Instruments & Methods, Quantifying New Paradigms

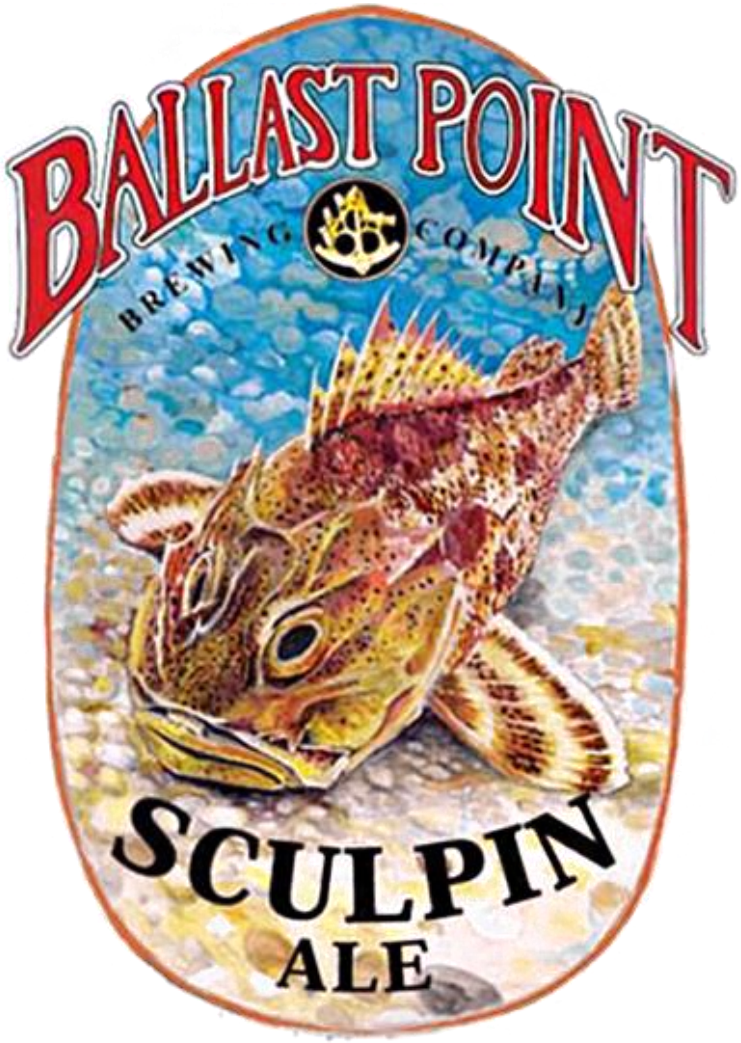
Tell them what you're going to tell them

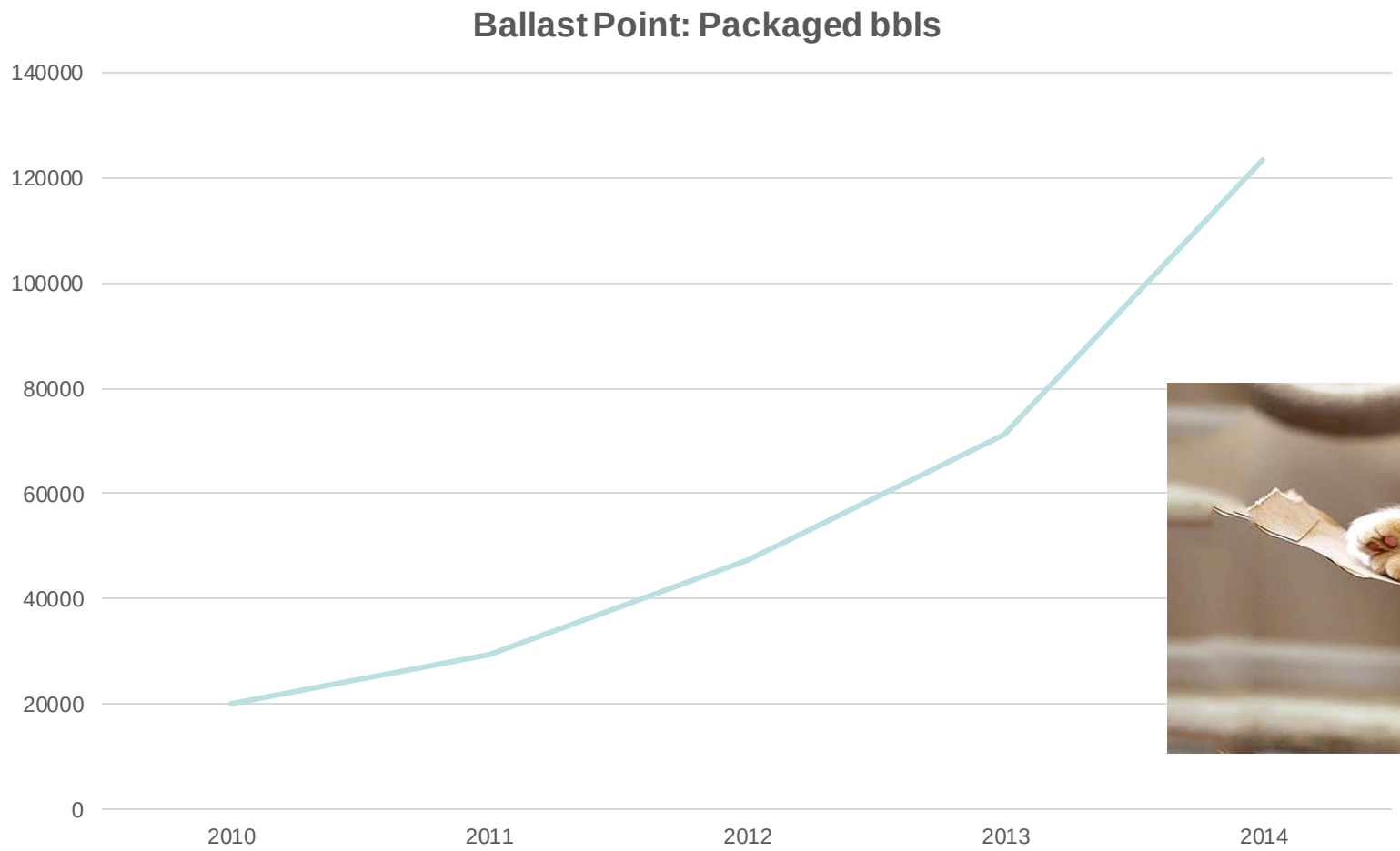
- Bit more philosophical than might be expected
  - Every brewery is different
  - Your Lab/Quality Department should be as unique as your beers

1. Overall topic: How to grow your lab organically to answer your questions
2. Who, what, where, when, why, & how of a Quality Department
3. The "How" – Instrumentation and methods

Ballast Point

- Quick background:
  - Started as a home brew shop in 1992
  - Brewing since 1996
  - Very focused on Quality and customer service




Ballast Point: Packaged bbls
140000
120000
100000
80000
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2010
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BALLAST POINT
SCULPIN


BALLAST POINT
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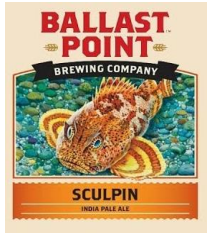
INDIA PALE ALE


BALLAST POINT
BREWING COMPANY
SCULPIN
INDIA PALE ALE

Ballast Point

- Constant innovation, many different styles = many Quality challenges!
  - Indra Kunindra…

Overall Topic:

How to grow your lab organically to answer your questions.

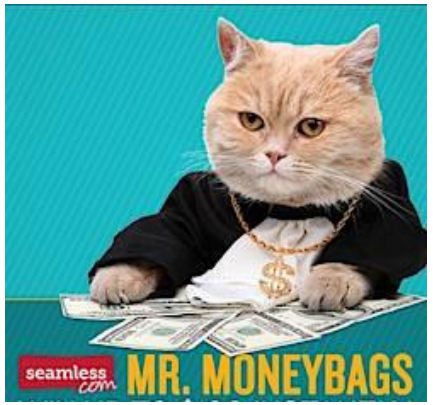
(Note: lab = Quality Department)

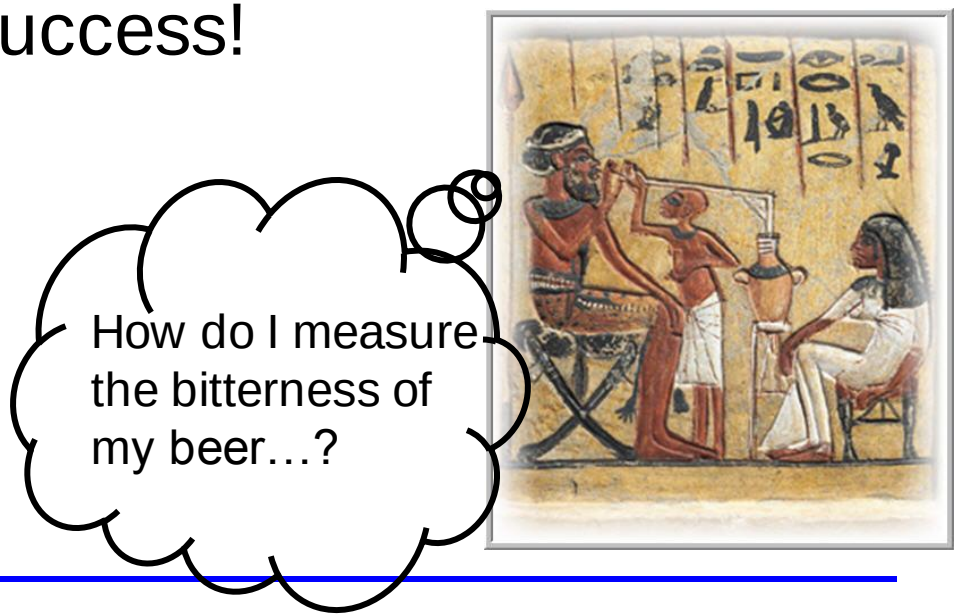
How to grow your lab organically to answer your questions

- Let your lab grow from a culture of quality
- Based on current needs
- Avoids excessive over-investment of $$, time, energy, people – on instruments and data collection
- Requires constant looking ahead/ingenuity

How to grow your lab organically to answer your questions

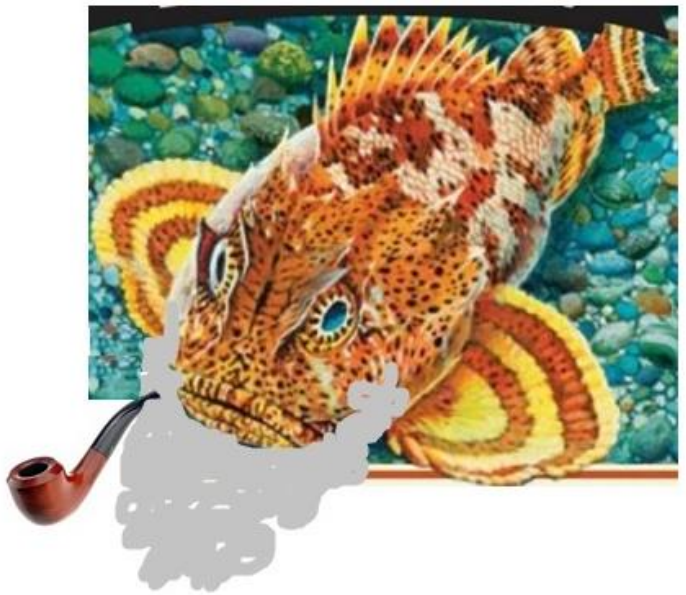
- Custom-tailor your lab – resources are tight for Quality
- Luckily, beer has been around a while – chances are, there's already a method out there to answer your questions
- Thinking in If/Then statements – great success!
  - Appeals to Mr. Moneybags





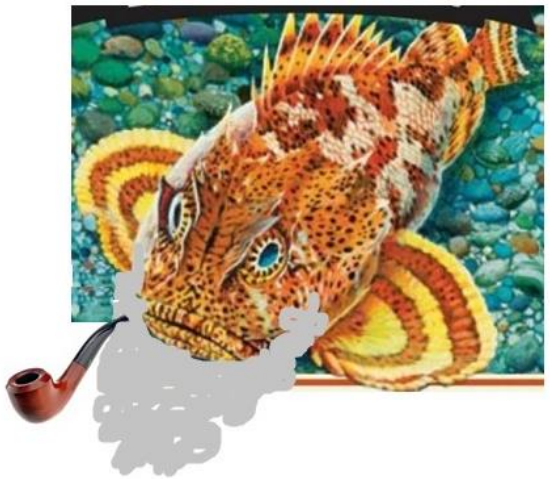
Some philosophy

- Simon Sinek's "Golden Circle"
  - How great leaders inspire action
  - http://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action?language=en



Philosophy Sculpin

Some philosophy

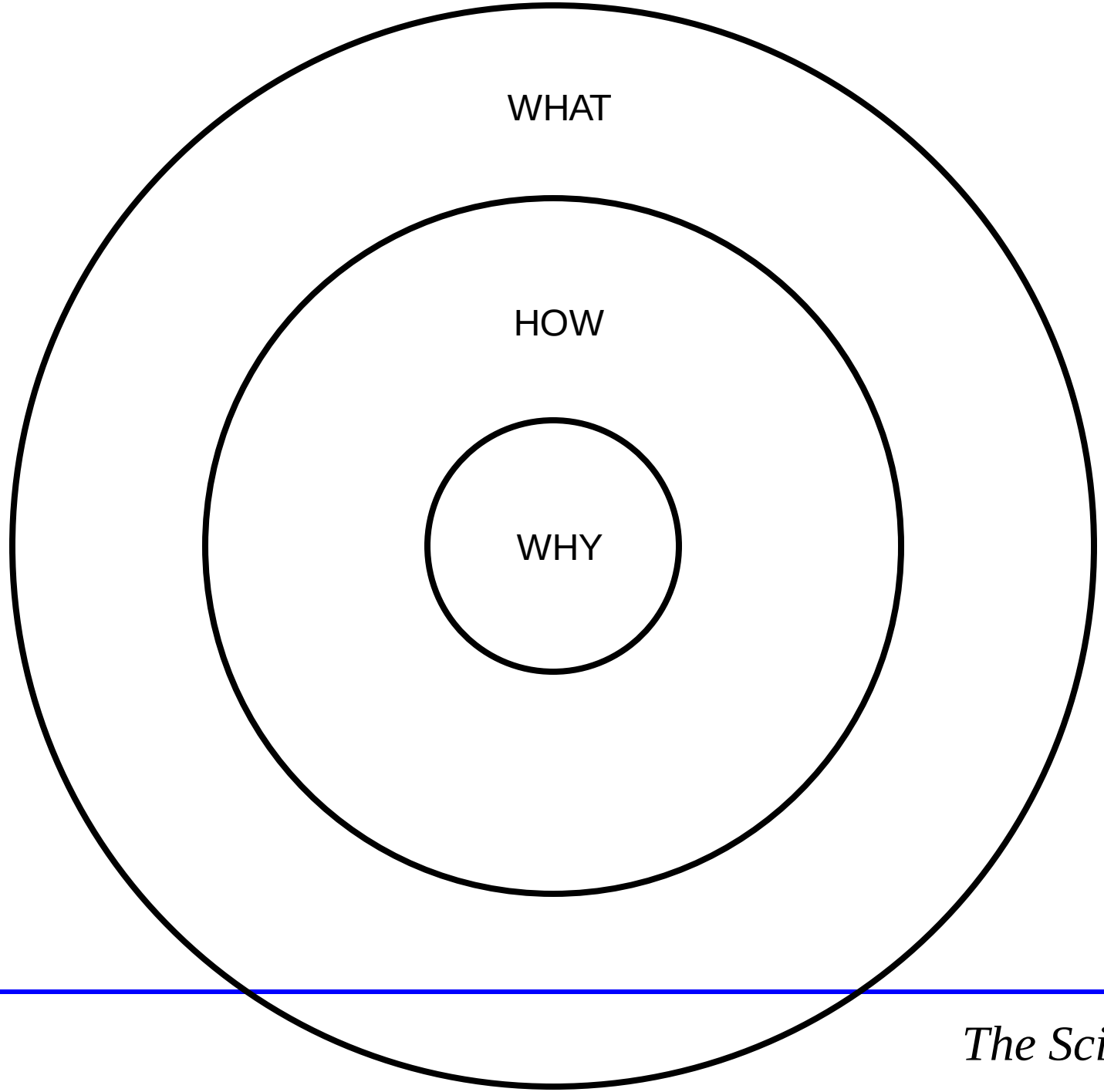


- Simon Sinek's "Golden Circle" - start with WHY.
- What he doesn't say: Apple is successful because they are all about the science
- Applies both to your brewery and your lab
- Bottom-up philosophy. Don't get fancy machines because you think you should, or that's what all the cool kids are doing.
- Ask: Is it right for YOU, to grow your lab ORGANICALLY, to answer YOUR questions?

Part Two

- Who, What, Where, When, Why, & How of a Quality Department
  - That grows ORGANICALLY
  - That is built to answer YOUR questions

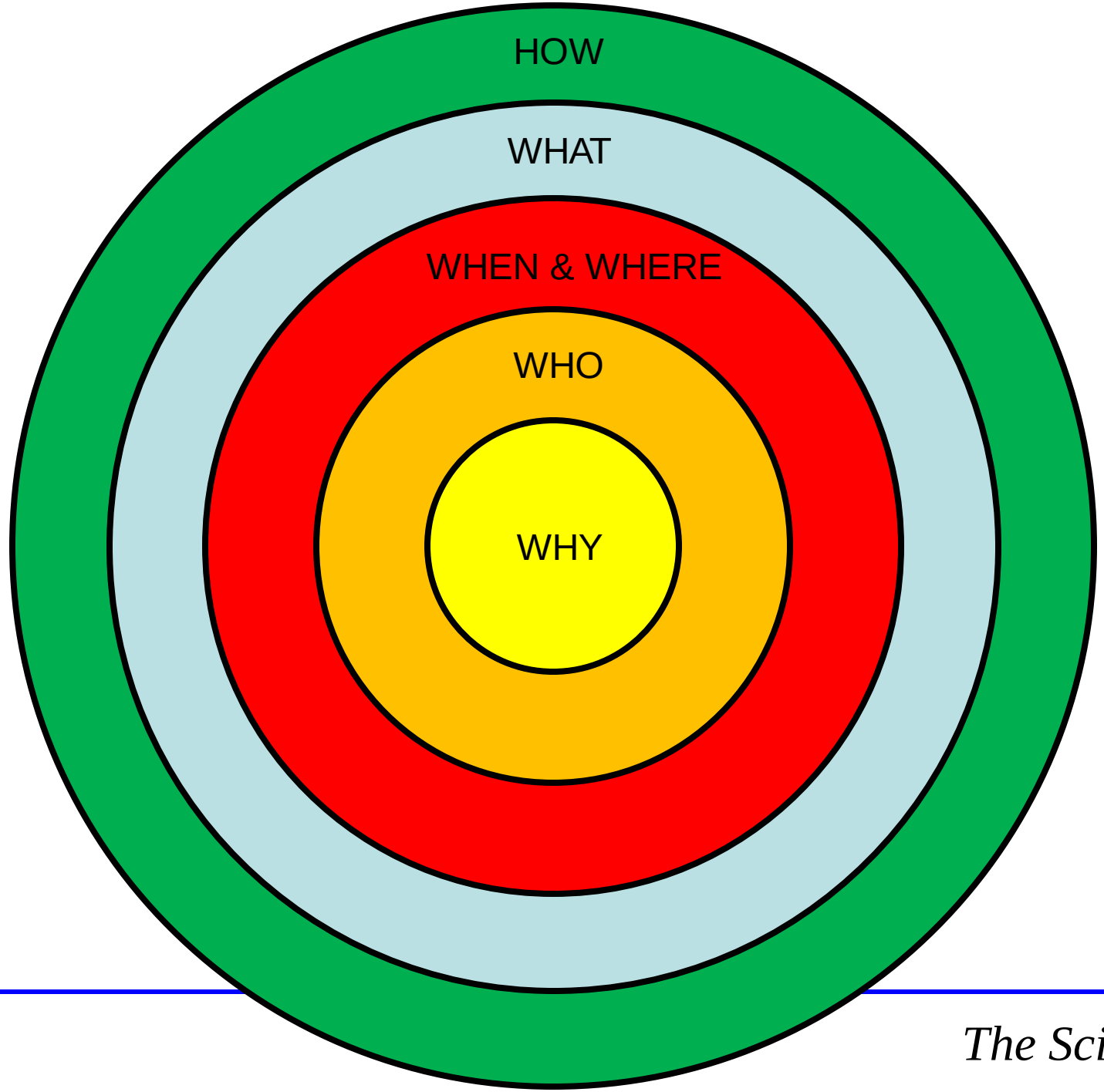
Who,
What,
Where,
When,
Why, &
How



Forget this!

In order of priority:

Why,
Who,
When/
Where,
What, &
How

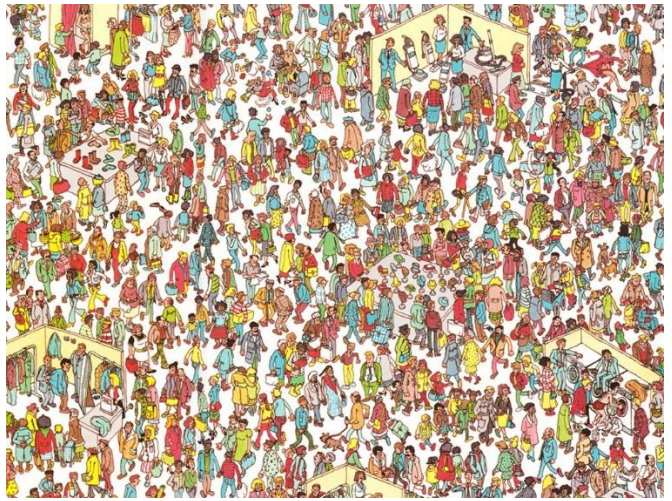


WHY

- Quality is King (or Queen)
- The name of the game is to reduce batch-to-batch variation as much as possible.
- Beer is alive!
  - Changes over time
  - Measure each batch when fresh, then keep a log of immutable values to trend over time.

WHO

- EVERYONE! Your people are your best tool!
- Make Quality cultural, integrative
- Won’t need a huge nerdy lab team, because everyone is “the lab”
- Collaboratively assess QA/QC needs
- Sensory



WHEN & WHERE

- Everywhere, all the time.
- Having a culture of quality is the best way to be everywhere, all the time.

WHAT

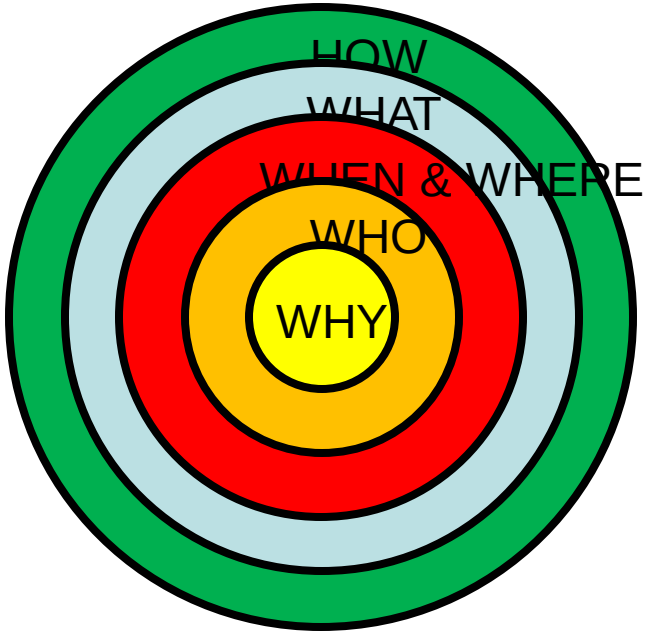
- What questions do you have (to grow your lab organically, remember?)?
- Varies from brewery to brewery
- Be creative – beauty in simplicity
- What measurable parameters have the most value for your protocols/processes?
- NOTE: The government has questions too!
  - Fill level, ABV

WHAT: Example Questions

- How healthy are my fermentations?
- How many generations can my yeast last?
- What is the shelf life of my beer?
- How low is the dissolved oxygen in my beer?
- Are my beers contaminated?

Part Three: HOW

- Remember: How to grow your lab organically, to answer your questions
- Several ways to frame the “how”:
  - By ingredient
  - By process
  - By equipment



Part Three: HOW, by process

1. Fermentation
2. Packaging
3. Brewing
4. Filtering
5. Raw Materials
6. Flavor matching
7. (Sensory and Micro)

How to do the “how”

- Just do it!
- Start measuring, compare results to sensory, then determine your target
- Then SPCs, etc. (see Aaron’s talk)

Fermentation

- What the heck is going on in there?
- Yeast feast
- (Understand the theory)
- How often do you want to sample? (What are you looking for?)

The necessary disclaimer

- I do not work for any company that sells the instruments about which I am going to talk. I do not advocate for one over the other. I am like Switzerland. This is a talk about the theory of the method, not about which company you should choose. My word is not gospel. I am not trying to sell you anything. There are plenty of options out there of which I am not aware. I am not affiliated with any company but Ballast Point. Again – Switzerland.

Fermentation: How consistent is it?

- GRAVITY

Hydrometer
- $80
- Not terribly accurate
- Meniscus mayhem

DMA35
- Anton Paar
- $1500
- Very accurate

Fermentation: How consistent is it?

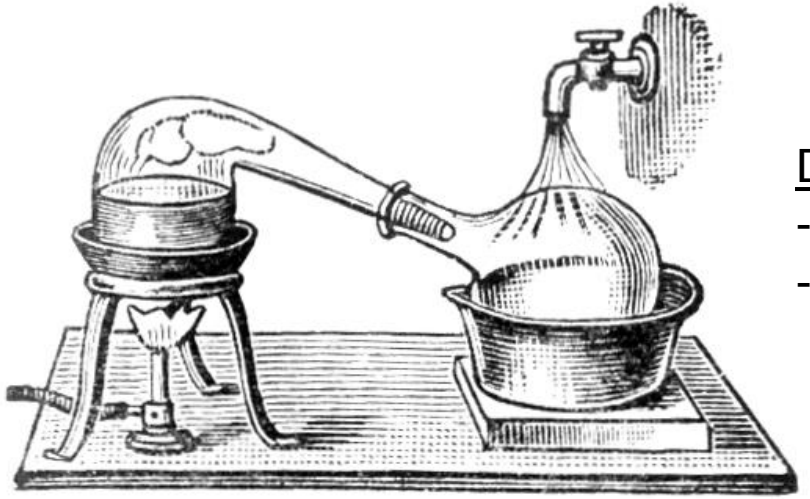
- Gravity
- CELL COUNTS (pitching and in beer, growth curves) (viability, vitality)

<u>Haemocytometer</u>
- $80
- Interpretation is an issue
- Great hazing tool

<u>Automated cell counting</u>
- Heaven-sent
- $15k
- Very accurate
- Viability worthwhile

Fermentation: How consistent is it?

- Gravity
- Cell counts
- DIACETYL



Distillation method
- Icky chemicals
- Method is very… "involved"

Gas chromatograph (ECD)
- Pricey ($40-60k)
- Very accurate
- Minimal sample prep
- Makes lab look fancy

Fermentation: How consistent is it?

- Gravity
- Cell counts (pitching and in beer, growth curves)
- Diacetyl
- Esters, aldehydes, and alcohols
  - Yeast gen
  - FV shape
  - Pitching/aeration scheme
  - …etc.!!!!!!

(FID)

Fermentation: How consistent is it?

- Gravity
- Cell counts (pitching and in beer, growth curves)
- Diacetyl
- Esters, aldehydes, and alcohols
- Sugar profile

HPLC (RI)
- Pricey ($20-60k)
- Accurate
- Fingerprinting

Packaging

Packaging: How consistent is my carb?

- CO2

Zahm & Nagel
- Inexpensive
- Unreliable

Better CO2 technology
- Anton Paar Cbox, Haffmans gehaltemeter
- $10-20k
- Reliable!

Packaging: How low can I go with O2?

- CO2
- O2

Many technologies available
- Hach Orbisphere 3100
- Anton Paar Cbox
- Hach's TPO beast
- Haffmans too
- At least $10k

Packaging: How do my beers age?

- CO_2
- O_2
- Shelf life

(just need space!)

Brewing

- Again, think: what's going on?

Brewing: How consistent is it?

- Gravity

Refractometer
- Quintessential tool
- $20

DMA35
- KO samples
- Good when brewing team is large

Brewing: How consistent is it?

- Gravity
- ABV

<u>Anton Paar</u>
- Really only tool out there
- $50k
- Modular… go all in
- Good for monitoring fermentation too

Brewing: How consistent is it?

- Gravity
- ABV
- Bitterness, color, etc.

<u>UV/Vis Spectrophotometer</u>

- Any one will do
- $5k +
- Bitterness method needs more
- ALSO:
  - FAN
  - Polyphenols
  - T-BARs
  - Beta-glucans
  - Hops acids
  - OK Rick are we still friends?

Brewing: How consistent is it?

- Gravity
- ABV
- Bitterness, color
- Oxygen

<u>High-range O2 meters</u>

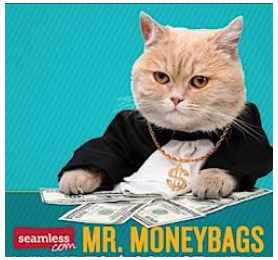
- Haffmans, Hach, …
- Needs to be able to handle solids
- Good for BBT purges too (if portable)
- Understand how O2 dissolves

Brewing: How consistent is it?

- Gravity
- ABV
- Bitterness, color
- Oxygen
- Grist profile

<u>Sieves & shaker</u>

- Optimize balance of lauter time and BH efficiency
  - Good case for Mr. Moneybags
- Good for checking malt COAs
- Good for less-than-ideal crop years (You know what I'm talking about)



Filtration

Filtration: How effective is it?

- Turbidity

Turbidity meter

- Several technologies available
  - Siegrist, Optek, etc.
- Real-time results
  - Wheat beers?
  - Crystal clear lagers?
- Good for shelf life too

Filtration: How much DO pickup?

- O2 again

Shared time between filter and finished package

Raw materials

- Grain
  - Sieve analysis
  - Extract
- Hops
  - Acids: spec, HPLC
  - Oils: GC
- Water
  - Titration kits, etc.
- Yeast
  - Micro, cell counting, forced fermentations

Next gen: Genetics!

Flavor matching, Fingerprinting

- Different brewhouses
  - Sugar profile – HPLC
  - Nutrient/protein content (FAN) – spec (also TBARs, etc.)
- Different FVs
  - Attenuation – gravities, DMA/alcolyzer, cell counter, HPLC
  - Yeast “waste” products – GC
- New breweries
  - All of the above!
  - … again… **sensory**!!!

That’s all well and good, but…

- Think of what questions YOU want to answer, as you are growing your lab ORGANICALLY and thinking about WHY you’re doing what you’re doing
- Then peruse ASBC’s MOAs
- Then talk to people, see what’s out there
- Be creative!

Thank you!

Lauren Zeidler

Director of Quality

Ballast Point Brewing & Spirits

lauren@ballastpoint.com