



The Science of Beer

Setting the Standard: A Deep Dive into Quality

July 31–August 4, 2017 ■ Fort Collins, Colorado, U.S.A.
Colorado State University ■ Gifford Building, Room 235

Monday – July 31

8:00 am

Introduction and Welcome

Jeff Callaway, Colorado State University

Rob Christiansen, New Belgium Brewing Company

8:10 am

Microbiology Day 1 Yeast and More Yeast!

Scott Britton, Duvel

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
- Analysis of Yeast Stats and what it Means in Your Brewery
- Beer Inclusion Identification
 - Lab Exercises
- Yeast Pitching Basics
- Propagation
- Cone to Cone Pitching
- How and When to Harvest Yeast
 - Math lessons

12:00 pm

Lunch Provided

1:00 pm

Microbiology Day 1 Yeast and More Yeast! Continued

4:00 pm

Day 1 Wrap Up

5:00 pm

New Belgium Brewing Company Tour

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 – August 1

8:00 am **Microbiology Day 2 Contamination**
Scott Britton, Duvel
Rob Christiansen, New Belgium Brewing Company
Kelly Tretter, New Belgium Brewing Company

- 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 **Packaging Quality: Why Paperboard Matters**
Perry Dickerson, Left Hand Brewing Company

- Packaging Supplier Quality
- In Process Quality
- Voice of the Customer
- Group Problem Solving Exercises
- Review/Discussion of Problem Solving Exercises, “real” Results

4:00 pm **Day 2 Wrap Up**

5:00 pm **Odell Brewing Company Tour and Social Hour**
Use your Uber credits to get to/from 800 E Lincoln Ave, Fort Collins, CO 80524.

Wednesday – August 2

8:00 am **Chemistry in Brewing**
Kim Bacigalupo, Sierra Nevada Brewing Company
Katie Fromuth, Colorado State University
Dana Sedin, New Belgium Brewing Company

- Safety
- Good Laboratory Techniques
- MOA Overview and Standards Calculation
- Sampling, Degassing, and Sampling Stability
- Specific Gravity

- Exercise: Pipet and building a calibration curve
- pH and Titratable Acidity
- Spectrophotometer – Wort and Beer Methods
- Tristimulus
 - Exercise: IBUs
- Alcohol
- SO₂
- 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 Chemistry in Brewing Continued

**4:00 pm Day 3 Wrap Up
Open Night – No Activities**

Thursday – August 3

- 8:00 am Sensory Program Development**
Melissa Antone, Aroxa
Lindsay Barr, New Belgium Brewing
- Introduction to Sensory Analysis
 - Application of Methods for Quality Control
 - Other Sensory Methods
 - Panelist Training
 - Panelist Validation and Utilization
 - Conclusion and Review of Best Practices

12:00 pm Lunch Provided

- 12:30 pm** **Sensory Program Development Continued**
- 3:30 pm** **Day 4 Wrap Up**
- 4:00 pm** **Bus Departs**
Bus departs CSU Gifford Building and will return at approximately 10:00 pm
- 5:00 pm** **Sensory Beer Dinner at Blue Moon Brewing in Denver**
Bus transportation provided to/from 3750 Chestnut Place Denver, CO 80216.

Friday – August 4

- 8:30 am** **Raw Materials**
Christian Holbrook, New Belgium Brewing Company
- Hop Quality – Basics for Craft Brewers
 - Malt COA Interpretation – Breaking down the Numbers
 - Practical Session – Troubleshooting Raw Material Issues & Addressing them with the Supplier
- 11:30 am** **Lunch provided**
- 12:30 pm** **QA Management Systems**
Mary Burge, Kathinka Labs
- Introduction to QA Management Systems
 - Setting up Minimum Frequencies
 - In House Controls & Monitoring
 - Laboratory Maintenance
 - Organization Tools
 - Documentation and Controls
 - Quality roles in Process Improvement and Root Cause Analysis
- 4:00 pm** **Day 5 wrap up**