

The Microbiology and Culture of Cheese and Wine

11:680:410 (3 credits)

Taught in Summer Session / Study Abroad

The Microbiology and Culture of Cheese and Wine is a lecture and interdisciplinary engaged global learning experience for undergraduates in the life sciences.

Instructors

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Course Summary

The course explores the science and culture of cheese and wine through readings, lectures, group projects and an intensive two-week experience-based global learning course segment in France. The course combines applied microbiology with socioeconomic and cultural history, on site in southern Burgundy. At the intersection of applied sciences and French cultural studies, this dynamic program investigates the science of wine and cheese fermentation, and its central role in French cultural heritage. Students will study the complex chemical and biological processes that create diverse varieties of cheese and wine, with techniques that blend modern scientific knowledge with traditional values and practices.

Readings, lectures, group projects, presentations and field trips with wine and cheese tasting, meld a comprehensive appreciation of the science, history and culture of cheese and wine. Students will learn about the factors that control microbiological growth and activity, and how humans exploit and manipulate microbes in food and beverage production. We will discover how milk is curdled and processed into cheese and how bacteria and fungi are central in this process. By savoring the complex tastes and aromas of the diverse cheese varieties of the region we gain an appreciation the central role of food in French *patrimoine* (cultural heritage). We learn about the history of viticulture, how yeast ferments sugars to ethanol, and the complexity of the chemical and biological reactions during maturation which give wine their character. We experience the importance of *terroir*, the set of special characteristics that the geography, geology, climate and cultural heritage express in agricultural products, such as cheese and wine.

During the two-week session on site in France, classes will typically meet daily from nine in the morning till six in the evening. Some mornings will be devoted to classroom lecture, on the science and culture themes of the day, with excursions in the afternoon. Other days will be devoted entirely to field trips and site studies. Field trips and excursions will include visits to local farms, dairies, vineyards, caves (i.e., wine cellars), weekly markets in Cluny and adjacent towns, the Louis Pasteur house and laboratory in Arbois, great monasteries and chateaux connected with the wine trade, and Beaune, the historic capital of the Burgundy wine region.

Course Learning Objectives

By the end of the course, students should be able to:

1. Differentiate the role of microorganisms and how they impact humans, our food, and the environment.
2. Recognize how microbial food fermentations have developed from an art & craft to a science & technology.
3. Compare and contrast the microbial principles relating to the production of cheese and wine, and other fermented foods
4. Develop their scientific literacy so they may critically analyze and knowledgeably discuss current issues in food microbiology and agriculture, read appropriate literature, and incorporate the information in practical reports on food microbiology and agricultural products.
5. Appreciate the role of cultural heritage in the production, commerce and consumption of agricultural products, such as cheese and wine.

Student Projects & Reports, Examinations

Pre-departure readings, meetings and examination. Readings will be available to students in early May. The course will meet for two afternoons for an overview of the course objectives and a general introduction to the material and readings. A pre-departure examination on the reading material will be completed on-line.

1. Cheese

Research report and class presentation on a selected French cheese variety (discussion of the characteristics, source of milk, production process, history, taste & aroma, trade).

2. Wine

Research report and class presentation on a selected French wine (discussion of the characteristics, production, history, trade).

3. Daily Log and Course Report

Detailed notes on visits, excursions, different cheese & wine “encounters” and compile a final travel report at the end of the course. The course log and report can be written/prepared in different formats, such as a daily diary, blog, photo-collection or video. Specific questions to address: How has the Study Abroad experience changed your view on the role of gastronomy in daily life? How does the way we approach food (both its production and its consumption) tell us about ourselves and our society?

4. Course Paper

A “mini-review” paper on a selected topic in the area of cheese or wine production. Aim for approximately 10 pages, including references and any figures and (Format: 12 point font, 1.5 line spacing). Use the style/format of *Journal of Industrial Microbiology & Biotechnology*.

The written reports are due 3 weeks after the end of the course.

A take-home examination will be due 3 weeks after the end of the course.

Textbook and Readings

Reading material, lecture notes and homework assignments will be posted on a SAKAI course site. Additional reading material and reference books will be available on site.

Reading assignments include selected sections from:

- Catherine W. Donnelly (Editor). Cheese and Microbes. 2014, ASM Press.
- Hugh Johnson. Vintage: The Story of Wine. 1989, Simon and Schuster
- Karen MacNeill. The Wine Bible. 2001, Workman Publishing Company
- Christian Teubner. The Cheese Bible. 2010, Chartwell Books.
- Kazuko Masu, Tomoko Yamada & Gillian Emerson-Roberts. 2004. French Cheeses. DK.
- John Postgate. Microbes and Man. 2000, Cambridge University Press.
- Clive Coates. Wines of Burgundy. 2008, University of California Press.
- Rene Dubos. Louis Pasteur: Free Lance of Science. 1986, Da Capo Press.
- Edwin Mullins. Cluny In search of God's Lost Empire. 2006, Bluebridge.

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Draft schedule for two-week activity-based global learning experience

- Day 1. Joint Departure from Paris, Welcome to Cluny
- Day 2. Introduction to course
General introduction to microbiology of food fermentations
Discovering Medieval Cluny
A first exploration of the cheeses and wines of Burgundy
- Day 3. Microbiology and Biochemistry of Food Fermentations
The Cow: turning grass into milk, a brief microbiology of the rumen
Milk and lactic acid Fermentations, Lactic acid bacteria
Making Cheese: fermentation, curdling, storage & aging
Introduction to different cheese varieties
- Day 4. Excursion. Viticulture and cheese making
Visits to farms, cheese manufacturers and wineries in the Macconnais region
- Day 5. Microbiology and biochemistry of alcoholic fermentations
Microbiology of wine
Vinegar – sour wine
- Day 6. Excursion Viticulture and cheese making in Burgundy
Visits to vineyards and dairies of the Côte d’Or
- Day 7. Morning visit to Farmer’s Market in Cluny
The role of small farms and producers in agriculture. Agritourism
Eating Cheese: taste-olfactory evaluation of different cheese varieties. Compare and contrast: how does source of milk and processing affect taste & texture. What is the role of affinage?
- Day 8. Sunday – Free time
- Day 9. Viticulture
History and geography of Burgundy and how this relates to cheese and wine production. The concept of terroir.
Impacts of climate change for agriculture in the region.
- Day 10. Excursion: Beaune, the cultural and wine capital of Burgundy
History and trade patterns for cheese and wine in Burgundy/France
Economy of cheese and wine in the European Union
- Day 11. A brief history of microbiology: from applications to fundamentals
How to preserve food - the importance of salt.
- Day 12. Excursion to Jura
Arbois, Pasteur's house and lab: The beginnings of the science of microbiology
Visit to salt mines. Why do we earn a “salary”?
- Day 13. Excursion to Jura
“Jurassic” cheese and wine. Larger co-operative cheese makers.
- Day 14. Morning visit to Farmer’s Market in Cluny
Wrap up - Presentation of student projects
- Day 15. Departure