Indiana, Here We Come: A Fresh Look at the Science and Art of Winemaking!

Dr. Christian Butzke
Director of Winemaking
Sakonnet Vineyards
A brief introduction:

**Dr. Christian E. Butzke**
Director of Winemaking
*Sakonnet Vineyards*
OUTLINE

• Wine Color
• Vintage Quality
• Corks & Closures
• Wine Storage
Grapes: 75%
Equipment: 10%
Barrels: 10%
Winemaker: 5%

Thomas Eddy, 2000
In: Wine Marketing
University Press
WineGrape Quality

Weather: 75%
Pest Mgmt: 10%
Soil: 5%
Trellis: 5%

CEB, 2005
Grapes are grown in the vineyard.

Wine is made in the winery.

Anon. Winemaker
Napa Valley, 2000
(L)Attitude

Oregon

New England

France

California

Indiana

Iberia

42°

32°
Vidal Blanc
Gewürztraminer
Chardonnay
Cabernet Franc
OUTLINE

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The Color of Wine

“Anthocyanins”

Berry:
- 100% in skin
- 0% in seeds
- 0% in pulp

Wine:
- 25% Cabernet
- 15% Pinot noir

Dr. Roger Boulton
UC DAVIS
Copigmentation or 2 + 0 = 3

Anthocyanin

Cofactor

Anthocyanin

Copigment Stack
Cap Management Technique

Does it matter?
Cap Management Technique

Say NO to Crack!
Relationships between Copigmented Color and Red Wine Color

- Cabernet Sauvignon
- Pinot Noir
- Merlot
- Petite Sirah

Graph showing the correlation between copigmented anthocyanin (mg/L) and red wine color (OD 520nm).
Wine Color

Photo: Wine Spectator
Co-Fermentation

Historically:
- Pinot Noir/Pinot
- Syrah/Viognier
- Sangiovese/Trebbiano

Photo: Wine Spectator
Wine Color
Brix
- 20.0 - 21.1
- 21.1 - 22.1
- 22.1 - 23.0
- 23.0 - 24.9

Range: 20.0 - 24.9
Mean: 22.1 +/- 0.9
• Wine Color
• Vintage Predictions
• Corks & Closures
• Wine Storage
Artificial Neural Networks

"Lots of raspberry jam and vanilla with a hint of exotic spice. A well-balanced wine that finishes with a touch of creamy smokiness."
Artificial Neural Networks

Viticulture

Clone
Rootstock
Weather
Soil Type
Vine Spacing
Irrigation
Fertilizer
Pest Control
Yield
Management

Grape Juice Characteristics
Inoculum Characteristics
Processing Parameters

Dr. David Block
UCDAVIS

Fermentation Kinetics
Chemical Analysis
Sensory Analysis
# Weather Effects on Cabernet Quality

## Inputs:

<table>
<thead>
<tr>
<th>Average Temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. May 2 - July 1 (Previous Year)</td>
</tr>
<tr>
<td>2. April 16 - May 15</td>
</tr>
<tr>
<td>3. May 16 - June 14</td>
</tr>
<tr>
<td>4. June 15 - June 29</td>
</tr>
<tr>
<td>5. June 29 - July 14</td>
</tr>
<tr>
<td>6. July 15 - July 29</td>
</tr>
<tr>
<td>7. July 29 - August 13</td>
</tr>
<tr>
<td>8. August 14 - August 28</td>
</tr>
<tr>
<td>9. August 28 - September 12</td>
</tr>
</tbody>
</table>

## Outputs:

<table>
<thead>
<tr>
<th>Napa Cabernet Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wine Spectator</td>
</tr>
<tr>
<td>Wine Advocate</td>
</tr>
<tr>
<td>1975 - 1996</td>
</tr>
</tbody>
</table>
Predicting Optimal Temperature Profiles

Model Fit
\[ R = 0.773 \]
\[ (p < 0.001) \]

Neural Network Fit
Mean Temperature

Data Source: www.weather.com
Annual Precipitation

Data Source: www.weather.com
• Wine Color
• Vintage Quality
• Corks & Closures
• Wine Storage
Corks

- bark dedusted
- bark 1934
- agglomerated Twin-Top
- molded Cellukork
- molded SupremeCorq
- extruded Ecork
The End of Corks?

$135 per bottle!
Cork Taint

2,4,6-Trichloroanisole

= musty, moldy smell
TCA Formation

**Chlorination**  **Methylation**

Lignin $\rightarrow$ Phenol $\rightarrow$ Chlorophenol $\rightarrow$ Chloroanisole

**Methylation**  **Chlorination**

Lignin $\rightarrow$ Phenol $\rightarrow$ Anisole $\rightarrow$ Chloroanisole

Methylation

Penta/Tetra-Chlorophenol $\rightarrow$ Chloroanisole
Oxygen Permeability of Corks

![Graph showing oxygen permeability comparison between synthetic and bark corks.](image-url)

- Synthetic Corks
- Bark Corks

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ASEV Annual Meeting Seminar

The Science of Closures

Seattle - June 24, 2005

Co-Chairs:

• Christian Butzke, Sakonnet Vineyards
• Patricia Howe, Allied Domecq
OUTLINE

• Wine Color
• Vintage Quality
• Corks & Closures
• Wine Storage
Monitoring of Wine Shipments

Summer 2000:
Atlanta, GA
Austin, TX
Brooklyn, NY
Cerritos, CA
Chicago, IL
Glen Rock, NJ
New Orleans, LA
Raleigh, NC
Tampa, FL
Data Acquisition

External Probe

Model wine

Temperature data logger
Heat Exposure en Route

To: Chicago, IL
Heat & Cold Stabilization

A Discussion