ANTARCTIC PENINSULA PROGRAM EDUCATION MODULE 2

"Where in the World is King George Island?" (Understanding the Geography)

INTRODUCTION

"Scientific research," for most people, brings to mind an image of a laboratory filled with elaborate instruments inside a building at a university or similar setting. But for scientists Dr. Ning Zeng and Dr. Jay Gregg, and project manager Sheldon Bart of Wilderness Research Foundation, the location for their scientific research was on King George Island.

WHERE IN THE WORLD IS KING GEORGE ISLAND?

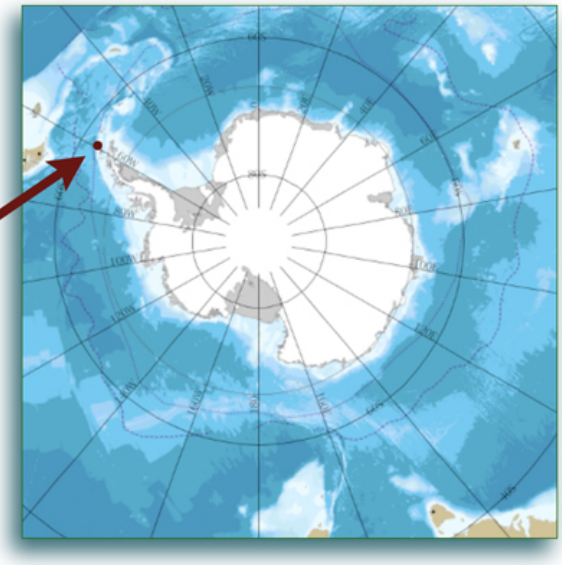
For a start, it's in Antarctica, so find a globe or map of the continent.

Here's one image:

Source: Nations Online Project

WHERE IN THE WORLD IS KING GEORGE ISLAND?

Next, it's off the Antarctic Peninsula.



Source: Australian Antarctic Data Centre

Q1. What continent and two countries are nearest to the Antarctic Peninsula?

continent: _____

two countries: _____ and _____

Q2. Antarctica is often divided into West Antarctica or East Antarctica by the Prime Meridian/180° longitude.

In which hemisphere is the Antarctic Peninsula? _____

DR. NING ZENG'S DESCRIPTION OF THE FIELD RESEARCH LOCATION:

Research for this project was conducted on King George Island, situated at the tip of the Antarctic Peninsula. King George Island is the largest of the South Shetland Islands, close to the Antarctic Circle at approximately 62° S. At the north shore is the Drake Passage and to the South is Bransfield Strait. The island is approximately 95 km in length and 25 km across, and has an area of over 1100 square kilometers, of which over 90% is permanently glaciated.

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DR. NING ZENG'S DESCRIPTION OF THE FIELD RESEARCH LOCATION:

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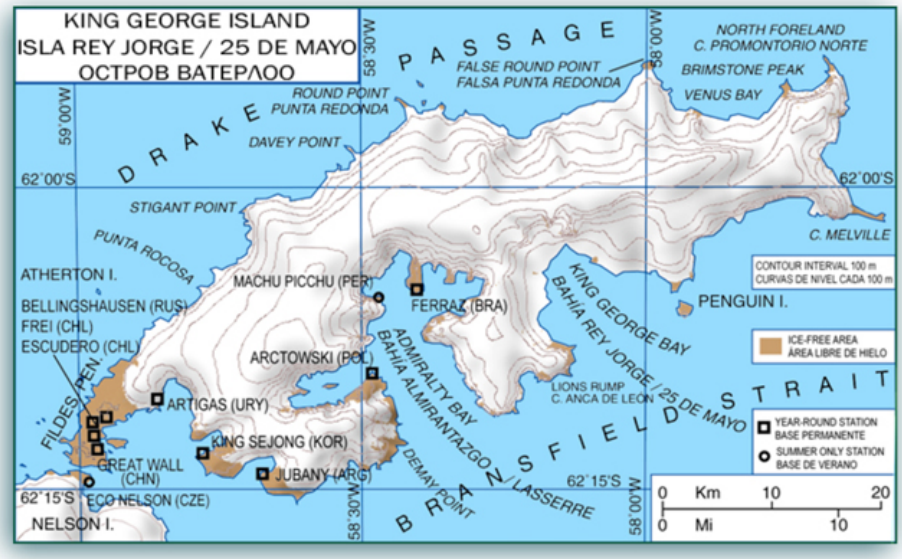
King George Island is a dynamic place. As the climate has warmed, glaciers are receding from Fildes Peninsula on the southwest part of the island. The newly exposed soil supports lichens, mosses, grasses and other vegetation, as well as Antarctic Terns and Skuas. Coastal areas support Chinstrap and Gentoo penguins, Elephant, Weddell and Leopard seals, Snow Petrels and Kelp Gulls.

Because of the wildlife and the dynamic geology, many countries have established research stations (most of them operating year-round) on King George Island, including Argentina, Brazil, Chile, China, Ecuador, South Korea, Peru, Poland, Russia, and Uruguay. Research for this project was conducted from the Russian Bellingshausen Station, though the field sites were near the edge of the Collins Glacier, near the glacial moraine.



Source: Giovanni Fattori

Q3. **A.** To the nearest degree, what is the latitude _____ and longitude _____ of the Bellingshausen station?

B. To the nearest degree, what is the latitude _____ and longitude _____ of you home or school?

C. So how many degrees of latitude are you north of the Bellingshausen station? _____

D. How many degrees of longitude are you east/west (circle the correct direction) from the field station? _____

E. One degree of longitude is approximately equal to 69 mi or 111 km. Calculate how far it is from your home/school to the Bellingshausen station. Give the value for both units.

F. In what direction is the South Pole (90° S) from Bellinghausen? _____

How many degrees of latitude are between them? _____

Calculate how far it is from Bellingshausen station to the South Pole. Give the value in km and mi

G. The main Antarctic base operated by the United States is at McMurdo Sound. Locate it on the map above. Use the scale to determine how far it is in a straight line between the McMurdo and Bellingshausen bases. _____ km or _____ mi

H. Who was Bellinghausen?

HOW CAN YOU GET TO THE BELLINGSHAUSEN STATION? WHAT DOES IT LOOK LIKE?

More from Dr. Zeng's preliminary report:

Getting to Antarctica is not easy. Some tourists manage the journey on expensive cruise ships or charter flights, visiting much of the continent, but only coming ashore for short stays. Because Antarctica is reserved for scientific research, scientists may arrange longer stays at the invitation of a research station. The Russian Bellingshausen station hosted more than a dozen researchers and scientists as part of the 2010 King George Island Summer Institute. We booked passage on a Uruguayan Air Force Hercules transport plane out of Punta Arenas, Chile. Because of the short runway and treacherous conditions, the flights only occur when the weather on King George Island is fair, with no low clouds. This is by nature hard to predict, as King George Island's maritime climate can produce quickly changing and unpredictable weather conditions. For instance, our inbound flight was delayed a number of times, and our return flight was canceled altogether. Flexibility is a necessity when conducting field research in such an environment.

(For more about the trip's details and experiences, read the blogs posted by Sheldon Bart, project manager & president of Wilderness Research Foundation: http://wildernessresearch.org/?cat=14)

The first three days on the island were devoted to settling in, learning how to stay safe in the hostile Antarctic environment, and conducting reconnaissance hikes with experienced scientists. The team learned the safety protocols when doing field research, hazards of the island (snow swamps, slippery permafrost under a layer of mud), and its unpredictable and quickly changing weather. They were instructed also about wildlife on the island, safe distances to maintain, and sensitivity to the fragile flora in this environment.

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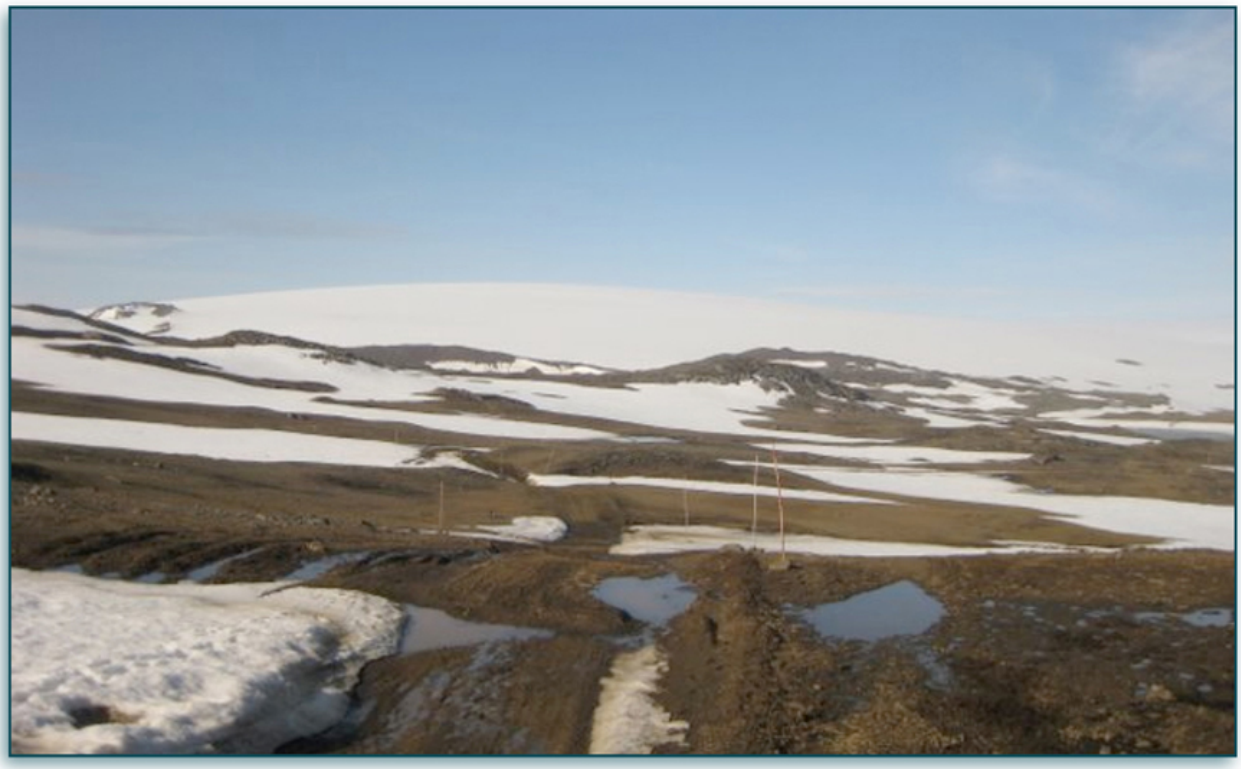
During scouting hikes conducted along the edge of Bellingshausen Dome (Collins Glacier) guided by Russian glaciologist, Dr. Bulat Mavlyudov, they discovered areas of particular interest in recently exposed features that served as the field sites for this project. The edge is marked with glacial moraines and nunataks (rock islands in ice). Over the last several decades, the edge of the ice cap has been retreating rapidly. A moraine about 50 meters away from the edge of the ice cap was under ice 20 years ago. This is consistent with the general warming in the region.

The Antarctic Peninsula is one of the fastest warming regions in the world. The temperature measured at the Russian Bellingshausen Station shows an annual increase of 1.3° C in summer over the last 50 years, while the winter temperature has increased by about 2.4° C. Typical of global warming patterns, winter here warms more than summer; this is because there is much less sunlight during the long Antarctic winter so the greenhouse effect is relatively stronger. Further back in time, the entirety of King George Island, including the Fildes Peninsula, was covered by ice during the last glacial maximum 21,000 years ago (a time when what became New York City was under or near the edge of the last great ice sheet).

Bellingshausen Station
(photo credit: Sheldon Bart)



Collins Glacier and the environment near Bellingshausen Station
(photo credit: Ning Zeng)

As the ice retreats, "pioneer plant" vegetation develops quickly on newly exposed surfaces. Lichen, moss and grass grow on KGI. The team sought an area where no modern plants were growing on the older, now-exposed materials. Visual inspection showed no visible sign of vegetation in the few meters nearest to the ice edge.

Moss vegetation near the coast of the King George Island
(photo credit: Ning Zeng)

At a location north of Uruguay's Artigas Station (62° S 58° W), a glacial moraine was found to contain large amounts of organic carbon. An isolated outcrop contained clearly distinguishable layers of rubble, soil, moss, shell, muddy soil, and ice. Samples were taken from the moss layers.

Dr. Zeng at the moraine (Site 1.)
(photo credit: Sheldon Bart)

Closer look at the layered moraine outcrop. (Tool is shown to provide size scale.) Moss layers are brown, one layer above the tool, one layer below. Shells (small white pieces) can be seen below the lower moss layer. Exposed ice (permafrost) is white-blue at the lowest level.

(photo credit: Ning Zeng)

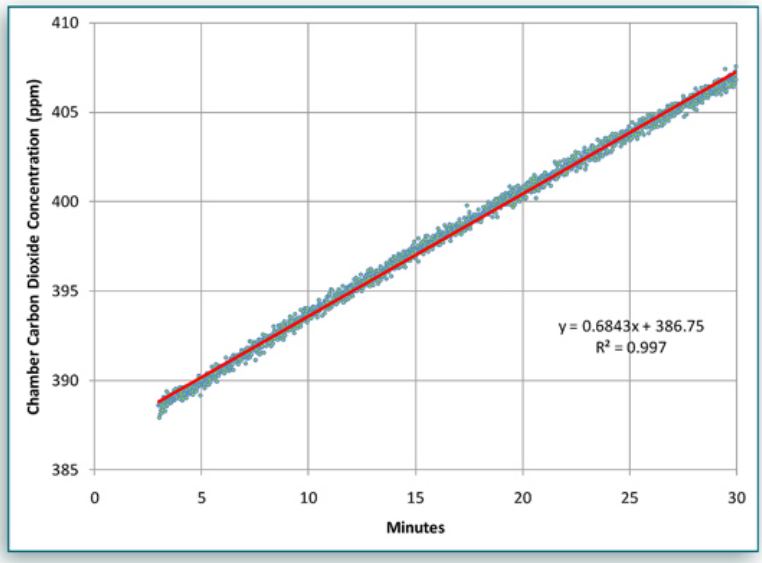
In front of the outcrop is a muddy glacial outwash originating from the layered material. A stream winds around the moraine and flows down towards the sea, approximately 50m away. Slightly before the stream enters the sea, a mud field appeared to contain the same organic material that was washed out from the moraine and deposited there. Clumps of moss were found in the river-cut deposit and samples were collected at 1 meter and 2 meter depths (Site 2).

Glacial outwash deposit containing organic-rich material, 50m downstream from the outcrop. (Site 2) (photo credit: Ning Zeng)

Once the collecting sites were located, Dr. Zeng and Dr. Gregg used the CO_2 analyzer instrument to collect data.

Jay Gregg sets up the LICOR LI-8100 Automated Soil CO_2 Flux System near Site 1. (photo credit: Ning Zeng)

Much modern science research involves finding suitable collection sites, deploying instruments, and then processing the data into graphs, tables, and other visual formats. Here is an example of measurements based on samples collected at Site 2:



The data show the increase in CO_2 within the LI-8100 chamber during the 30-minute testing period.

Because no photosynthesis could occur inside the darkened chamber, the increase can be attributed to decomposition by bacteria.

GETTING HOME: From Sheldon Bart's blog:

Antarctica is hard to get to and can be impossible to leave. In the heroic days, one was at the mercy of the Antarctic ice pack, the ring of ice that surrounds the continent. If the ice extended too far north and was too thick, ships could not break through to retrieve expeditions. Today, we're at the mercy of the weather and inexplicable air charter schedules.

The original departure date was to be January 26th, but word came on Friday, the 22nd that the flight had been canceled. A flight that could accommodate the entire group was available the next day, Saturday, the 23rd. The next flights were on the 27th and the 28th, but could not accommodate all of the team and were, in any event, iffy. We decided to cut short the trip and grab the certain flight. However, the storm that all signs had been pointing to struck that night with bellowing winds and a fresh snowfall. The station was encrusted with an inch of new snow by morning, and due to the bleak weather, the Saturday flight was canceled.

With nothing but uncertainty to cling to, we were given the consolation prize today of a visit to the Korean station, a spanking new facility located across the bay from our peninsula. Two Zodiacs came to ferry us across. Zodiacs are oversized inflatable rafts with two outboard motors affixed to the stern. We were given heavy, one-piece orange exposure suits to wear and clambered aboard. You sit on the inflated rim of the raft, facing inwards. You reach behind you and grab hold of a thick line that loops around the raft. The Zodiacs bump along like bucking broncos. The ride is exhilarating; it also scares you to death.

The Koreans treated us like dignitaries and gave us a tour of a large and impressive compound. The main building, a long rectangle with three floors, could have been lifted off a modern campus. The conference and dining rooms inside are spacious and well-appointed. The food is good and spicy, and the facilities are cutting-edge. The station commander is a young, friendly, non-officious scientist who showed us around himself. Visitors are so rare that various members of the staff shook our hands, welcomed us and dined with us.

When humans get out into space, this is what exploration will be like. Various nations will have stations of their own with much reciprocal fraternizing. And it will probably be as chance-y getting off Mars as it is getting out of Antarctica.

The storm that blew in Saturday night blew the overcast out to sea. Sunday was a cloudless day of sunshine and the first blue skies we had seen in the Antarctic. We were told that multiple flights from Punta Arenas and back would be made that day to take advantage of the weather. Our instructions were to pack and be ready to move out at 2 PM. Then, departure time was said to be 4 PM. Later, we were told to be ready by 5:30. The strip is illuminated with ground lights when a landing is imminent. Some of us kept a watch on the strip, waiting for the lights to go on. Eventually, they did. A large number of Korean scientists were also flying out on our plane, and the commander of the Korean station was on hand to see them off. He greeted us warmly when we entered the small waiting room decorated with photos of Chilean Antarctic expeditions. Meeting good people from around the world and making friends was one of the highlights of the trip for me.

YOUR CHALLENGE: Based on what you have read here and knowledge you can obtain from other resources, create a fictional account of "your" expedition to King George Island. Begin with your departure from home and travel to Antarctica. Then describe the living conditions at the base camp and your scientific field research. Finish with your return home.