Think What You Drink

Ruminations on Recipe Formulation and Flavor Perception

Thinking in Flavor

- It isn’t EASY!
- Generally poor vocabulary of flavor
- Taste is a sense we can’t share directly
- Taste/smell used less than sight, sound, touch

Beer Creation: Flavor Vocabulary!

- “Amber” is not a flavor
- Neither is “rich,” “mild,” “refined,” or “attractive”

Beer Creation

- Follow a recipe
  - Easy
  - Great way to explore
  - Placing your trust ...

Diversey Lager

Recipe
6 lb Wheat Malt Extract
1.5 lb Munich Malt
2 oz Black Patent Malt
2 oz malto-dextrin
Beer Creation

• Brew a style or clone a beer

“I want to make a bock beer”

“I want to make a beer like Pliny the Elder”

Beer Creation

• Brew a style or clone a beer

• Well-established flavor model so you don’t have to articulate

• Lots of resources to guide you
  – Designing Great Beers, Brewing Classic Styles, Classic Style Series of books, etc.
  – 88,800 Google results for “Pliny the Elder recipe”!

Beer Creation

• Brew a style or clone a beer

• Compare your brew to the model

• Learn & assess for key off-flavors

• Build ingredient/process connections to flavor

Beer Creation

• Modify a well-known concept

“I want to make a black IPA”

“I want to make a Hefeweizen with rye instead of wheat”

“What happens if you make a stout from wheat malts?”

Beer Creation

• Imagine a Flavor Profile

“Time for a Rosemary-black pepper beer!”

I want a beer that tastes like this:

Medium toasting with no caramel sweetness, modest bitterness but very bold minty/spicy noble hop aroma and flavor. Light fruitiness associated with American ale yeast fermentation.

Beer Creation: Flavor Vocabulary!

• Ultimately, recipe formulation is:

**Desired**

**Flavor** → **Ingredients**

**Process**
Beer Creation: Flavor Vocabulary!

Wouldn’t it be great if homebrew shops always offered:

- Samples of malt
- Single hop beers
- Yeast test batches

Make sure you TASTE your ingredients!

Malt Flavor

Many ways to make an amber beer (14 SRM)

- Munich/Dark Munich
- Pale + Crystal
- Pils + Carafa
- 2-Row + Brown Sugar

Color is not a flavor!

Malt Flavors

- Flour
- White bread
- Water crackers
- Wheat bread
- Bread crust

Malt Flavors

- Graham cracker
- Biscuit
- Toasted bread
- Wood
- Heated wood
Malt Flavors

“Nutty”
- Sunflower seeds, pine nuts
- Peanut, cashew, (beans, brown rice?, couscous)

Malt Flavors

“Nutty”
- Pistachio, almond (toasted/untoasted)
- Pecan, walnut – woody, wood bark?

Malt Flavors

- Caramel
- Toffee
- Chocolate (powder/syrup)
- Coffee

Malt Flavors

Sneaky flavors (malt, malt + fx, maybe ox)
- Raisin
- Prune

Hop Flavors

A lot has happened here in the past 30 years!
- New varieties
- Transition from Noble hops as only aroma hop
- New knowledge about hop chemistry
- New flavor descriptions

Hop Flavors

- Flavor wheel lists 3 things under “Hoppy”:
  - Kettle hop
  - Dry hop
  - Hop oil
Hop Flavors

Classic Hop Flavors
• Floral
• Fruity
• Herbal/Spicy
• Citrus
• Grassy
• Pine/Forest

Next: spiders ....
Hop Flavors

Barth-Haas Hop Aromas
- **Menthol**: mint, sage, metallic, camphor
- **Tea**: green tea, chamomile tea, black tea
- **Green fruits**: pear, quince, apple, gooseberry, wine yeast, ethereal
- **Citrus**: grapefruit, orange, lime, lemon, bergamot, lemon grass, ginger
- **Green**: green-grassy, tomato leaves, green peppers
- **Vegetal**: celeriac, leek, onion, artichoke, garlic, wild garlic
- **Cream caramel**: butter, chocolate, yogurt, gingerbread, honey, cream, caramel, toffee, coffee
Hop Flavors

Barth-Haas Hop Aromas

• **Woody aromatic**: tobacco, cognac, barrique (oak), hay, leather, tonka (vanilla substitute), woodruff, incense, myrrh, resin

• **Spicy/Herbal**: lovage (similar to fennel?), pepper, chilli, curry, juniper, marjoram, tarragon, dill, lavender, aniseed, licorice, fennel

• **Red Berries**: cassis, blueberries, raspberries, blackberries, strawberries

• **Sweet fruits**: banana, watermelon, honeydew, peach, apricot, passion fruit, lychee, dried fruit, plum, pineapple, white jelly bears

• **Floral**: elderflower, chamomile blossom, lily of the valley, jasmine, apple blossom, rose, geranium.
Recipe Formulation Evolves

- Original Designing Great Beers
- New analysis of NHC 2nd Round recipes
- Bock beer recipes

Specialty Malt Selection: Bock

<table>
<thead>
<tr>
<th>Malt</th>
<th>Incidence</th>
<th>Proportion</th>
<th>Incidence</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal/Cara/Caramel Malts</td>
<td>≥75%</td>
<td>14</td>
<td>60%</td>
<td>7</td>
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<tr>
<td>Wheat Malt</td>
<td>≤50%</td>
<td>6</td>
<td>20%</td>
<td>4</td>
</tr>
<tr>
<td>CaraPils/CaraFoam</td>
<td>≤50%</td>
<td>6</td>
<td>17%</td>
<td>4</td>
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<tr>
<td>Carafa/Black malt</td>
<td>≤50%</td>
<td>1</td>
<td>31%</td>
<td>2</td>
</tr>
<tr>
<td>Melanoidin</td>
<td>≤50%</td>
<td>1</td>
<td>31%</td>
<td>4</td>
</tr>
<tr>
<td>Aromatic/Biscuit/Victory</td>
<td>≤50%</td>
<td>5</td>
<td>17%</td>
<td>5</td>
</tr>
<tr>
<td>Chocolate</td>
<td>0-60%</td>
<td>2</td>
<td>34%</td>
<td>1</td>
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Base Malt Selection: Bock

<table>
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<tr>
<th>Malt</th>
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<th>Proportion</th>
<th>Incidence</th>
<th>Proportion</th>
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</thead>
<tbody>
<tr>
<td>Pilsner/2-Row Malt</td>
<td>100%</td>
<td>&gt;60%</td>
<td>86%</td>
<td>32%</td>
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<tr>
<td>Munich/Dark Munich/Vienna</td>
<td>73%</td>
<td>25%</td>
<td>100%</td>
<td>63%</td>
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Today: malt extract use is far less common
- Only 6% (3/48) used in 2007-8
- One NHC 2nd round recipe was 100% extract

In Designing Great Beers:
- 50% of all bock recipes used some extract
- 20% used no base malt

But what does this have to do with Recipe Formulation?
Bock Mashing

**Mash Methods - Bocks (2007-8 NHC)**

<table>
<thead>
<tr>
<th>Method</th>
<th>All Bocks</th>
<th>Maibock</th>
<th>Bock</th>
<th>Dopplebock</th>
<th>Eisbock</th>
<th>Avg Sac Temp</th>
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<tbody>
<tr>
<td>Infusion Mash</td>
<td>80%</td>
<td>70%</td>
<td>83%</td>
<td>50%</td>
<td>83%</td>
<td>193.2</td>
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<tr>
<td>Single Decoction</td>
<td>10%</td>
<td>7%</td>
<td>5%</td>
<td>0%</td>
<td>0%</td>
<td>191.7</td>
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<tr>
<td>Double Decoction</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>151.7</td>
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<tr>
<td>Triple Decoction</td>
<td>0%</td>
<td>13%</td>
<td>20%</td>
<td>17%</td>
<td>17%</td>
<td>151.7</td>
</tr>
</tbody>
</table>

Designing Great Beers:
Average Saccharification Rest of 155° F

Hop Usage: American Pale Ale

**Varieties Used (by addition)**

- Amarillo: 42 23%
- Cascade: 39 22%
- Centennial: 33 18%
- Simcoe: 23 13%
- Columbus: 13 7%
- Willamette: 7 4%
- Warrior: 5 3%
- Chinook: 4 2%
- Magnum: 3 2%

Average number of additions: 6.4 / APA

Galena, N. Brewer, Palisade, Crystal, Goldings, Horizon, Nugget each accounted for 1% of additions.

Hop Usage: American Pale Ales

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<th>Number of Additions</th>
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<td>Amarillo</td>
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</tr>
<tr>
<td>Cascade</td>
<td>39</td>
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<td>Centennial</td>
<td>33</td>
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<td>Simcoe</td>
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<td>Chinook</td>
<td>4</td>
</tr>
<tr>
<td>Magnum</td>
<td>3</td>
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