# Biophysical Field Methods Workshop at Gobabeb: 10-26 February 2020

Day-by-day schedule

*Every day, Breakfast, Lunch and Dinner will be served at 07:00, 13:00 and 18:00, respectively. The lunch break will be until 15:00, after which we will gather in the lecture hall or library to workup data together and hold discussions. Evening activities will be held in the lecture hall or the library, depending on the subject, beginning at 19:00. Also, depending on the weather, some of the indoor activities might take place in the afternoon, when it is hot, rather than in the evening. Some of the lecture slots listed might be replaced by other activities, depending on how we progress. Every so often there may be guest lectures by other scientists working at Gobabeb while we are there.

| *Date* | *Day* | *DoW* | *Activity* | *Notes* |
|---|---|---|---|---|
| 10 Feb. | 1 | Mon | Afternoon arrival at Walvis Bay International Airport; travel to Gobabeb in time for dinner. | Greetings and a short introduction to Gobabeb - Dr. Gillian Maggs-Kölling, director of Gobabeb. After that, we will introduce ourselves to each other. |
| 11 Feb. | 2 | Tue | *Morning*: general orientation and introduction to Gobabeb and the surrounding area where projects will be done; detailing connection to principles.<br>*After lunch*: Division into groups and project choice. Project design with instructors; data sheet preparation and organization; assembling necessary equipment for fieldwork.<br>*Late afternoon*: *Welwitschia* Wash and sundowners back at Gobabeb. | No lecture this evening, but a short Discussion Circle: Project development until we run out of steam. |
| 12 Feb. | 3 | Wed | Group 1-Project 1<br>Group 2 Project 2<br>Group 3 Project 3 | Morning: Initial outing to research areas, marking research areas, identifying potential problems, completion of equipment organization.<br><br>Afternoon - evening: Discussion Circle: Initial presentation of projects by each group of students (background, questions, hypotheses and predictions). |
| 13 Feb. | 4 | Thu | Group 1-Project 1<br>Group 2 Project 2<br>Group 3 Project 3 | 19:00 - 19:45. *Evening Lecture*: **Brief** introduction to geological and climatological history of the Namib Desert - Dr. Eugene Marais.<br><br>Discussion Circle |
| 14 Feb. | 5 | Fri | Group 1-Project 1<br>Group 2 Project 2<br>Group 3 Project 3 | 16:45 - 18:00 *Late Afternoon Discussion* - outdoors: Philosophy of science in a nutshell, how to think like a scientist - Dr. Scott Turner<br>After dinner - Project handover in discussion circle |
| 15 Feb. | 6 | Sat | Group 1-Project 2<br>Group 2 Project 3<br>Group 3 Project 1 | 19:00 - 19:45 *Evening Lecture*: Dr. Nurit Agam |
| 16 Feb. | 7 | Sun | Group 1-Project 2 | 19:00 - 19:45 *Activity to be announced (TBA)* |

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| | | | Group 2 Project 3<br>Group 3 Project 1 | Discussion circle about the day's work |
| 17 Feb. | 8 | Mon | Group 1-Project 2<br>Group 2 Project 3<br>Group 3 Project 1 | 19:00 - 19:45 *Activity to be announced (TBA)*<br>Discussion circle about the day's work |
| 18 Feb. | 9 | Tue | Day field trip to Mirabib and other sites or to Swakopmund (students can choose one or the other) | Gobabeb for supper |
| 19 Feb. | 10 | Wed | Group 1-Project 3<br>Group 2 Project 1<br>Group 3 Project 2 | 19:00 - 19:45 *Evening Lecture*: Dr. Scott Turner. Discussion circle |
| 20 Feb. | 11 | Thu | Group 1-Project 3<br>Group 2 Project 1<br>Group 3 Project 2 | 16:45 - 19:00. End of data collection sundowners on the rocks near Villa 3.<br>*Evening Lecture*: Handling data and its presentation - Dr. Scott Turner. Open ended. |
| 21 Feb. | 12 | Fri | Group 1-Project 3<br>Group 2 Project 1<br>Group 3 Project 2 | Research till noon. Lunch at 12:00. Depart at 13:30 for overnight field trip |
| 22 Feb. | 13 | Sat | Field trip - return for lunch at ~13:00 | 15:00 - 18:00 Work on data together |
| 23 Feb. | 14 | Sun | Work on data together | 19:45 *Evening Discussion*: Dr. Berry Pinshow |
| 24Feb. | 15 | Mon | Work on data together | 16:00 Group photo at gate. |
| 25 Feb. | 16 | Tues | Wrap up and Pack up; including cleanup of research areas | 15:00 Mini conference - each group will make a short (20 minutes including questions) presentation of its data. Summation of the workshop - Dr. Scott Turner. Party after dinner |
| 26 Feb. | 17 | Wed | Depart for Walvis Bay and home | Bus leaves immediately after 06:30 breakfast! |

Summer: Students will work together online to analyze and write up their results for publication.

*Link*s:
Prof. Pinshow e-mail: pinshow@bgu.ac.il
Prof. Pinshow web page: http://scholar.google.co.il/citations?user=-2orJ8MAAAAJ
Dr. Agam's e-mail: agam@bgu.ac.il
Dr. Agam's web page: http://www.micrometlab.com
Prof. Turner web page: https://jscottturner.com
Prof .Turner e-mail: jsturner@syr.edu
Gobabeb: http://www.gobabebtrc.org

# Biophysical Field Methods 2019. Potential Projects

| Projects: | Principles: | Project |
|---|---|---|
| !Nara wind and moisture capture (!N) | Wind and boundary layer. Humidity, fog and dew point; turbulence | |
| Black vs white desert beetles (B) | Operative temperature, radiation, convection, wind and boundary layer | |
| Welwitschia Niche Construction (W) | Radiation heat balance<br>Wind and boundary layer, soil moisture and temperature, water vapor cycling | |
| Lichens? | | |

| | | |
|---|---|---|
| Spider burrows? | | |

!NARA

*Source: http://www.dw.com/en/over-1000-years-old-drought-resistant-and-unique-miracle-plants-in-the-namib-desert/a-39952494*

!Nara plants are well adapted to arid environments; they have spiky green stems and no leaves. Stomata are in furrows in the stems. !Nara plants grow on dunes and their many stems extend from small dunes that they "construct". (https://en.wikipedia.org/wiki/Acanthosicyos_horridus).

Potential questions: Do the protruding stems reduce air turbulence and so cause sand to settle, and to eventually build the !nara's sand dune? Does more fog water thus accumulate than in the surrounding sand?

Hypothesis: The greater the stem coverage of the !nara dune, the higher will be the water content of the dune sand.

BEETLES

*Source: https://www.gettyimages.com/videos/tenebrionid-beetle?sort=mostpopular&offlinecontent=include&phrase=tenebrionid%20beetle*

Many desert beetles (Tenebrionidae) are black in colour and diurnally active; a phenomenon known as the “black beetle paradox”.

Potential questions: From and energetic point of view, is being black advantageous over being a lighter color? Hypothesis: Since beetles are small and convection-coupled, being black allows them to dissipate enough absorbed radiation through the cooling effect of convection, allowing them to maintain optimal activity temperature for much of the day.

WELWITSCHIA


*Source: http://www.dw.com/en/over-1000-years-old-drought-resistant-and-unique-miracle-plants-in-the-namib-desert/a-39952494*

In contrast to !nara, Welwitschia is not a desert-adapted plant. Rather it has its origins in more mesic savannah. It has typical C-3 photosynthesis; its stomata are on both sides of the leaf and are not specially protected. However, the huge spread of the leaf creates a shaded environment all around the plant base.

Potential questions: Does the surface area of Welwitschia leaves cool sufficiently by radiative heat exchange at night to cause dew precipitation that might roll down the leaves to the protected soil surface below - and so serve as a water source for the plant? What does shading of the ground by the leaf do to the retention of soil water during the day?

Prediction: Surface temperatures of Welwitschia leaves rapidly drop below the dew point and remain so during clear nights, allowing dew to precipitate. Soils under Welwitschia leaves retain more water through the day than does unshaded, adjacent soil.