

Using Sensory as a Tool for Both Consistency and Innovation

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Bale Breaker Brewing Company

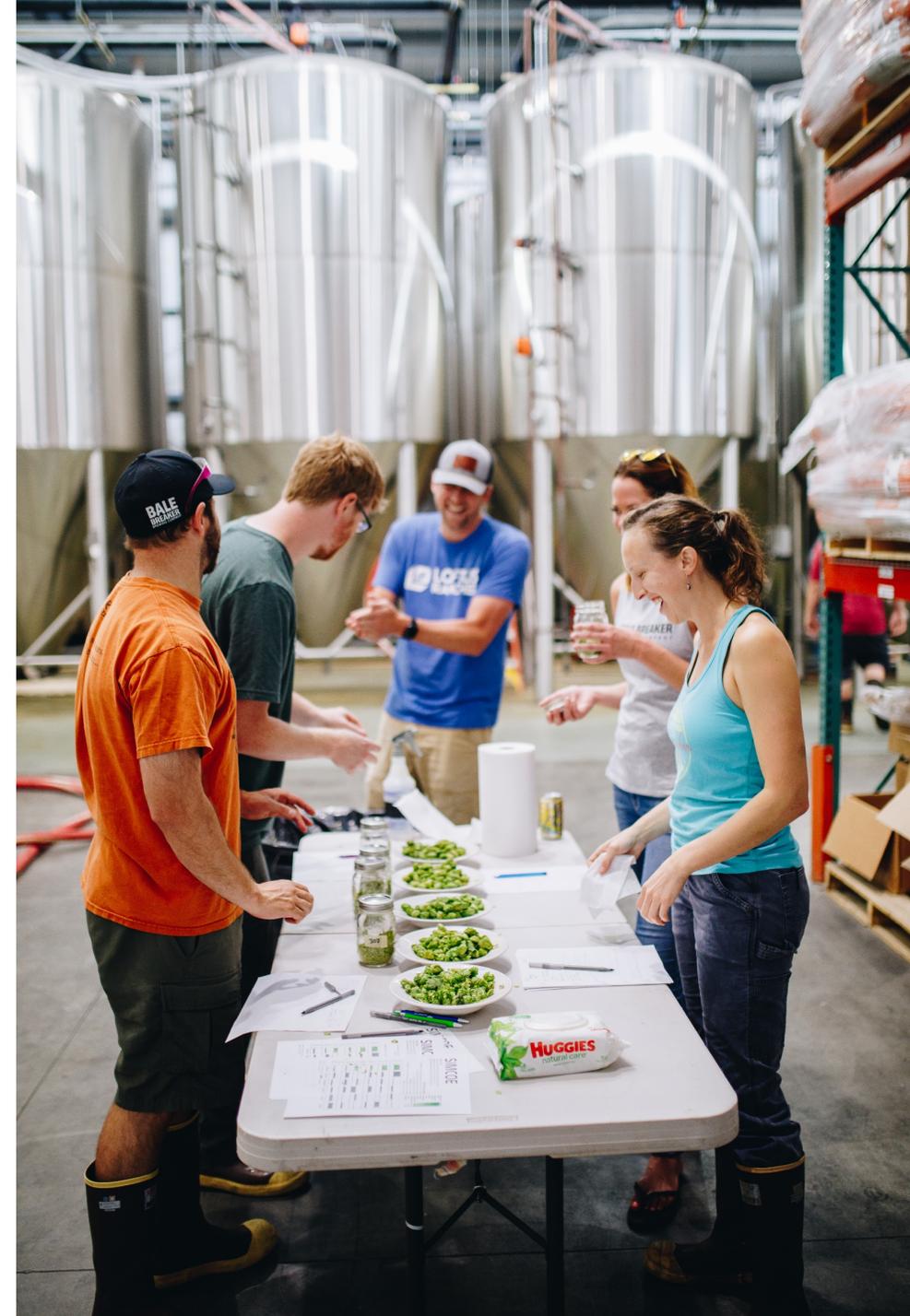
November 8, 2019



Introductions

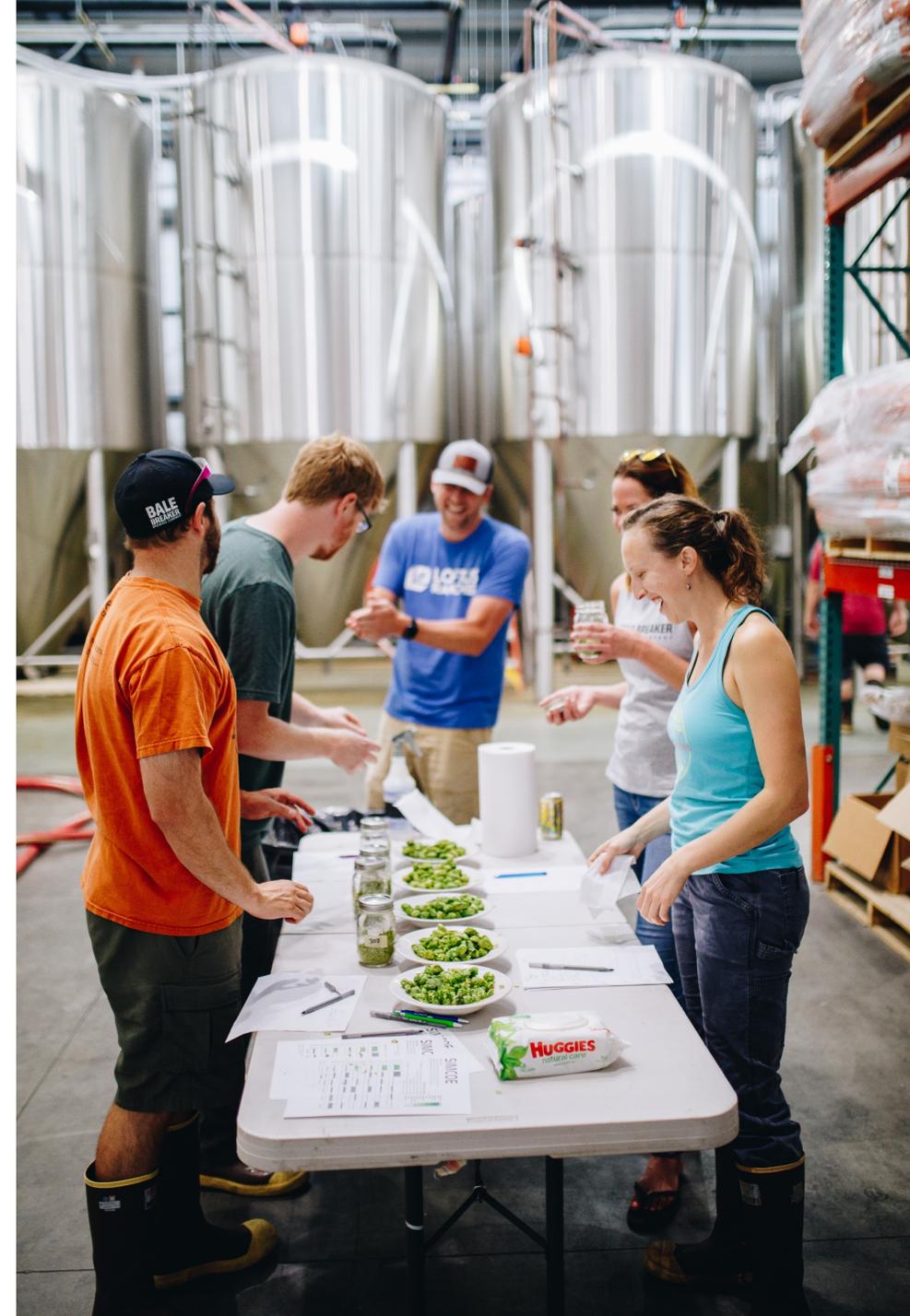
- Background
- Bale Breaker Brewing Company
- Our Sensory Program

- Who's In the Room?



What is Sensory?

- A way to scientifically measure, analyze, and interpret characteristics of food, beverages, and materials using our senses.
- Treat human subjects as measuring instruments.
- Intersection of biochemistry, psychology, and statistics.



Goal for Today

Inspire you to invest in your sensory infrastructure and help you leverage your new or pre-existing sensory program strategically for both consistency and innovation.



Scenario 1: You're a small brewery who just expanded into a new, larger production space. You're getting into distribution in cans via a mobile canning line with a small number of flagship beers that you've been making for a while with established recipes and flavor profiles.

You want your flagships to be consistent and you want to understand their shelf life in order to communicate when to pull product at the end of its life to distributors and accounts.



Our Quality & Consistency Definition:

At Bale Breaker, our goal is for **our fans to get the beer they expect** every time they crack a can or sip a pint of our flagship beers.

That beer should be **free from faults**, hit the **top aroma and flavor notes**, have the **expected malt / hop balance**, and **age similarly** to other batches.



Scenario 1: Flagships, Consistency & Shelf Life

Helpful sensory tools:

- Raw Materials Sensory (Water, Hops, Malt, Yeast, Fruit/Spices)
 - Hot Malt Steep (ASBC Sensory-14)
 - Hop Tea (ASBC Sensory-15) or Hop Grind (ASBC Sensory-16)
- In-process sensory (VDK, other flaws)
- True to Brand Testing / Production Release (ASBC Sensory-17)
- Tetrad Test for major process changes (ASBC Sensory-18)
- Shelf Life Testing / Forced Aging



Scenario 1: Flagships, Consistency & Shelf Life

Are my raw materials consistent in flavor and quality?

Raw Materials Sensory (Water, Hops, Malt, Yeast, Fruit/Spices)

- Hot Malt Steep (ASBC Sensory-14)
- Hop Tea (ASBC Sensory-15) or Hop Grind (ASBC Sensory-16)

Develop & define sensory specifications for each type of raw material.

Define off-aromas and flag when present!



Fig. 1. Hop pellets.



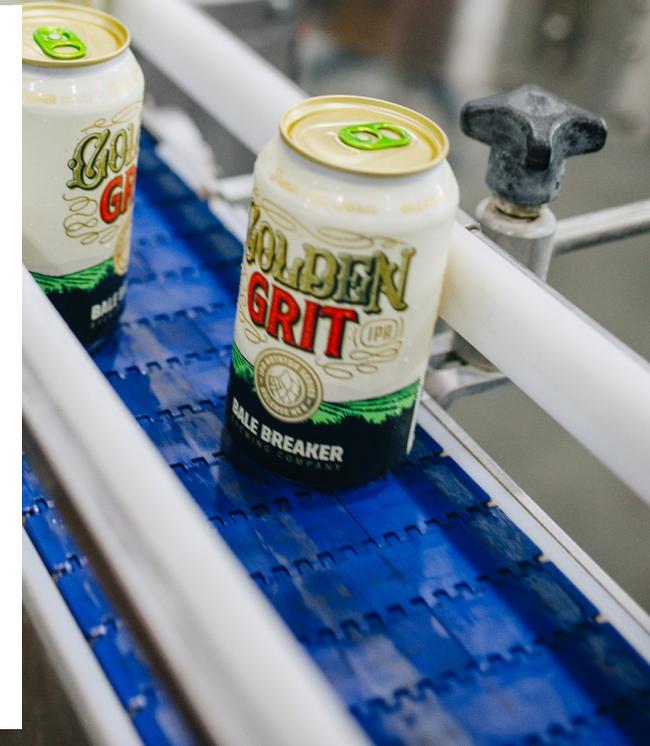
Fig. 3. Ground hop pellets (left) and hop cones (right).



Fig. 2. Hop cones.



Fig. 4. Ground hop material in sample jars.



Scenario 1: Flagships, Consistency & Shelf Life

Are my beers free of flaws before I put them into package?

In-process sensory (diacetyl, other fermentation flaws)

- For diacetyl, warm 200mL of benchtop-centrifuged or filtered beer at 65°C (149°F) for 45 minutes. Cool and sniff with a panel.
- To practice, spike using a reference standard into warmed samples. Lots of aroma interference from warming!
- Similar procedures for other flaws but no need to heat. Centrifuging/filtering removes yeast character and bitterness and is closest to the finished beer.



Scenario 1: Flagships, Consistency & Shelf Life

Is this the beer I expect for this brand?

True to Brand Testing / Production Release (ASBC Sensory-17)

Beer changes with age → no appropriate reference standard for each brand.

Instead, use a written description of the brand and compare each sample against that description.

True to Brand description defines intensity and balance of important aspects and calls out common flavors for each brand.



Scenario 1: Flagships, Consistency & Shelf Life

True to Brand Testing / Production Release (ASBC Sensory-17)

Beer: Growler ???

Please check all descriptors that apply to the sample in your glass.

AROMA/FLAVOR:

- | | |
|---|---|
| <input type="checkbox"/> Citrus | <input type="checkbox"/> Boozy / Hot / Fusel |
| <input type="checkbox"/> Orange / Tangerine | <input type="checkbox"/> Spicy |
| <input type="checkbox"/> Lemon | <input type="checkbox"/> Floral |
| <input type="checkbox"/> Grapefruit | <input type="checkbox"/> Grassy |
| <input type="checkbox"/> Orange Peel | <input type="checkbox"/> Vegetal |
| <input type="checkbox"/> Berries | <input type="checkbox"/> Onion / Garlic |
| <input type="checkbox"/> Blueberry | <input type="checkbox"/> Chives |
| <input type="checkbox"/> Blackberry | <input type="checkbox"/> Canned Corn / Canned Beans |
| <input type="checkbox"/> Raspberry | <input type="checkbox"/> Sweet aromatic |
| <input type="checkbox"/> Stone Fruit | <input type="checkbox"/> Bubblegum |
| <input type="checkbox"/> Cherry | <input type="checkbox"/> Caramel/Toffee |
| <input type="checkbox"/> Peach | <input type="checkbox"/> Whipped Cream |
| <input type="checkbox"/> Nectarine | <input type="checkbox"/> Honey |
| <input type="checkbox"/> Apricot | <input type="checkbox"/> Pound Cake |
| | <input type="checkbox"/> Cereal |



True to Brand Pass/Fail Analysis

Please read each of the brand descriptions for visual, aroma, flavor, mouthfeel and overall characters and indicate whether the description is accurate for the beer in your glass. If the sample in your glass is not true to brand, please indicate why, referencing specific flaws if possible or, if not, giving as much description as possible about what you taste.

Beer: Can GG

Visual: Clear to slight haze with no sediment. Golden color with good foam retention and small bubble size.

Does the sample match this visual description?

YES NO If not, why not? _____

Aroma/Flavor: Hops dominant with fruity character: citrus (grapefruit, lime, orange peel), berries, stone fruit (apricot), melon. May include tropical fruit (mango, pineapple), pine, and bread/toast aromas and flavors. Somewhat delicate aroma (low-moderate) and flavor (moderate-high). No faults detected.

Does the sample match this aroma / flavor description?

YES NO If not, why not? _____

Bitterness: Low-moderate, smooth, not aggressive.

Does the sample match this bitterness description?

YES NO If not, why not? _____

Mouthfeel: Crisp, dry mouthfeel, with balanced sweetness/acidity and slightly watery body.

Does the sample match this mouthfeel description?

YES NO If not, why not? _____

Overall: Does the sample taste like **Golden Grit IPA?**

YES NO If not, why not? _____

Scenario 1: Flagships, Consistency & Shelf Life

Is there a noticeable difference between two beers?

Tetrad Test for major process changes (ASBC Sensory-18)

Greater sensitivity than Triangle Test for smaller panels.

Appropriate for a major process change or when the nature of a difference between samples is unknown.

Use alone or with just a couple of other samples to avoid excessive sensory fatigue.

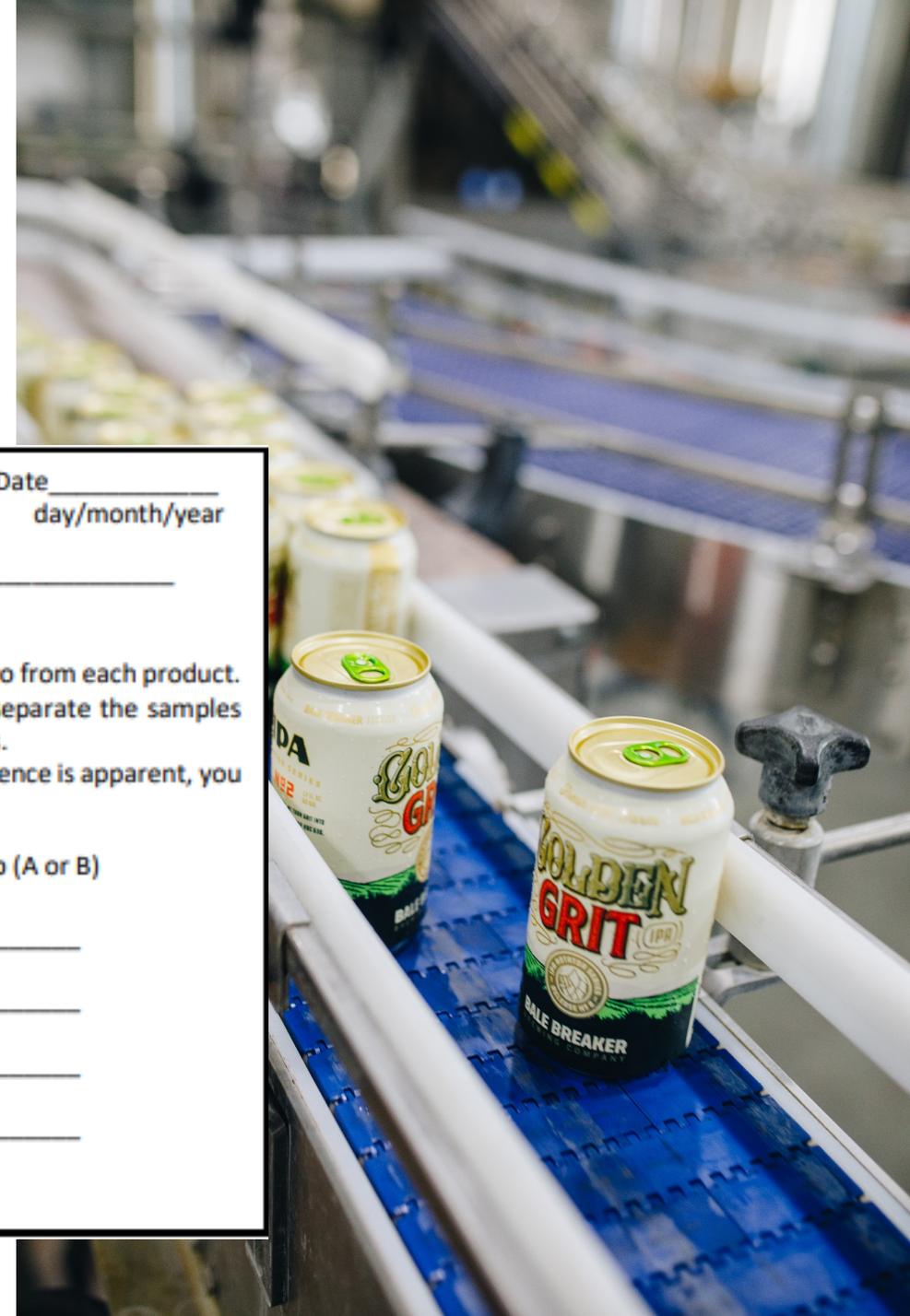
Name _____ Date _____
day/month/year

Product subject to test _____

Instructions
You are presented with four samples, two from each product. Evaluate the samples left to right and separate the samples into two groups based on similarities. You may retaste the samples. If no difference is apparent, you must make a guess.

Set of four samples	Group (A or B)
_____	_____
_____	_____
_____	_____
_____	_____

Comments _____



Scenario 1: Flagships, Consistency & Shelf Life

How does this beer change as it ages?

Shelf Life Testing / Forced Aging

Force age (or cold age) can or keg samples and run through your True To Brand testing or through a round table tasting to determine at what point this beer is no longer acceptable.

1 day in a hot car (~110F)

= 1 week at room temp (~65F)

= 1 month cold stored (~35F)

Also a great way to test if process improvements are making a difference in your shelf life.



Scenario 2: You're a small brewery who sells your beer over your Taproom counter. You never make the same beer twice, although you try to keep similar categories of beers on tap (e.g. Light, Malt-Forward, West Coast IPA, Hazy IPA, Saison, Sour). You have lots of control over your product and tend to drink it quickly.

Your main concerns are communicating to customers what a beer tastes like and avoiding general embarrassment from flawed beer.



Scenario 2: Communicating Flavor, Avoiding Flaws

Helpful sensory tools:

- Raw Materials Sensory (Water, Hops, Malt, Yeast, Fruit/Spices)
 - Hot Malt Steep (ASBC Sensory-14)
 - Hop Tea (ASBC Sensory-15) or Hop Grind (ASBC Sensory-16)
- In-process sensory (VDK, other flaws)
- General training on flaws in different types of beer for Production & Taproom staff
- Descriptive Analysis for Marketing (ASBC Sensory-10...sort of)



Scenario 2: Communicating Flavor, Avoiding Flaws

Are my beers free of fermentation flaws or other flaws (e.g. from tap lines, microbial contamination, or re-fermentation)?

General training on flaws in different types of beer for Production & Taproom staff

Identify your primary concerns and train using spikes / reference standards (Siebel, Aroxa, Flavor Activ, grocery store) – see ASBC Sensory-4 and referenced presentations for training session ideas.

Routinely have your tasters identify off-flavors blind (without knowing which they are) or spiked into beer



Scenario 2: Communicating Flavor, Avoiding Flaws

What does this beer taste like?

Descriptive Analysis for Marketing (ASBC Sensory-10...sort of)

Panelists give responses and the panel coordinator composes a description based partly on aggregated panel feedback and partly on marketing objectives.

Tasting Notes: Ripe blackberries, earthy, red starburst, plums, wine. So thick it should have seeds. Low bitterness, very tart, with a bit of red wine-like tannin.

Tasting Notes: Hoppy peach cobbler: white peaches, cantaloupe, lemon, grass, sweet basil, garlic, pine. Full-bodied, hazy, with assertive bitterness.



Scenario 2: Communicating Flavor, Avoiding Flaws

What does this beer taste like?

Descriptive Analysis for Marketing

Beer: Growler ???

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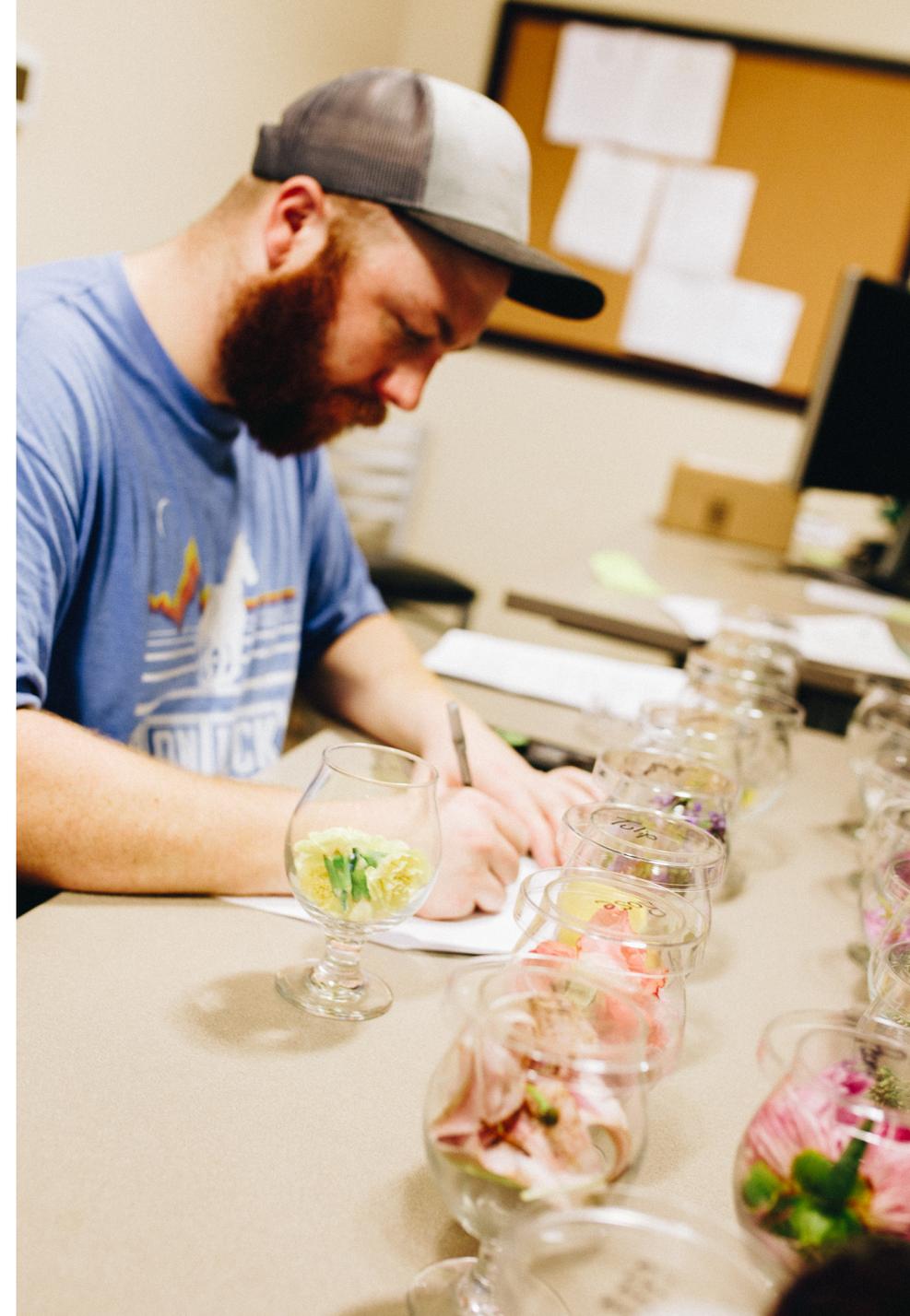
Beer: Growler ???

Visual	Floaties		Hazy		Clear
Retention	Poor		Good		Persistent
Aroma Quality	Bad	Sketchy	Neutral	Good	Great
Overall Aroma Intensity	Faint		Moderate		Pronounced
Aromas & Flavors					
Faults Detected					
Flavor Quality	You Bad	Sketchy	Neutral	Good	Great
Flavor Intensity	Faint		Moderate		Pronounced
Body	Watery		Medium		Full
Acidity	Candy	Slightly Sweet	Balanced	Acidic	Pucker Face
Bitterness Intensity	Low		Moderate		Intense
Astringency	Low		Moderate		My Mouth Is So Dry
Overall Malt-Hop Balance	Malt Dominant		Balanced		Hops Dominant
Overall Freshness	Off		Stale		Fresh
Other Notes					



Scenario 3: You're a brewery of any size trying to innovate new recipes and new flavors.

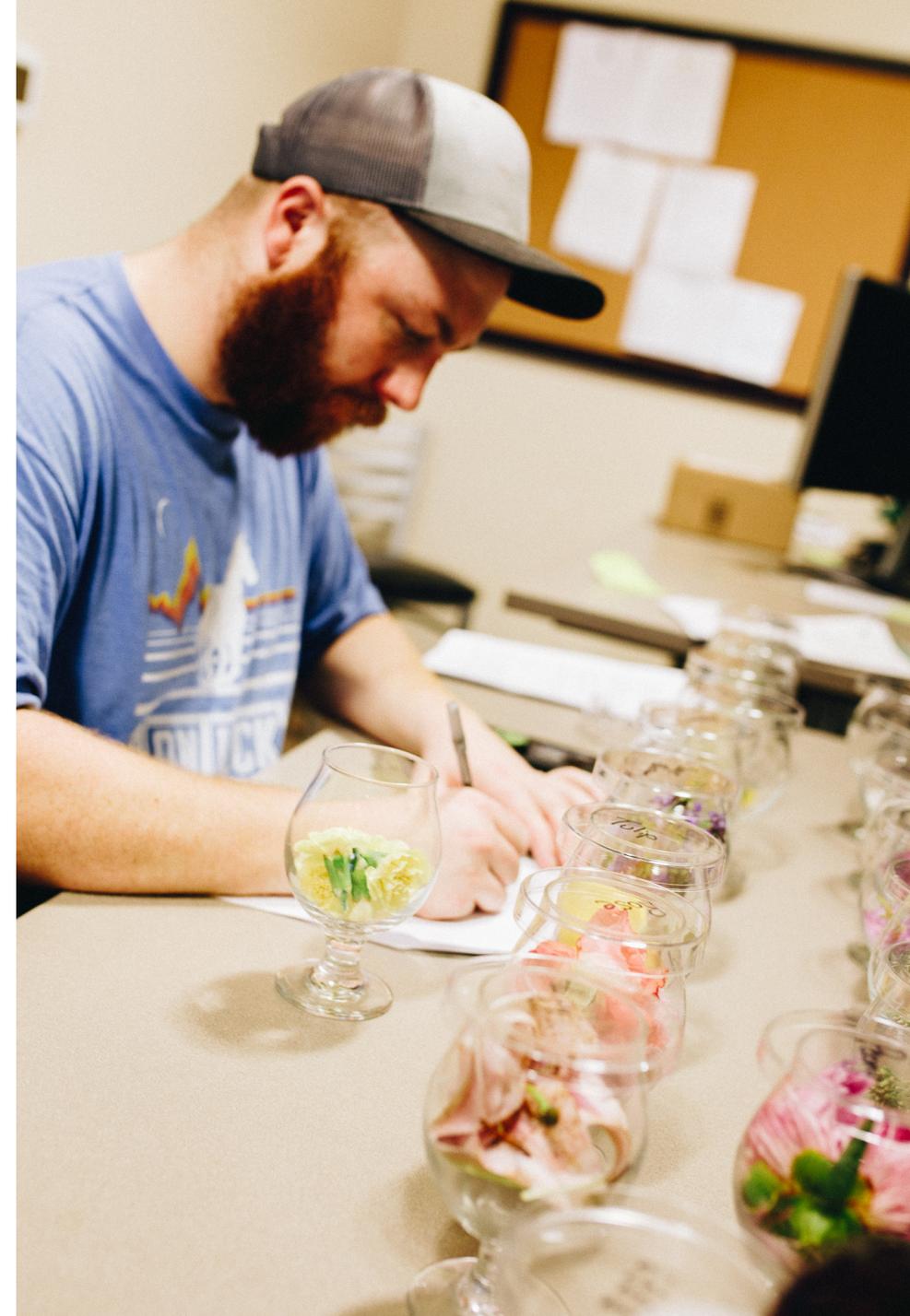
You might be trying to decide which recipes to move from a Taproom-only audience to a larger audience (putting it in cans, distributing to a larger market of restaurants/bars, etc.) or you're heavily focused on R&D.



Scenario 3: Focus on Innovation

Helpful sensory tools:

- Exposure to new-to-you flavors & cuisines!
- Once you have a new recipe in the keg/can/bottle:
 - Descriptive Analysis (ASBC Sensory-10)
 - Paired Preference for Consumers and Staff (ASBC Sensory-6)
 - Competitive Tasting



Scenario 3: Focus on Innovation

Exposure to new-to-you flavors & cuisines!

Innovation comes from the adjacent possible.

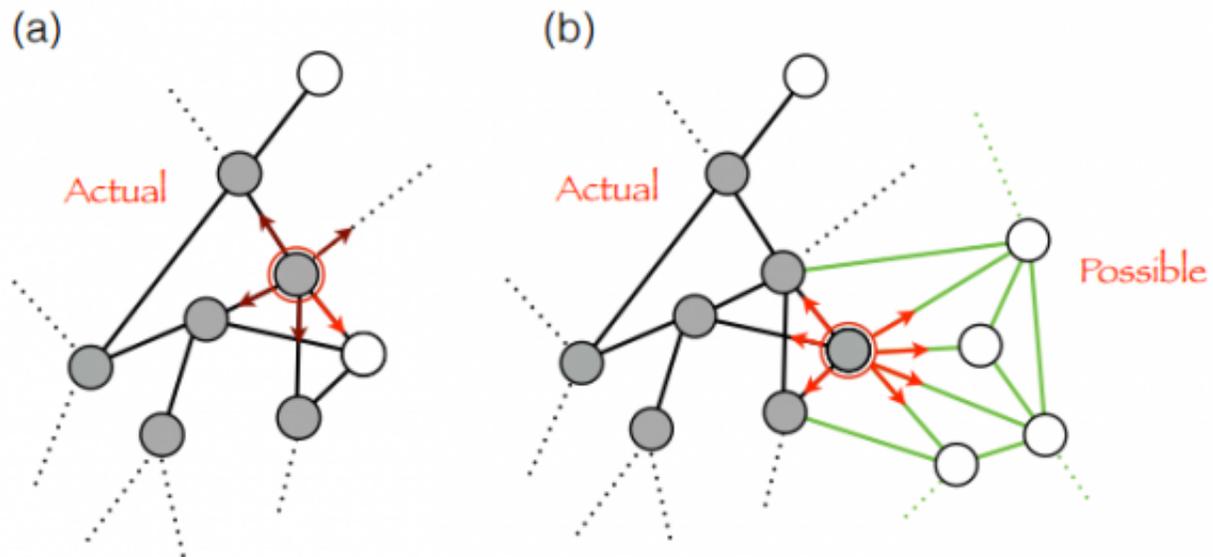
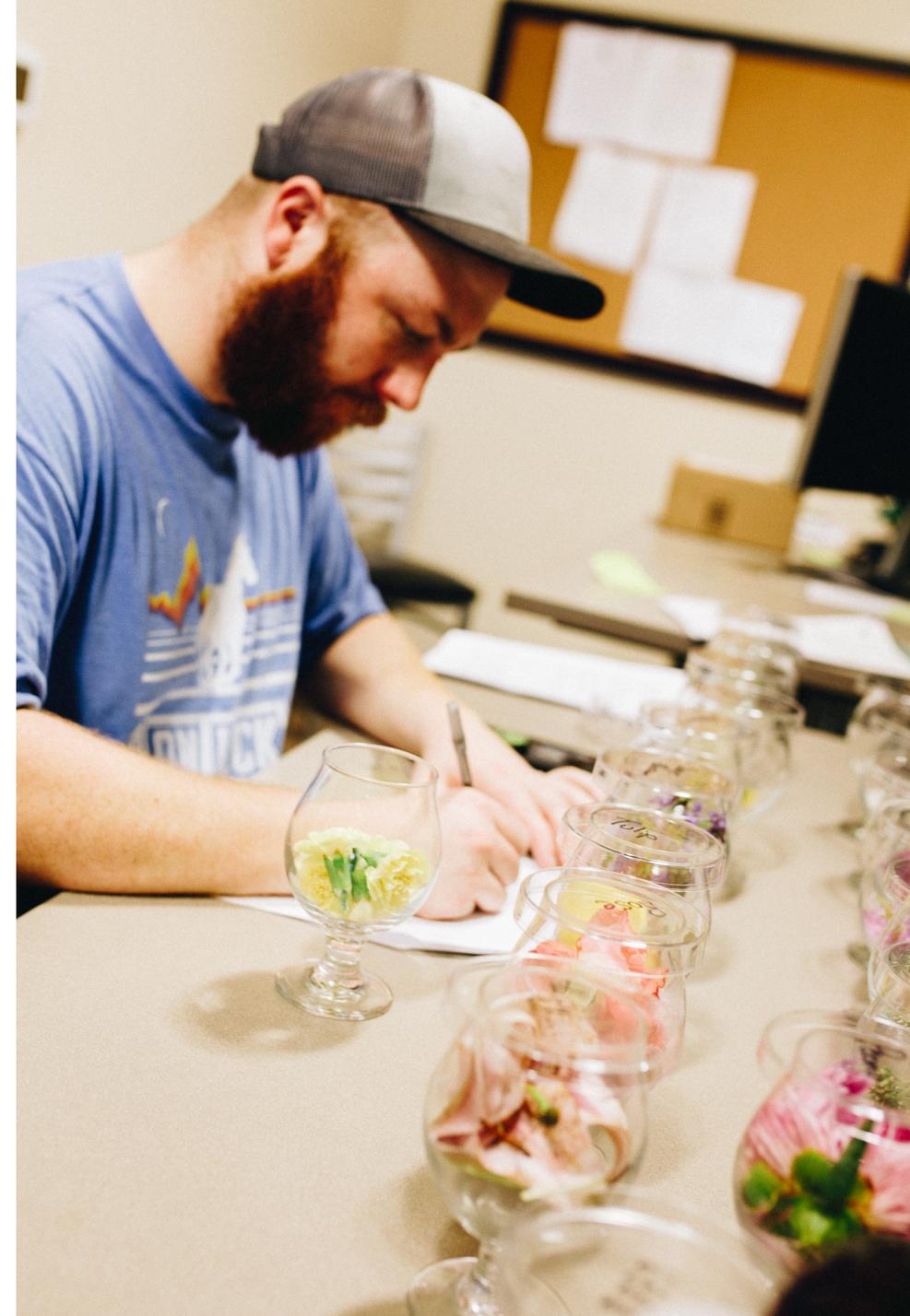


Image from MIT Technology Review, Research from Loreto et al. 2017
“Dynamics on Expanding Spaces: Modeling the Emergence of Novelties”

Scenario 3: Focus on Innovation

Exposure to new-to-you flavors & cuisines!



Scenario 3: Focus on Innovation

Descriptive Analysis (ASBC Sensory-10)

Scale A:
0 1 2 3 4 5
not just slight moderate strong very
present recognizable

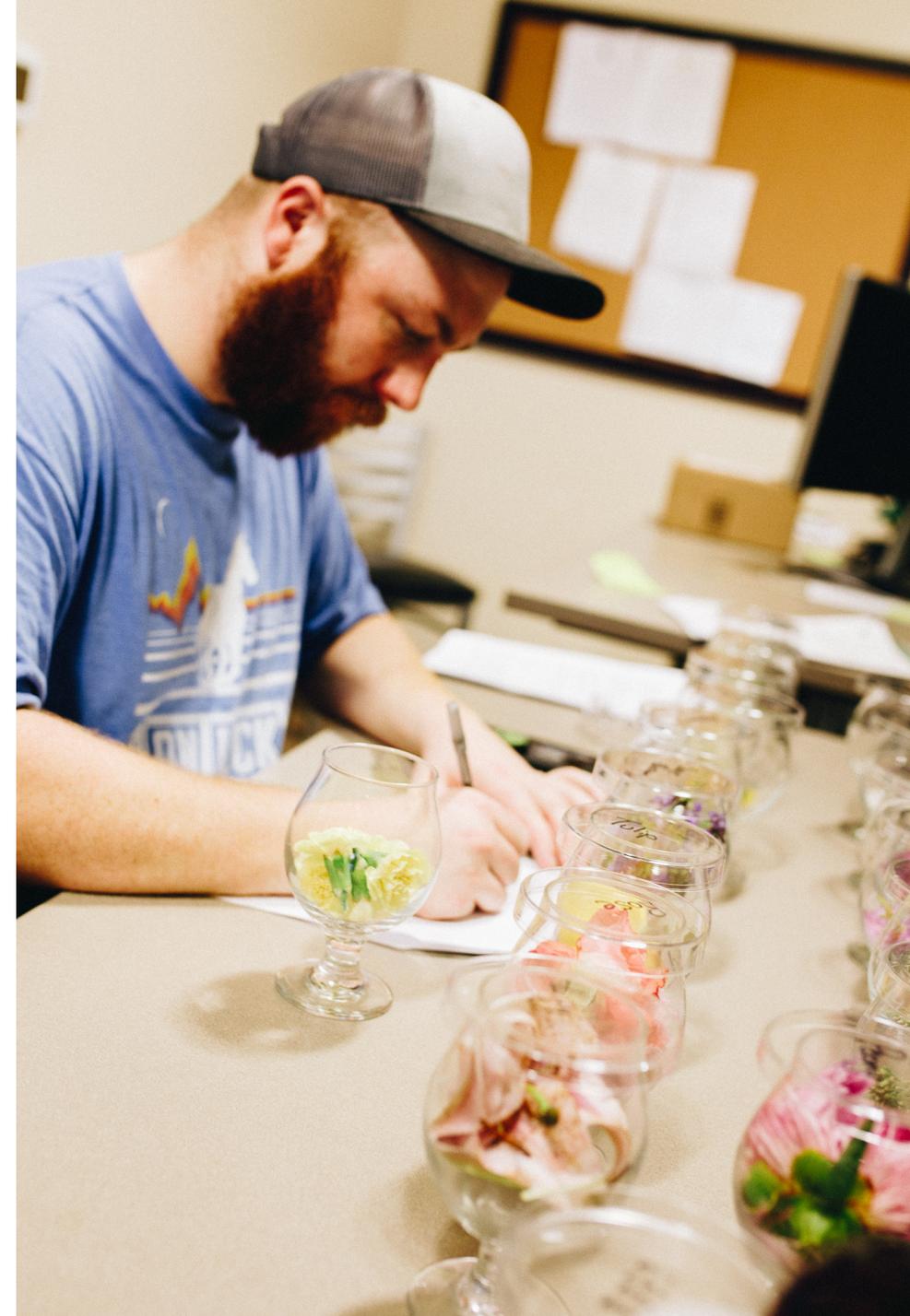
Scale B:
weak 0 0 0 0 0 0 0 strong
 ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮ ⋮

Scale C:
A 15-cm line with descriptive terms 1.5 cm from each end.



Ideally, your tasters are trained on intensity for each reference standard or descriptive category (e.g. bitterness, citrus, floral, sweetness). Panel is “calibrated” through tasting alone and as a group and comparing answers, and scales (below) are anchored with reference standards.

Requires clarity before testing on which descriptors are of interest – better for brewing to targets rather than free-form description.



Scenario 3: Focus on Innovation

Once you have a new recipe:

Paired Preference for Consumers and Staff (ASBC Sensory-6)

Do our beer drinkers have a solid preference for one beer over another?

No training required!



HELP US WITH OUR
BEER SCIENCE



**WHICH GOLDEN GRIT
DO YOU PREFER?**

Circle one.

A

B

No difference

Scenario 3: Focus on Innovation

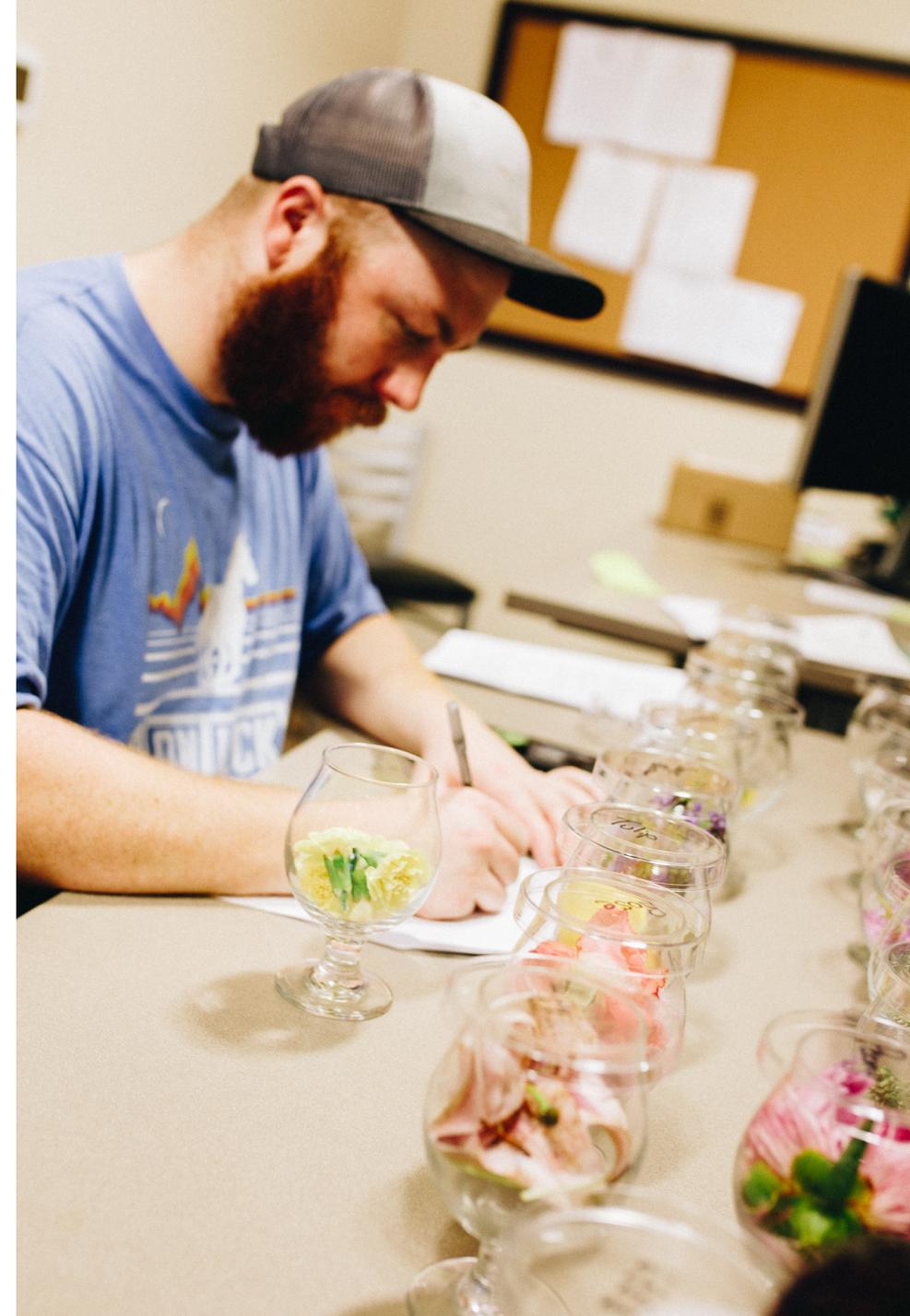
Competitive Tasting

How does this brand compare to other offerings in the market?

Buy up similar beers (package type, ABV) in your market and taste them blind.

In a roundtable format: taste each beer, rank, and discuss your rankings. Then reveal the beer identities and discuss key takeaways.

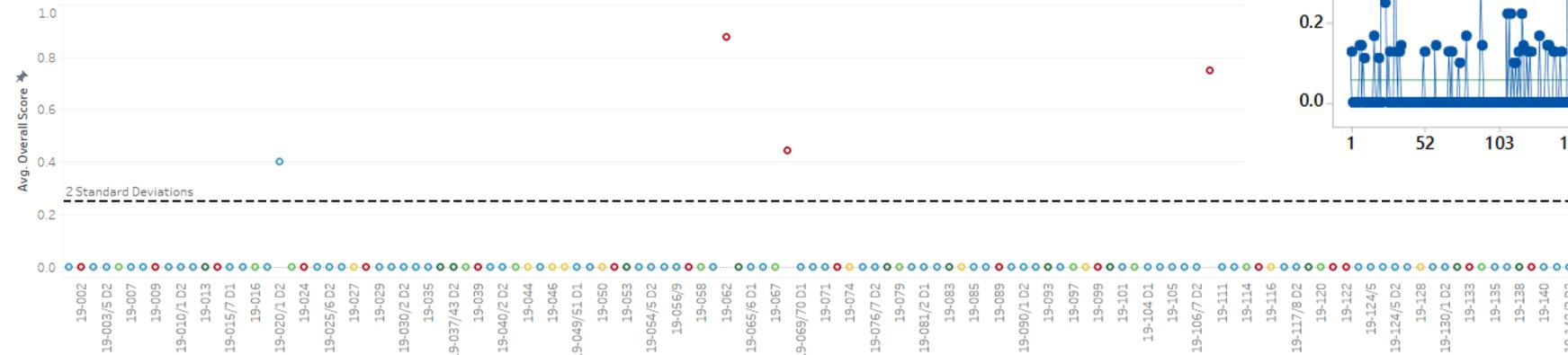
In an individual format: Use Descriptive Analysis (Sensory-10).



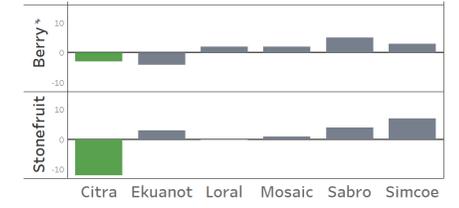
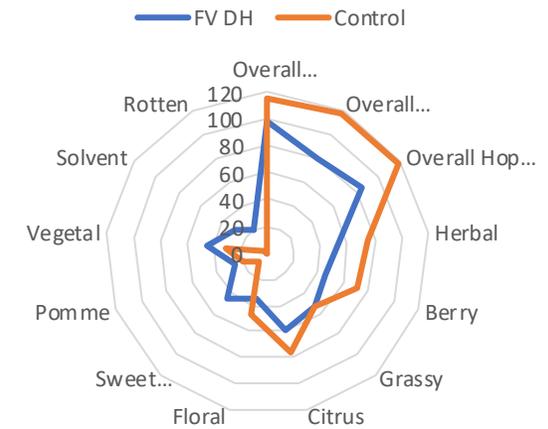
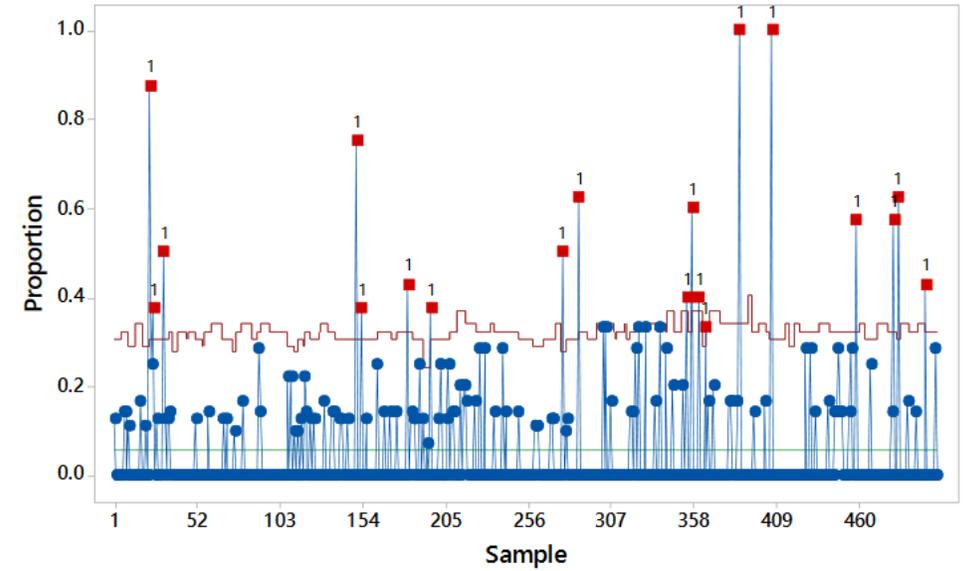
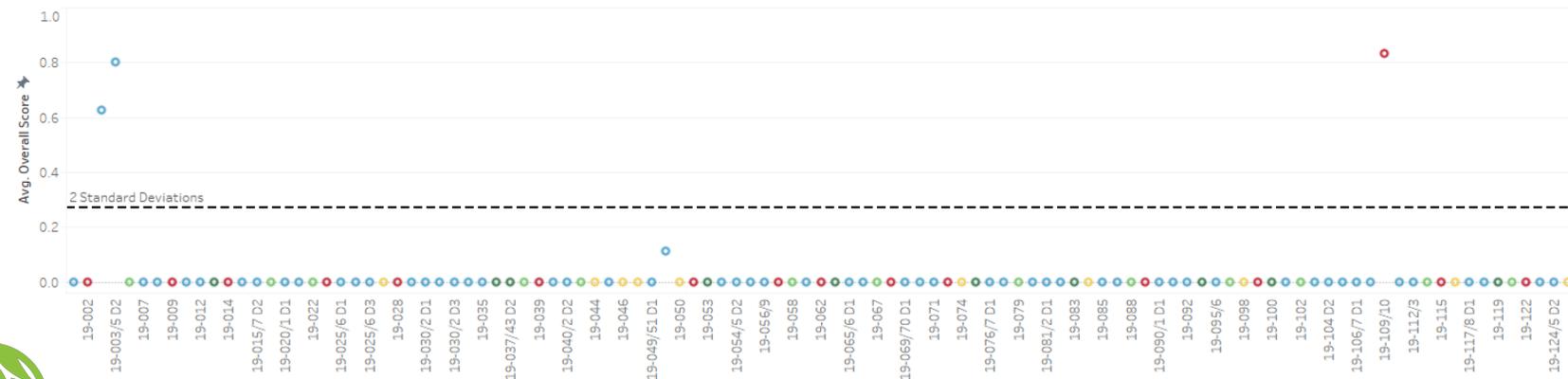
A Brief Aside on Data

Core Four Beers & Rotators: Comparison of Sensory Analysis by Lot Number and Age

Overall Sensory Score at Beer Release



Overall Sensory Score at Market Age



Balancing Sensory & Analytical Data

Sensory for questions of balance and flavor interaction.

A trained sensory panel for low-cost detection of catastrophic microbial defects and for off-flavors at POS.

For greater sensitivity and to prevent defective product from ever entering the market, you need a comprehensive microbiology program (Plating, PCR, HLP tubes, isolation, microscopy, etc).

Analytics for measuring recipe consistency and fermentation progress (ABV, IBU, Plato, pH, DO, CO₂, Temp, yeast health & pitch quantity metrics).

Combination of sensory and analytics for troubleshooting flavor problems.



General Considerations

DO decide on your priorities before testing.

DO collect actionable data.

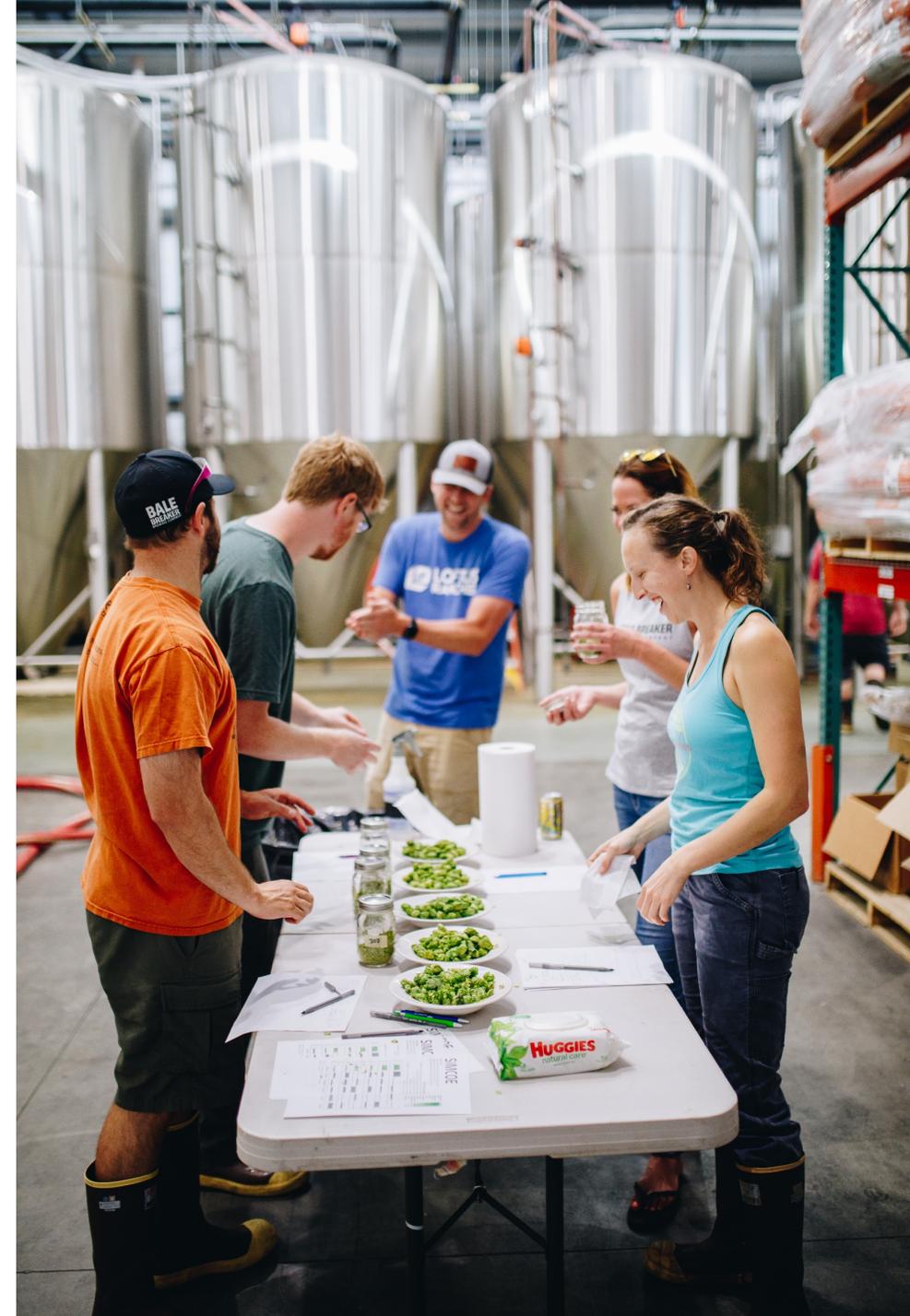
DO screen, train, and validate your panelists (ASBC Sensory-4). Your sensory measurement machine (aka your panel) needs calibration and maintenance: encouragement, performance feedback, attendance rewards, and training.

DO create a shared lexicon (vocabulary) with your panelists using reference standards (Siebel, Aroxa, Flavor Activ, grocery store).

DO carve out a quiet, well-lit space free from distracting smells for doing your sensory analysis.

DO listen to others and create a sensory culture of learning and discussion rather than ego and posturing.

DO utilize the resources out there to hone your skills!



Acknowledgements

My warm thanks to:

Tiffany Pitra, Yakima Chief Hops

Bale Breaker Brewing Family,
especially our sensory panelists,
Quality Team, & talented resident
photographers!

ASBC Sensory Subcommittee



Additional Resources

Meilgaard, Civille, & Carr, 2016. Sensory Evaluation Techniques.

Spikes / Standards: Aroxa, Flavor Activ, Siebel

ASBC Sensory Analysis Methods (1-18)

DraughtLab resources, including Flavor Maps.

MBAA Presentations Archive, especially:

Clawson, 2015. “Establishing a Sensory Program.”

Davey, 2018. “Sensory on a Brewpub Scale.”

Kelly & Nasiatka, 2017. “A Holistic Approach to Sensory for the Practical Brewer.”

Pratt, 2018. “Start Where You Are: A Sensory Program Pep Talk.”



Questions?

For additional questions:

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