

Think What You Drink

Ruminations on Recipe Formulation
and Flavor Perception

Think What You Drink

The best brewers think in flavor



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"

Galena
Origin: USA

Neutral. This hop can be very bitter, but blends well with finishing hops. Used in American ales and lagers, but suitable for all beer styles. (Aroma is medium but pleasant.)

Substitutes: Cluster, Nugget, Chinook.

Alpha Acid: 13.0%
Beta Acid: 8.0%
Cohumulone: 40.0%
Myrcene: 57.5%
Humulene: 12.5%
Caryophyllene: 12.5%
Farnesene: 0.0%
Storage: Good

ID: 11

Name	Value
Galena	
Satus®	
can Pale Ale	
Volume @ 212 °F	7 gal
Vort Boil Duration	1 h
Evaporation Loss	0.5 gal
er Volume Added	0.0 gal
Volume @ 68 °F	6.24 gal

Beer Creation

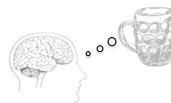
- **Follow a recipe**
 - Easy
 - Great way to explore
 - Placing your trust ...



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**

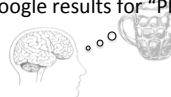
“I want to make a bock beer”

“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



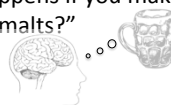
Beer Creation

- **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?”



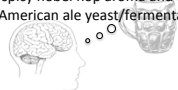
Beer Creation

- **Imagine a Flavor Profile**

“Time for a Rosemary-black pepper beer!”

I want a beer that tastes like this:

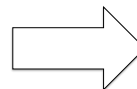
Medium toastiness with no caramel sweetness, modest bitterness but very bold minty/spicy noble hop aroma and flavor. Light fruitiness associated with American ale yeast/fermentation.



Beer Creation: Flavor Vocabulary!

- Ultimately, recipe formulation is:

**Desired
Flavor**



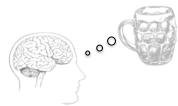
**Ingredients
Process**



Beer Creation: Flavor Vocabulary!

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

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



Beer Creation: Flavor Vocabulary!

- Make sure you TASTE your ingredients!

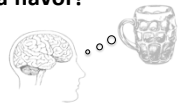


Malt Flavor

Many ways to make an amber beer (14 SRM)

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

Color is not a flavor!

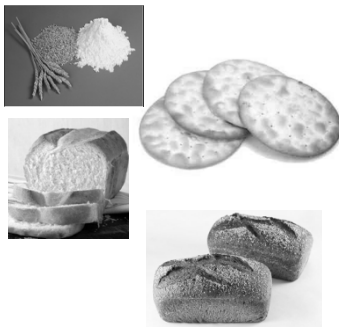


Malt Flavors



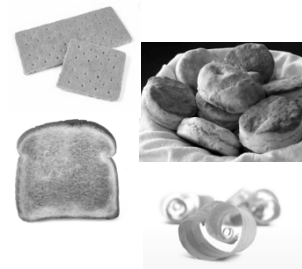
Malt Flavors

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



Malt Flavors

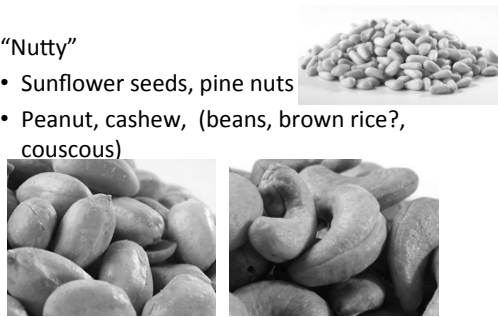
- Graham cracker
- Biscuit
- Toasted bread
- Wood
- Heated wood



Malt Flavors

“Nutty”

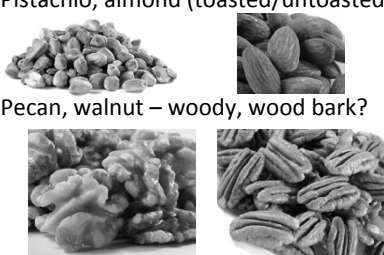
- Sunflower seeds, pine nuts
- Peanut, cashew, (beans, brown rice?, couscous)



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



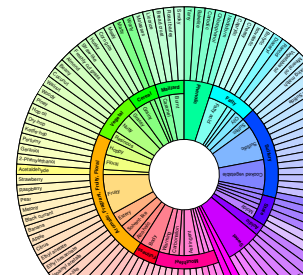
Hop Flavors

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

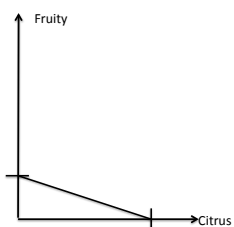
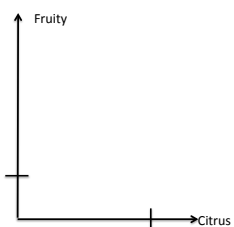
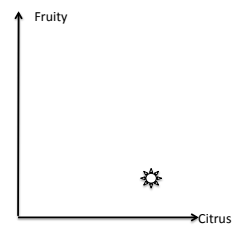
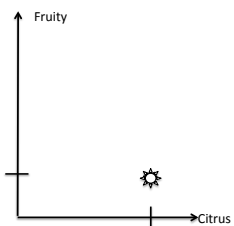
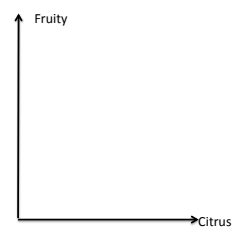


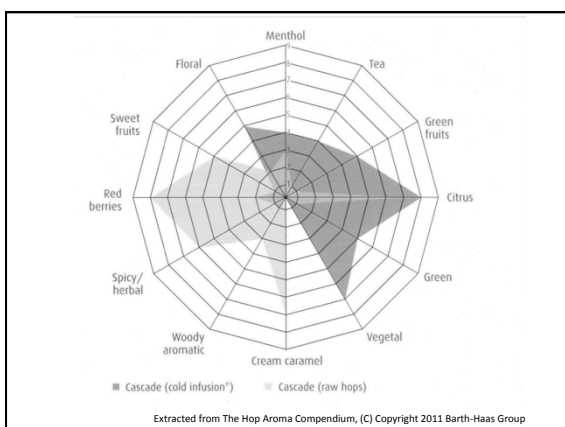
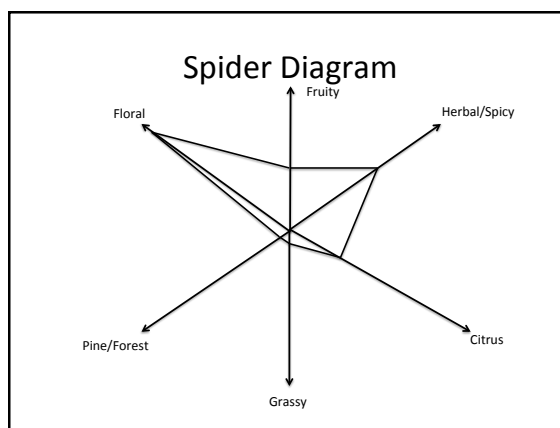
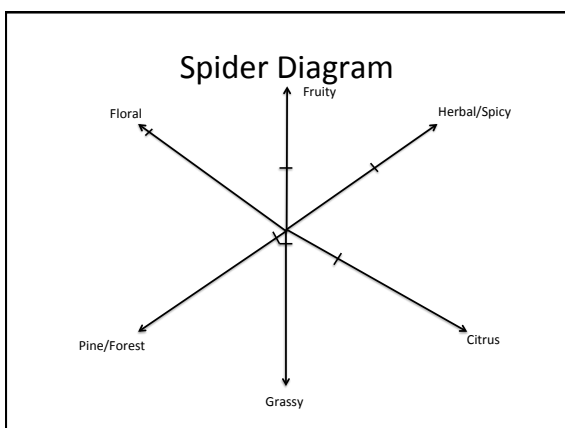
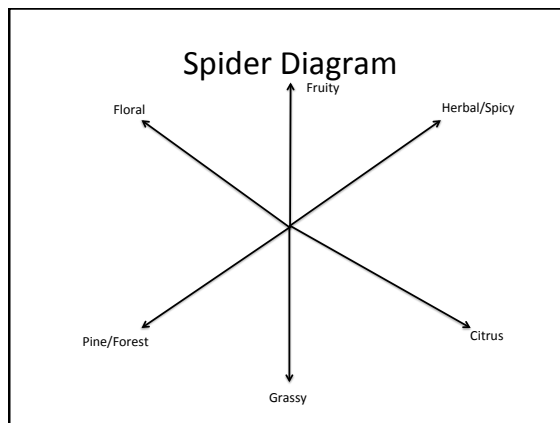
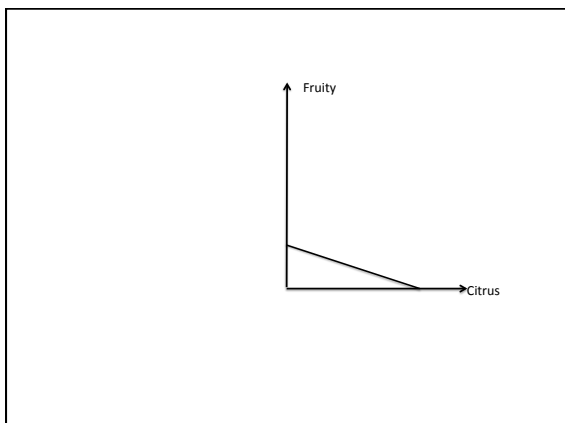
Hop Flavors

Classic Hop Flavors

- Floral
- Fruity
- Herbal/Spicy
- Citrus
- Grassy
- Pine/Forest

Next: spiders





Hop Flavors

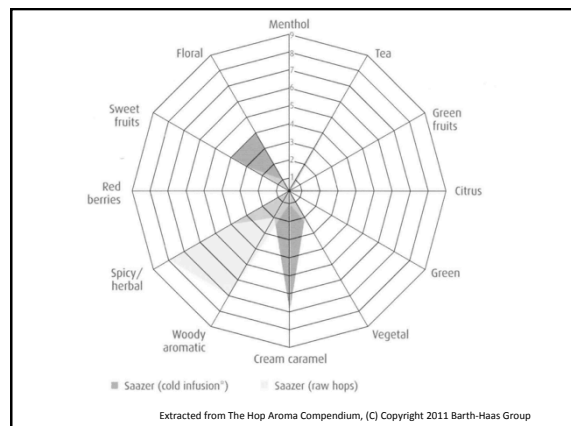
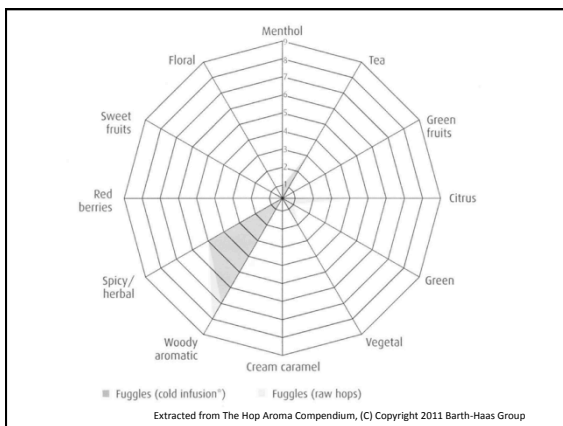
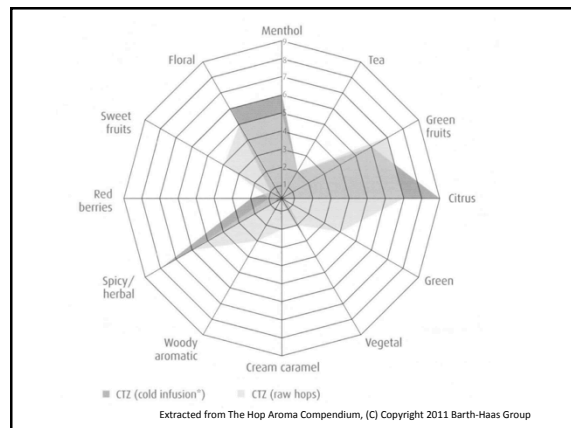
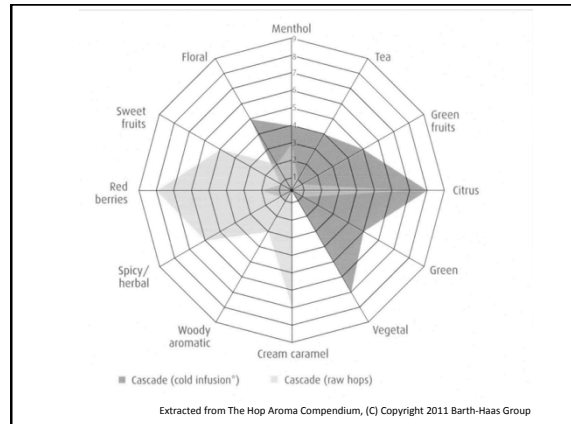
Barth-Haas Hop Aromas

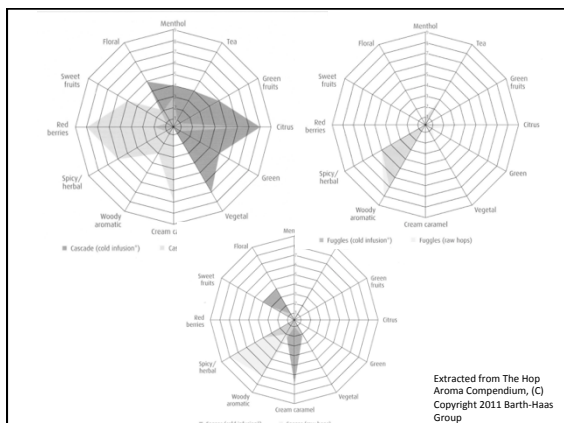
- **Menthol:** mint, sage, metallic, camphor
- **Tea:** green tea, chamomile tea, black tea
- **Green fruits:** pear, quince, apple, gooseberry, wine yeast, ethereal
- **Citrus:** grapefruit, orange, lime, lemon, bergamot, lemon grass, ginger
- **Green:** green-grassy, tomato leaves, green peppers
- **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.

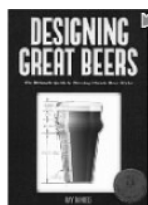




But what does this have to do with
Recipe Formulation?

Recipe Formulation Evolves

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



Specialty Malt Selection: Bock

Malt	Designing Great Beers		2007-8 NHC 2nd Round	
	Incidence	Proportion	Incidence	Proportion
Crystal/Cara/Caramel Malts	>75%	14	60%	7
Wheat Malt	<30%	6	20%	4
CaraPils/CaraFoam	<30%	6	17%	4
Carafa/Black malt	<30%	1	31%	2
Melanoidin	<30%	-	23%	8
Aromatic/Biscuit/Victory	<30%	5	17%	4
Chocolate	30-60%	2	34%	1

Base Malt Selection: Bock

Malt	Designing Great Beers		2007-8 NHC 2nd Round	
	Incidence	Proportion	Incidence	Proportion
Pilsner/2-Row Malt	100%	>60%	86%	32%
Munich/Dark Munich/Vienna	73%	25%	100%	63%

More

Base Malt Selection: Bock

- 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

Bock Mashing

Mash Methods - Bocks (2007-8 NHC)

	All Bocks	Maibock	Bock	Dopplebock	Eisbock	Avg Sach Temp
Infusion Mash	64%	70%	63%	53%	83%	153.3
Single Decoction	8%	10%	25%	0%	0%	
Double Decoction	15%	20%	0%	27%	0%	151.7
Triple Decoction	13%	0%	13%	20%	17%	(All decoctions)

Designing Great Beers:
Average Saccharification Rest of 155° F

Hop Usage: American Pale Ale

Varieties Used (by addition)

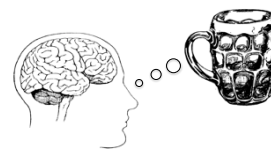
Amarillo	42	23%
Cascade	39	22%
Centennial	33	18%
Simcoe	23	13%
Columbus	13	7%
Willamette	7	4%
Warrior	5	3%
Chinook	4	2%
Magnum	3	2%

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

	Mash	FWH	90	75	60	55	45	30	25	20	15	10	5	4	2	1	Sleep	Dry	Total
Amarillo			3		3					2	4	5	4		2	1		9	42
Cascade			1		1			3		2	6	5	3		1	1		8	39
Centennial			1	1	7		1	3		1	4	3						2	33
Chinook			1	1	2														4
Columbus			2	1	1						1	2			1				13
Crystal											1								1
Galena					1	1													2
Goldings					1														1
Horizon?											1								1
Magnum						3													3
Norther Brewer												2							2
Nugget						1													1
Palisade						1						1							2
Simcoe			1		2	1	1		2	1		2				3	5	5	23
Warrior					3	1	1												5
Willamette						1	1				1	1						1	7
Total Additions/Time	1	9	1	2	27	1	2	8	1	7	19	19	9	1	4	8	24	36	179
Proportion of all Additions:	1%	5%	1%	1%	15%	1%	1%	4%	1%	4%	11%	11%	5%	1%	2%	4%	13%	20%	



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