**Asbury University**
**Biology 393R (3 Credits)**
**Biogeography of the Galapagos Islands**

**TERM:** Summer Term I 2023
**INSTRUCTOR:** Ben Brammell, Ph.D.
**OFFICE:** CLC 247
**CONTACT:** ben.brammell@asbury.edu; (859) 858-5123
**OFFICE HOURS:** MWF 11:00 – 1:00; Thurs 11:00 – 12:00; or by appointment

**PREREQUISITES:** None

## COURSE TEXTS: All provided

Darwin, Charles. 1996. *The Voyage of the Beagle*. Wordsworth Classics of World Literature. Herts, UK: Wordsworth Editions. Chapter 17: Galapagos Archipelago

Grant, Peter R. "Natural selection and Darwin's finches." *Scientific American* 265, no. 4 (1991): 82.

Frazier, J., 2021. The Galapagos: Island home of giant tortoises. In *Galapagos giant tortoises*. Academic Press.

Collins, Francis S. *The language of God: A scientist presents evidence for belief*. No. 111. Simon and Schuster, 2006. Chapter 4: Of Microbes and Man.

## PURPOSE:

To learn about the biology, biogeography, and history of the Galapagos Islands with an emphasis on how the ideas that arose there laid the foundation for the field of biology.

## SPECIFIC OBJECTIVES:

1. Learn to identify a portion of the flora and fauna found on three of the largest Galapagos Islands (San Cristobal, Santa Cruz, and Isabela).
2. Learn about the ecology, physiology, and behavior of these organisms with an emphasis on the *ultimate cause* of each (how does each increase the fitness of these organisms in their unique environments).
3. Learn about the evolutionary processes that gave rise to these organisms, and why the outcomes of those processes are more visible in the Galapagos relative to similar mainland environments.
4. Learn about the history of the Galapagos Islands and humans, including how the ideas that first arose on the islands have changed the world and how humans have impacted the islands.

## INSTRUCTIONAL METHODS:

1. **Pre-departure -** Students will be expected to attend three two-hour meetings during which discussions will take place concerning the following topics. In additional details concerning practical aspects of the trips will be discussed at these meetings.

   Meeting 1: Galapagos Overview and Brief History – Topics covered include formation and age of the islands, factors contributing to climate, Darwin's route through the Islands, history of humans and human impact and the Islands.

   Meeting 2: Galapagos Island Biogeography – Topics covered include basic overview of island biogeography, adaptive radiation and how island habitats facilitate this process, impact of different types of competition on this process, niche partitioning and character displacement, and examples of all these processes that may be observed in Darwin's finches with an introduction to the Grant's research.

   Meeting 3: Course introduction and final trip instructions – Review of the final schedule, overview of the islands and cities to be visited, instructions on interacting with and being polite in Latin American culture, review of eating and drinking safety, general safety. Additionally, instructions and advice on viewing and

interacting with organisms of the Galapagos Islands safely, overview of which organisms will be found where, instructions on field logs and daily journals.

Readings: The four readings previously listed in the syllabus have been selected to support the course learning objectives. Students are expected to complete these readings and will need to do so in order to fully participate in course discussions, complete course assignments, and most importantly full appreciate the significance of the world we will be privileged to observe in the Galapagos Archipelago. All readings are posted on Disc.

2. **Trip -** During the trip most days will be filled with field sessions, with discussions held each evening to recap the main learning objectives of the day, introduce topics for the next day, and reflect on what each student learned and thought about that day's experience. Participation in daily discussions is mandatory and **20%** of the overall course grade.

   Each student will keep a field journal in which they will be expected to take notes, in a manner similar to Darwin (Voyage of the Beagle, Ch. 17) on the organisms observed and habitats encountered (**20%** of grade). This journal will have an entry for each day (11 total, May 3 – 13) that are completed in real time on these days. The journal may be kept in electronic or paper form but must be turned in electronically via Discovery.

   Students are expected to photo document (**20%** of grade) organisms encountered in the archipelago and compile an electronic collection (PowerPoint) of a minimum of 20 organisms encountered during the trip. A template slide is found on our Discovery page, complete collection information is found there and includes location, date, common name, scientific name, range, diet, and life history notes.

   Cobos Finca flora and fauna survey (groups of 2 or 3): On May 12th we will travel to the 150 hectare (370 acre) Cobos family Finca on San Cristobal. We will spend 4 – 5 hours here both observing (through hiking) different parts of the finca and collecting data (via photography) of the flora and fauna, through the use of transects if possible. These will be similar to the organism photo collection but turned in as a group on Discovery (**10%**). All plants and animals documented here may also be used in the main collection.

3. **Post-trip –** After returning to the U.S. students will be expected to compose a post trip paper. The prompt for the paper (300 points) is found below.

   **Post trip paper prompt –** The idea of evolution by natural selection, upon which the entire discipline of biology rests, finds its origins in the Galapagos Islands. Please respond in a thoughtful manner to each of the following prompts in the weeks following our return. I am always hesitant to specify length, quality is highly desired over quantity. However, were I pressed to recommend a length for these responses I would suggest 2 to 3 pages double spaced, which seems appropriate to me. Certainly, it would be possible to spend more time on one prompt and less on another.

   **1.** Why the Galapagos Islands were the perfect place for the evolution by natural selection to first be recognized? What unique characteristics do they possess? What organisms were instrumental in this observation.

   **2.** Select two of your favorite organisms endemic to the Galapagos and describe their biology, physiology, phylogeny, and behavior. Be sure to point out the ultimate cause of each adaptation you discuss.

   **3.** Please describe the most significant aspect of the trip to the Galapagos for you. This does not have to be related to biology but may be cultural, relational, spiritual, or any other aspect in which you found significance during the trip.

## ETHICS:

Academic integrity, the embodiment of the moral and spiritual principles to which we adhere, is the essential basis of the Asbury University academic community. Integrity, as partially defined by the Student or Program Handbook on *Community Life Expectations,* is "both knowing the right thing to do and doing it regardless of the circumstances." This definition may be applied to all of the scholastic interactions of the academic community. Every member of the community shares responsibility for maintaining mutual trust, respect, and integrity. Violations of such trust and specific acts of academic dishonesty will be subject to disciplinary action.

**Grade Composition**

| Assignment | Points |
|---|---|
| Field journal | 200 |
| Collection (organism photos) | 200 |
| Daily discussions (20 points x 10) | 200 |
| Cobos Finca flora and fauna survey | 100 |
| Post trip paper | 300 |
| **Total** | **1000** |

**SCHEDULE:**

| Month | Day | Location | Daily activity schedule |
|---|---|---|---|
| February | 12 | AU, CLC 111 | Pre-departure Meeting #1 |
| March | 26 | AU, CLC 111 | Pre-departure Meeting #2 |
| April | 23 | AU, CLC 111 | Pre-departure Meeting #3 |
| May | 2 | | Traveling |
| | 3 | San Cristobal | Flight arrives at 10:00 a.m.<br>P.M. - Tortoise breeding center tour - Guide<br>Evening discussion and next day's introduction |
| | 4 | San Cristobal | A.M. - Snorkeling at Muelle Tijeretas (Darwin's Bay)<br>P.M. - Tour to San Cristobal Highlands - Guide<br>Evening discussion and next day's introduction |
| | 5 | Santa Cruz | ***Morning ferry***<br>P.M. - Tortuga Bay – Wildlife viewing and kayaking?<br>Evening discussion and next day's introduction |
| | 6 | Isabela | ***Morning ferry***<br>P.M. - Snorkeling at Concha Perla<br>Evening discussion and next day's introduction |
| | 7 | Isabella | A.M. – El Muro de las Lágrimas (Wall of Tears) bike ride<br>P.M. – Free time<br>Evening discussion and next day's introduction |
| | 8 | Isabela | A.M. – Islote las Tintoreras (kayaks) – Guide<br>P.M. – Free time<br>Evening discussion and next day's introduction |
| | 9 | Isabela | A.M. - Volcan Sierra Negra hike - Guide<br>P.M. – (hike ends about 3:00)<br>Evening discussion and next day's introduction |
| | 10 | Isabela | A.M. - Los Tuneles snorkeling (boat trip) - Guide<br>P.M. – (return about 3:00)<br>Evening discussion and next day's introduction |
| | 11 | Santa Cruz | ***Morning ferry***<br>P.M. - Darwin research center tour - Guide<br>Evening discussion and next day's introduction |
| | 12 | San Cristobal | ***Morning ferry***<br>P.M. Data collection at Cobos Finca<br>Evening discussion and next day's introduction |
| | 13 | San Cristobal | A.M. Snorkeling at Leon Dormido (boat trip) – Guide<br>Final day discussion and plans for travel home |
| | 14 - 15 | | Depart San Cristobal 3:20 p.m., arrive in Miami 2:15 p.m. |
| May | 30 | | All assignments due |