2-3:30pm ET
Speakers: Katrina Knauer, BioCellection Inc. and Philippe Reutenauer, Léa Nature
Moderator: Peter Boul, Aramco Americas

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What You Will Learn:

- Challenges in recycling of plastics and scaling new depolymerization technologies
- Chemical pathways for breaking down single-use plastics with an emphasis on polyethylene
- Synthesis of new polymers from chemically recycled monomers
- How food companies can modify their relationship towards plastics to face the public concerns linked to plastic packaging
- Mechanical recycling and its limitations and the emerging solutions for chemical recycling

Co-produced with: ACS Division of Polymer Chemistry

Date: Thursday, February 4, 2021 @ 2-3pm ET
Speaker: Jayshree Seth, 3M
Moderator: Glenn Ruskin, American Chemical Society

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What You Will Learn:

- What the world thinks of science during the global pandemic and if skepticism gone up or down
- What the global public cares about the most as it relates to science
- What specific actions can we all take to advocate for science

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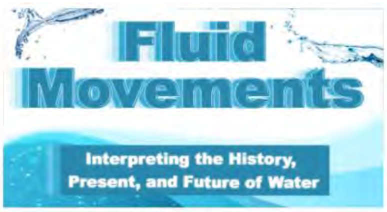

Date: Thursday, January 21, 2021 @ 2-3pm ET
Speakers: Jahnavi Phalkey, Science Gallery Bengaluru and Jesse Smith, Science History Institute
Moderator: Daryl Boudreaux, Principal, Boudreaux & Associates LLC

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109