Biology 370 Bevington
Senior Seminar Fall Term, 2015
8:55 – 9:45 am

RAIN FORESTS OF THE NEOTROPICS

TEXTS: Kricher, John. 2011. **Tropical Ecology**. Princeton University Press. 632 pp.
ISBN: 978-0-691-11513-9

The course will focus on the nature of rain forests and cloud forests of the Neotropics with an emphasis on the Amazon and Central America. These forests represent a truly spectacular storehouse of biological diveresity. We will examine some of the fascinating interactions between the plants, animals and microorganism that inhabit the forests. These interactions are at times peculiar or even bizarre, and they often force us to reexamine or abandon our temperate zone biases and expectations. We will also examine the ecological role of indigenous peoples in these forests. Students will pursue individual research projects on topics of their own choosing. It is hoped that by understanding some of the biotic interactions in these forests you will gain an appreciation for the importance of preserving them. The course will involve seminar presentations, class discussions, and a written paper.

About 50% of Earth's species reside in tropical forests, yet they cover less than 6% of the surface area of the Earth. Each year the loss of tropical forests amounts to an area approximately the size of the state of Ohio. Based on current rates of deforestation, conservative estimates suggest that most of the world's tropical forests will be gone in two or three decades. If this is true, we may be the last generation to see the rain forests. How many species do these forests contain? Why should we be concerned about them? Why are they important to us?

COURSE OBJECTIVES:

1. To become familiar with the biological literature and with on-line search strategies to access information from scientific data bases.
2. To develop good library research skills.
3. To acquire skills of critical data analysis and to formulate hypotheses and ways to test them.
4. To research and prepare effective oral presentations on topics of your choice.
5. To become acquainted with the field of tropical ecology.
6. To improve your formal writing skills.

ORAL PRESENTATIONS:

The ability to effectively communicate one's ideas is the mark of an educated person. In science this skill is particularly important because the information acquired by one scientist must be verified by others before it is accepted as part of the body of scientific knowledge. Scientists communicate research findings to their colleagues primarily in the form of journal papers to be read by the scientific community. This constitutes the primary literature. From the primary literature one or more authors may assemble the results of many scientists into a reference book

on a specific topic. Another method of communicating with one's colleagues is an oral presentation of data where one speaks to an audience of peers, typically at a professional meeting. Scientists attending professional meetings exchange information about their current research efforts and often present their data before it has been published in the primary literature.

During the semester you will give two oral presentations to the class on topics in tropical biology. One of your topics should be plant-related and the other should be about an animal. Or, you could do one topic on an organism(s) of your choice and another topic on some aspect of the ecosystem as a whole. Topics must be approved in advance by the instructor. The first presentation should be 15 minutes in length, and we will follow it with 10-15 minutes of questions and discussion. The topic you select for your first seminar will be the basis for your research paper (see page 5). The second presentation will be longer (30 minutes), and it should be more detailed in scope and involve more extensive preparation. With the second presentation the question and answer period will be longer. During the first class meeting the dates for seminars will be assigned by drawing lots, and potential topics will be discussed. While it is not a requirement that you do so, you are encouraged to use Power Point to prepare your presentations.

As you conduct the research for your seminar, select a scientific paper which seems to be central to the theme you plan to develop. This will serve as a **focus paper** for the rest of the class since they will read it before hearing your presentation. This article should be from the primary literature, and ideally it should have been published within the last 10 years.[1] One photocopy of the article is to be placed on reserve in Reeves Library and another copy is to be given to the instructor **one full week prior to the date the seminar is to be given**. At the same time you will give the instructor a typed abstract of your seminar (not to exceed 300 words). Duplicate enough copies of your abstract so that you can distribute one copy to each member of the class. It is important that your abstract and the copies of your focus article be in on time. It is your responsibility to see that a copy of the article is on reserve in the library **and** in the hands of the instructor and other members of the class one full week before your talk. The importance of timely submission of your focus paper and abstract is explained below.

CLASS PARTICIPATION:

It is your responsibility to come to class prepared to discuss the seminar topics. You have a standing, weekly assignment to go to the library and read the focus papers for each presentation. Prepare three (3) questions from the paper for the presenter, and bring them to class on the day the topic is to be discussed. You are also expected to ask questions about the oral presentation. Class participation makes up 20% of your grade, so it is an important component of the course.

VIDEO TAPING OF SEMINAR PRESENTATIONS:

One of the most effective ways to evaluate your presence in front of an audience is to see a video of your own presentation. This will give you an opportunity to see yourself after the

[1] Some of the seminal papers or classic citations for your topic may be more than 10 years old. Generally, however, it is preferable to utilize more current literature unless you feel there is a compelling reason to do otherwise. Check with the instructor if you are in doubt.

seminar. A video recording of your first seminar will be by the Media Center staff. It is your responsibility to make an appointment with the Media Center staff to pick up your video during the week after it is given. The Media Center will prepare a CD for you for this purpose, but you will need to make an appointment to pick it up.

CRITERIA FOR EVALUATING SEMINAR PRESENTATIONS:

1. Were the abstract and focus paper turned in on time?

2. Is there a central theme developed through the presentation?

3. Is the focus paper selected by the speaker representative of the topic, and does it focus on the theme?

4. Does the presentation indicate that the speaker has thoroughly researched the topic and has command of the literature?

5. Is the speaker neatly dressed?

6. Delivery of the presentation:

    A. Is there an introduction?

    B. Are the data clearly presented? Do they illustrate the points being made?

    C. Is the theme cohesive? Does the speaker ramble?

    D. Did the speaker analyze the data correctly?

    E. Was the use of visual aids effective?

        (1) Are figures and tables **properly labeled** (i.e. conspicuous titles, were the axes on figure labeled and supplied with appropriate units)?
        (2) Is the amount of data presented adequate for the points being made?
        (3) Do PowerPoint slides or overhead transparencies have too much data so that they appear crowded and difficult to read, or has the speaker obviously taken care to make the data easy for the audience to understand? **This is especially important to a good seminar presentation**.
        (4) Are visual aids used to illustrate points, or just to consume time and "get the speaker through?"
        (5) Were Power Point slides left on the screen long enough for the audience to grasp their contents, or were they removed too quickly due to the speaker's nervousness? **Another important point**.

F. The speaker's demeanor:

(1) Did the speaker maintain eye contact with the audience, or was the presentation read from a script?

(2) Was the delivery smooth or jerky?

(3) Were gestures used effectively, or were they distracting?

(4) Posture. Did the speaker stand up straight, or lean over the lectern or or against the blackboard?

G. Response to questions:

(1) How did the speaker handle himself/herself under fire (i.e. in response to questions from the audience)?

(2) Were answers logical and analytical?

(3) Were questions answered directly, or did the speaker "beat around the bush?"

7. Was there a summary? Did it focus audience attention on the major points made during the presentation. **A summary is important**.

READING ASSIGNMENTS:

The readings come from the text by Kricher. These will give you ideas for seminar topics and an introduction to important concepts in tropical ecology. From time to time you may receive a few relevant articles electronically from the instructor; these would be recently published papers pertinent to the course. Unannounced quizzes may be given occasionally on readings in the text and/or the focus papers assigned for your presentations. There are two copies of the text on reserve in Reeves Library. These can be used only in the library.

Due Date	Assignment
Mon. 7 Sept.	Ch. 1 pp. 6-37 What are the tropics and where are they? Overview, climate
Wed. 16 Sept.	Ch. 2 pp. 38-78 Vicariance, endemism, speciation
Wed. 30 Sept.	Ch. 3 pp. 79-108 Forest physiognamy
Wed. 14 Oct.	Ch. 4 pp. 109-153 Biodiversity. Why is there a latitudinal diversity gradient?
Fri. 23 Oct.	Ch. 5 pp. 154-187 Tree species richness
Fri. 6 Nov.	Ch. 14 pp. 500-529 Forest fragmentation and biodiversity

RESEARCH PAPER INSTRUCTIONS:

The research paper should be a major library research project, and as a result, it should be substantial in character.[2] Plan to write your paper on your first seminar presentation topic. You might want to keep in mind that toward the end of the semester course assignments and deadlines begin to pile up, so there is merit to writing a paper before the end-of-term chaos sets in.

The paper should summarize the current status of our understanding about your topic. **The paper must be written in college-level English**. Papers not meeting this standard will be returned ungraded to be rewritten.[3] Pay particular attention to spelling, grammar, and syntax. The paper should be written in a **critical** and **analytical** manner. As you work your way through the reference materials for your topic, ask yourself what important issues are unresolved. Where are the gaps in our knowledge about this topic? What issues should we know more about? What specific questions do you think should be answered?

When you construct the narrative for your paper, devote the last section of the paper to the specific questions you want to answer and describe how you propose to answer those questions. You can title this section "Unresolved Problems" or "Strategies to Address Unanswered Questions." I am asking you here to **go beyond** simply recounting what you have read by making value judgements about what additional work needs to be done and by explaining how you would go about doing it. In short, I am asking you to think scientifically. What experiments need to be done? How would you set them up? Lay out the rationale for them. How would you interpret the results from your experiments. I want you to identify interesting, unanswered questions and then show your reader how you propose to address them experimentally.

In the text of your paper **you must document statements with literature citations**. You may do this by number or by author's last name and date. In scientific writing documentation is necessary so that your reader can find the sources of the information to which you refer. Assemble your citations at the end of the paper, alphabetically by first author's last name according to the format on page 7. Note that this is not a bibliography of reference works which you consulted, but rather a list of specific papers from the primary literature and reference texts which you have cited directly in the text of your paper. **Follow the prescribed literature citation format carefully**.

Students who wish to request accommodations in this class for a disability shoulde contact the Academic Support center, located on the first floor of Monocacy Hall (extension 1401). Accommodations cannot be provided until authorization is received from the Academic Support Center.

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[2] Approximately 15-20 typewritten pages with normal margins in 12 point font. Statements referring directly or indirectly to scientific research must be properly documented with literature citations.

[3] Not a good thing at the end of the semester when you have 10^6 things to do.

GRADING:

Grades will be based on your seminar presentations, class participation, a written paper, and other library assignments. Unannounced quizzes may be given during the semester on reading materials for seminars for the day.

Seminar presentations (Short seminar 10%, Major seminar 25%)	35%
Class participation	20%
Research Paper	40%
Quizzes and/or library assignments	5%

TIME LINE FOR WRITING YOUR PAPER

Put these dates into your datebook calendar. It is important to stay on target with the progress of your paper. Since it is a major undertaking and involves a substantial amount of library research time, it is unlikely that you will do well on it if you put it off until late in the semester.

Date	Items Due
Wed. 9 Sept.	Selection of first seminar topic
23 - 30 Sept.	1. Paper outline 2. List of literature citations and reference texts you plan to use 3. Photocopies of all journal articles you have received through interlibrary loan.
Wed. 16 Oct.	1. Expanded outline. 2. Rough draft 3. A list of the gaps in our knowledge (i.e. unanswered questions) which you have identified about the topic. 4. Photocopies of all journal articles you are using
Fri. 13 Nov.	Second draft (this is a **firm deadline**)
Fri. 4 Dec.	Paper due

HOW TO CITE LITERATURE IN YOUR PAPER:

Literature Cited

For journal articles:

Arcell, A.P. 2001. Elevated rates of tree collisions by high-flying toucans in an Ecuadorian rain forest associated with increased dietary intake of *Erythroxylum coca*. Ecology. 102: 76-85.

Baker, T.L. 1902. A preliminary study of the adaptive escape strategies of the green iguana. I. Swan-diving from tall trees into rivers. It only hurts for a while. Journal of Herpetology. 26: 243-249.

Bortnick, J.B. and F.N. Johnson 1987. Pollination failure in tropical vines affected by hummingbird intoxication and its correlation with the period of party activity by the birds during the previous night. Ecological Monographs. 26: 89-103.

Gandy, M.W. 2004. Why bats sometimes fly into walls. Collision Science. 16: 2017-2023.

Giardina, A.M, L.A. Hill, and J.B. Lema. 1992. How to enjoy termite ecology while they eat you out of house and home. Journal of Irreproducible Results. 54: 22-47.

For a chapter or an article in a reference book:

Hill, L.A., C.N. Marinaro, and J.B. Lema. 1994. Migratory tropical birds flying at low altitudes have difficulty discriminating between open windows and closed ones. In: J.N. Zalis and M.W. Gandy. The Secret Lives of migratory birds. Macmillian Publishing Co, Inc., New York. pp. 223-227.

Lambert, C. and A. M. Giardina. 2000. The sloth and the hare: a new paradim. In: T.L. Baker and J.B. Lema. Winning is Everything. Bench Press, Inc. Bogota. pp. 235-253.

Suggestions for Topics in Tropical Ecology

This is a short list of ideas to get you thinking about potential topics. You can find additional topics which may be more interesting by consulting the list of selected references for each chapter in Forsyth and Miyata's book, or the instructor may have additional ideas for you to consider.

Ecological roles of bats: bats as keystone species, pollination, tree seed dispersal, etc.
Poison dart frogs: natural history, life cycles, patterns of parental care, sources of toxins, mimicry among species
Dung beetles
Sloth ecology: A long way to the toilet!
Leks and sexual selection in tropical birds: cotingas, manakins, cock-of-the-rock
Leaf cutter ants (social structure, foraging behavior, food preference, phermonal communication, fungus gardens, roles in nutrient recycling)
Army ants
Arboreal termites
Life cycle of the fig wasp
Figs as keystone species in lowland forests
Ecology of strangler figs
Ecological succession in tree fall gaps (gap specialists)
Gap dynamics: How does tree fall contribute to species diversity?
Plant/ant mutualisms (*Cecropia*, *Duroia*, *Triplaris*, *Cordia*, *Acacia*, *Macaranga* etc.)
Euglossine bees, orchids, floral scents, and pollination
Herbivore defense in tropical plants
Tank epiphyte ecosystems (e.g. bromeliads, orchids)
Epiphytes: What is the ecological significance of epiphyte load? Why are there more epiphytes is some forests (e.g. cloud forests) than in others?
Tropical spiders (e.g. tarantulas)
Ecological succession along rivers: plant and animal communities, cochas (oxbow lakes), palm swamps
Giant river otters
Coca (*Erythroxylum coca*): cultural importance to Andean peoples, history of its use and exploitation, spiritual significance, etc.
Chocolate (*Theobroma cacao*): biology and natural history
The ecology of bamboos
Medicinal plants of the Amazon
Hallucinogenic plants, their uses by indigeous peoples, modes of action
Caiman ecology
Fresh water dolphins of the Amazon (evolutionary origins, ecological roles, distribution, myths, and legends)
Mycorrhizae (roles in nutrient recycling, tree growth, nutrient uptake)
Nitrogen fixation
Soils of the Amazon Basin

Lianas (vines) – natural history, importance in the canopy, establishment
Capybaras – the world's largest rodent
Large cats (jaguar, puma, ocelot)
What is the role of the Amazon Basin in the world's carbon budget
Venomous snakes, arboreal snakes, anaconda
Ecology of dry tropical forests
Cloud forests and elfin forests
Paramo of the high Andes
Iguanas
Large rodents in lowland rain forests: agoutis, paca, pacarana. What ecological roles do they play? Who eats them and what do they eat?
Ant eaters, opossums, porcupines, armadillos
Peccaries: wild pigs (white lipped, collared). Ecological roles, food sources, predators
Hummingbirds and their flowers: caloric rewards, territoriality, hermit birds, bill adaptations to flower corolla structure
Heliconius/*Passiflora* interactions
Müllerian mimicry in *Heliconius*
Why are there so many more species in tropical forests than in other ecosystems?
Keystone species and their roles in the forest ecosystem
Swidden agriculture (slash and burn) in the lowland tropics: crop species, importance to native peoples, impact on the forest
Raptors: Harpy eagles, caracaras, falcons
Gold mining in the Amazon – cyanide pollution and accumulation in the food chain, sociopolitical aspects, economic considerations
Fishes of Amazonia: arauna, peacock bass, giant catfish, golden dorado, pacu, arapiama
Fish migration, predation, seasonal movenents
Fresh water stingrays
Pirahna
Monkey ecology
Plant strategies to avoid herbivory
Natural history of unique tropical birds: guans, toucans, trumpter birds, curassows, oropendolas, parrots, macaws, manakins, pihas, etc.
The rubber boom and its effects on indigenous peoples of the Amazon
Threats to tropical forest
How do tropical forests respond to disturbance and fragmentation?
Varzea forests (flooded forests)
Commercially important rain forest tree species (mahogany, cedar, Brazil nut, etc.)
Savannas and dry forests
The role of fire in tropical forests
How are successional plants that occupy light gaps different for those of the high canopy?
What habitats in tropical forests do migratory songbirds from North America utilize?

SEMESTER SCHEDULE

Mon.	31 Aug.	Orientation, course objectives, discussion of topics
Wed.	2 Sept.	Seminar topics
Fri.	4 Sept.	Seminar topics
Mon.	7 Sept.	Structuring your presentation, presentation skills
Wed.	9 Sept.	Surprise
Fri.	11 Sept.	Library session: online searching strategies
Mon.	14 Sept.	Deep Jungle (?)
Wed.	16 Sept.	Tropical ecology: principles and precepts
Fri.	18 Sept.	Tropical ecology: principles and precepts
Mon.	21 Sept.	Tropical ecology: principles and precepts
Wed.	23 Sept.	Tropical ecology: principles and precepts
Fri.	25 Sept.	Tropical ecology: principles and precepts
Mon.	28 Sept.	Paper critiques and analysis
Wed.	30 Sept.	Paper critiques and analysis
Fri.	2 Oct.	Posing questions, forming hypotheses, designing experiments
Mon.	5 Oct.	Forming hypotheses, designing experiments
Wed.	7 Oct.	Short seminar 1 – Jessie Bortnick
Fri.	9 Oct.	Short seminar 2 – Tiana Baker
Sat. 10 Oct. – Tue. 13 Oct.		Fall Recess
Wed.	14 Oct.	Short seminar 3 – Jack Lema
Fri.	16 Oct.	Short seminar 4 – Andrew Arcell
Mon.	19 Oct.	Short seminar 5 – Andrea Giardina
Wed.	21 Oct.	Short seminar 6 – Letitia Hill
Fri.	23 Oct.	Short seminar 7 – Courtnie Lambert
Mon.	26 Oct.	Short seminar 8 – Kyle East
Wed.	28 Oct.	Short seminar 9 – Felicia Johnson
Fri.	30 Oct.	Short seminar 10 – Matthew Gandy
Mon.	2 Nov.	Short seminar 11 – Christina Marinaro
Wed.	4 Nov.	Short seminar 12 – Kirsten Keet
Fri.	6 Nov.	Major seminar 1 – Jessie Bortnick
Mon.	9 Nov.	Major seminar 2 – Tiana Baker
Wed.	11 Nov.	Major seminar 3 – Jack Lema
Fri.	13 Nov.	Major seminar 4 – Andrew Arcell

Mon.	16 Nov.	Major seminar 5 – Andrea Giardina	
Wed.	18 Nov.	Major seminar 6 – Letitia Hill	
Fri.	20 Nov.	Major seminar 7 – Courtnie Lambert	
Mon.	23 Nov.	Major seminar 8 – Kyle East	
Wed. 25 Nov. – Sun. 29 Nov.		Thanksgiving Recess	
Mon.	30 Nov.	Major seminar 9 – Felicia Johnson	
Wed.	2 Dec.	Major seminar 10 – Matthew Gandy	
Fri.	4 Dec.	Major seminar 11 – Christina Marinaro	Research papers due
Mon.	7 Dec.	Major seminar 12 – Kirsten Keet	
Wed.	9 Dec.	Wrap up	
Fri.	11 Dec.		