



*The Science of Beer*

## Setting the Standard: A Deep Dive into Quality

June 4 – 8, 2018 ■ Fort Collins, Colorado, U.S.A.

Colorado State University ■ CSU Stadium, Room 1204

### Monday – June 4

- 8:30 am**      **Registration, coffee/tea**
- 9:00 am**      **Introduction and Welcome**  
Meet and greet for participants and instructors followed by an introduction and expectation discussion  
*Jeff Callaway, Colorado State University*  
*Rob Christiansen, New Belgium Brewing Company*
- 11:00 am**      **Lunch Provided**
- 12:00 pm**      **Microbiology Day 1 Yeast and More Yeast!**  
*Rob Christiansen, New Belgium Brewing Company*  
*Kelly Tretter, New Belgium Brewing Company*
- Physiology and Metabolism of *Saccharomyces Cerevisiae*
  - Cell Counting Basics
  - Yeast Health (viability and vitality)
    - Lab Exercises
- 4:00 pm**      **Day 1 Wrap Up**
- 5:00 pm**      **New Belgium Brewing Company Tour and Beers**  
Use your Uber credits to get to 500 Linden St., Fort Collins, CO 80524.
- 7:00 pm**      **Dinner at Illegal Pete's**  
320 Walnut St., Fort Collins, CO 80524. It's a short .5 mile walk from New Belgium Brewing Company. Use your Uber credits to get back to your hotel.

## Tuesday – June 5

- 8:00 am**      **Microbiology Day 2 Propagation and Pitching, Contamination**  
*Rob Christiansen, New Belgium Brewing Company*  
*Katie Fromuth, Colorado State University*  
*Kelly Tretter, New Belgium Brewing Company*
- Analysis of Yeast Stats and what it Means in Your Brewery
  - Yeast Pitching Basics
  - Propagation
  - Cone to Cone Pitching
  - How and When to Harvest Yeast
    - Math lessons
  - Contamination in Beer and Yeast
  - Types of Media and Why/How to Use Them
  - Reading and Identifying Contamination on Plates
  - Identification Techniques (PCR, MALDI-TOF, Sequencing)
    - Lab Exercises
  - Where to Start with a Micro Program
  - Resources for Micro in our Industry
- 12:00 pm**      **Lunch Provided**
- 1:00 pm**      **Microbiology Day 2 Propagation and Pitching, Contamination continued**
- 4:00 pm**      **Day 2 Wrap Up**
- 4:30 pm**      **Ramskeller Pub**  
Tour, followed by beer and pizza.  
Colorado State University, 1101 Center Ave Mall, Fort Collins, CO 80521  
Use your Uber credits to get back to your hotel.

## Wednesday – June 6

- 8:00 am**      **Brewing Chemistry Methods**  
*Katie Fromuth, Colorado State University*  
*Karl Lakenburg, Anheuser-Busch InBev*  
*Dana Sedin, New Belgium Brewing Company*
- Safety
  - Good Laboratory Techniques
  - MOA Overview and Standards Calculation
  - Sampling, Degassing, and Sampling Stability
  - Specific Gravity and Calculated Values
    - Exercise: Pipetting and Building a Calibration Curve

- pH and Titratable Acidity
- Spectrophotometer – Wort and Beer Methods
- Tristimulus
  - Exercise: IBUs
- Alcohol
- SO<sub>2</sub>
- Gluten
  - Exercise: Anton Paar
- Physical Stability and Turbidity
- Gas Chromatography
- Liquid Chromatography
- VDKs
- IAAs versus IBUs
- DMS
- Fermentation Volatiles
  - Exercise – Chromatography Lab Visit
- Foam
- Metals
- Beer Flavor and Fishbones
- Flavor Stability
- Method Validation, Control Samples, and Proficiency Schemes
- Lab Design, Maintenance, and Outsourcing

**12:00 pm Lunch Provided**

**1:00 pm Brewing Chemistry Methods continued**

**3:30 pm Day 3 Wrap Up**

**4:00 pm Bus Departs**

Bus departs CSU Gifford Building and will return at approximately 11:00 pm.

**5:00 pm ASBC LABS (Local Area Brewing Science) Meeting and Dinner at Avery Brewing Company in Boulder**

Bus transportation provided to/from 4910 Nautilus Ct N, Boulder, CO 80301.

Beer Social, Tour, Dinner, and Presentation

Maximizing Cold-side Flavor and Aroma Additions (Hops and Adjuncts)

Presenter: John Olson, Cellar Manager, Avery Brewing Company

**11:00 pm Bus Returns to CSU Gifford Building**

Use your Uber credits to get back to your hotel.

## Thursday – June 7

9:00 am

### **Sensory Program Development**

*Lindsay Barr, New Belgium Brewing*

- Introduction to Sensory Analysis
  - Overview of Flavor and Sensory Evaluation
  - Overview of Sensory Principles
  - Sensory Program Parameters
- Building a Sensory Program
  - Panelist Selection
  - Sensory Laboratory Space
- Panelist Training
  - Introduction to Attribute Training
    - Activity – Flavor Training
- Sensory Evaluation in Quality Control
  - Maintenance of Product Quality
  - Measuring Quality
- Sensory Evaluation Throughout the Process
  - Sampling Plans
  - Documentations and Reaction Plans
- Statistical Quality Control
- Sensory Methods
  - Discrimination Testing
  - Threshold Testing
  - Shelf Life Analysis
    - Activity – Case Studies and Method Selection
- Validation
  - Measuring Panelist Acuity
  - Measuring Panel Performance
    - Activity – Validating and Utilizing Panelist Data
- Sensory Evaluation in New Product Development
  - Descriptive Analysis Principles and Practices
    - Activity – Running a Descriptive Analysis Panel
- Conclusion
  - Review of Best Practices

12:00 pm

**Lunch Provided**

1:00 pm

**Sensory Program Development continued**

4:30 pm

**Day 4 Wrap Up**

Open night to explore Fort Collins

## Friday – June 8

- 8:00 am**      **Raw Materials**  
*Christian Holbrook, New Belgium Brewing Company*
- Hop Quality – Basics for Craft Brewers
  - Malt COA Interpretation – Breaking down the Numbers
  - Activity – Troubleshooting Potential Contaminants
- 11:30 am**      **Lunch provided**
- 12:30 pm**      **Packaging Quality: Why Paperboard Matters**  
*Perry Dickerson, Left Hand Brewing Company*
- Packaging Supplier Quality
    - Setting Expectations with Suppliers
    - Regular Visits
    - Quality Expectations
  - Using Data to Hold Suppliers Accountable
  - Building Partnership to Maximize Supplier Relationships
  - In-process Quality
  - Critical Parameters to Monitor for Package Ops
    - Total Package Oxygen
    - Fill Volume
    - Can Seams
  - Voice of the Customer
    - Using Feedback to Improve Quality of Product
      - Activity – Group problem solving exercises based on customer complaints
    - Review and Discussion of problem solving case studies, “Real” Results
- 4:30 pm**      **Day 5 Wrap Up**
- 5:00 pm**      **Ramskeller Pub (optional)**  
Colorado State University, 1101 Center Ave Mall, Fort Collins, CO 80521