

Frankfurt International Airport

Terroir around Frankfurt Airport
(Geology and Wine in Franconia)

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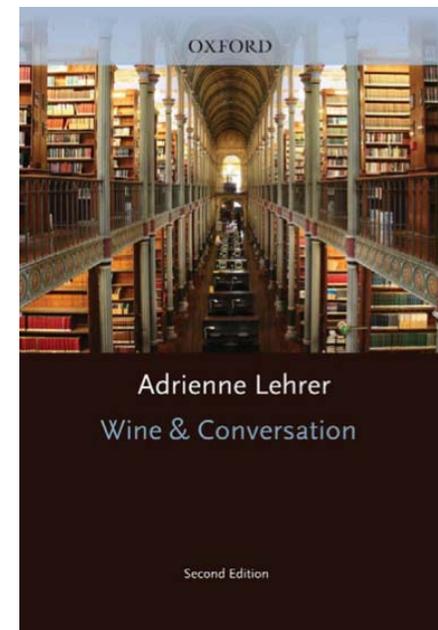
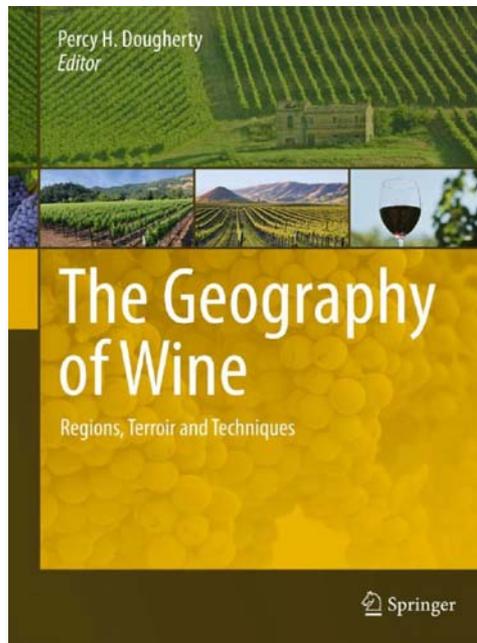
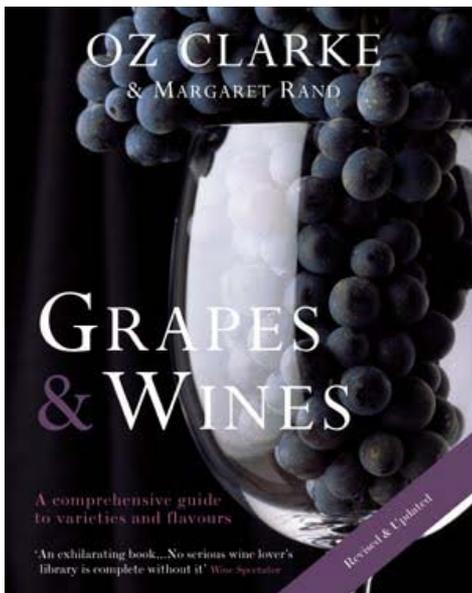
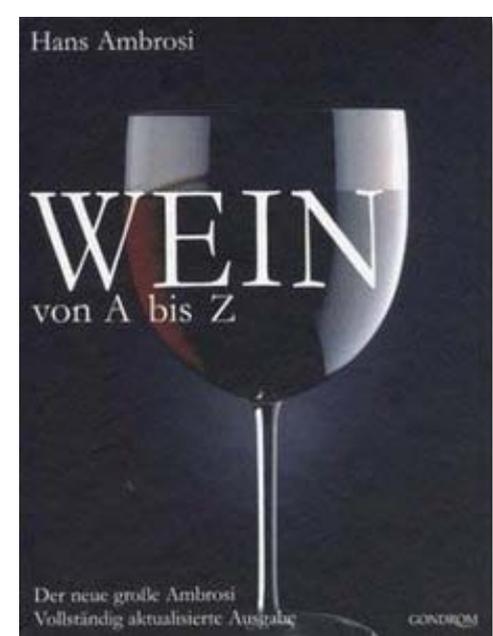
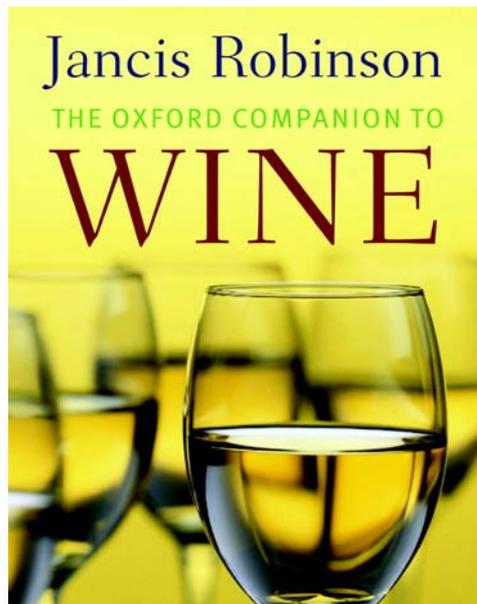
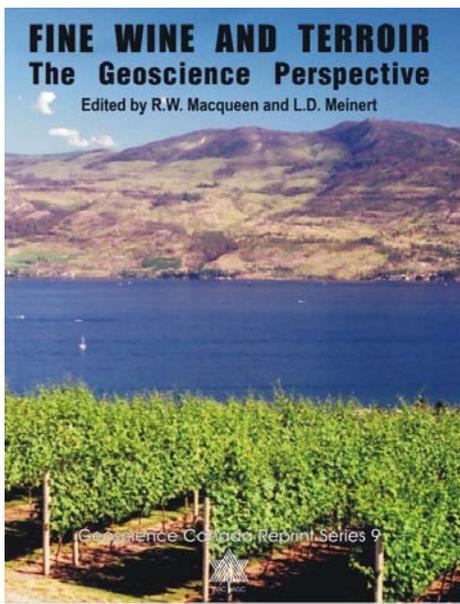
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Jürgen KRAUS
Ph.D., Dipl. Geol., P.Geo.
President

Egelsbach





Around Fraport?

What is Terroir?



FRAPORT since 1936 // 2 large terminals

Main hub of LUFTHANSA German Airlines

Serves 264 destinations in 113 countries

57.5 MM passengers (2012)

11th busiest airport in the world/3rd busiest in Europe

2nd busiest airport by cargo traffic

South side hosted **Rhein-Main Airbase** (1947-2005)



Franconia: -> Franks (3rd century A.D.), Lower and Middle Rhine

Frankfurt: *Vadum Francorum* (794) -> Frankonfurd ["ford of the Franks"]

France: from the Franks...Frankish Empire ->France established in the 8th century



VER CRUISES >
ss Alps to Holland's North Sea,
most famous
mposing mec
r Cruises
Rhine River
Cruise Expe



MAIN RIVER CRUISES >
Quaint, quiet, and quintessentially Germany, the
surely through the country's most
s, passing hilltop castles and
ieval villages alike.
n River Cruises
se the Main River?
Main Cruise Expert

Al Franken

Frankenstein



FRANCONIA (FRANKEN)

Rhineland

<- FRANCE

FRANKFURT

Main

Frank'n'furter
Frankfurter sausage



Calgary

Medicine Hat



Rhine

Rhineland

Koblenz



Château Migraine
TERROR!



FRANKFURT

Main

Frankfurt International Airport

WÜRZBURG

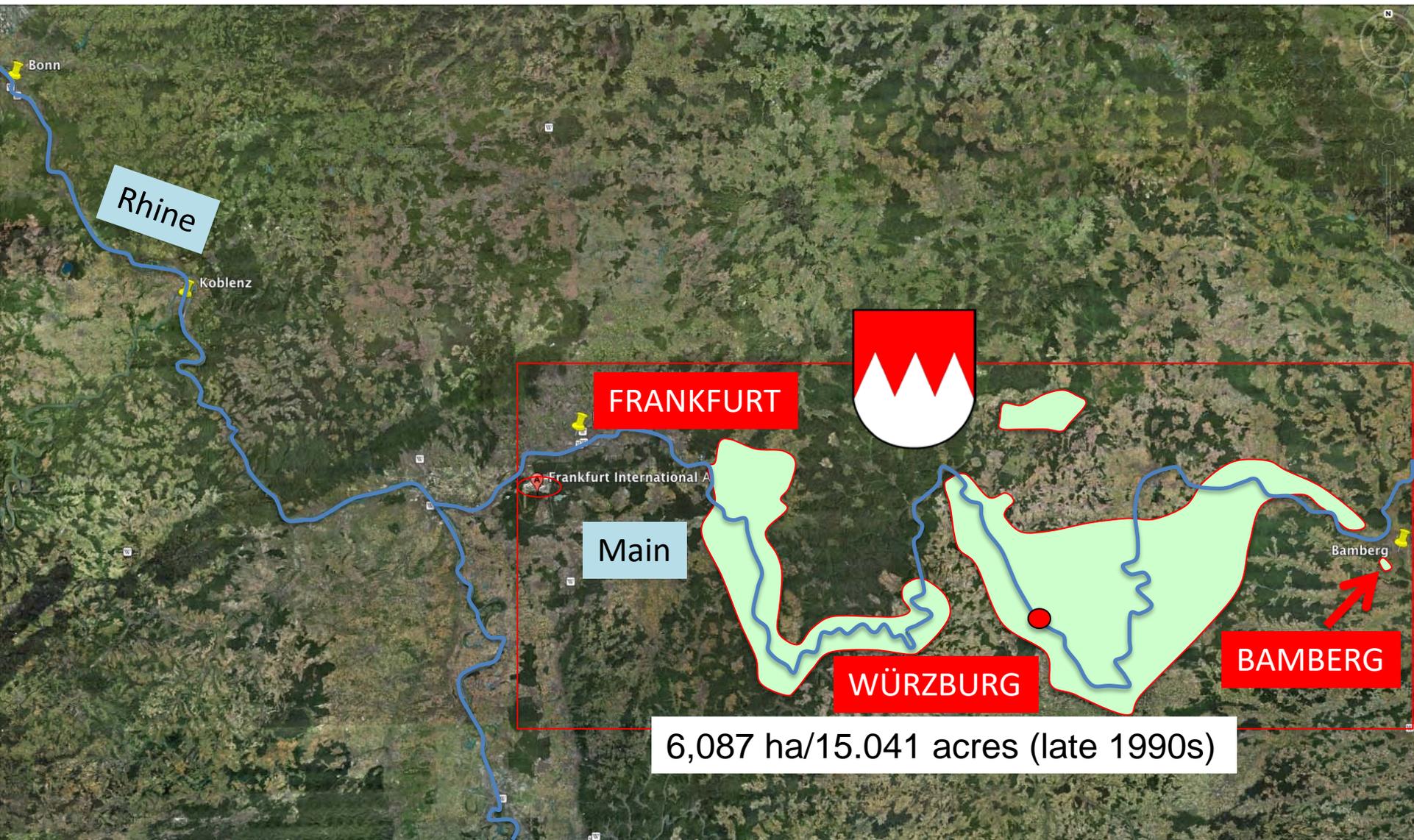
BAMBERG

FRANCONIA (FRANKEN)



Calgary

Medicine Hat



Rhine

Bonn

Koblenz

FRANKFURT



Frankfurt International A

Main

WÜRZBURG

BAMBERG

Bamberg

6,087 ha/15.041 acres (late 1990s)



Calgary

Medicine Hat



Bamberg – World Beer Capital

- 1093: first beer brewing documented
- 1122: brewing rights awarded to Benedictine monks
- 1439: 440 l annual beer consumption per capita
- 1516: Bavarian purity law introduced
- 1818: 65 breweries produce 4,000,000 l beer for 17,000 people
- 1902: 36 breweries produce 16,000,000 l beer for 38,000 people
- Today: 280 l annual consumption per capita, 9 private breweries



Franconia Geoscience Ltd.
Consulting for International Hydrocarbon Exploration since 2003

**Beer Geology of Franconia (Northern Bavaria):
900 years of flow**

Jürgen Kraus
Franconia Geoscience Ltd.
Calgary, Alberta
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Structural Geology Emplaced Reservoirs Unconventional Emptier Exploration

Why Beer?

- Steady flow
- Always commercial flow rates
- No pressure decline
- No pipelines required
- Recession proof
- → No risk!

Malm: Kimmeridgean reef limestone
→ highly increased brewery density

Dogger
Lias

Keuper (Rhaetian):
arkosic sandstone → storage
faults → water

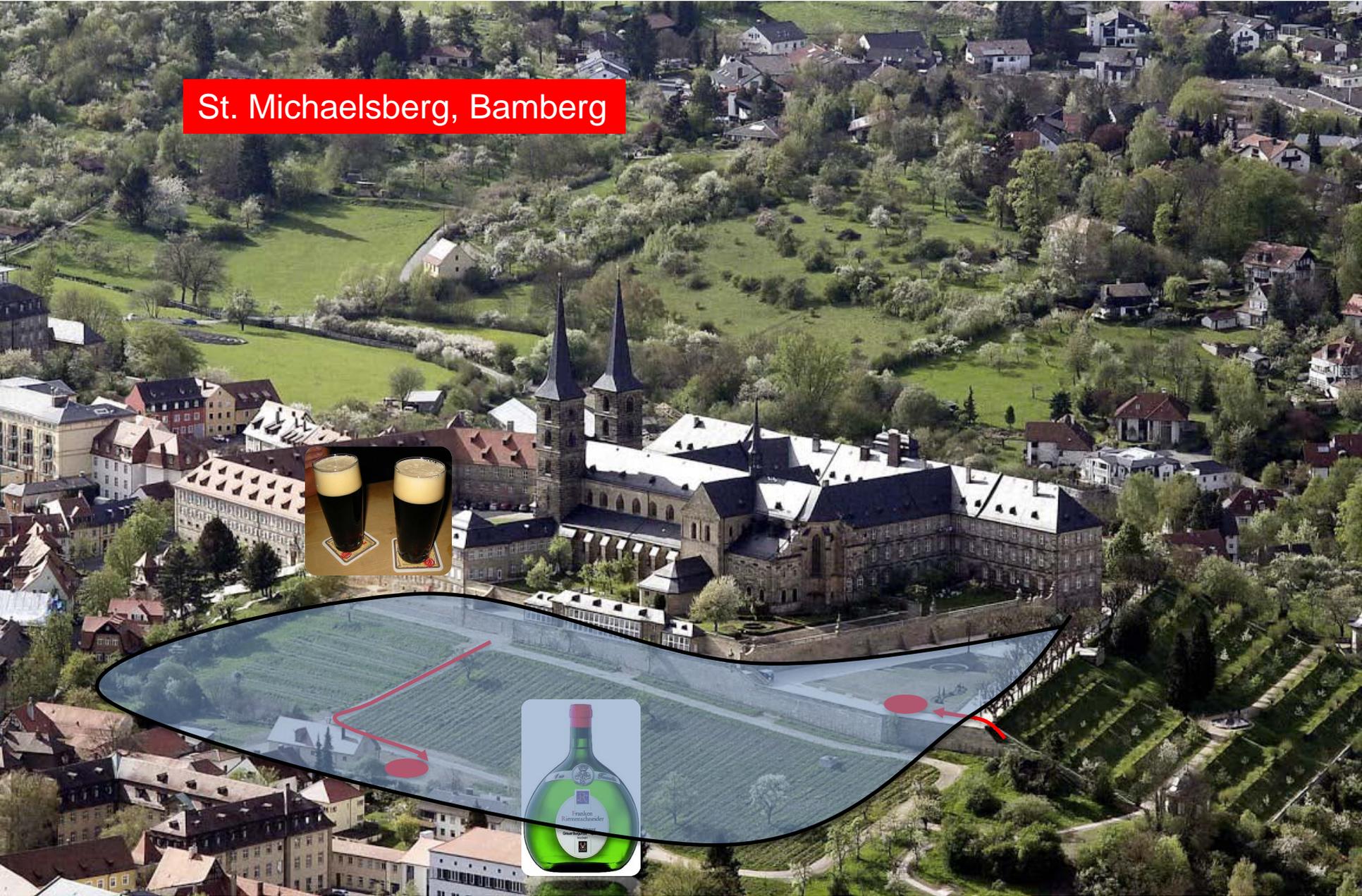
Think Tank

Bamberg

380 Breweries!
1 brewery per 5511 people
USA: 1383; Canada: 197



St. Michaelsberg, Bamberg





Around Fraport?

What is Terroir?



Definition?

Terroir – This is still a **relatively poorly understood concept**...but...terroir does **not** mean soil (Grapes & Wines; Oz Clarke)

Terroir – much discussed term for the **total natural environment of any viticultural site** (The Oxford Companion to Wine; J. Robinson)

Terroir – Based on the French AOC (*Appellation d'origine contrôlée*) system

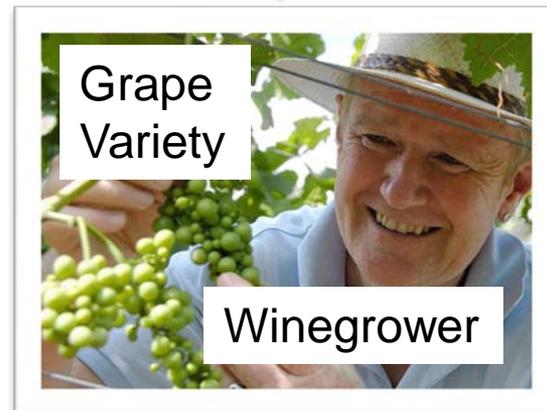
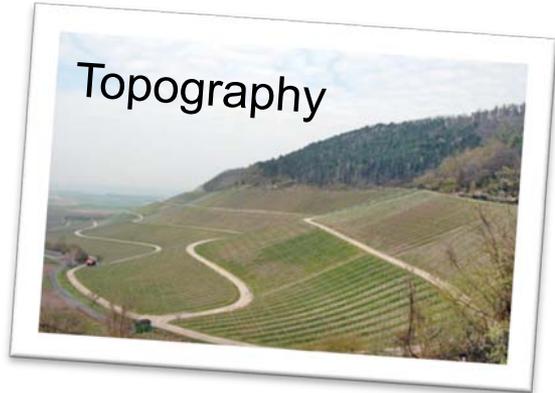
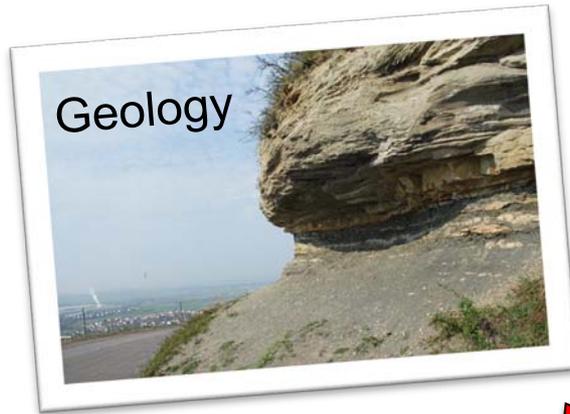
Terroir – The idea that wine is **deeply rooted in a certain place** (Wine Wars; M. Veseth)

Terroir – **The taste of the place** (The Geography of Wine; P.H. Dougherty)

Wikipedia – **Terroir is the set of special characteristics** that the geography, geology, and climate of a certain place...express

JK – the characteristics inherent to **'localness'** (all local factors considered)

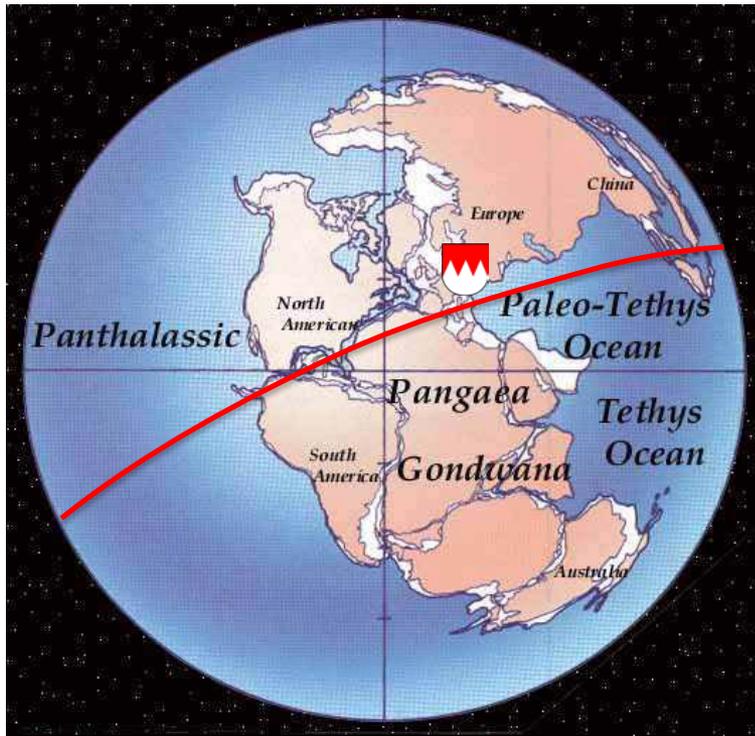
Interactions that describe the term Terroir





Terroir and Geology

Breakup of Pangea: worldwide rifting → German Trias (251-200 Ma)



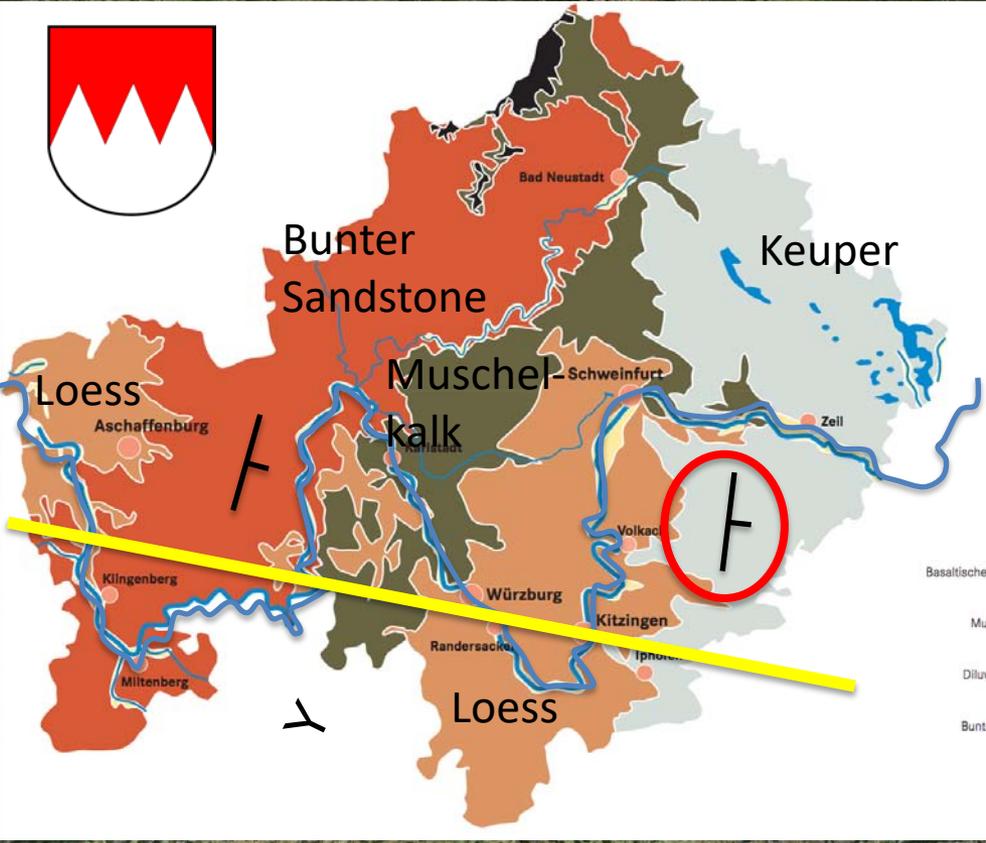
Permo-Triassic Basins worldwide!

System	Series	Stage	Age (Ma)	European lithostratigraphy
Jurassic	Lower	Hettangian	younger	Lias
Triassic	Upper	Rhaetian	199.6–203.6	Keuper
		Norian	203.6–216.5	
		Carnian	216.5–228.7	
	Middle	Ladinian	228.7–237.0	Muschelkalk
		Anisian	237.0–245.9	Bunter or Buntsandstein
	Lower	Olenekian	245.9–249.5	
Induan		249.5–251.0		
Permian	Lopingian	Changhsingian	older	Zechstein

Major lithostratigraphic units of northwest Europe with the ICS's geologic timescale of the Triassic.^[1]



Rhine rift 30 Ma -> tilting; development of escarpments
Main valley 2.4 Ma, 80-100 m deep
Created undercut slopes the wine quality relies on.





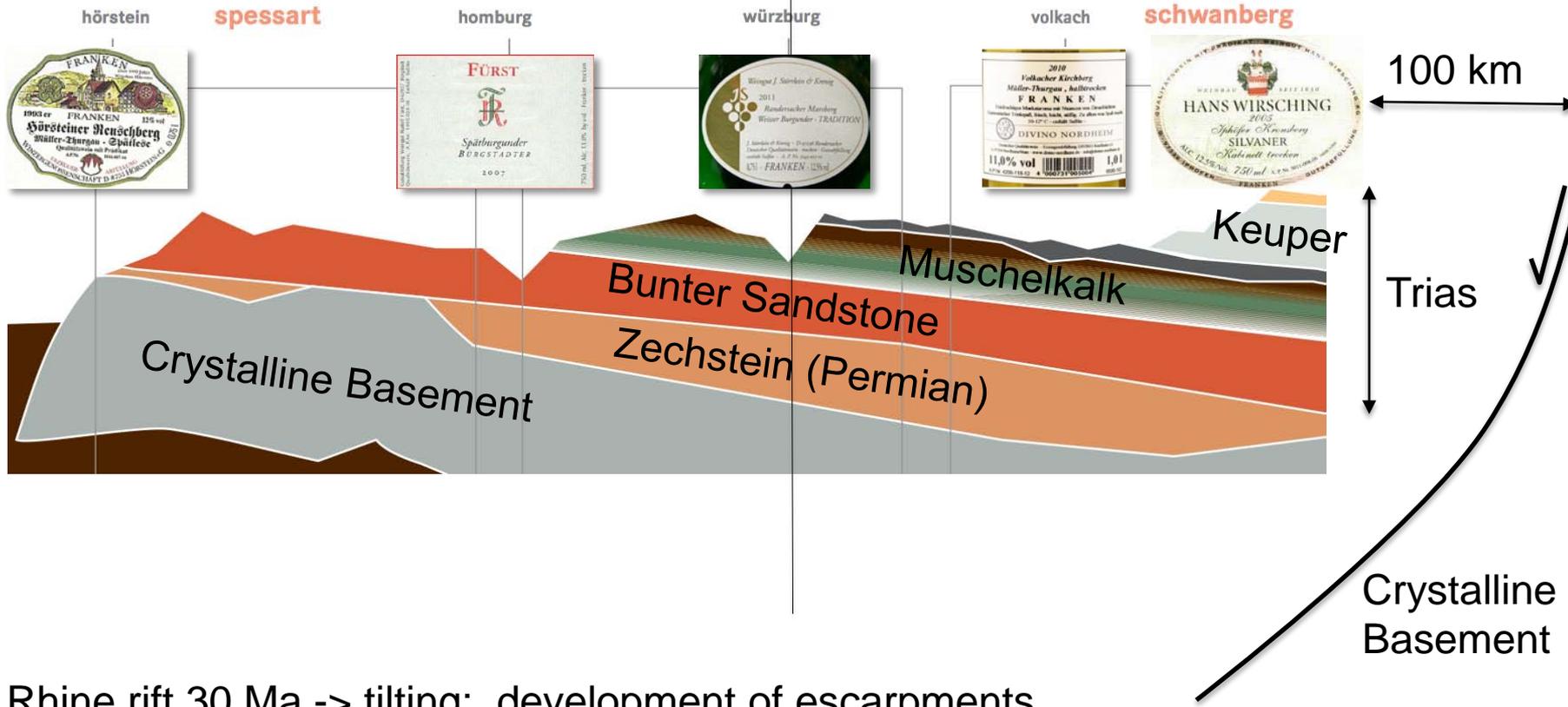
JK undergrad (1983-86)

Not to scale

Younger formations exposed →

W

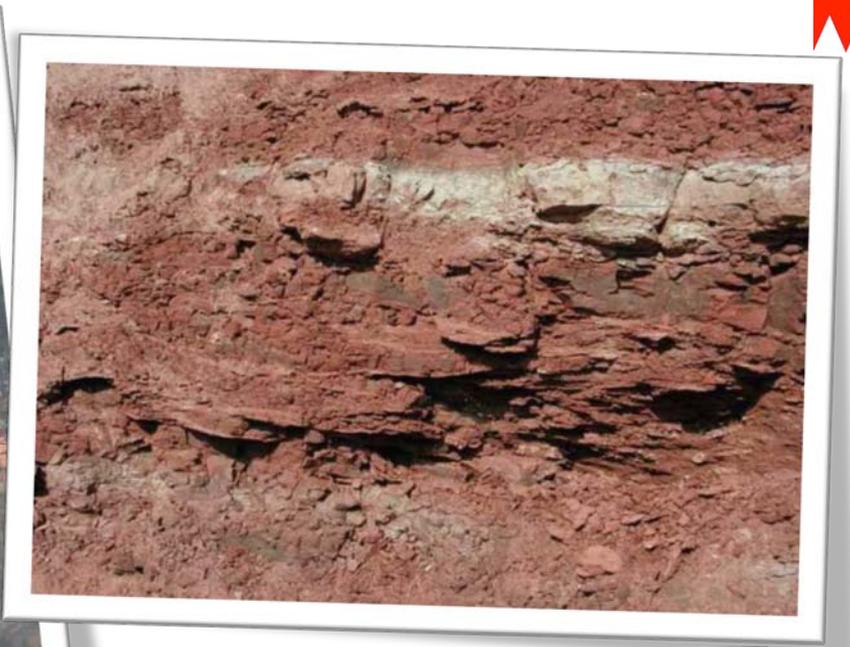
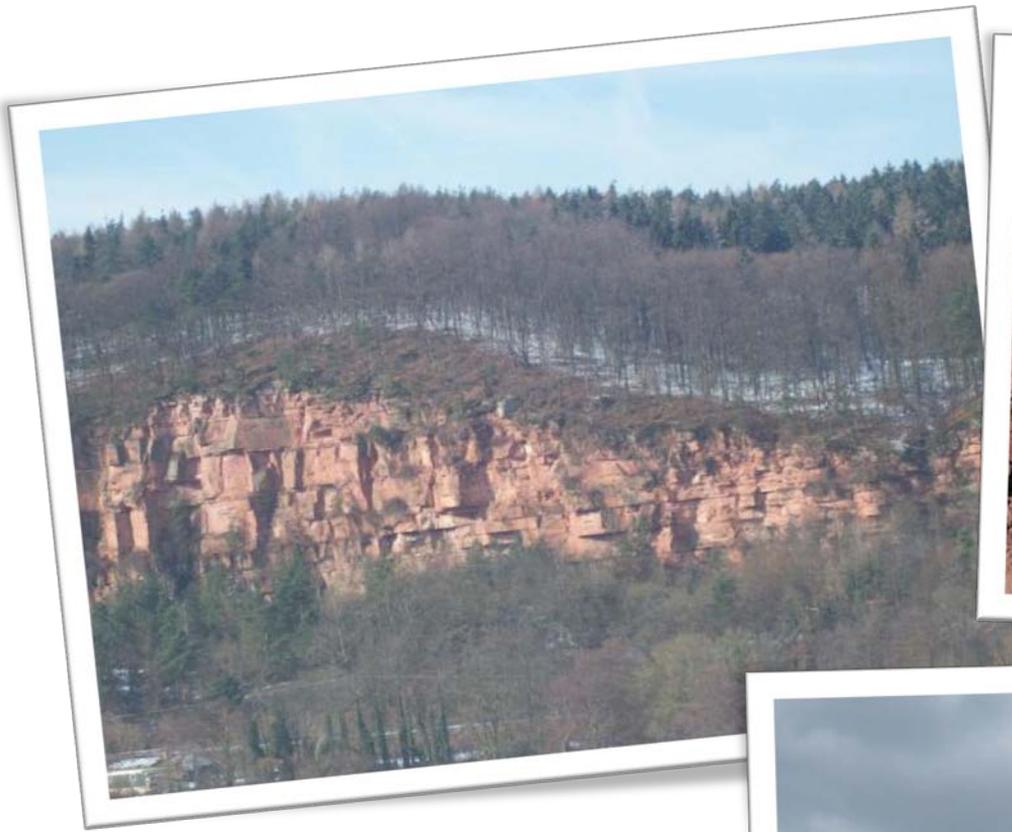
E



Rhine rift 30 Ma -> tilting; development of escarpments (cf. Paris basin, southern England)



Bunter Sandstone (Buntsandstein)



Bunter Sandstone! New Red!
~ Sherwood Sandstone, England
Morecambe Bay gas field

240 Ma: semi-arid climate,
Continental, fluvial
oxidation (red beds)



Aschaffenburg Castle
(40 km E of Fraport)



Muschelkalk



230 Ma...Tethys opening -> shallow marine, warm, mediterranean climate, fertile, repeated transgressions and regressions, reef formation, carbonate shelf of Tethys



Keuper

Keuper (220 – 200 Ma):

1. Coastal, Delta -> Swamps
2. Marginal Basin -> Marls, Dolomites
3. Continental, Fluvial -> Ark. Sandstone, Clays





Climate & Topography

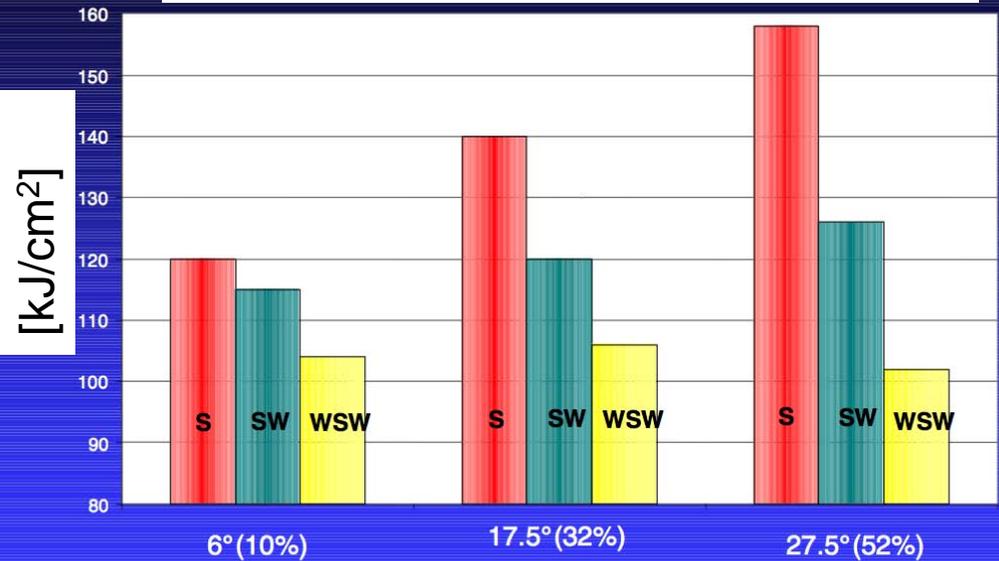


Microclimate:

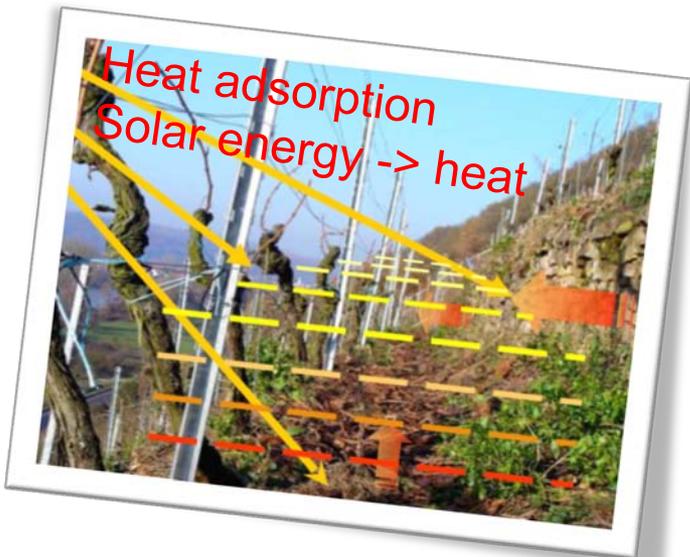
- Topography
- Soils – Water Budget – Soil Humidity
- Soil Colour
- Rock Clast Content
- Inclination – Angle of Incidence – Solar Irradiation
- Cold Air – Wind – Hail – Frost
- Drainage



Cumulative Global Irradiation
September - October [kJ/cm²]



inclination of slope



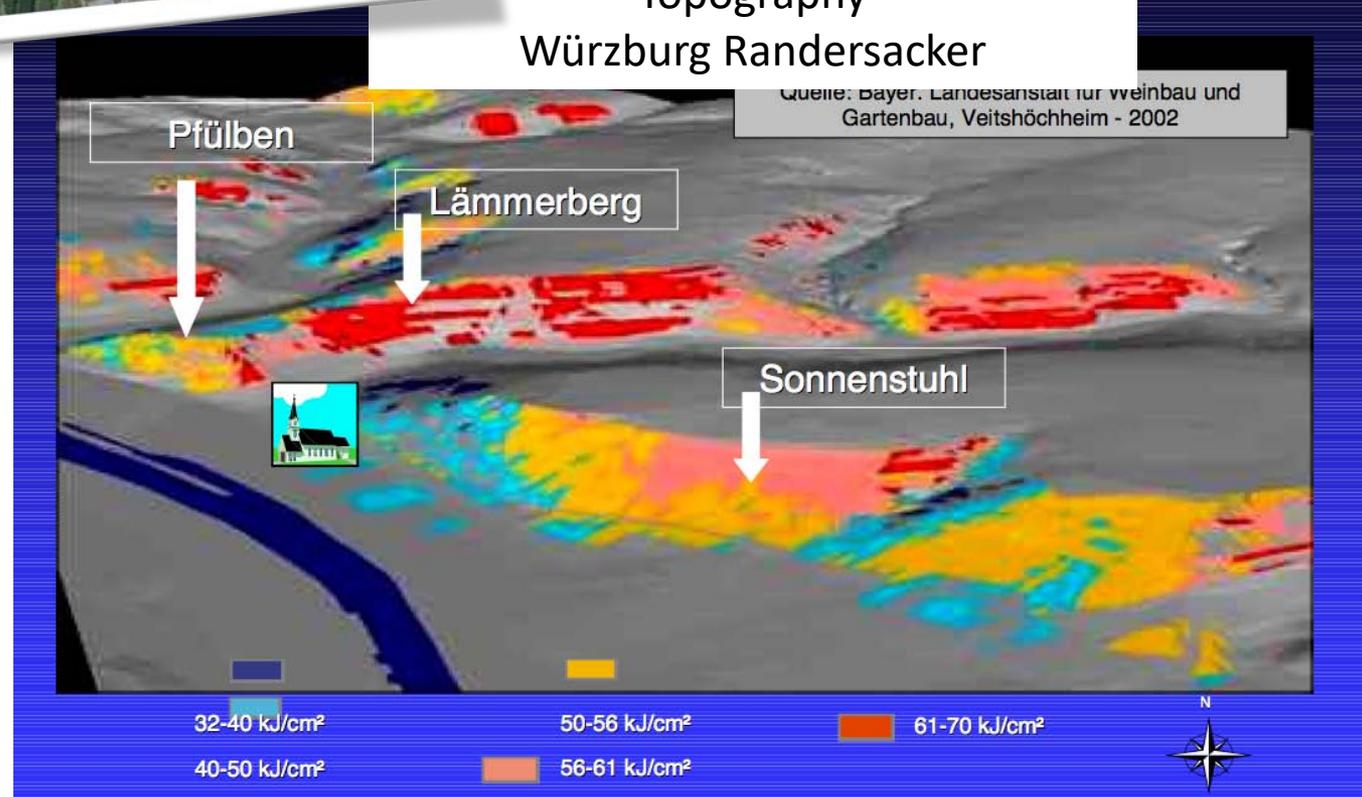


Topography:

- Relief/Elevation
- Inclination
- Exposition

Solar Radiation Energy vs. Topography Würzburg Randersacker

Quelle: Bayer. Landesanstalt für Weinbau und Gartenbau, Veitshöchheim - 2002



Wines named after their slope



The Profile of a Top Performer



Roof: forest or agricultural land

Weathering surface: dry grassland, bush zone

Steepest inclination: coarse weathered material, shallow, high rock content

2nd Quality

Steep inclination (middle of slope):

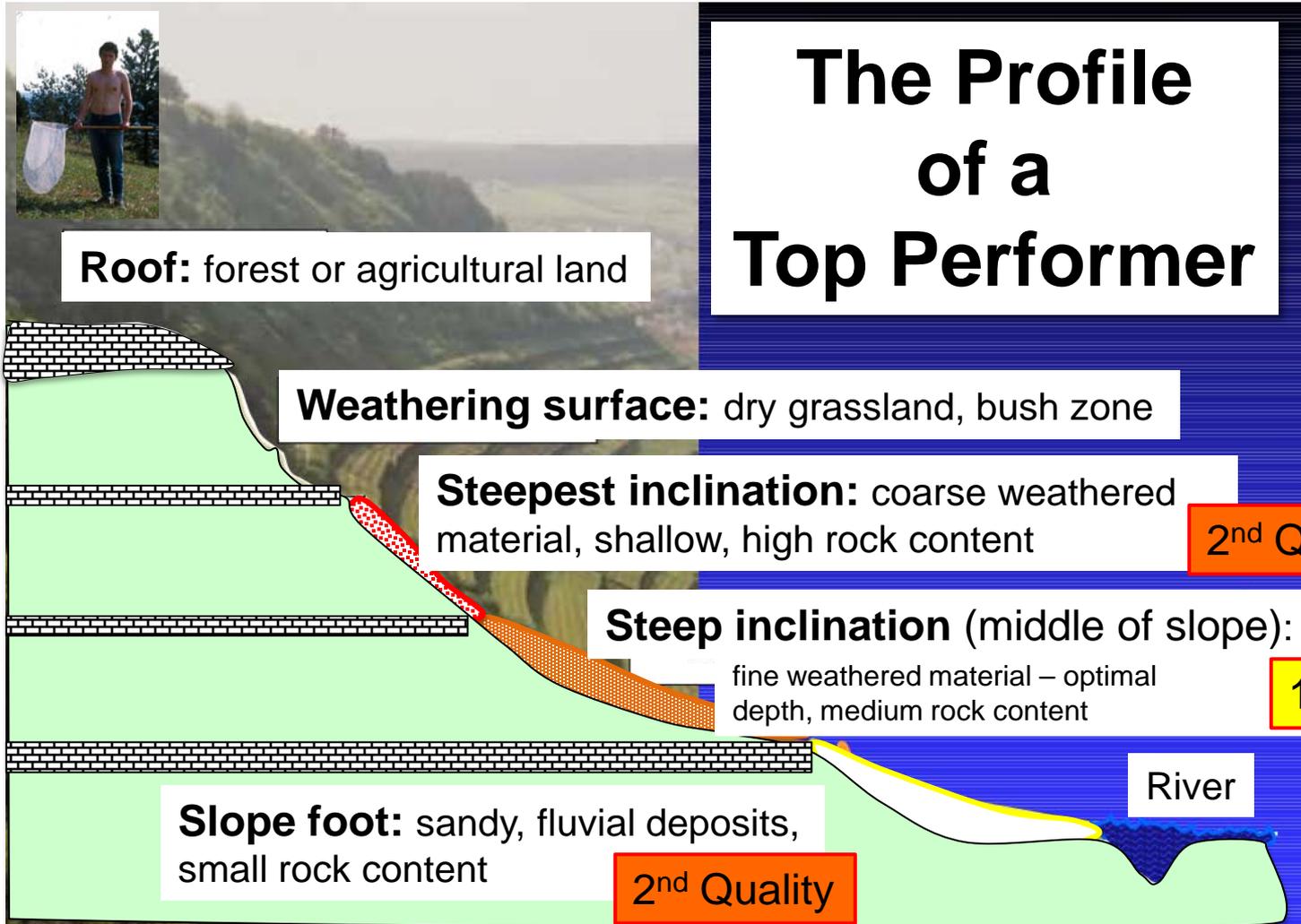
fine weathered material – optimal depth, medium rock content

1st Quality

Slope foot: sandy, fluvial deposits, small rock content

2nd Quality

River





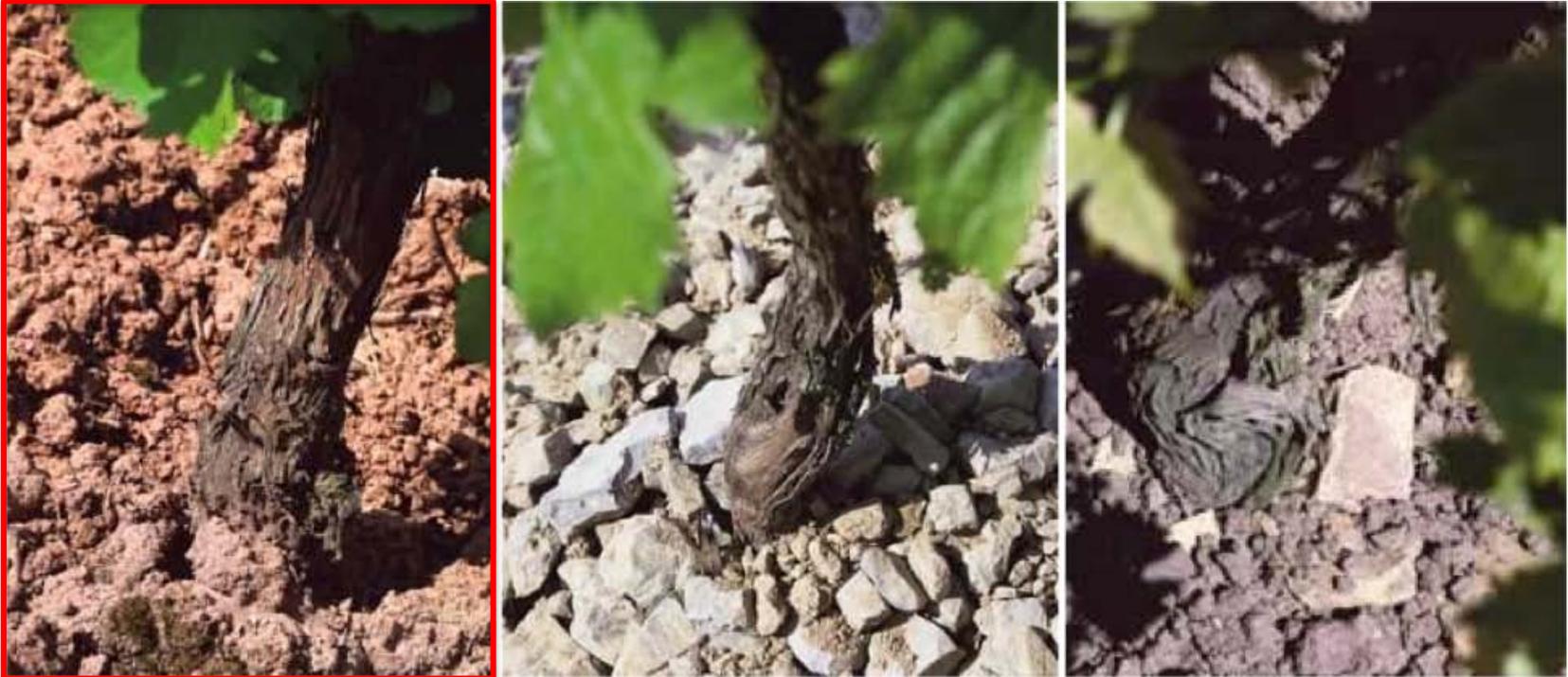
Soil



Bunter Sandstone:

Bedrock: sandstone, clays

Soil: clayey sand, sandy clays, silts



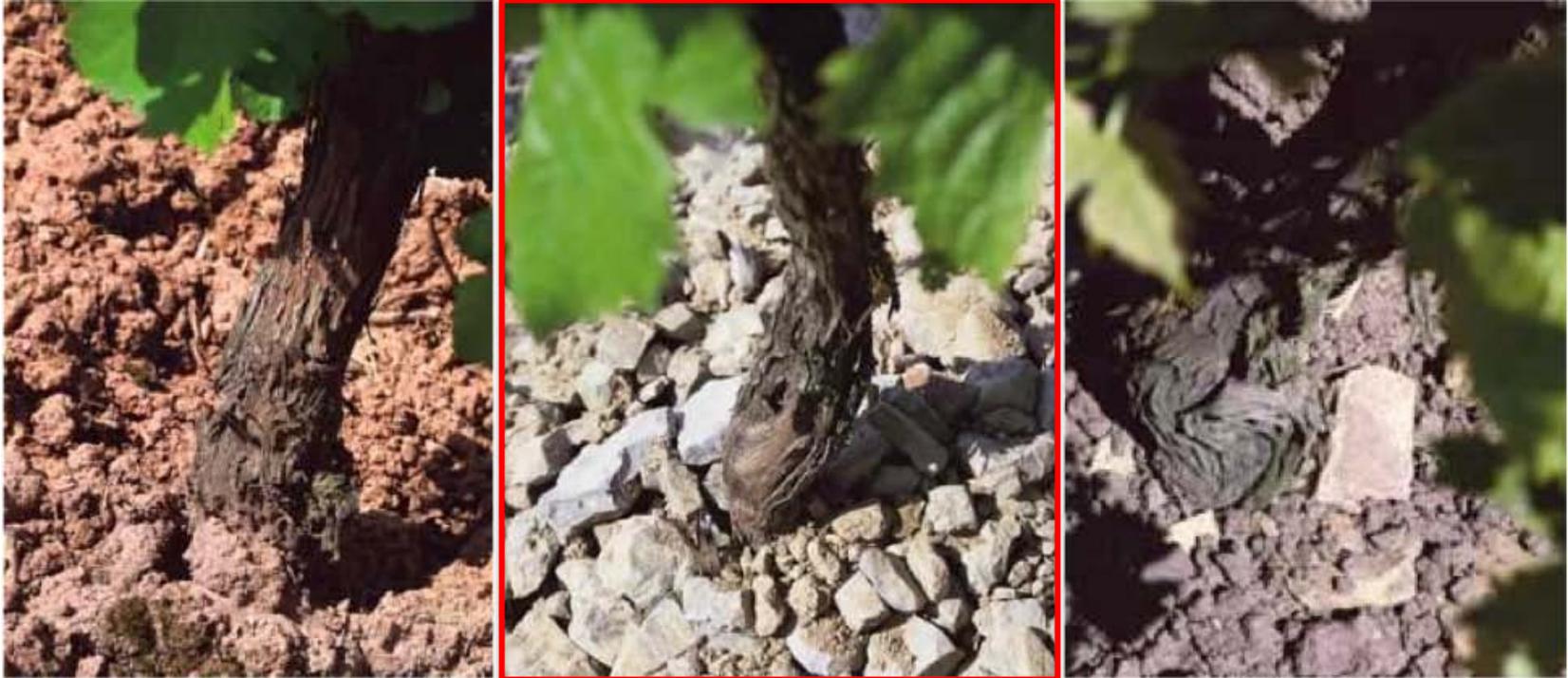
Medium dry to very dry
Locally high clast content
Low water retention
Fast heating/cooling rates
Hot
Shallow towards the top
pH: 5.5 - 6.8



Muschelkalk:

Bedrock: limestone and limey marls; clays, dolomites

Soil: rocky, silty clays, clayey sands



Medium dry to dry

High clast content

Low to excellent water retention

Good heat retention

Slow heating/cooling rates

Locally shallow

pH: 7.3 - 7.7

Keuper:

Bedrock: carbonate-rich shales,
shaley gravel

Soil: silty clays



Medium dry to dry

Low to medium clast content

Low to excellent water retention

Slow heating/cooling rates

Good heat retention

High heat emission

Frequently shallow towards the hilltop

pH: 7.0 – 7.4



Wine?



Frankenwein

6,087 ha/15,041 acres (late 1990s)

Mainly white wines

60% 'trocken' (dry)

Star performer: [Riesling](#) (4%)

21% [Silvaner](#): most notable & typical grape

36% [Müller-Thurgau](#)

12% [Bacchus](#)

Flagon-shaped bottle:
['Bocksbeutel'](#)

Coop movement: highest per-litre price in Germany



FRANKENWEIN

Der Wein mit Charakter.

War on Terroir and the Return of the Terroirists





Vin Du Marché
(McWine)



Vin De Terroir
(Weltklasse)

Mateus vs. Frankenwein

I get juiced on Mateus and just hang loose (Elton John, Social Disease, 1973)

Mateus stockpiled in the vaults of Saddam Hussain's palaces ([Daily Telegraph](#))

The **Grape Wall of Wine** – wine brands vs. specific wines!





Concluding Remarks



TERROIR

Small things...

Become a Terroirist:
Visit the Franconian viticulture on your way
through Frankfurt Airport!

Thank you! *In vino veritas!*

Take a
Brochure

Download this talk: franconia-geo.com

THANKS to:

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