BIOL 488 / 688, Arctic Vegetation Ecology: Geobotany

University of Alaska Fairbanks

Spring semester 2013

Instructor: Prof. D.A. (Skip) Walker

Lecture: T/Th, 2:00 pm – 3:30 pm: Lab: Th 3:40-5:00

Room 103 Irving I

Course web sites

- Alaska Geobotany Center: http://www.geobotany.uaf.edu/
- BIOL 488/688. Arctic Vegetation Ecology: http://www.geobotany.uaf.edu/teaching/biol488/

Course description

- Detailed study of Arctic plant communities including their composition, structure, paleo-history, biogeography, major environmental controls, applications of Arctic vegetation methods to current Arctic issues including climate change, wildlife management, and changing land-use in the Arctic.

A little about myself

Cross-county skiing at UAF

2010 Joint Russia-U.S. Expedition to Franz Josef Land

- Born in Denver, Colorado, USA, 1945.
- Educated at the Air Force Academy and University of Colorado in Boulder, Colorado (graduated 1972; M.S. 1977; Ph.D. 1981).
- Was married and have one son (19 years old).
- Favorite things to do: Ski, go to natural landscapes anyplace.
- First went to the Arctic in 1969 to work on an oil rig at Prudhoe Bay, Alaska.
- Did my M.S. and Ph.D. as part of the International Biological Programme, Tundra Biome.
- Have worked in the Arctic as a plant ecologist ever since.
- Currently at the University of Alaska Fairbanks.
- Director of the Alaska Geobotany Center.

Course contents

Lectures: 12 lectures will examine the tundra plant communities and ecology of Arctic tundra. The emphasis will be on the factors controlling vegetation patterns, including climate, permafrost, geomorphology, soils, animals, zonation, paleogeography, biogeographic history, plant adaptations, and succession patterns.

Snow Ecology component: 3 lectures plus a weekend snow ecology trip. The focus will be on describing snow pits, subnivian environments, and the effects of topography and snow distribution patterns, plant habitat distribution and wildlife.

Arctic plant identification component: 7 labs. Students will learn 160 of the most common Arctic species in Alaska, including trees, shrubs, dwarf shrubs, grasses, sedges, rushes, bryophytes, and lichens. Students will be tested over their ability to identify these species.

Instructional Method

- **Lectures:**
  - Mainly on Tues, 2-3:30 pm .
  - Generally, two lectures will address a given topic.
  - Students are expected to attend the lectures and read the assigned literature.
  - No exam over lectures
  - 3 points will be awarded for attendance at each lecture.
- **Literature discussion:**
  - Thursdays, (2-3:30 pm)
  - 7 weekly discussion groups to explore the key literature related to the lectures.
  - These overviews should focus on the principal points of the paper and major concepts. Grading criteria that will be handed out early in the semester. All students will be graded on their full participation in the presentations and discussions.
  - The class will be divided into two **discussion groups** at the beginning of the semester. Selected members of each group will present a key paper each week as a team.
  - Each student will present material at 2 literature discussion groups during the semester.

Instructional Method (cont')

- **Plant identification component:**
  - Thur Lab (3:40-5 pm)
  - During most sessions a brief lecture will present slides and photos of the plants to be learned that day with a focus on plant family characteristics and morphological and ecological characteristics that help in identification.
  - Students will work with herbarium specimens and literature sources
  - Students are expected to read information on plant family characteristics and explore the other information available on the web.
  - The final test will cover identification of about of 75 selected plants and key plant characteristics.
- **Final Student oral presentations of research topics**:
  - Oral presentations of in-depth literature review on Arctic Vegetation topic of choice.

Course schedule and reading assignments (on the web site)

Course schedule and reading assignments:

Lesson	Dates	Topic	Reading assignments
			see Reading Assignments for PDFs
Lecture 1	Jan 17	Introduction, Lecture 1	Read syllabus
Lab 1	Jan 17	Plant identification: Overview of plant terminology guides dichotomous keys. Common Arctic trees and shrubs	Read Web site links to family characteristics for Pinacea, Betulaceae, Salicaceae. Plant identification: Trees (6 species) and tall shrubs (4 species), and low shrubs (12 species) during lab.
Lecture 2	Jan 22	Overview of Arctic Ecosystems: The role of climate	Callaghan, T.V., Bjorn, L.O., Chapin III, F.S., et al. 2005. Chapter 7, Arctic tundra and polar desert ecosystems. Arctic Climate Impact Assessment - Scientific Report. Cambridge University Press. Cambridge. pp. 243-352. *This is an excellent summary of the current state of knowledge of Arctic terrestrial ecosystems. Use as a standard reference, skim it now, begin reading and complete by Mar 21, Literature Discussion 7.*
Lecture 3	Jan 24	The role of topography	Bliss, L.C. 1997. Arctic Ecosystems of North America. Polar and Alpine Tundra. Elsevier. Amsterdam. Pp. 551-683. Focus on p. 551-568.
Lab 2	Jan 24	Plant identification: Arctic dwarf shrubs	Read Web site links to family characteristics for Betulaceae, Salicaceae, Caprifoliaceae, Elaeagnaceae, Myricaeae, Rosaceae. Review required dwarf shrub species (24 species).
Lecture 4	Jan 29	The role of soils: pH, texture, moisture	Tedrow, J.C.F. 1977. Chapter 9. The tundra zone and its soils, pp. 145-196, In: Tedrow, J.C.F. Soils of the Polar Landscapes. New Brunswick, NJ: Rutgers University Press.
Literature discussion 1	Jan 31	Overview of North America Tundra	Bliss, L.C. 1997. Arctic Ecosystems of North America. Polar and Alpine Tundra. Elsevier. Amsterdam. Pp. 551-683. *Focus on p. 551-539.*
Lab 3	Jan 31	Plant identification: Grasses, sedges, rushes	Read Web site links to family characteristics for Poaceae, Cyperaceae, Juncaceae. Review required grasses (11 species), sedges (11 species), rushes (5 species) during lab.
Lecture 5	Feb 5	Loess ecosystems and the Mammoth Steppe	Guthrie, R.D. Mammals of the mammoth steppe as paleoenvironmental indicators. In: Hopkins et al. 1987. Paleoecology of Beringia, New York: Academic Press, p. 307-326.

Overview of lectures

2-3	Overview of Arctic Ecosystems: The role of climate and topography
4-5	The role of soils: pH, texture, moisture, loess ecosystems and the Mammoth Steppe
6-7	The role of permafrost, biocomplexity of small-scale patterned-ground features
8-9	Snow ecology (3 lecture + field trip)
10	Climate change
11	Arctic vegetation mapping
12?	Cumulative effects of oil development

Literature discussion groups

Group 1:

- Victoria Frehill (1, 6),
- Kayla Friedrich (1, 6),
- Emily Garrett (2, 7**L**),
- Breanne Gilbert (2, 7),
- Amanda Grimes (1, 3),
- Amy Hendricks (2**L**, 4),
- David Hogan (3, 5),
- Samantha Jones (4**L**, 6),
- Sara Klingensmith (5, 7),

Group 2:

- Robert Liebermann (1**L**, 6),
- Jamie Luce (1, 6),
- Stephanie McClendon (2, 7),
- Eri Nakanishi (2, 7),
- Karolina Pavic (1, 3**L**),
- Kailey Skinner (2, 4),
- Leigh Strehlow (3, 5**L**),
- Sheila Swanberg (4, 6),
- Laramie Yancey (5, 7),

Codes in parentheses: Numbers indicate literature discussion session numbers for formal presentations. **L** = Lead.)

Literature discussion groups

	Name	Literature discussion						
Undergraduates		1	2	3	4	5	6	7
Group 1:								
1	Frehill, Victoria A.	x					x	
2	Friedrich, Kayla D.	x					x	
3	Garrett, Emily		x					L
4	Gilbert, Breanne M.		x					x
5	Grimes, Amanda L.	x		x				
6	Hendricks, Amy S.		L		x			
7	Hogan, David A.			x		x		
8	Jones, Samantha N.				L		x	
9	Klingensmith, Sara M.					x		x
Group 2:								
10	Liebermann, Robert J.	L					x	
11	Luce, Jamie R.	x					x	
12	McClendon, Stephanie A.		x					x
13	Nakanishi, Eri		x					x
14	Pavic, Karolina	x		L				
15	Skinner, Kailey E.		x		x			
16	Strehlow, Leigh E.			x		L		
17	Swanberg, Sheila R.				x		x	
18	Yancey, Laramie L.					x		x

Codes : Numbers indicate literature discussion session number where student presents material; L = Lead.

Snow-ecology component

- Three lectures plus a Saturday excursion to Cantwell cabin near Denali Park
- Need to set aside March 8-11. First weekend and Monday of Spring Break.
- Will need skis and winter equipment, sleeping bags, pads.
- Students can in the cabin or a Western Shelter yurt or quinzhee.
- Fun days. Students will be graded only on attendance.
- Details of the trip and content of the field trip will be made during the course.
- Replaces lessons on April 9, 11, 16, 18, when Dr. Walker is in Europe for meetings.

Research topics

- Each student will select a research topic of their choosing early in the semester.
- At the end of the course, students will present 30-minute oral summaries of individual library research topics.
- Guidelines for talks will be handed out early in the semester.

Attendance policy

Students are expected to attend every class, lab and discussion group and be seated at the beginning of the class (3 points per session). Late attendance will receive no points.

Expectations

1. Attend all lecture, labs, and discussion groups (3 points each session).
2. Participate in 2 literature discussion presentations (100 points total):
3. Attend the snow ecology field trip. (100 points).
4. Give a 30-minute oral presentation of a research topic of interest related to Arctic vegetation (200 points).
5. Final plant exam (200 points).

Grading

Undergraduate student grading (BIOL 488 students):

Attendance at lectures and labs (3 pts/class, 33 classes)	100 pts
Presentations at 2 literature review sessions:	100
Snow Ecology Field Trip	200
Plant identification exam	200
Plant id notebook	100
Oral presentation of research topic	200
TOTAL	900 pts

These criteria may be modified somewhat as the course progresses.
Final grades will be as follows: greater than or equal to 90% = A; 80-89% = B; 70-79% = C; 60-69% = D; < 60% = F.

Reading for Lectures 1, 2, 3

Callaghan, T.V., Bjorn, L.O., Chapin III, F.S., et al. 2005.
Chapter 7, Arctic tundra and polar desert ecosystems.
Arctic Climate Impact Assessment - Scientific Report.
Cambridge University Press. Cambridge. pp. 243-352.

The full ACIA (1036 pages!) is on reserve in Biosciences Library. Recommended reading. Good graphics for talks.

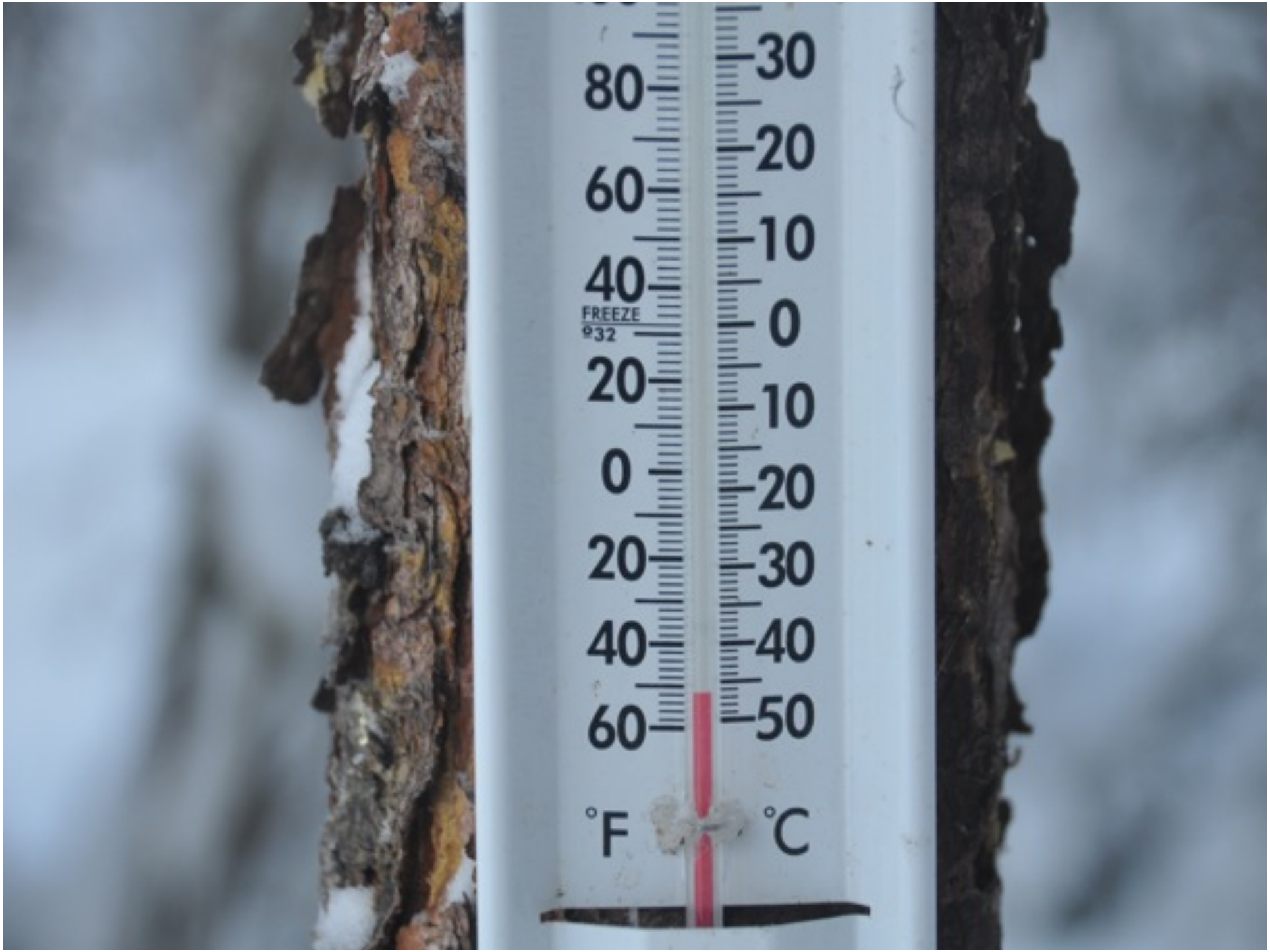
Also…!

Bliss, L.C. 1997. Arctic Ecosystems
of North AmericaIn: Wielgolaski, F.E. 1997. Polar and Alpine Tundra. Elvesier. Amsterdam. pp. 551-683.

Chernov, Y.I., Matveyeva, N.V.
1997. Arctic ecosystems in Russia. In: Wielgolaski, F.E. 1997. Polar and Alpine Tundra. Elvesier. Amsterdam. pp. 361-507.

Both chapters are in Wielgolaski, F.E. 1997. **Polar and Alpine Tundra.** ***Elsevier: Amsterdam, 420 pp.***
Several excellent chapters on plant adaptations, biomass, leaf chemistry, and vegetation in most of the Arctic including Svalbard (Norway), Iceland, Russia, North America (including Greenland) and many alpine areas and Antarctica.
Also on reserve in the Biosciences library.

Take advantage of the North Campus Lands in winter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