

# INTD255, Safe Return Doubtful: Midterm 1

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February 27, 2025

## 1 Early Antarctic and Oceanographic Exploration

1. Who was Captain James Cook? List several notable achievements of his three main expeditions.

Captain James Cook was a British explorer, cartographer, navigator, and naturalist. The 3 main expeditions are the voyage of HMS *Tendræder* that was to observe the transit of Venus from Tahiti to better calculate the Earth-Sun distance. Another voyage was HMS *Resolution* and HMS *Adventure*, as well as the HMS *Discovery* which wanted to explore the North Pacific more specifically the coast of Alaska but failed.

2. What was the significance of the *Venus transit* on one of the Cook expeditions? What other, more secret, mission did Capt. Cook have in the Southern Ocean?

The significance of Venus transit was that it was a major event that helped calculate the distance between Earth and the Sun. The secret mission that Capt. Cook had was to search for the *Terra Australis Incognita*, which was the unknown Southern land.

3. Kepler's Laws: If the units of orbital radius  $r$  are AU, and the units of orbital period  $T$  are years, then  $T^2 = r^3$ . (a) If the orbital radius of Uranus is 19.22 AU, what is its orbital period in years? (b) If the orbital period of Mars is 1.88 years, what is its orbital radius? (c) What parameter in orbital mechanics was fixed by the observations of the Venus transit in the late 18th Century by scientists who accompanied the Cook expedition?  $T^2 = r^3$

$$A) T^2 = (19.22)^3 = T^2 = 7090.77 = T = \sqrt{7090.77}$$

$$T = 84.22 \text{ yrs.}$$

$$B) r^3 = T^2 = r^3 = (1.88)^2 = r^3 = 3.53 = r = \sqrt[3]{3.53}$$

$$r \approx 1.52 \text{ AU}$$

C) The parameter in orbital mechanics was fixed by the observations of Venus transit to help fix the Astronomical Unit (AU).

4. List some of the achievements in early polar exploration attained on the following expeditions:

- The *Belgica* - first expedition to overwinter in Antarctica when a ship became trapped in ice.
- The *Fram*, with Nansen - provided valuable data on Antarctic Current and sea ice movement.
- The *Gjøa* - Gave the route through the Arctic was possible.
- The *Discovery*, with Scott - Gave the foundation for later British Antarctic expeditions like Scott's tragic South Pole attempt.

5. Who were the *Dorset* and the *Thule*? How did they survive in their environment?

Dorset and the Thule were ancient Arctic indigenous cultures that lived in the regions of where Canada, Greenland, and Alaska are now. They survived in that environment by doing things like hunting seals and walruses. They also used tools like harpoons and lived in houses made of stone.

6. Who are the Chinook? Where did Capt. Cook approach their territory?

The Chinook were Native American tribe that lived along the Columbia River. Capt. Cook approached their territory on his 3rd voyage along the northwestern coast of North America.

7. Discuss the risks and rewards of cultural exchange, in light of the writings of Barry Lopez in *Horizon*. As examples, consider the stories of Ranald MacDonald, Captain James Cook, Captain Amundsen and the Netsilik.

The risk and rewards of cultural exchange was that sometimes it led to many misunderstandings and conflicts, like for example when Capt. Cook was at first welcome in Hawaii but then later killed after tensions got higher. Also the cultural exchange led to the spread of diseases like how Europeans gave the indigenous deadly diseases.

## 2 Survival Skills: Work, Energy, Food, and Physics

1. How many kcal of energy is stored in 2 kg of pemmican? (Treat this as a fatty food, not a protein).

$$1 \text{ kg} = 1000 \text{ g} \quad 2 \text{ kg} = 2 \times 1000 \text{ g} = 2000 \text{ g}$$

$$\text{Energy} = \text{Mass} \times \text{Energy per gram}$$

$$\text{Energy} = 2000 \text{ g} \times 9 \text{ kcal/g} = 18,000 \text{ kcal}$$

2. How many kg of wheat biscuits are required for 500 kcal of energy? (Treat this as mostly carbohydrates).

$$\text{mass/(kg)} = \frac{\text{Total Energy Need (kcal)}}{\text{Energy per kg}}$$

$$\text{mass} = \frac{500 \text{ kcal}}{4000 \text{ kcal/kg}} = 0.125 \text{ kg}$$

3. How many Joules of energy are required to pull 1000 kg across 5 km of snowy tundra, if the relevant coefficient of friction is 0.1?  $W = F \times d$   $F = \mu \times m \times g$   
 $F = (0.1) \times (1000) \times (9.8) = 980 \text{ N}$   
 $W = 980 \times 5000 = 4,900,000 \text{ Joules}$

4. Take your result from the previous exercise, and divide the energy among 10 sled dogs. How much energy is required of each dog? Now feed each dog that much pemmican. How many kg of food, per dog, is required?

$$\frac{4,900,000}{10} = 490,000 \quad 1 \text{ kcal} = 4,184$$

$$9 \text{ kcal} \times 1000 \text{ kg} = 9000 \text{ kcal}$$

**13 grams per dog per kg**

$$\frac{490,000}{4,184} = 117.2 \text{ kcal per dog}$$

$$\frac{117.2}{9000} = 0.013 \text{ kg}$$

5. What food related health risk is associated with spending long durations at sea and in polar regions?

A food related health risk that many of them got was scurvy.

### 3 Navigation: Distance, Time, Speed, Longitude and Latitude

1. How many nautical miles correspond to travelling 2.5 degrees directly South?  $\text{Distance} = 2.5 \times 60$

$$\text{Distance} = 150$$

2. If we travel due North by 400 km, what is our change in latitude?  $\text{Change in latitude} = \frac{\text{Distance Traveled}}{\text{Distance per degree of latitude}}$

$$= \frac{400}{111.32} \approx 3.59 \text{ degrees latitude}$$

3. If we are travelling due West at a latitude of 60 deg North, what distance corresponds to a change of 1.5 degrees longitude? - Earth circumferences at equator  $40,075$

$$\text{Latitude} = 60^\circ$$

$$\frac{40,075}{360} \approx 111.32 \quad D = 111.32 \times \cos(\text{latitude})$$

$$D = 111.32 \times \cos(60^\circ) \quad \text{Distance} = 55,606.65$$

$$D = 111.32 \times 0.5 \quad = 83,109 \text{ km}$$

$$D = 55,606 \text{ km per degree}$$

4. If a ship sails East at 10 knots, how many nautical miles are travelled in 48 hours?  $\text{Knot} = 1 \text{ mile per hour}$

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$= 10 \times 48$$

$$\text{Distance} = 480 \text{ nautical miles.}$$

### 4 The British, The Norwegians, and Cultural Exchanges

1. Having read the first part of the story of the race for the South Pole, describe the differences in style between the Norwegian/Scandinavian expeditions and the British ones. **Bonus:** Connect your ideas to indigenous cultural exchange, or our reading in *Deep Survival*.

The differences in style between the Norwegian/Scandinavian was that the Norwegian approach was that they focused on efficiency and adaptation. While the British naval traditions

2. List five technologies for polar survival that the Norwegians learned from the *Netsilik*.

1) Dog sled

4) Igloos

2) Fur Clothing

5) A high fat

3) Travel Strategies like snowshoes with rest periods

diet (live seal meat)

3. What was the primary role of the Royal Geographic Society in British Antarctic exploration?

The primary role was funding, promoting, and organizing British Antarctic exploration.

4. (a) How did the British travel and move gear in the polar regions, before motorized craft were developed?  
(b) How did this differ from the Norwegians?

A) They used sleds that they would pull themselves

B) They differed from the Norwegians because Norwegians used dog sleds which was quicker and used less energy.

5. In your view, what are the major risks to ships and explorers when exploring the polar regions in this period?

The major risks to ships and explorers is ships getting trapped by ice and scurvy.

When American ambassadors first arrived in Japan, after a period of intense isolationism in Japan, they found the Imperial court already knew how to speak English? How did this happen? Who helped them to learn English, and of the desire of Western nations to trade? This happened because Ronald Macdonald taught them English - after stranding himself in Japan. This helped Western nations because it helped Japan adapt quickly and open to trading.

7. Consider the following quote "Whether the change facing a people comes on swiftly ... or slowly ... the responsibility of the wisdom keeper is to recognize the early signs of significant change, to look into the past, and locate, again, a through line to the future." Apply this idea to a story we have encountered in the course, or a problem facing our community today.

This quote can be applied to the Netsilik and Norwegian explores because the Netsilik had lots of knowledge about survival knowledge in the Arctic which was recognized by Amundsen and valued their knowledge.

## 6 Survival and Psychology

1. Using the terminology found in *Deep Survival*, what is the difference between a *primary emotion*, and a *secondary emotion*?

*Primary emotion are innate, automatic respond to stimuli that are hardwired to human brain like anger, fear, joy and fight or flight*

2. Using the terminology of emotional bookmarks, how are secondary emotions formed, and how do they protect you?

*Secondary emotions is formed when an individual experiences a traumatic event, the individual associates strong emotions. They protect you because it allows people recognise dangerous patterns. It also protects you because passed experiences influence cautious and safe choices.*

## 5 Exploration Achievements

1. Discuss the cultural significance of Nansen's first crossing of Greenland to the nation of Norway.

The cultural significance is that Norway was under Swedish rule so the Nansen's expedition showed the Norwegians independence.

2. Was Roald Amundsen the first leader to cross the North-West Passage? On whose progress did he build?

Yes he was the first leader to cross North-West Passage. But he built off explores Sir John Franklin and Robert McClure progress.

3. What were the highlights of Robert Falcon Scott's "furthest South" on the *Discovery* expedition?

The highlights of "furthest South" was that they reached the farthest lengthened for that time, as well as the first to identify Emperor penguins.

4. Scientifically, why was important for explorers in the early 20th century to locate the magnetic North and South poles?

It was important because it helped better understand the Earth's Magnetic Field and helped correct navigation and improve it.

## 7 Reflections

1. While on Skraeling Island, the writer Barry Lopez interacts with a research team responsible for finding artifacts from Dorset, Thule, and Norse cultures in Northern Canada. What is the significance of these diverse finds, in your view?

The significance of these diverse finds is the evidence that proves multiple cultures exists together and most likely interacted with each other.

2. While reflecting on the Pacific Ocean in Cape Foulweather, Lopez notices that you can never see the entire Pacific, because the Southern Ocean covers more than one hemisphere of area of our planet. What an area of life or academic topic that you wish you understood, but might not ever fully understand?

An area of a academic topic that I wish you understood but might not ever fully understand is the human body like I understand the basic that is taught in general Biology class but any more complex I don't understand or know.