

BIOLOGY 343: PLANTS AND PEOPLE

FALL 2008

INSTRUCTOR:

Michael W. Hawkes, Dept. of Botany

Office: Biosciences Bldg. Rm. 2526

Email: mhawkes@interchange.ubc.ca

<http://www.botany.ubc.ca/people/hawkes.htm>

Phone: 604-822-5430, on voice-mail so leave a message if no answer

Office Hours: By appointment

TEACHING ASSISTANT: Christine Woollacott

Email: wchristi@interchange.ubc.ca

Lectures: Monday and Wednesday 2:00 p.m., BioSc. Rm. 2361

Tutorial/Lecture: Monday 3:00 p.m., BioSc. Rm. 2361

Laboratory: Wednesday 3:00-5:00 p.m., BioSc. Rm 3001

TEXT: Simpson, B.B. & M.C. Ogorzaly. 2001, 3rd ed. *Economic Botany: Plants in Our World*.

EVALUATION: 30% mid-term lecture exam, 24% mini lab reports (Project #1: 6%; Project #2: 18%), 6% lab quizzes/participation, 40% final exam (which includes both lecture and lab components)

SYNOPSIS: Plants have played an integral role in shaping human nature and cultures. This course will explore our utilization of plants for food, materials, fuels, medicines, gene sources, and social purposes, from the dawn of human history to the present day. For a variety of important plant products we will explore the chemistries, natural occurrences, and functions of the materials in nature. We will also consider ecosystem services provided by plants. The world virtually depends on about fifteen plant species, most of which have been highly modified by humans. We will examine the future ecological, economic, and social implications of this dependency in light of rapidly increasing loss of plant biodiversity and habitats. In the laboratory students will have the opportunity to investigate some of the botanical diversity discussed in lecture.

OBJECTIVES

- To gain an appreciation for the myriad uses of plant biodiversity by human societies, both past and present
- To consider how many different cultures have viewed and interacted with plants in very different ways from our technological society
- To investigate the origins of major crop plants and understand the biological basis of their modification and selection by plant breeders
- To know 10 plant families of major economic importance to our contemporary global economy
- To understand the issues and potential impact of biotechnology, environmental change, and biodiversity loss on plants & people

- To emphasize how human well-being, both mental and physical, is dependent on our wise use and conservation of cultivated plants, wild plants, and their associated habitats

PREREQUISITES/COMPANION COURSES:

There are no prerequisites, but 3rd or 4th year standing is required. Note that this course carries full credit for students registered for degrees in the Faculty of Science, and is also suitable for 3rd and 4th year students in other faculties who have science requirements to complete.

IMPORTANT DEADLINES: EXAMS and MINI-PROJECTS

3 Sept: Sign up for Mini-Project #1

17 Sept: Mini-Project #1 DUE (both oral & written)

17 Sept: FIELD TRIP TO UBC Botanical Garden & Centre for Plant Research, meet at Garden entrance (see map in lab manual) at **2:00 p.m.**

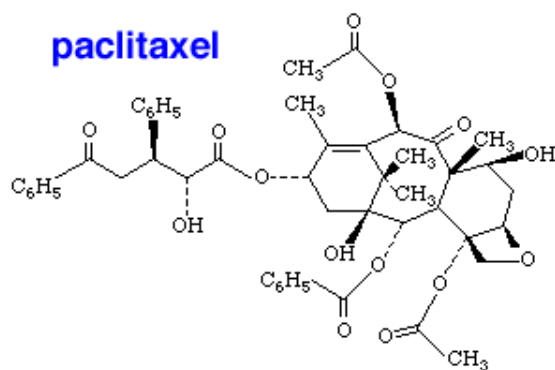
8 October: Mid-term exam (covers both lecture and lab material)

22 October: Mini-Project #2 DUE (for those who signed up for this date)

29 October: Mini-Project #2 DUE (for those who signed up for this date)

26 November: Last day of classes

December date TBA (set by Registrar's Office): final exam



The bark of the **Pacific yew** (*Taxus brevifolia*) is a source of **Paclitaxel**, which is used to treat some types of cancer. It works by interfering with cell division (mitosis).

MINI-PROJECTS

As part of your participation in the Plants & People course, you will carry out 2 mini-projects. These will involve doing some background research on the uses of two plant species, making something with one of the plants, and giving two short oral presentations (no longer than 5 minutes each) and preparing two short written reports. These reports will be marked and will be counted as part of your overall laboratory grade.

<p>MINI-PROJECT #1: USES OF TEMPERATE ZONE PLANTS IN THE UBC BOTANICAL GARDEN</p>
--

See **page 10** in your Lab Manual for details

DUE: 17 September

GRADE TOTAL: 6%

The UBC Botanical Garden and Centre for Plant Research is a marvelous repository of Temperate Zone botanical diversity (both indigenous and exotic). The Gardens are especially rich in Asian and alpine species as well as species used by First Peoples of British Columbia. On our field trip to the Gardens we will split the class into two groups. Each group will then visit different parts of the Garden and students will give 5-minute oral presentations on the plant that they have investigated. At the end of the field trip you will hand in a 1-2 page written report.

NOTE: This field trip will go ahead regardless of the weather so dress accordingly and bring some extra warm and waterproof clothing.

GUIDELINES

Where possible, and appropriate, try to include the following information in both your oral and written presentations. Use these headings in your written report:

1. Major type of plant, e.g. Flowering plant, Conifer, Fern, Horsetail, Moss, or other
2. Family, scientific, and common name of plant.
3. Part(s) of plant used.
4. Common name of the plant product(s) (raw material).
5. History of the plant and its use(s) (especially use by First Peoples).
6. Methods of growing, harvesting or gathering.
7. Current distribution and region of presumed origin.
8. Information sources.

USEFUL REFERENCES TO GET YOU STARTED ON MINI-PROJECT #1

(On Reserve in Woodward Library)

- Kuhnlein, H. V. & N. J. Turner. 1991. *Traditional plant foods of Canadian indigenous peoples: nutrition, botany, and use*. 633 pp. Gordon & Breach: New York.
- Moore, M. 1993. *Medicinal plants of the Pacific West*. 359 pp. Red Crane Books: Santa Fe.
- Moerman, D. E. 1998. *Native American ethnobotany*. 928 pp. Timber Press: Portland.
- Munro, D. B. & E. Small. 1997. *Vegetables of Canada*. 417 pp. NRC Research Press: Ottawa.
- Pojar, J. & A. MacKinnon (eds.). 1994. *Plants of coastal British Columbia including Washington, Oregon & Alaska*. 527 pp. Lone Pine: Vancouver.
- Smith, H. I. (edited, annotated and expanded by B. Compton, B. Rigsby, & M-L. Tarpent) 1997. *Ethnobotany of the Gitksan Indians of British Columbia*. Canadian Mus. Civilization, Mercury series, Canadian ethnology series, paper 32. 210 pp.
- Turner, N. J. 1995 (revised edition). *Food plants of coastal First Peoples*. 164 pp. UBC Press: Vancouver [revised version of 1975 Handbook].
- Turner, N. J. 1979. *Plants in British Columbia Indian technology*. 304 pp. Handbook No. 38, B.C. Prov. Museum: Victoria.
- Turner, N. J. 1997 (revised edition). *Food plants of interior First Peoples*. 215 pp. UBC Press: Vancouver. [revised version of 1978 Handbook].
- Turner, N. J. 1998. *Plant technology of First Peoples in British Columbia*. Royal British Columbia Museum Handbook. 256 pp. UBC Press: Vancouver. [revised version of 1979 Handbook].
- Turner, N. J. 2003. *Plants of Haida Gwaii*. Sono Nis Press: Winlaw, B.C.
- Turner, N. J. 2005. *The Earth's blanket: Traditional teachings for sustainable living*. Douglas & McIntyre: Vancouver.
- Turner, N. J. & M. J. Hadley. (eds.). 1997. *Making it with your hands. Projects using indigenous plant materials from British Columbia and other places*. 83 pp. School of Environmental Studies, Univ. Victoria: Victoria.
- Turner, N. J. and Douglas Deur [co-editors]. 2005. *Keeping it living: Traditions of plant use and cultivation on the northwest coast of North America*. UBC Press: Vancouver.
- Vaughan, J. G. & C. A. Geissler. 1997. *The new Oxford book of food plants*. 239 pp. Oxford Univ. Press: Oxford, New York, Tokyo.

WRITTEN REPORT FORMAT – See instructions at the end of Mini-project #2

MINI-PROJECT #2: MAKING IT WITH PLANTS

See page 54 of Lab Manual for details

DUE: Weeks of 22 & 29 October (depending on which group you signed up for)
GRADE TOTAL: 18%

All human societies, past and present, have relied on plants as important sources of materials, food, and medicine. For this mini-project you will **either a food plant or a materials plant** have the opportunity to investigate, make something from it, and report your findings to the class. You can choose local or exotic plants and the particular plant use can be from any society, e.g. First Peoples of B.C., Polynesian societies, Asian cultures, etc. If you choose a food plant make sure it is something unusual. **I expect you to make a serious effort on this project (i.e. using your own hands!), with emphasis on taking the time to make a finished product from plant raw materials.**

We will have two special student-led lab sessions during which you will give a short oral presentation (no longer than 5 minutes) to the class. If you chose a materials plant, bring a sample of what you have made and demonstrate what you did. If you chose a food plant, bring samples for the class to try! **Hand-in a 2-3 page written report at the end of the lab period. Prior approval of your choice of plant species is required** (to avoid duplication of topics).

GUIDELINES

If appropriate, try to include the following information in both your oral and written presentations:

1. Family, scientific, and common name of plant.
2. Part(s) of plant used.
3. Common name of the plant product(s) (raw material).
4. History of the plant and its use(s).
5. Method(s) by which you used your hands to convert the plant raw material into a finished product. **Oral report to focus on this.**
6. Current distribution and region of presumed origin.
7. Information sources.

Additional options for the project

1. Cultivating useful plants. Students who are keen gardeners (indoor or outdoor) and who have useful plants growing can bring the plant to the lab and report on its cultivation as well as its uses.
2. Painting plants. For any botanical artists in the crowd, you can bring a painting or drawing of a useful plant to the lab and give us some insights into the artists techniques as well as uses of the plant.

WRITTEN REPORT GUIDELINES FOR MINI-PROJECTS #1 & #2

- Report should be word-processed and **1-2 pages in length (project #1)** or **2-3 pages (project #2)**, exclusive of the literature cited and any illustrative material you choose to include
- Margins 1" around the top, bottom and sides of each page
- Number the pages
- Captions to any Figures and Tables should also be typed
- Single-sided and double-space (exception being the Literature Cited section which can be single-spaced)
- Use a clear font (e.g. Arial) in a 10-12 pt size
- Use headings for major sections of the report. Choose headings that make sense in a logical presentation of the material. Since this is a short report, DO NOT use Materials & Methods, Results, Discussion, etc as headings
- Any illustrations, graphs, diagrams included must be cited as to source e.g. (Hawkes 1998: 2) and require proper captions to be included
- Please be sure to **run a Spellchecker** on the report before submitting it
- Sources for all points of fact must be cited in the body of the report, e.g. Hawkes (1998) found that seaweeds are high in Vitamin C. Do not use footnotes. The relevant reference then must be cited in a Literature Cited section at the end of the report. Note that names of Journals & Books are italicized or underlined, as are all latinized scientific names throughout the text. Here are examples of the format to use for citing references in this course:

Journal articles

Hawkes, M. W. 1998. Survey of Vitamin C content in marine benthic macroalgae of British Columbia. *Journal of Irreproducible Results* 20: 19–69.

Books

Lembi, C. A. & J. R. Waaland (eds.). 1988. *Algae and Human Affairs*. 590 pp. Cambridge University Press: Cambridge.

Chapter or article in a book

Mumford, T. F. Jr. & A. Miura. 1988. *Porphyra* as food: cultivation and economics. pp. 87–117 In: C. A. Lembi & J. R. Waaland (eds.), *Algae and Human Affairs*. Cambridge University Press: Cambridge.

Electronic references or data, e.g. email, discussion groups, listserves, Web sites: must cite the author(s) [if known] and give the full URL (Uniform Resource Locator), e.g.

L. Watson and M. J. Dallwitz. The Families of Flowering Plants.
<http://www.biologie.uni-hamburg.de/b-online/delta/angio/>

WEB PAGES YOU MIGHT FIND USEFUL

Search Engines:

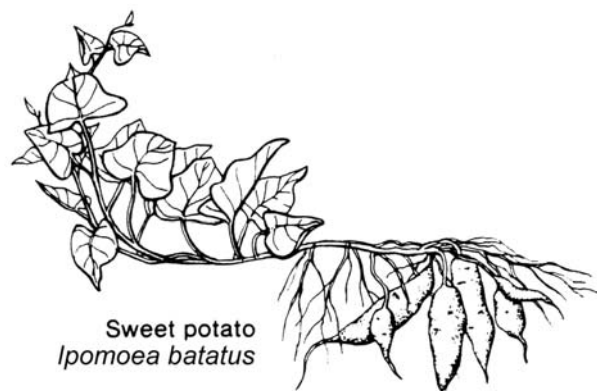
- Google
<http://www.google.ca/>
- HotBot
<http://hotbot.lycos.com/>

Electronic Journals at UBC

<http://toby.library.ubc.ca/ejournals/ejournals.cfm>

Useful Botany Sites

- Centre for Economic Botany, Royal Botanic Gardens, Kew, England
<http://www.rbgekew.org.uk/scihort/ecbot.html>
- Institute of Economic Botany, New York Botanical Gardens
<http://www.nybg.org/bsci/bsci.html>
- The Society for Economic Botany
<http://www.econbot.org/home.html>
- Tree of Life (for the BIG picture of where things fit; up-to-date information)
<http://tolweb.org/tree/phylogeny.html>
- *Index Nominum Genericorum* (for information on plant genera. To find out what Family a genus belongs to, go to the site, type in the generic name and hit SEARCH. The Family information for that genus will be returned by the search).
<http://ravenel.si.edu/botany/ing/>
- The Families of Flowering Plants (site has useful information on economic importance)
<http://www.biologie.uni-hamburg.de/b-online/delta/angio/>
- Flowering Plant Gateway
<http://www.csd1.tamu.edu/FLORA/newgate/cronang.htm>
- Green Plant Phylogeny Research Coordination Group
<http://ucjeps.berkeley.edu/bryolab/greenplantpage.html>
- Seaweed & other Algae
<http://www.seaweed.ie/>



Sweet potato
Ipomoea batatas

EXPECTED LEARNING OUTCOMES

1. Plant biodiversity, structure & reproduction (especially polyploidy)
Students will be able to:
 - Identify and name which plant parts a particular botanical product is derived from and give the species general area of origin
 - List the 10 most important food crops, know their scientific name, and give their area of origin
 - Explain the importance of genetic diversity within a crop species
 - Summarize why it is important to preserve wild relatives of crop plants
 - Analyze a data set involving hybridization and polyploidy and be able to assign ploidy and genomic constitutions to the taxa involved
 - Illustrate a flower x-section, label key parts, and identify sites of pollination and fertilization

2. Food plants: Sugar, cereal, starch
Students will be able to:
 - Summarize the economic, social, and political effects of sugar cane as a plantation crop
 - Draw and label a caryopsis
 - Describe the events leading to the development of bread wheat
 - Define and list 2 pseudo-cereals and describe their area of origin
 - Compare grain and root crops in terms of their support of large civilizations

3. Food plants: Vegetables, legumes, fruits/nuts
Students will be able to:
 - Contrast a caryopsis with a legume seed
 - Explain, in terms of human and ecosystem health, the importance of the New World agricultural practice of planting maize, beans, and squash
 - Compare simple versus compound fruit and give examples
 - Compare saturated versus non-saturated oils and explain their significance to human health

4. Origins of agriculture
Students will be able to:
 - Summarize 6 major centres where agriculture is thought to have originated and give examples of crops that were developed there
 - Compare the 'external forces hypothesis' versus the 'evolutionary origin hypothesis' for the origin of agriculture
 - Name 5 of the 10 most significant plant families for human uses and list two food and two non-food uses for each

- Describe how discovery of the New World's botanical treasures had significant social, cultural, economic, and political impacts
 - Explain, using examples, how affluent nations have come to rely on products from tropical plants
5. Medical Botany & Ethnopharmacology
Students will be able to:
- Explain the role of traditional healing in the development of some modern pharmaceuticals
6. Caffeine beverages & other psychoactive plants
Students will be able to:
- Describe the origin and preparation of the 3 types of tea
 - Explain the role of tea in the Opium wars
7. Hawai'ian Ethnobotany & the sweet potato story
Students will be able to:
- Explain how the sweet potato got to Polynesia
 - Develop an inventory of canoe plants (including their uses) that they would take with them on a one-way voyage similar to those made by the ancient Polynesians
8. Uses of Seaweed
Students will be able to:
- Summarize the uses of phycocolloids
 - List 2 red and 2 brown seaweeds and describe a food and non-food use for each

Lab mini-projects

Students will be able to:

- Conduct literature research, using paper and web-based resources, to investigate: 1. Uses of a temperate zone plant in the UBC Botanical Garden and 2. Investigate either a food plant or a materials plant and make something from it
- Present both oral and written reports on their research findings