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ACS WEBINARS™
August 11, 2011

Advances and Innovations in Wine Chemistry

Susan Ebeler,
University of California, Davis

Bill Courtney,
Cheese-ology,
St. Louis, MO

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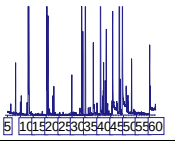
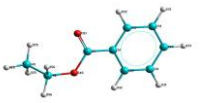
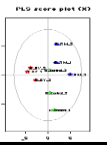
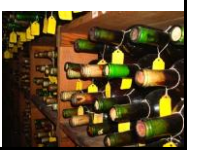
Advances and Innovations in Wine Chemistry and Flavor

Susan E. Ebeler
Department of Viticulture and Enology
University of California, Davis, CA









GRAPES
(white or red)

GRAPES
(white or red)

Destem
Crush*

WHOLE MUST
(white or red)

GRAPES
(white)

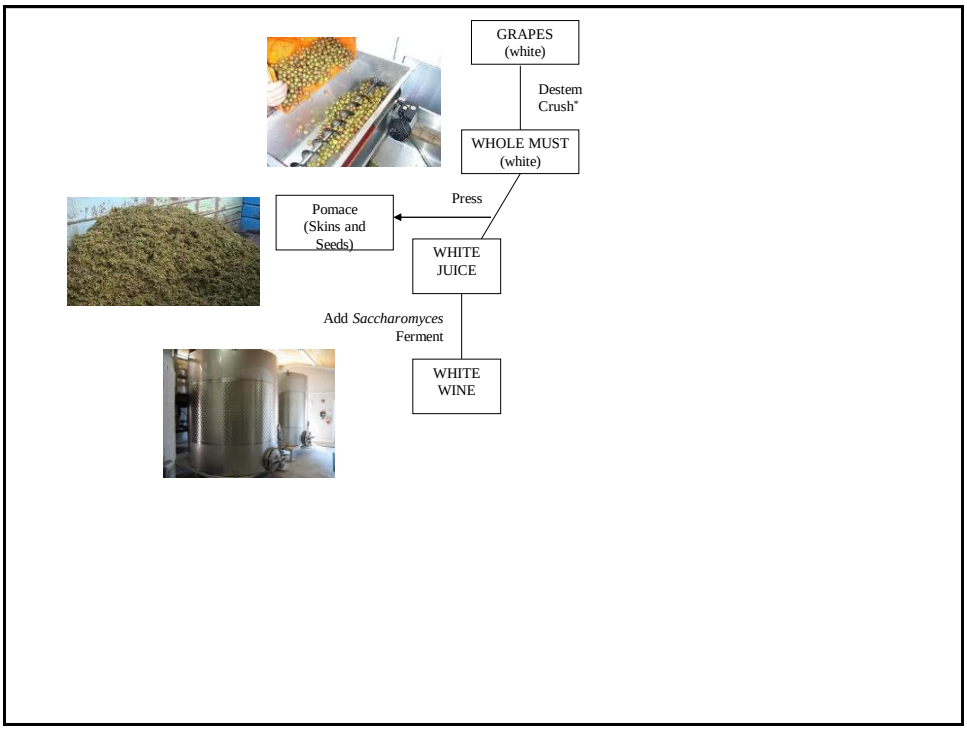
Destem
Crush*

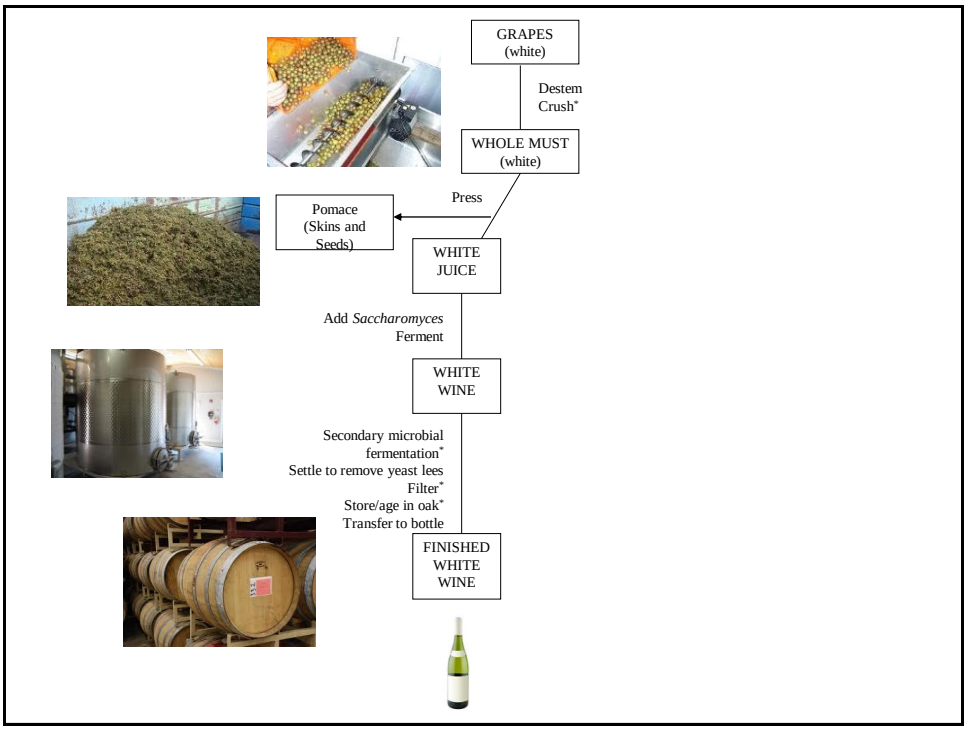
WHOLE MUST
(white)

Press

Pomace
(Skins and
Seeds)

WHITE
JUICE


GRAPES
(white)
Destem
Crush*
WHOLE MUST
(white)
Press
Pomace
(Skins and
Seeds)
WHITE
JUICE
Add *Saccharomyces*
Ferment
WHITE
WINE


GRAPES
(white)
Destem
Crush*
WHOLE MUST
(white)
Press
Pomace
(Skins and
Seeds)
WHITE
JUICE
Add *Saccharomyces*
Ferment
WHITE
WINE
Secondary microbial
fermentation*
Settle to remove yeast lees
Filter*
Store/age in oak*
Transfer to bottle
FINISHED
WHITE
WINE

GRAPES
(red)

Destem
Crush*

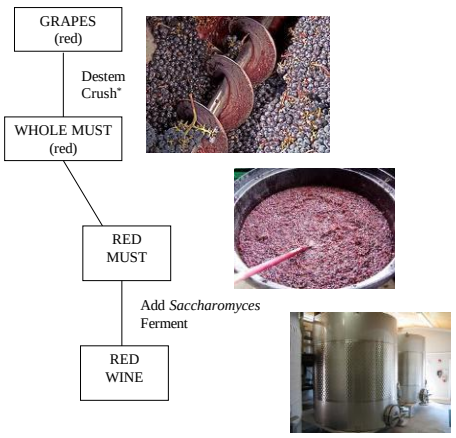
WHOLE MUST
(red)

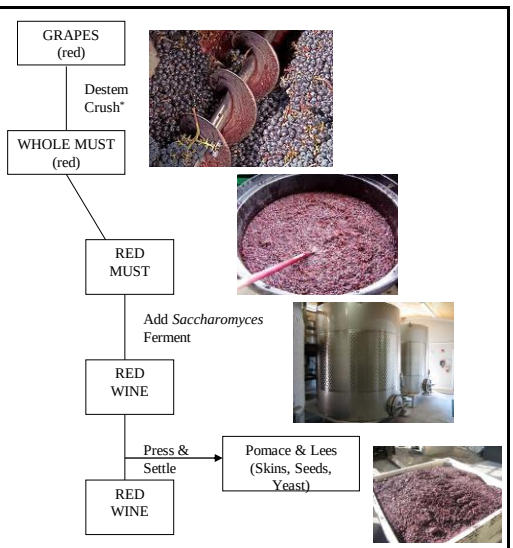
GRAPES
(red)

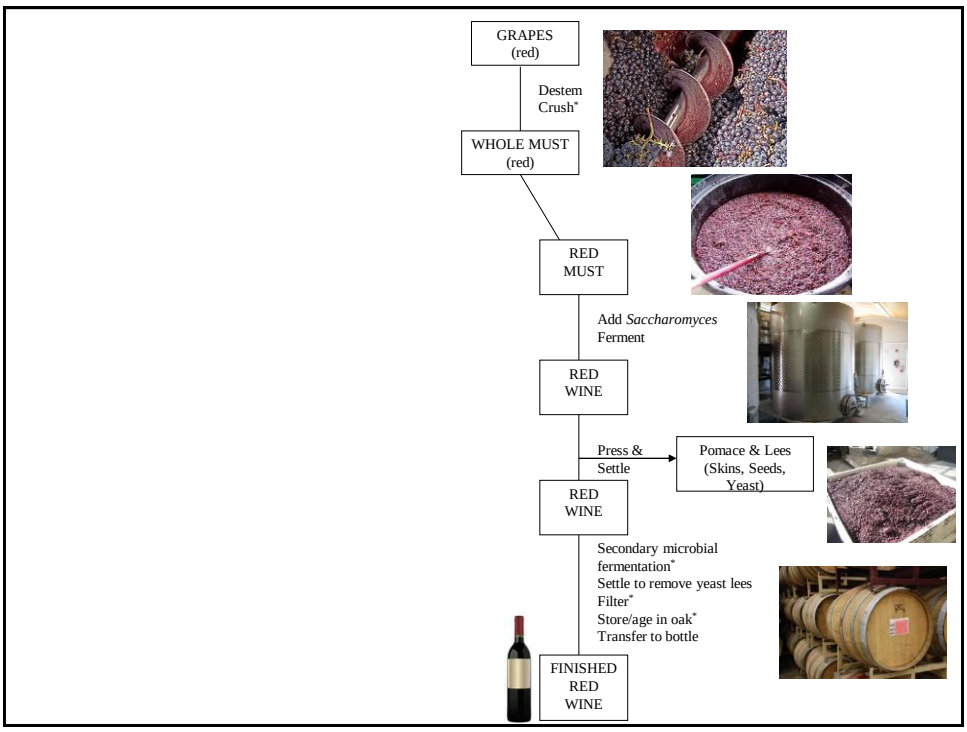
Destem
Crush*

WHOLE MUST
(red)

RED
MUST


GRAPES
(red)
Destem
Crush*
WHOLE MUST
(red)
RED
MUST
Add *Saccharomyces*
Ferment
RED
WINE


GRAPES
(red)
Destem
Crush*
WHOLE MUST
(red)
RED
MUST
Add *Saccharomyces*
Ferment
RED
WINE
Press &
Settle
Pomace & Lees
(Skins, Seeds,
Yeast)
RED
WINE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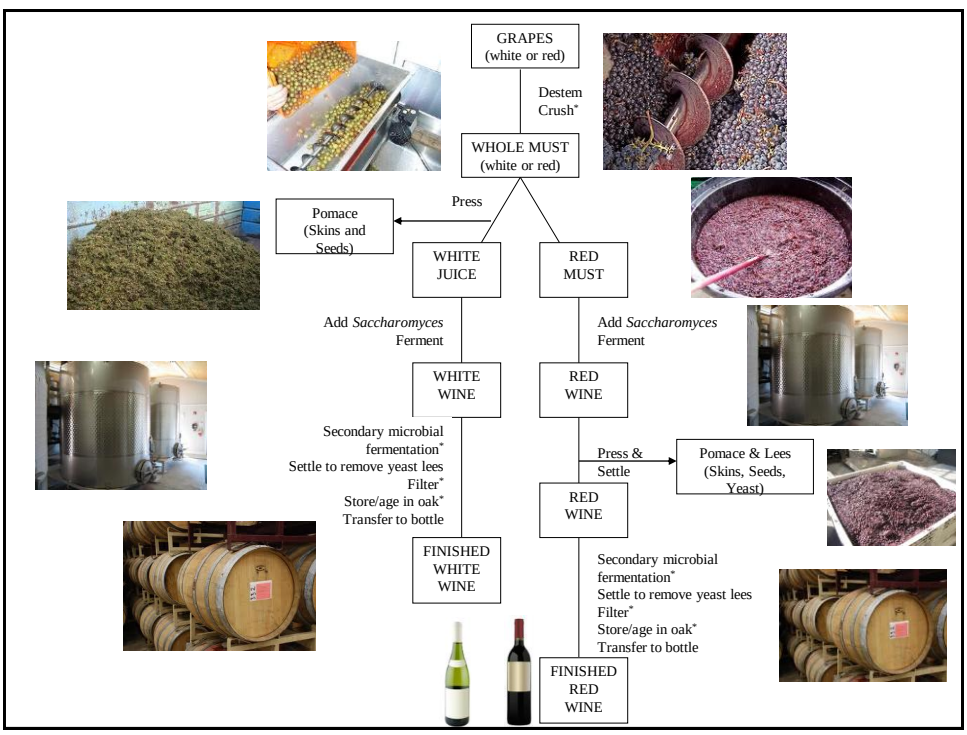
Destem
Crush*
WHOLE MUST
(red)
RED
MUST
Add *Saccharomyces*
Ferment
RED
WINE
Press &
Settle
Pomace & Lees
(Skins, Seeds,
Yeast)
RED
WINE
Secondary microbial
fermentation*
Settle to remove yeast lees
Filter*
Store/age in oak*
Transfer to bottle
FINISHED
RED
WINE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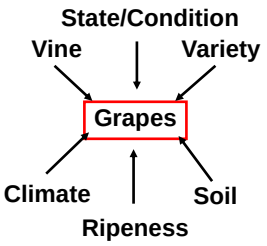
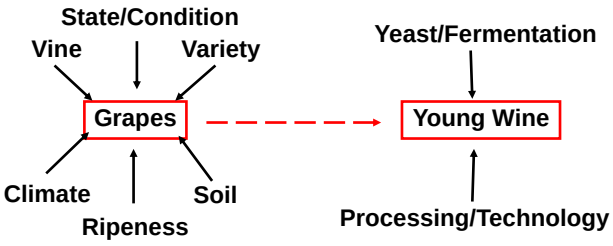
RED
WINE
FINISHED
WHITE
WINE
Secondary microbial
fermentation*
Settle to remove yeast lees
Filter*
Store/age in oak*
Transfer to bottle
FINISHED
RED
WINE

Wine Chemistry and Flavor



Adapted from Schreier, CRC Crit Rev Food Sci Nutr, 12(1): 59-111 (1979)

Wine Chemistry and Flavor



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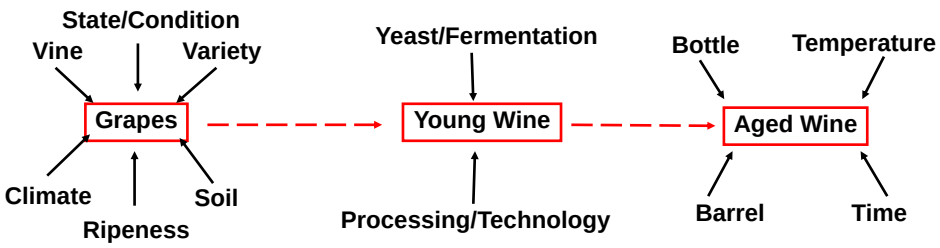
Wine Chemistry and Flavor



Adapted from Schreier, CRC Crit Rev Food Sci Nutr, 12(1): 59-111 (1979)

Understanding Wine Flavor

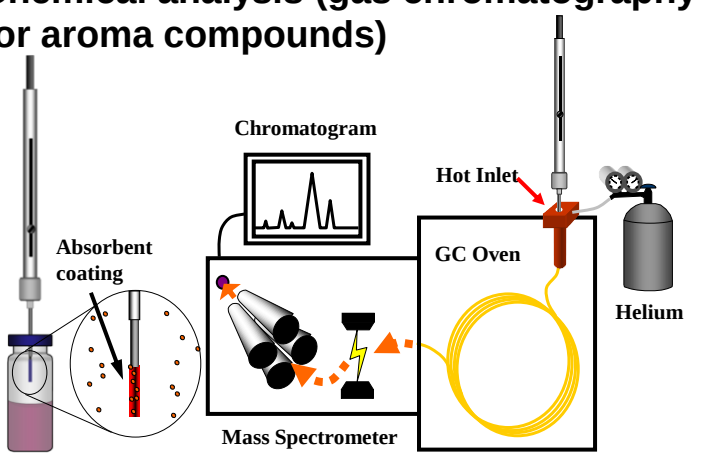
- WHAT IS FLAVOR?
- A perceptual construct comprised of multisensory inputs:
- Taste
- Aroma
- Color
- Texture/Mouthfeel

Understanding Wine Flavor

- What flavor compounds are present and how much?
- How do these compounds impact sensory properties? Individually and as complex mixtures?
- How do viticultural, winemaking practices effects grape/wine?

How do we measure flavor?

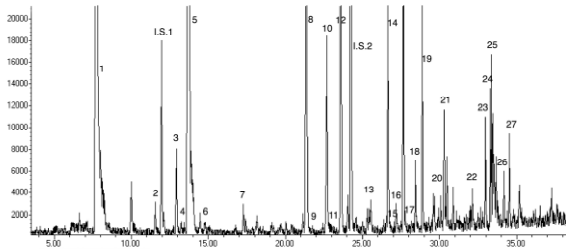
- Chemical analysis (gas chromatography for aroma compounds)



N. Lloyd, 2010

How do we measure flavor?

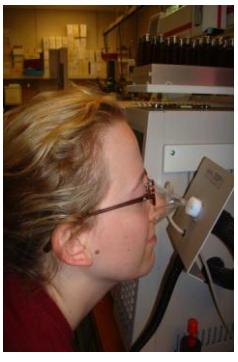
- **Chemical analysis--Cabernet Sauvignon grapes**



Canuti et al., J. Chromatogr. A (2009) 1216: 3012-3022

How do we measure flavor?

- **Combine instrumental and sensory information**



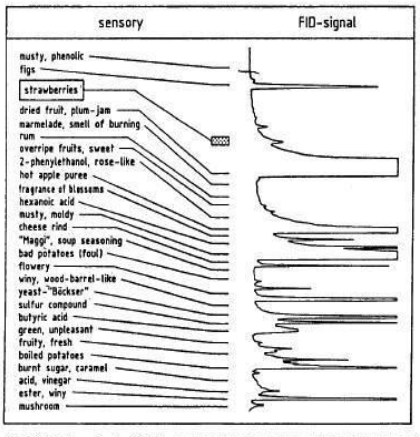
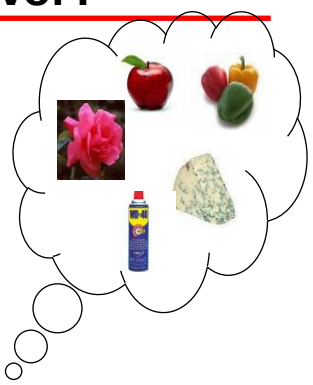


Fig. 18. Section of a "sniff"-chromatogram of an aroma extract of a grape variety with a typical strawberry-like flavour (cultivar: Pollux)

Rapp, 1988, Wine Analysis, Linskens and Jackson, Eds, Springer, Berlin

How do we measure flavor?

- Sensory Analysis

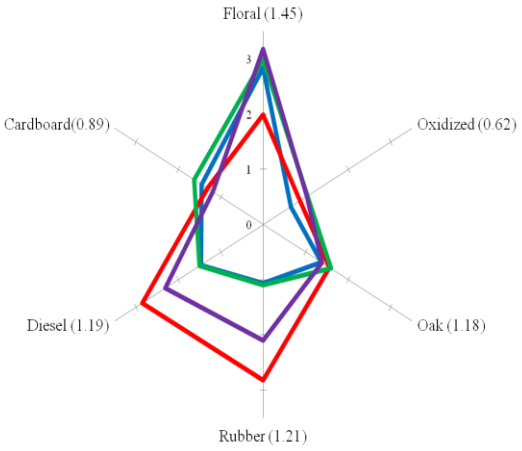


How do we measure flavor?

- Sensory Analysis
- Controlled conditions (light, temperature, serving conditions, etc)
- Requires panelist training
- Human becomes an analytical "instrument" to provide information about sensory attributes

How do we measure flavor?

- **Sensory Analysis**



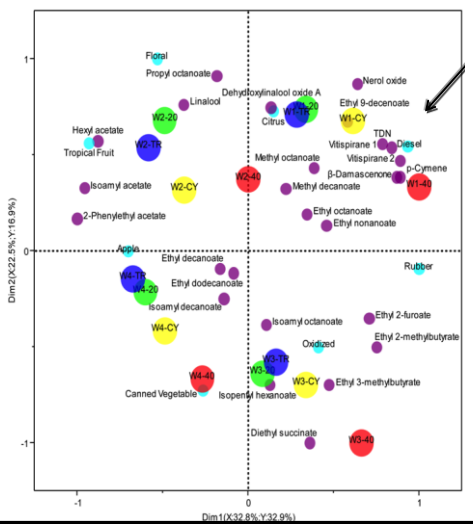
Riesling

Robinson et al.,
Am J. Enol. Vitic. 2010,
61: 337-347

Increased temp. → increased diesel & rubber

How do we measure flavor?

- **Statistics to relate chemical and sensory information**

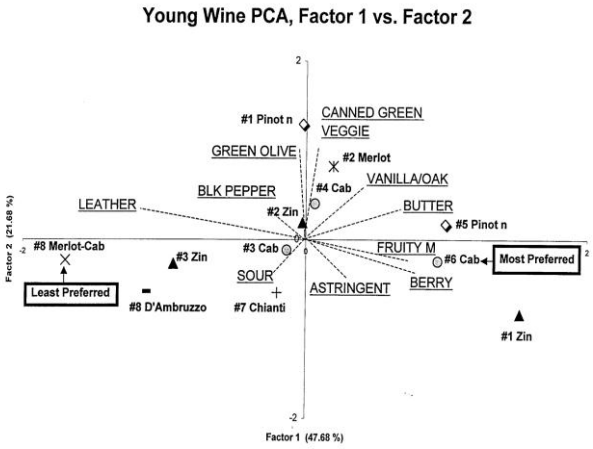


Riesling

Robinson et al.,
Am J. Enol. Vitic. 2010

How do we measure flavor?

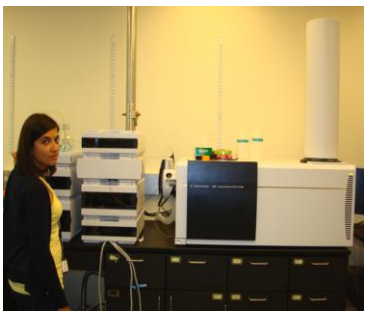
- Linking to consumer preferences

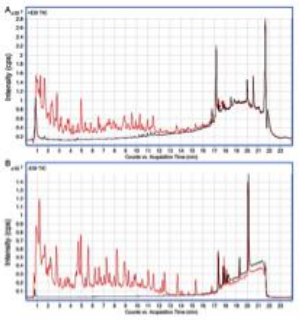


Ebeler, 1999 (courtesy of Dr. Ann Noble), Flavor Chemistry: Thirty Years of Progress, Teranishi et al. Eds., Kluwer, New York

New Tools to Measure Chemical Composition

- Nonvolatile compounds-HPLC-TOFMS
- Measure hundreds of compounds with exact mass information
- Identify new compounds
- Chemometrics to classify sample groups

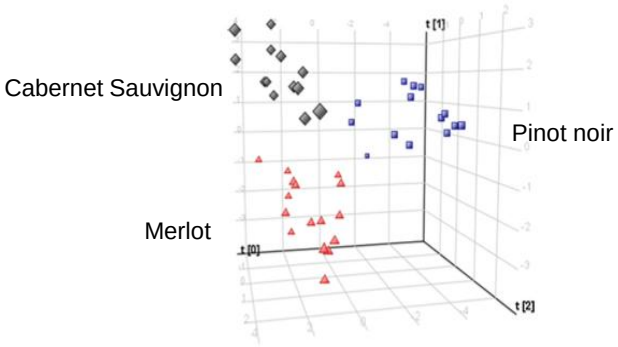




Vaclavek et al. 2011, Anal. Chim. Acta, 685: 45-51

New Tools to Measure Chemical Composition

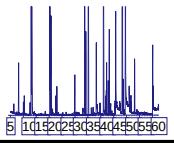
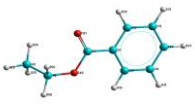
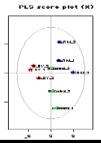
- **Can we measure differences in wine composition?**



Vaclavek et al. 2011, Anal. Chim. Acta, 685: 45-51

Summary

- **Wine chemistry and flavor are complex.**
- **Use chemical and analytical tools to identify and quantify compounds.**
- **Use sensory tools to relate compositional information to sensory properties/attributes.**
- **Use these approaches to study viticultural, winemaking, storage, etc. effects on flavor (chemistry and sensory).**
- **Relate to consumer preferences.**

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  http://extension.ucdavis.edu/unit/winemaking/certificate/winemaking/
- University Extension 1- and 2-Day Shortcourses

  http://extension.ucdavis.edu/index.asp

References/Information Sources

- Principles and Practices of Winemaking, Boulton et al., Chapman & Hall, 1996 (ISBN 0-412-06411-1)
- Chemistry of Wine Flavor, Waterhouse & Ebeler, American Chemical Society, 1998 (ISBN 0-8412-3592-9)
- Authentication of Food and Wine, Ebeler et al., American Chemical Society, 2007 (ISBN 978-08412-3965-4)
- Polaskova et al., *Chemical Society Reviews*, 2008, 37: 2478-2489, DOI: 10.1039/b714455p
- Ebeler and Thorngate, *J. Agric. Food Chem*., 2009, 57: 8090-8108, DOI: 10.1021/jf9000555
- *Journal of Agricultural and Food Chemistry*
- *American Journal of Enology and Viticulture*

Q&A Session

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Advances and Innovations in Wine Chemistry

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Paul Weiss

Thursday, August 25, 2011

Small is Beautiful: Everyday Applications and Advances in Nanochemistry

Dr. Paul Weiss, editor of ACS Nano and Director of California NanoSystems Institute

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