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BIOM 135N.01: Hot Springs Microbiology - Yellowstone National Park

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BIOM 135N Biology of Yellowstone Hot Springs

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The spectacular setting of Yellowstone National Park's thermal features provides an ideal backdrop for discussing the interdependence of biology, chemistry and geology, with respect to both how biological communities are shaped by the physical and chemical conditions of the environment, and, in turn, how the activities of organisms alter these conditions. Our first national park will serve as a natural laboratory for introducing several themes for subsequent development throughout the course.

Goals:

- (1) Develop a better understanding of how biology, chemistry and geology interact to shape the structure and function of the natural world
- (2) Enhance appreciation of how research science works as a process, both by discussing the park's rich history of revolutionary microbiological research, and through laboratory experiences aimed at enhancing our understanding of novel microorganisms in these communities
- (3) Introduce how microorganisms from extreme environments survive hostile conditions

Text: There is no text for this course. Readings will be provided as appropriate.

General policies. University policies on drops, adds, grade changes, changes of status and disability services for students will be observed in this course.

Performance will be evaluated with the +/- system: A (>92-100); A- (>90-92); B+ (>87-90); B (>82-87); B- (>80-82); C+ (>77-80); C (>72-77); C- (>70-72); D+ (>67-70); D (>62-67); D- (>60-62); F (<60).

Assessment will be based on the following:

- (1) Attendance and participation (30% of grade).** Classroom and laboratory experiences will be most successful if there is a spirit of open discussion, sharing of ideas and asking of questions. Missing class without a valid reason will result in a 5 point deduction of your final grade.
- (2) Homework and classroom/laboratory exercises (35% of grade).** Homework assignments are intended to prepare for and motivate class discussion. With its focus on microbial communities as a "last frontier" of biological diversity, laboratory activities will aim both to introduce basic techniques in microbiology and molecular biology and to stimulate a sense of biological wonder: our principal objective will be to attempt to grow novel bacteria in the lab for the first time.
- (3) Final project (35% of grade).** A small, independent project, to be developed in consultation with the instructor. During the course and field trip, you will make many observations and hopefully formulate new questions. These observations and questions will provide the basis for your project. The project may be (1) a primarily descriptive exploration of a course topic of interest or (2) a research proposal, with a research question derived from an observation, followed by proposed experiments to test the question. At the end of the semester, you will submit a 5-8 page paper and deliver a short (ca. 12 minute) presentation to the group. Details of the paper and presentation guidelines to follow.

UM Online Course Supplement: Course documents including lectures will be posted on the course's Moodle site. If you have not used such a course supplement before or have difficulty accessing the site, please contact technical support at UM Online (<http://www.umt.edu/xls/techsupport/default.aspx>). Lectures will be posted following the day's session.

Week	Topic
August 25	Introductions; Geology of Yellowstone and its thermal features
September 1	Yellowstone hot springs: A window on the evolutionary history of life on Earth
September 8	Introduction to Yellowstone microbial diversity
September 15	Introduction to Yellowstone microbial diversity; Field trip logistics
September 21	Sep 22: No class ; Pre-trip recap
September 26-28	Weekend field trip to Yellowstone National Park
September 29	Lab: Yellowstone microbes under the lens; Lab: Where discoveries still happen!
October 6	Life at high temperature; Lab: Discoveries continued
October 13	Life at high temperature; Living in acid
October 20	Lab: Discoveries continued; Microbial biogeography: Is everything everywhere?
October 27	Lab: Discoveries continued
November 3	Supervolcano! The future of Yellowstone; Nov 4: No class
November 10	Economics and ethics of Yellowstone microbiological research; Nov 11: No class
November 17	Lab: Diversity revealed!
November 24	Student presentations; Nov 27: No class
December 1	Student presentations
Finals Week	There will not be a final exam

** Topics and dates may be subject to change.