

We will start momentarily at 2pm ET



Download slides: <http://acswebinars.org/bamforth>

Contact ACS Webinars™ at acswebinars@acs.org

Upcoming ACS Webinars™

www.acswebinars.org/events



Thursday, September 2, 2010, 2-3 p.m. EDT

Programs and Funding Opportunities for Manufacturers and Small Chemical Businesses

Doug Devereaux, Senior Industrial Specialist, National Institute of Standards and Technology.



Thursday, September 9, 2010, 2-3 p.m. EDT

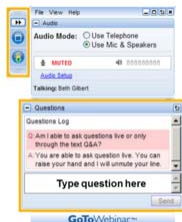
How Scientific Skills Are Used in Advising the Movie Industry – Facts and Fiction

Dr. Barry Byrne, Associate Chair and Professor, University of Florida.

Have Questions?



Please use the Question Panel to ask the speaker



Or tweet us using #acswebinars



Download slides: <http://acswebinars.org/bamforth>

ACS WEBINARS™ August 26, 2010



Tapping into the Chemistry of Beer and Brewing



Speaker: Charles Bamforth, Ph.D., D.Sc.
University of California, Davis



Moderator: Steven Carlo, Ph.D.
Chemist, Home Brewer

Please submit your questions for the speaker via the
Questions Panel in GoToWebinar

Slides download at: <http://acswebinars.org/bamforth>

Contact ACS Webinars™ at acswebinars@acs.org

Tapping into the Chemistry of Beer and Brewing



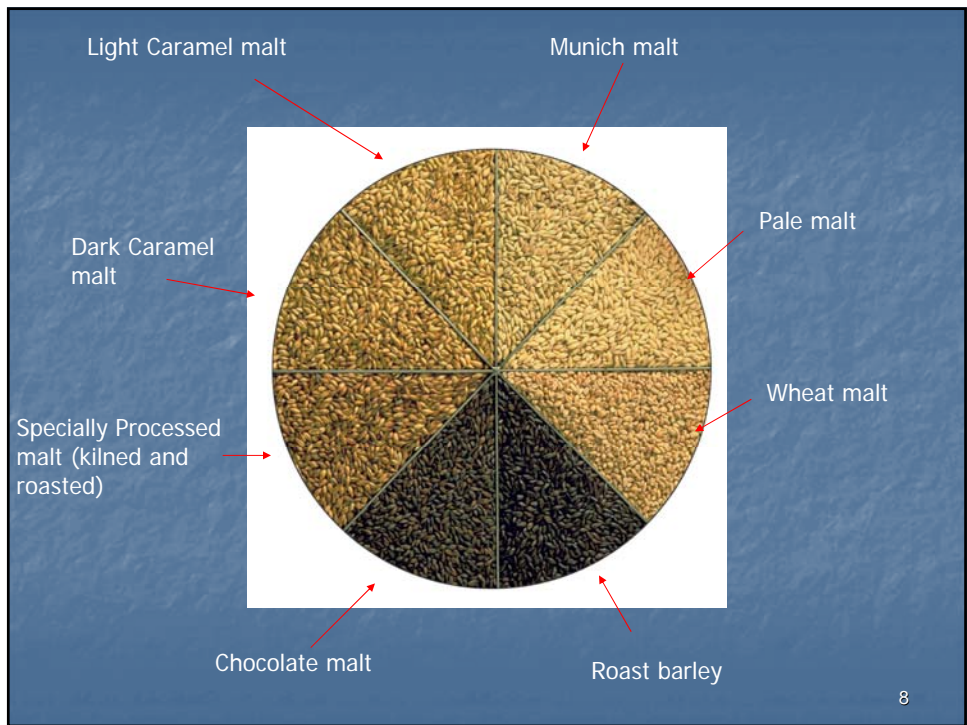
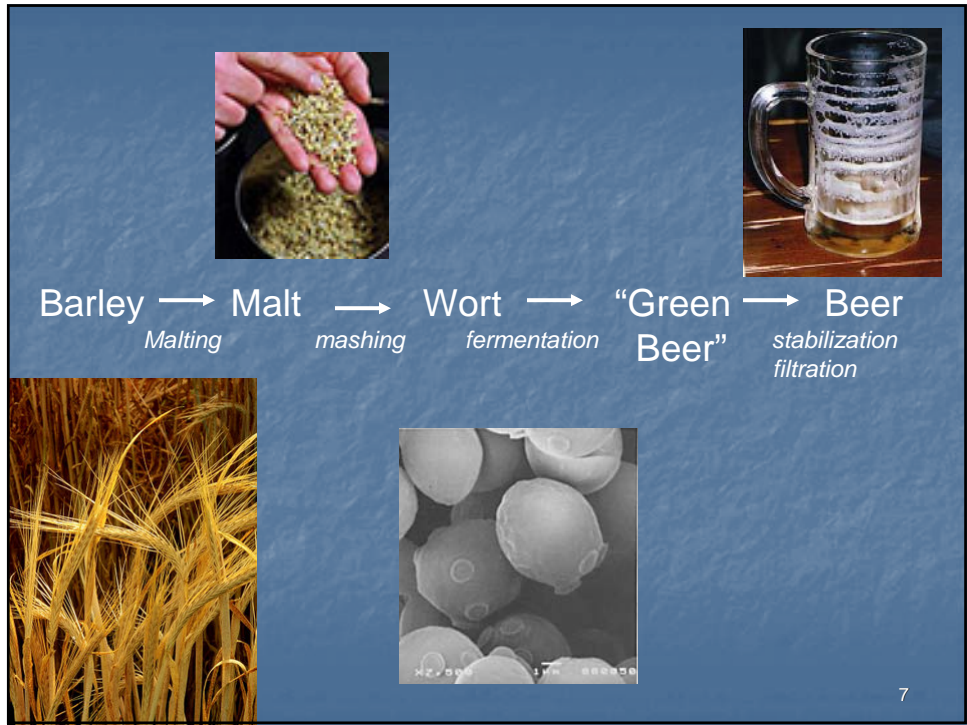
Charlie Bamforth



ACS Webinar August 26 2010



6

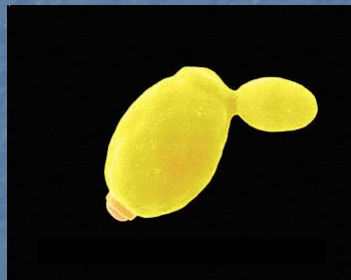




Resins

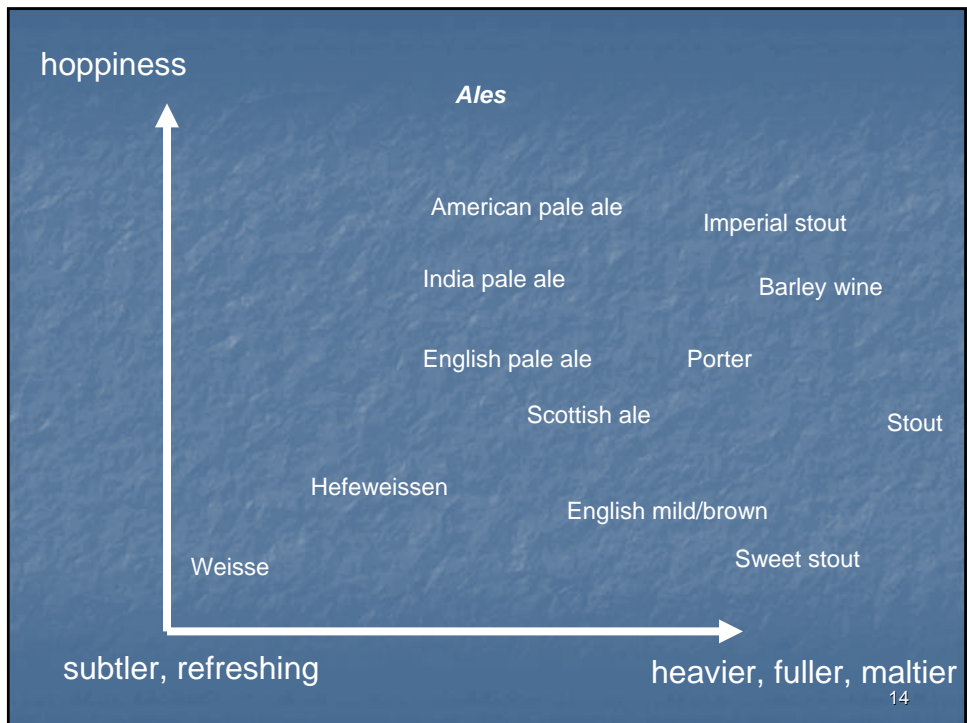
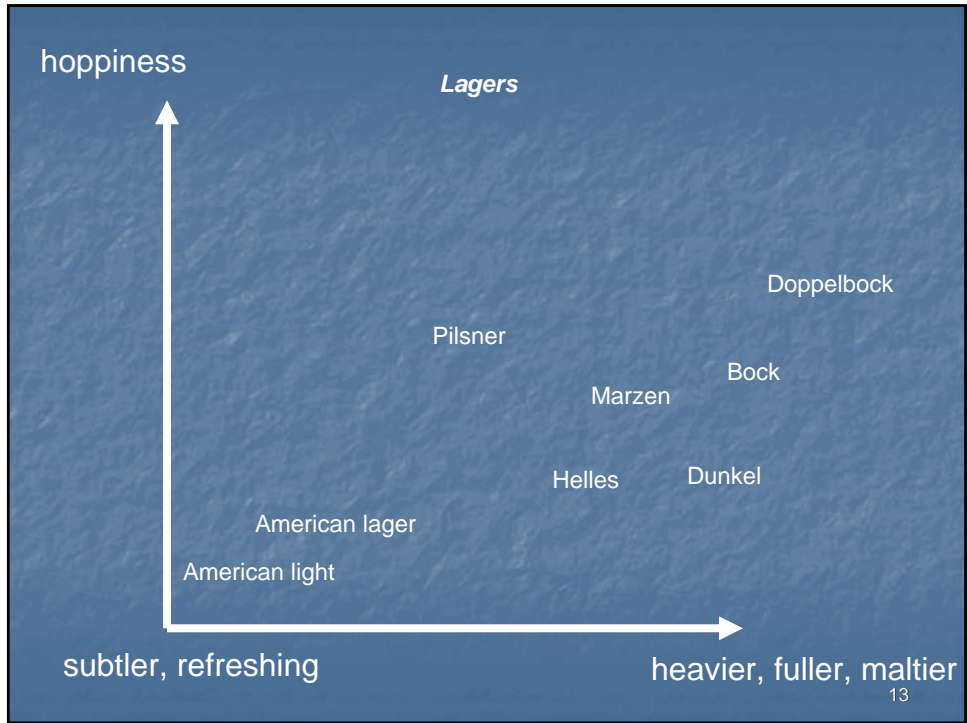
Oils

9



Saccharomyces cerevisiae
Saccharomyces pastorianus

10





Hefeweissen



15



Lambic

Enterobacteria
Kloeckera apiculata
Saccharomyces cerevisiae
S. pastorianus
S. bayanus
S. globosus
S. dairensis
Pedicococcus damnosus
P. cerevisiae
Lactobacillus
Brettanomyces lambicus
B. bruxellensis.
Candida
Hansenula
Pichia

16



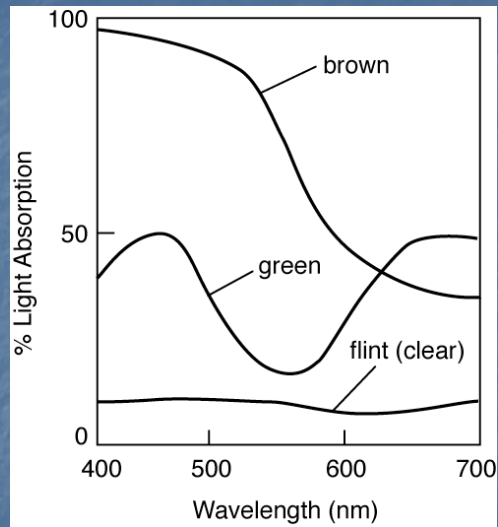
17

Brettanomyces

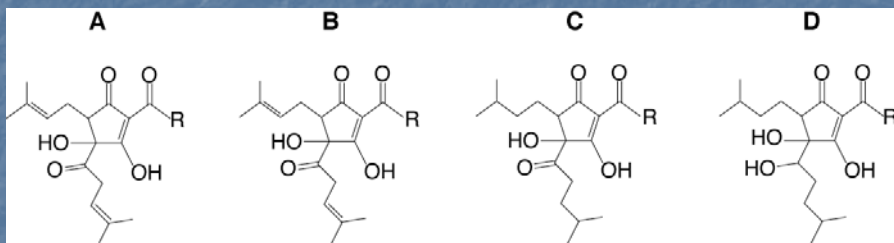


"...if used properly with care, it can add rich aromas and flavors of earthiness, leather, smoke, barnyard, & our favorite descriptor - wet dog in a phone booth."

18



19



rho

tetra

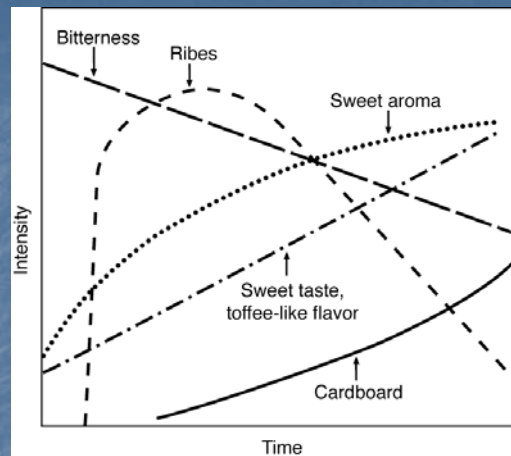
hexa

20

Flavor compounds produced by yeast

- Esters
- Alcohols
- Acids
- Vicinal diketones
- Sulfur compounds
- Acetaldehyde
- Short-chain fatty acids

21



Carbonyls e.g. E-2-nonenal

22

Carbon Dioxide

- 1-3 'volumes'
- 'Sparkle'
- Volatile delivery
- 'Tingle'
- Foam

23

Nitrogen

- Foam (10-50 mg. L⁻¹)
- Suppression of hoppy character

24

Oxygen

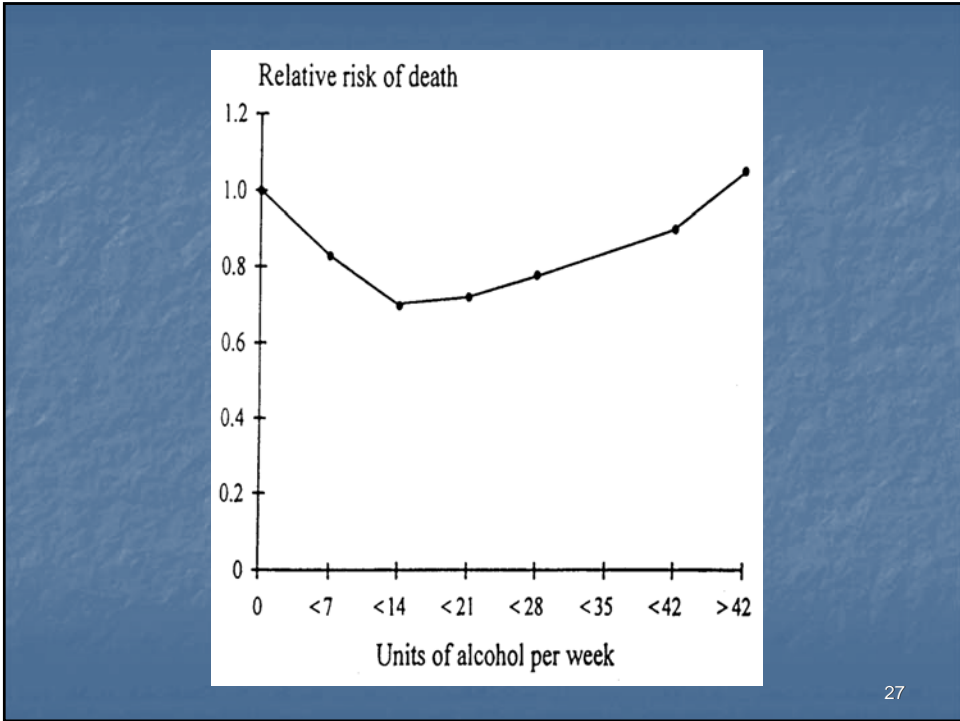
- Staling
- Haze

25

Ethanol

- 3-6% ABV mostly
- Direct effect on flavor
- Indirect effect on flavor
- Foaming - surface tension, inhibition
- Effect on health

26



27

But beer can make a significant contribution to dietary intake

Parameter	Daily adult (age 25-50) requirement		Range in beer (per litre)
	Male	Female	
Energy (Kcal)	2550	1940	150-1100
Protein (g)	63	50	3-5
Carbohydrate (g)	a	a	0 - 61
Fat (g)	a	a	Neg.
Vitamin A (µg)	1000	800	Neg.
Vitamin D (µg)	5	5	Neg.
Vitamin E (mg)	10	8	Neg.
Vitamin K (µg)	80	65	Neg.
Vitamin C (mg)	60	60	Up to 30
Thiamine (mg)	1.5	1.1	0.003-0.08
Riboflavin (mg)	1.7	1.3	0.02-0.8
Niacin (mg)	19	15	3-8
Vitamin B ₆ (mg)	2.0	1.6	0.07-1.7
Folate (µg)	200	180	40-600
Vitamin B ₁₂ (µg)	2	2	3-30
Biotin (µg)	30-100	20-100	2-15
Calcium (mg)	800	800	40-140
Phosphorus (mg)	800	800	90-400
Magnesium (mg)	350	280	60-200
Potassium (mg)			330-1100
Sodium (mg)			40-230
Iron (mg)	10	15	0.1-0.5
Zinc (mg)	15	12	0.01-1.48
Selenium (µg)	70	55	<0.4-7.2

The importance of beer as part of a **well-balanced** diet

Silicon

28

Proteins

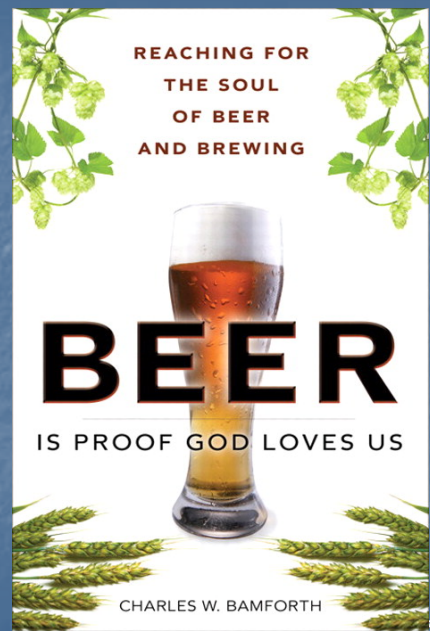
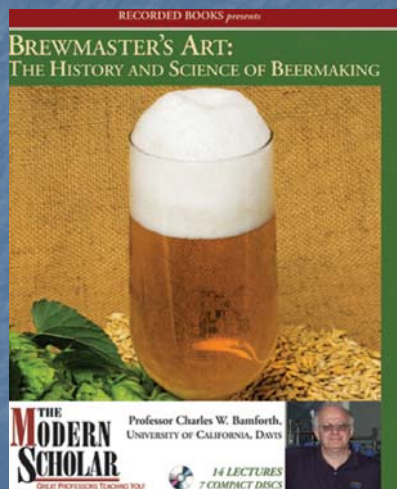
Amphipathic polypeptides - foam

Lipids

Foam inhibitory
Staling

29

cwbamforth@ucdavis.edu



30

Q&A SESSION



Tapping into the Chemistry of Beer and Brewing



Speaker: Charles Bamforth, Ph.D., D.Sc.
University of California, Davis



Moderator: Steven Carlo, Ph.D.
Chemist, Home Brewer

Please submit your questions for the speaker via the
Questions Panel in GoToWebinar

Slides download at: <http://acswebinars.org/bamforth>

Contact ACS Webinars™ at acswebinars@acs.org

More Questions?



ACS Webinars™
Post-Event Discussion Board
<https://communities.acs.org/groups/acswebinars>

Upcoming ACS Webinars™

www.acswebinars.org/events



Thursday, September 2, 2010, 2-3 p.m. EDT

Programs and Funding Opportunities for Manufacturers and Small Chemical Businesses

Doug Devereaux, Senior Industrial Specialist, National Institute of Standards and Technology.



Thursday, September 9, 2010, 2-3 p.m. EDT

How Scientific Skills Are Used in Advising the Movie Industry – Facts and Fiction

Dr. Barry Byrne, Associate Chair and Professor, University of Florida.



ACS Webinars™ does not endorse any products or services. The views expressed in this presentation are those of the presenter and do not necessarily reflect the views or policies of the American Chemical Society.