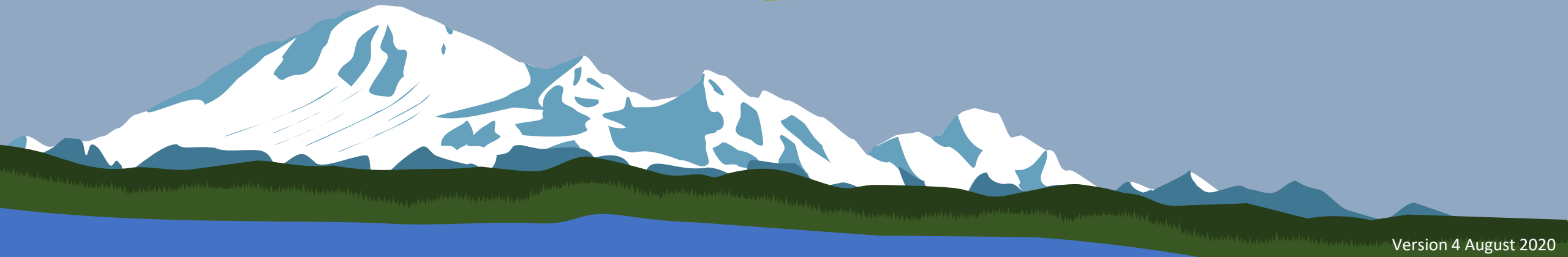
Exploration Merit Badge



Version 4 August 2020

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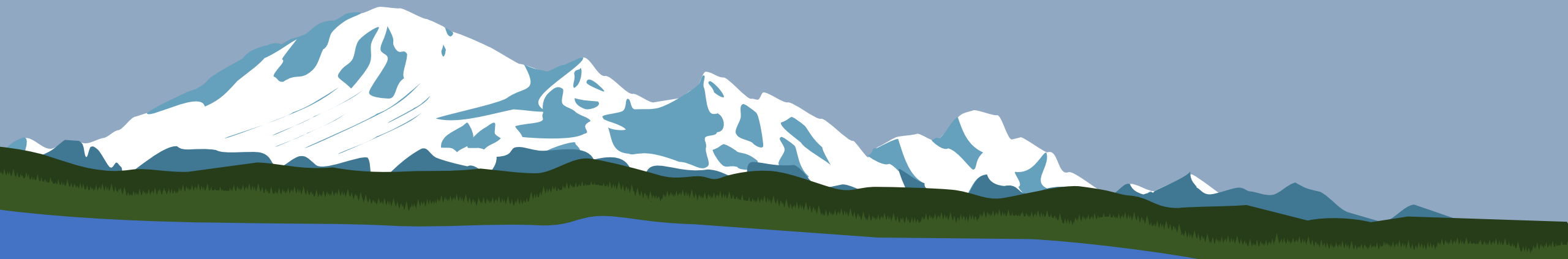

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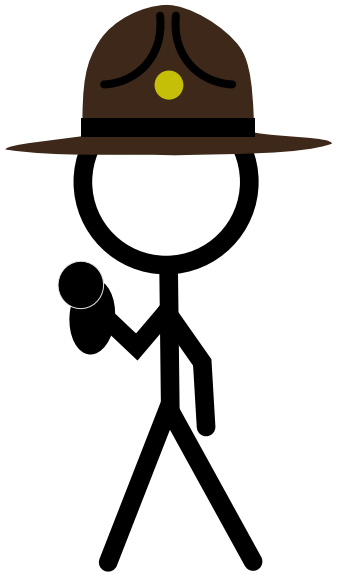

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Questions? Contact the owner.

Disclaimer

This PowerPoint slideshow was designed to be used to prepare scouts for the Exploration Merit Badge and nothing more.

There is inherent risk with exploration and expeditions, whether in the field or in a lab.

Proceed at your own risk and may god have mercy on your soul.

Examples used and opinions shared do not reflect policies of the BSA, your local council or any other person or entity related to this presentation.

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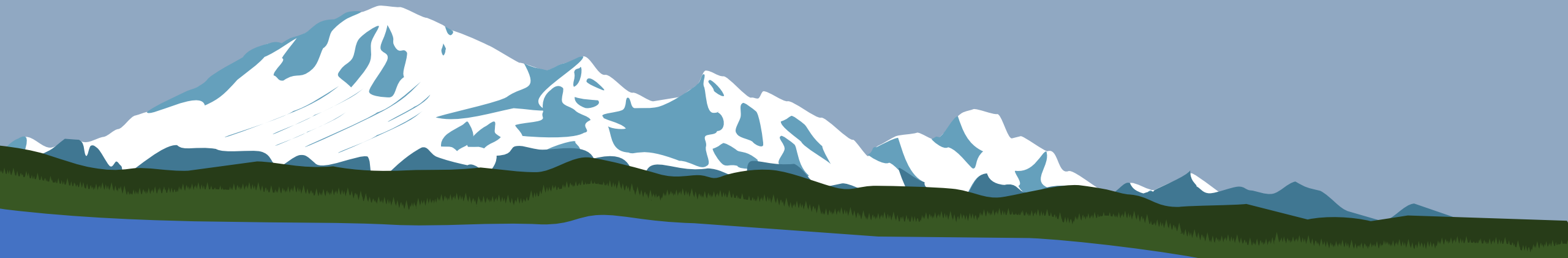
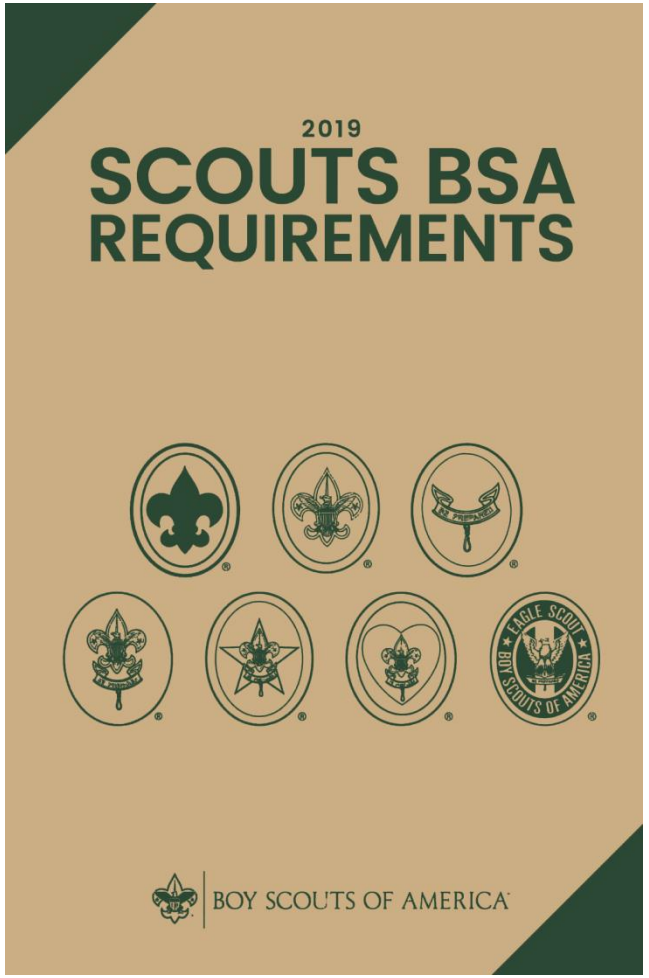
Merit Badge Requirements



Requirements

Requirements

- Merit Badge requirements are taken from: January, 2017 Merit Badge Requirements



Requirements

Requirements

1. **General Knowledge.** Do the following:
   a. Define exploration and explain how it differs from adventure travel, trekking or hiking, tour-group trips, or recreational outdoor adventure trips.
   b. Explain how approaches to exploration may differ if it occurs in the ocean, in space, in a jungle, or in a science lab in a city.

2. **History of Exploration.** Discuss with your counselor the history of exploration. Select a field of study with a history of exploration to illustrate the importance of exploration in the development of that field (for example, aerospace, oil industry, paleontology, oceanography, etc.).

3. **Importance of Exploration.** Explain to your counselor why it is important to explore. Discuss the following:
   a. Why it is important for exploration to have a scientific basis
   b. How explorers have aided in our understanding of our world
   c. What you think it takes to be an explorer

Requirements

Requirements

4. **Real-Life Exploration.** Do ONE of the following:
   a. Learn about a living explorer. Create a short report or presentation (verbal, written, or multimedia slide presentation) on this individual's objectives and the achievements of one of the explorer's expeditions. Share what you have learned with your counselor and unit.
   b. Learn about an actual scientific exploration expedition. Gather information about the mission objectives and the expedition's most interesting or important discoveries. Share what you have learned with your counselor and unit. Tell how the information gained from this expedition helped scientists answer important questions.
   c. Learn about types of exploration that may take place in a laboratory or scientific research facility (medicine, biology, chemistry, physics, astronomy, etc.). Explain to your counselor how laboratory research and exploration are similar to field research and exploration.

5. **Exploration in Lab and Field.** Do ONE of the following, and share what you learn with your counselor:
   a. With your parent's permission and counselor's approval, visit either in person or via the internet an exploration sponsoring organization (such as The Explorers Club, National Geographic Society, Smithsonian Institution, Alpine Club, World Wildlife Fund, or similar organization). Find out what type(s) of exploration the organization supports.
   b. With permission and approval, visit either in person or via the internet a science lab, astronomical observatory, medical research facility, or similar site. Learn what exploration is done in this facility.

Requirements

Requirements

6. **Expedition Planning.** Discuss with your counselor each of the following steps for conducting a successful exploration activity. Explain the need for each step.
   a. Identify the objectives (establish goals).
   b. Plan the mission. Create an expedition agenda or schedule. List potential documents or permits needed.
   c. Budget and plan for adequate financial resources. Estimate costs for travel, equipment, accommodations, meals, permits or licenses, and other expedition expenses.
   d. Determine equipment and supplies required for personal and mission needs for the length of the expedition.
   e. Determine communication and transportation needs. Plan how to keep in contact with your base or the outside world, and determine how you will communicate with each other on-site.
   f. Establish safety and first aid procedures (including planning for medical evacuation). Identify the hazards that explorers could encounter on the expedition, and establish procedures to prevent or avoid those hazards.
   g. Determine team selection. Identify who is essential for the expedition to be successful and what skills are required by the expedition leader.
   h. Establish detailed recordkeeping (documentation) procedures. Plan the interpretation and sharing of information at the conclusion of the expedition.

Requirements

Requirements

7. **Prepare for an Expedition.** With your parent's permission and counselor's approval, prepare for an actual expedition to an area you have not previously explored; the place may be nearby or far away. Do the following:
   a. Make your preparations under the supervision of a trained expedition leader, expedition planner, or other qualified adult experienced in exploration (such as a school science teacher, museum representative, or qualified instructor).
   b. Use the steps listed in requirement 6 to guide your preparations. List the items of equipment and supplies you will need. Discuss with your counselor why you chose each item and how it will be of value on the expedition. Determine who should go on the expedition.
   c. Conduct a pre-expedition check, covering the steps in requirement 6, and share the results with your counselor. With your counselor, walk through the Sweet Sixteen of BSA Safety for your expedition. Ensure that all foreseeable hazards for your expedition are adequately addressed.

Requirements

Requirements

8. **Go on an Expedition.** Complete the following:
   a. With your parent's permission and under the supervision of your merit badge counselor or a counselor-approved qualified person, use the planning steps you learned in requirement 6 and the preparations you completed in requirement 7 to personally undertake an actual expedition to an area you have not previously explored.
   b. Discuss with your counselor what is outdoor ethics and its role in exploration and enjoying the outdoors responsibly.
   c. After you return, compile a report on the results of your expedition and how you accomplished your objective(s). Include a statement of the objectives, note your findings and observations, include photos, note any discoveries, report any problems or adverse events, and have a conclusion (whether you reached your objective or not). The post-expedition report must be at least one page and no more than three; one page can be photos, graphs, or figures.

9. **Career Opportunities.** Identify three career opportunities in exploration. Pick one and explain to your counselor how to prepare for such a career. Discuss what education and training are required, and why this profession might interest you.

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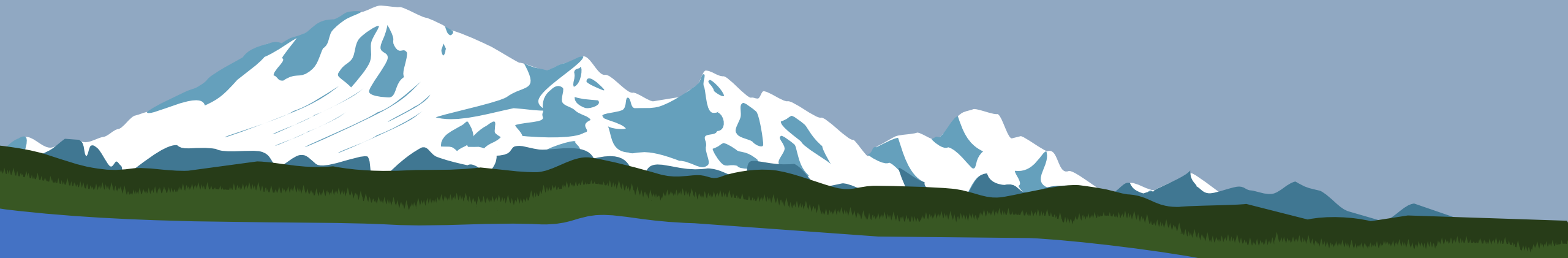
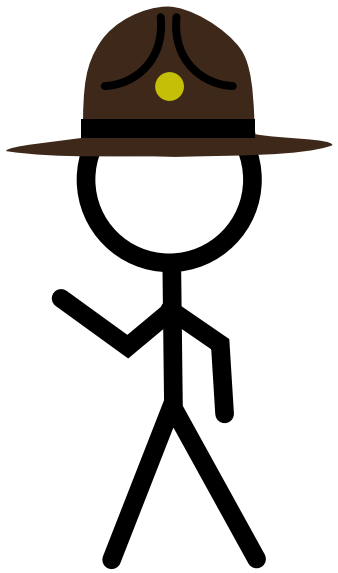
Merit Badge Intro



Merit Badge Intro

Instructor Introduction



Merit Badge Intro

Needed for Course

- Merit Badge Blue Card filled out and signed by your Scoutmaster
  - or other virtual agreement
- Merit Badge Pamphlet
- Scout Uniform
- A positive Scouting focus and attitude

Merit Badge Intro

Virtual Meetings

- Use your **REAL Name** and **Troop Number** if you want credit
  This is how we take attendance

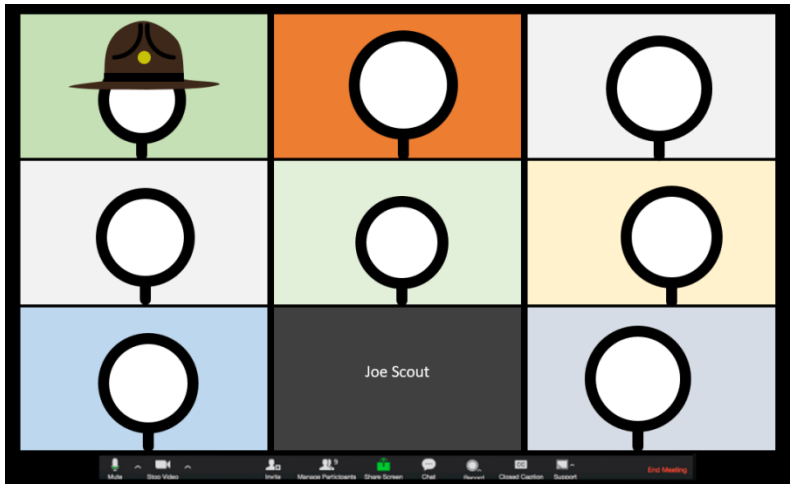
- MUTE yourself unless speaking to the group

- Please turn your video on so we can see you

- No Chat SPAMMING

- If you need to go pee, go

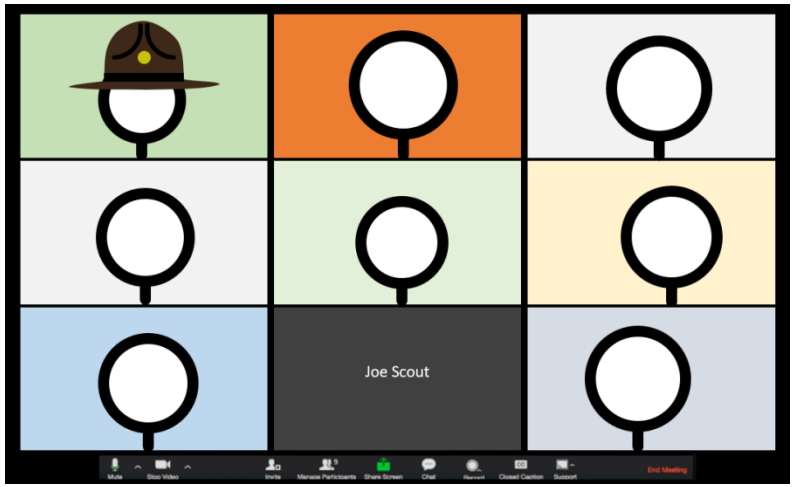
- If something isn't working, please let us know!



Merit Badge Intro

Virtual Meetings

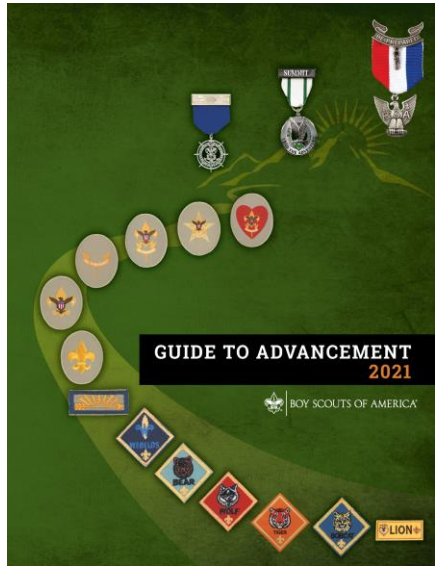
- We can’t do ALL the requirements virtually
- Option 1 – Partial Completion – need proof
- Option 2 – Completion – need proof
- Please send completed homework **AFTER** the final class
- Tell us who we should CC about completion



Rule Number One

Policy on Unauthorized Changes to Advancement Program

No council, committee, district, unit, or individual has the authority to add to, or subtract from, advancement requirements.



There are limited exceptions relating only to members with special needs.

Rule Number Two

Merit Badge Group Instruction

There must be attention to each individual's projects
and fulfillment of all requirements.

We must know that every Scout—actually and personally—completed them.

If, for example, a requirement uses words like "show," "demonstrate,"
or "discuss," then every Scout must do that.

**It is unacceptable to award badges on the basis of
sitting in classrooms *watching* demonstrations,
or remaining silent during discussions.**

~~Rule~~ Number Three

Scoutmaster Discussion

before working with a counselor or attending a group or virtual merit badge opportunity,
a Scout **should** meet with his or her unit leader.

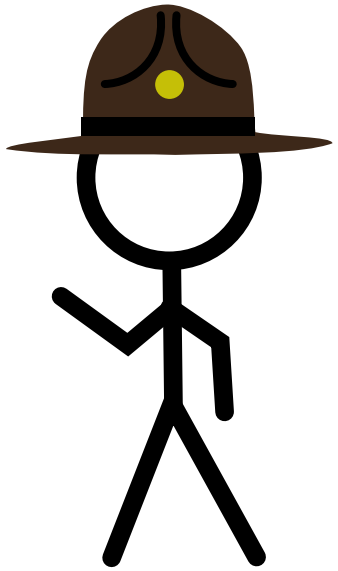
This is the leader's opportunity to give guidance on the wisdom of pursuing a selected badge, to advise the Scout on how work might be approached and what may be encountered along the way.

it is the Scout's decision whether or not to proceed.

Merit Badge Intro

Course Overview

- We will cover most of the requirements for this Merit Badge in class
- We need proof that you completed these requirements
  - Please turn in a completed **Workbook** if possible
    This makes is easier on the counselor
  - If you can't complete a **Workbook**, please contact your councilor for alternatives
  - Please take photos of Expedition



Merit Badge Intro

Definitions – Discuss

: to talk about (something) with another person or group
: to give information, ideas, opinions, etc., about (something) in writing or speech

- **Real Time Discussion**
  - Physical in-person verbal discussion
  - Videomeeting discussion
- **Asynchronous Discussion** – does not take place in real time
  - Email discussion
  - Google Classroom discussion
  - Worksheet discussion with Counselor interaction before/after
  - Audio or video recording of discussion

merriam-webster.com/dictionary/discuss

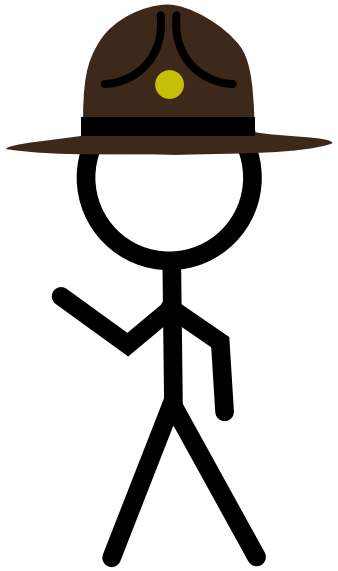
Merit Badge Intro

Course Overview

- Some of the requirements obviously can't be completed in class
  - Proof of completion can be submitted later

    or

  - Ask for a partial completion Blue Card after you turn in your partially completed work



Merit Badge Intro

Obligatory Warning

Exploration is Dangerous!

Merit Badge Intro

Obligatory Warning

- Many stories of explorers
  - Dying of the elements
  - Starving to death
  - Disappearing
  - Contracting horrible diseases
  - Being lost at sea
  - Being killed by locals
  - Being eaten

Amelia Earhart disappears over Pacific Ocean on July 2, 1937

Image Credit: Library of Congress www.loc.gov/resource/ppmsca.31771

Merit Badge Intro

Obligatory Warning

Practical requirements must be supervised by a Properly Skilled Adult

Merit Badge Intro

What is Exploration?

- Christopher Columbus discovering the New World
- Earnest Shackleton trying to cross Antarctica
- Is it Neil Armstrong stepping foot on the moon
- Jacques Cousteau navigating the earth's oceans on the Calypso
- The search for "The Golden King" *El Rey Dorad* and his city of gold
- Indian Jones and his search for relics and encounters with Nazis
- Experimentation with proton therapy to treat cancer

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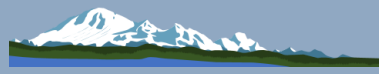
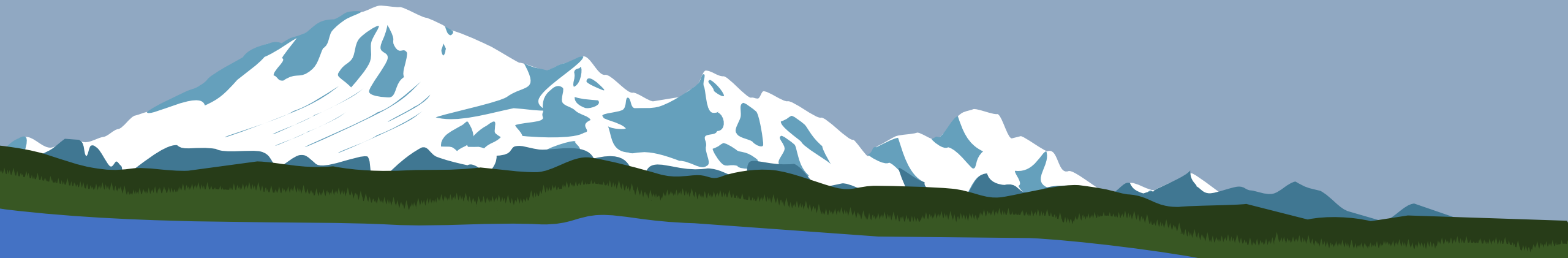


Exploration



Exploration

Requirement 1a – General Knowledge

Define exploration and explain how it differs from adventure travel, trekking or hiking, tour-group trips, or recreational outdoor adventure trips.

Exploration

Exploration

Exploration is NOT:

- Recreational outdoor adventure trips
- Tour-group trips
- Trekking or hiking
- Adventure travel

Image Credit: REI destinations.rei.com

Exploration

Exploration

Exploration IS:

- The Act of Searching
  - Find out what's out there

1565 Map of the World

Image Credit: Paolo Forlani en.m.wikipedia.org

Exploration

Exploration

- Information is collected
  - Information gathering is generally the primary goal
  - Enjoyment of the trip is secondary or not even a concern

Image Credit: USGS Fornani https://www.usgs.gov/media/images/lava-sampling

Exploration

Exploration

- Main Purpose of Exploration:
  - Discovery
  - May include:
    - Contributing to scientific knowledge
    - Military/Political expansion
    - Trade
    - Religious/Missionary work

Exploration

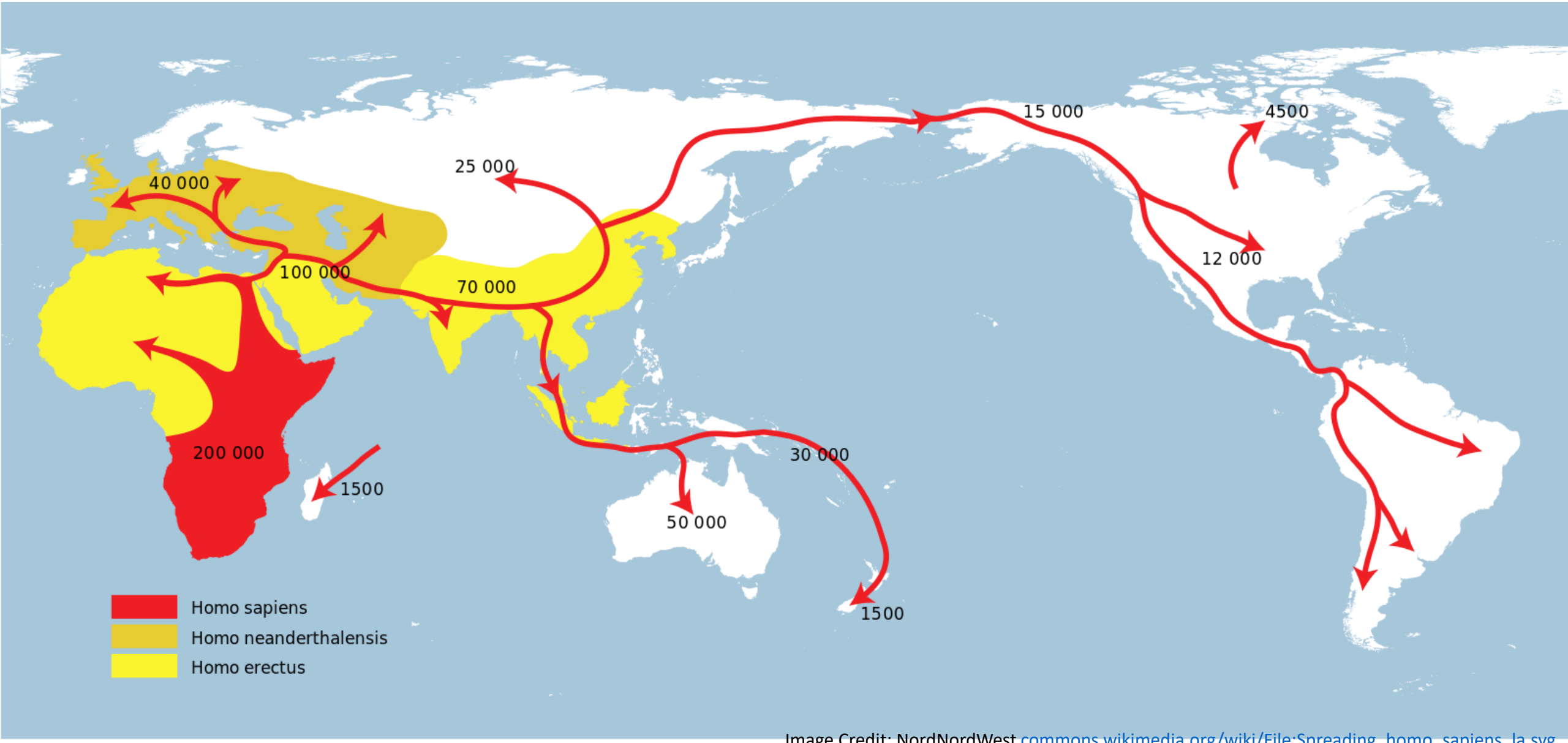


Image Credit: NordNordWest commons.wikimedia.org/wiki/File:Spreading_homo_sapiens_la.svg

Exploration

Exploration – Greek and Phoenicians

- 800-550 BC
  - Greek trade west to Spain NE to Tanais and East to Phoenicia
  - Phoenician trade from Levant to Britain

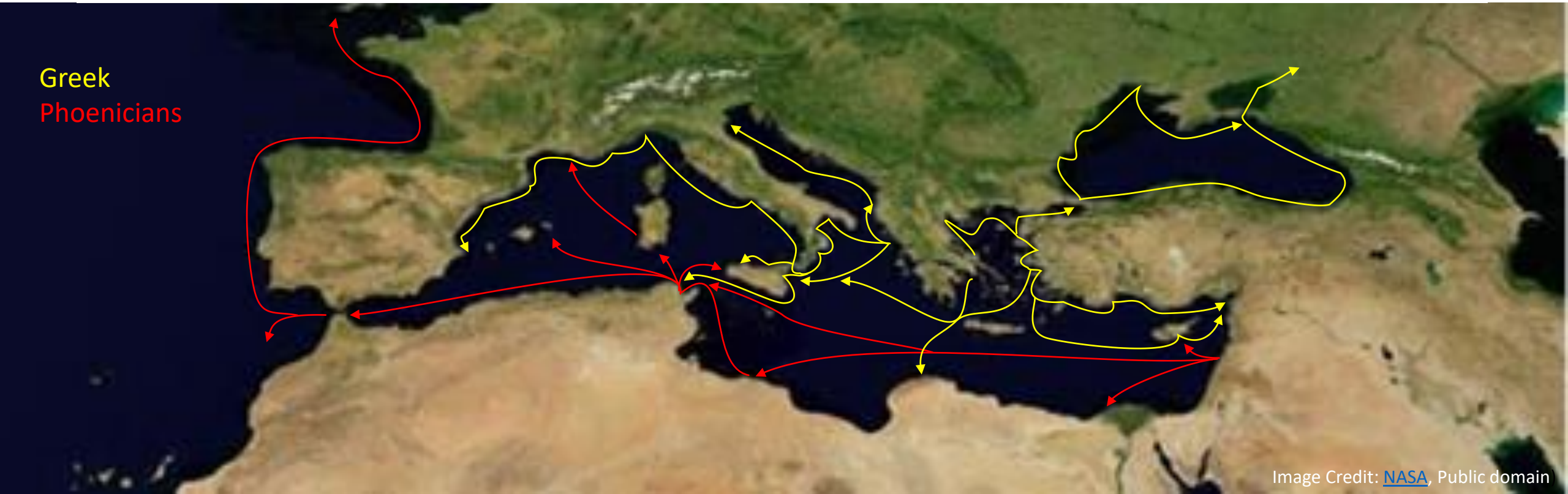


Image Credit: NASA, Public domain

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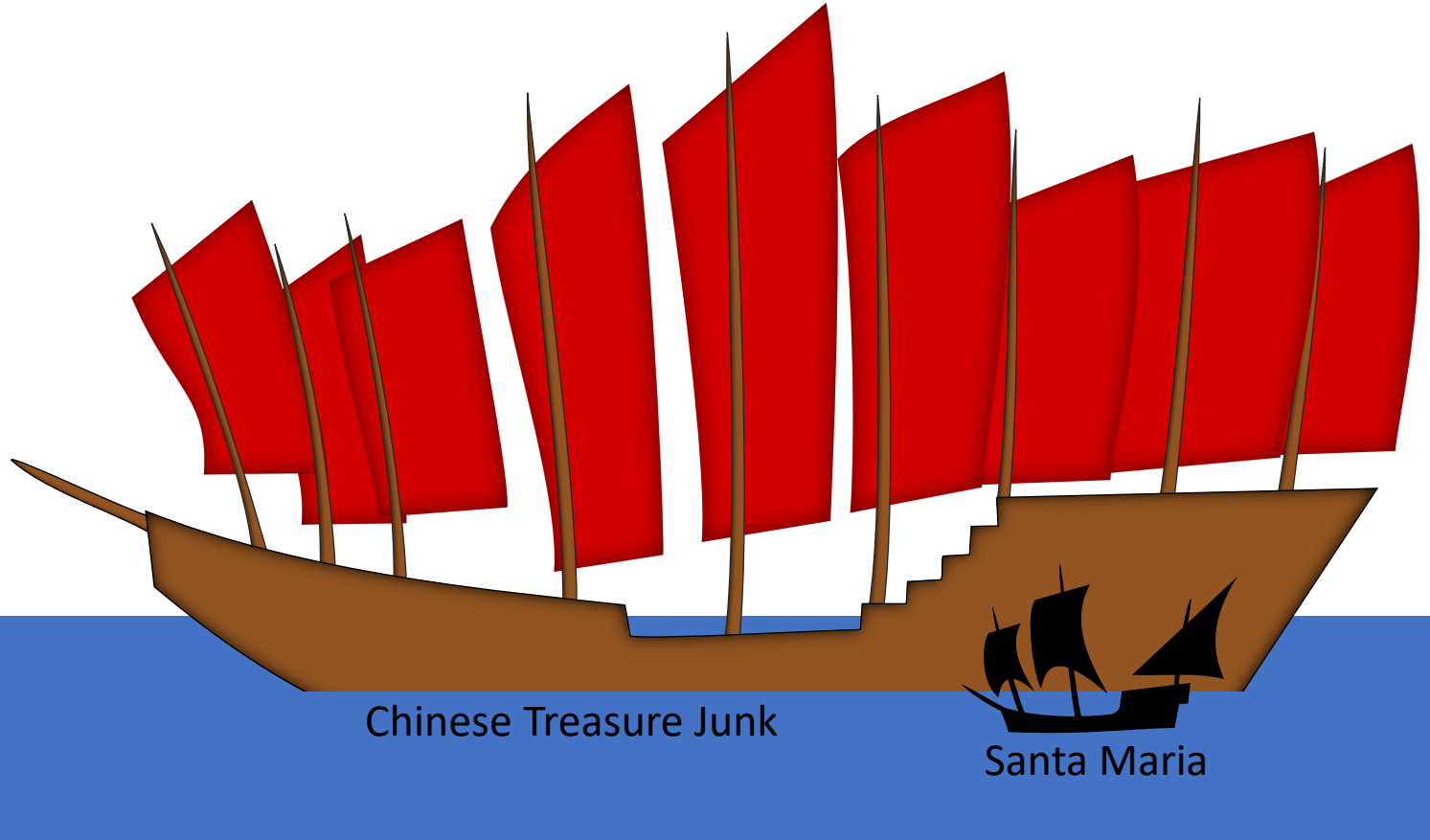
Image Credit: NASA, Public domain

Exploration

Exploration – Chinese

- **Chinese Voyagers**
  - 1402 - Zheng He explore sea
    - Southeast Asia
    - Indian sub-continent
    - Eastern Africa



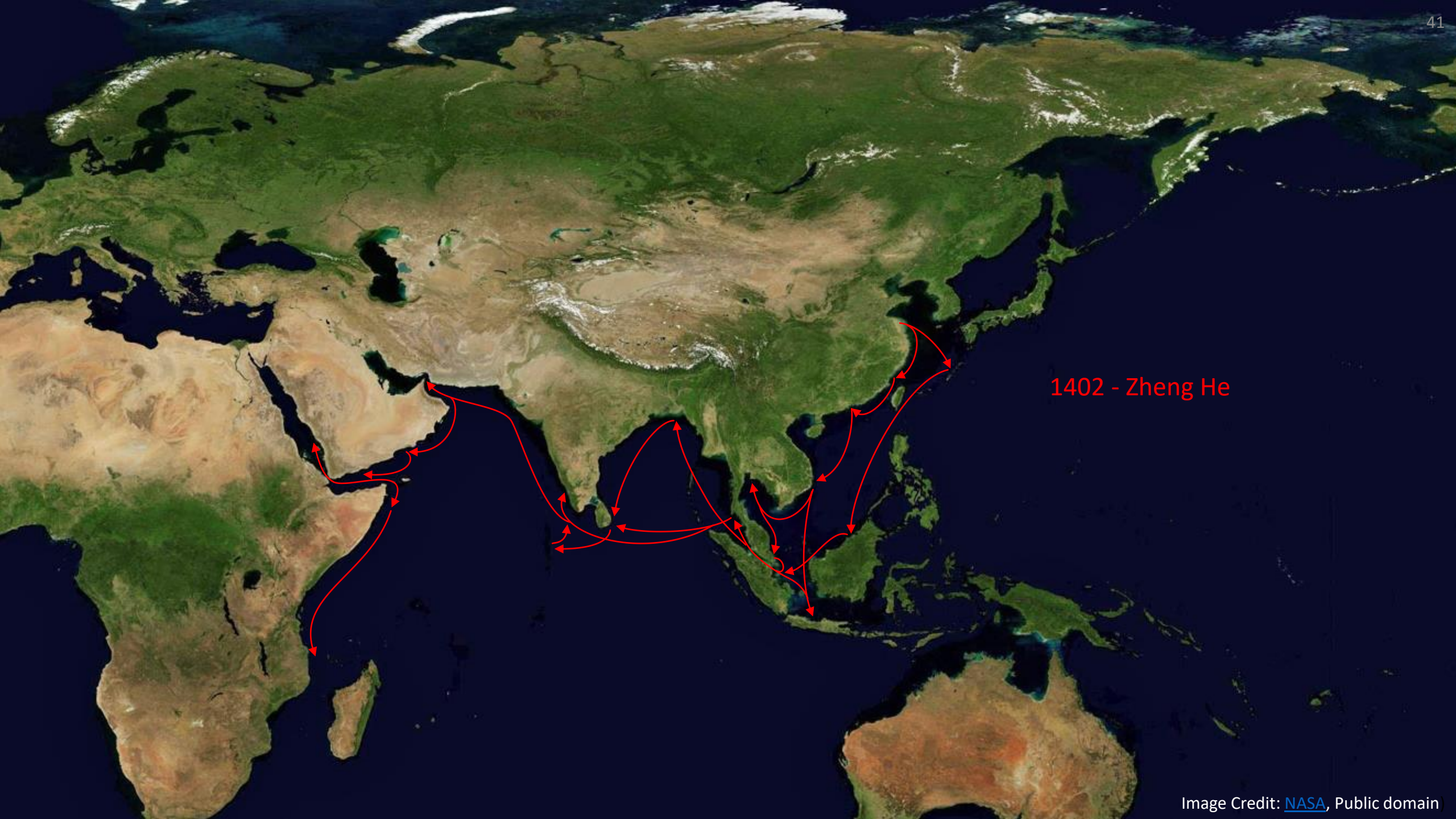


Image Credit: NASA, Public domain

Exploration

Exploration – The Age of Exploration

- **European Voyagers**
  - early 15th century - early 17th century
  - European ships travel and map the world
    - Christopher Columbus
    - Vasco da Gama
    - John Cabot
    - Pedro Álvares Cabral
    - Juan Ponce de León
    - Ferdinand Magellan

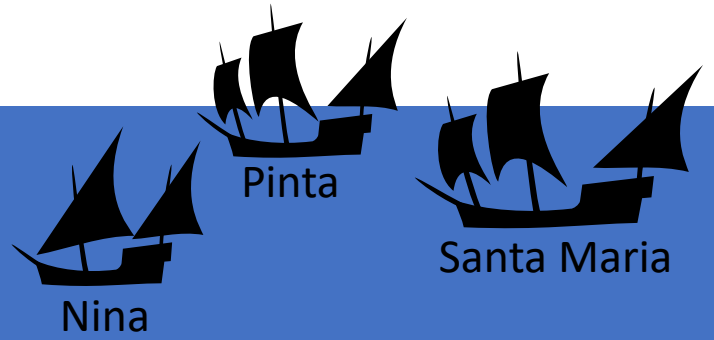


Image Credit: NASA, Public domain

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Exploration

Exploration – The Second Age of Exploration

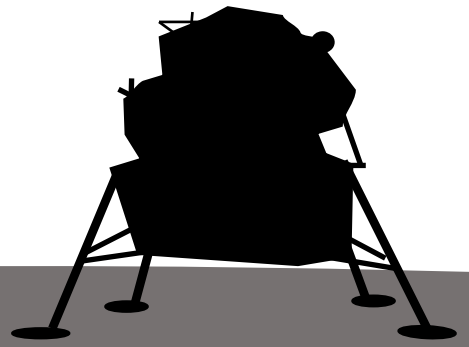
- **Science and Territorial Voyagers**
  - 18th-19th century
  - Great European and American Territorial Race
    - Australia, South Pacific and Scramble for Africa
    - Captain James Cook
  - **The Enlightenment**
    - Resurgence in science, reason, and learning
    - New "natural sciences" such as biology and geology

Endeavour

Exploration

Exploration – The Third Age of Exploration

- **20th century**
  - **Age of Science**
    - New technologies and hunger for knowledge
  - Polar Exploration
    - James Clark Ross
    - Robert Falcon Scott
    - Ernest Shackleton
  - Soviets join in
  - International Geophysical Year - 1957
  - Space Exploration



Exploration

Requirement 1b – General Knowledge

Explain how approaches to exploration may differ if it occurs in the ocean, in space, in a jungle, or in a science lab in a city.

Image Credit: NASA, Public domain)

What’s In There

Exploration

Jungle Exploration

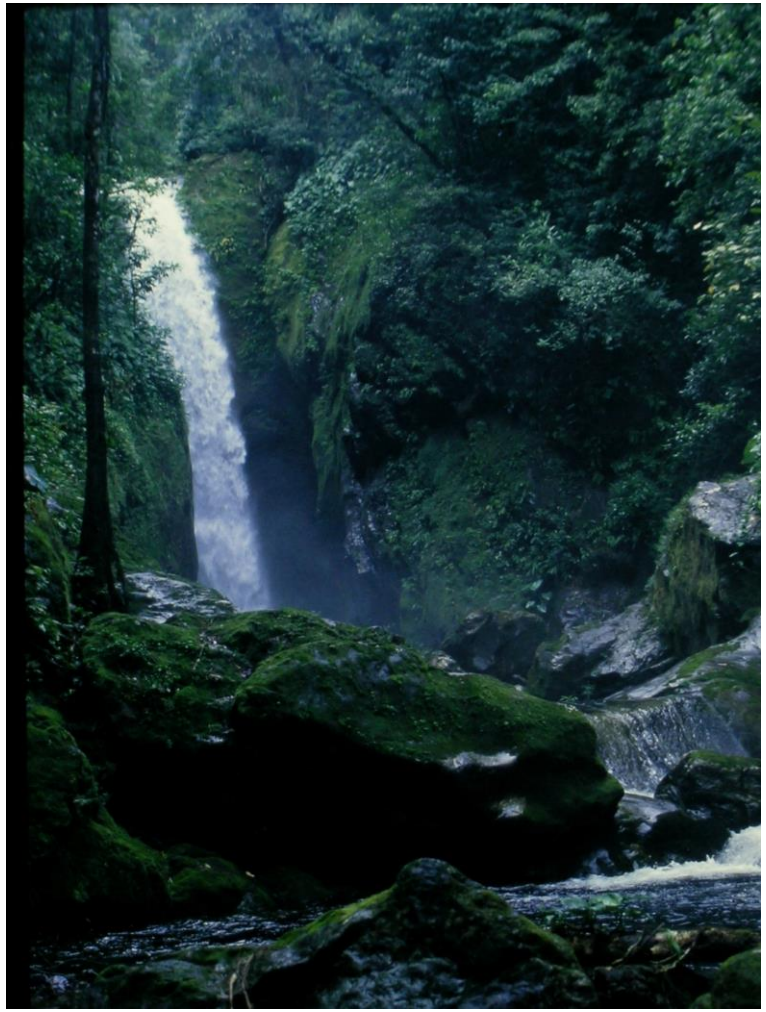
- Why Explore the Jungle?
  - Gold
  - Conquest
  - Spread of religion and culture
  - Meet new cultures
  - Mapping the world

Image Credit: Classical Numismatic Group, Inc. www.cngcoins.com commons.wikimedia.org

Exploration

Jungle Exploration

- Why Explore the Jungle?
  - 2/3rds of all known plants & animals live in tropical rain forests
    - Amazing Bio Science
    - New Foods and Spices?
    - New Technologies - Rubber
    - New Drugs?
    - Cure for cancer?



Honduran Rain Forest
Discovery of *Muscodor albus*
A fungus that gives off an anti-microbial gas

Image Credit: Ivette Perfecto www.nsf.gov/discoveries/disc_summ.jsp?org=NSF&cntn_id=104473

Exploration

Jungle Exploration

- So much to explore up in the trees
  - Almost half of Earth's biodiversity lives in treetops

- Canopy Scientists today use:
  - Ropes
  - Hot-air balloons
  - Walkways
  - Ladders
  - Construction cranes

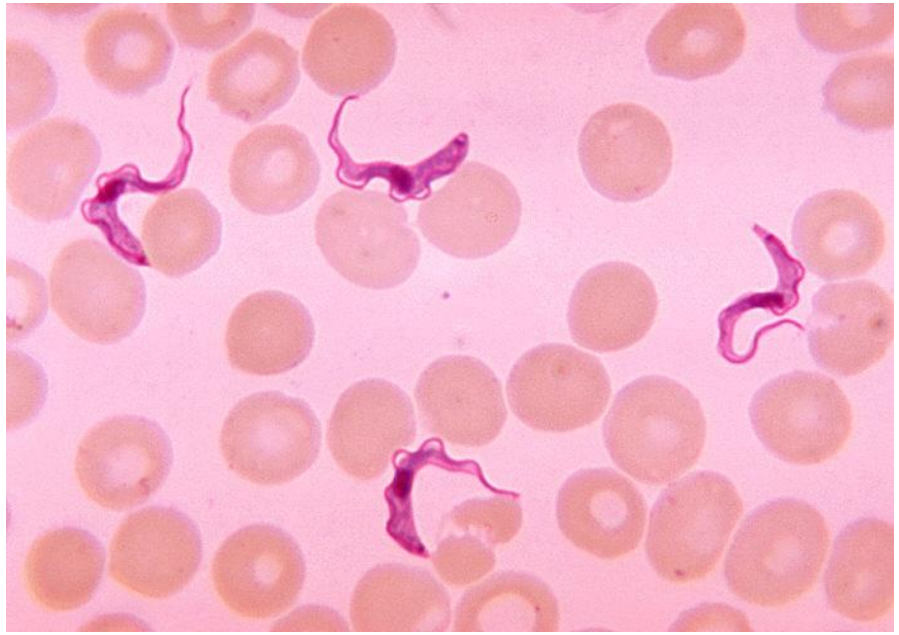
Abornaut Canopy Meg (Dr. Meg Lowman)

Image Credit: Meg Lowman canopymeg.com/2016/11/28/canopy-meg-and-the-science-of-tree-tops/

Exploration

Jungle Exploration – Hazards

- Jungle has many hazards
  - Heat
  - Easy to get lost
  - Lack of potable water
  - Diseases
  - Poisonous plants
  - Things that can kill and possibly eat you
    - Bugs
    - Animals
    - People
  - Lack of food for those who are unprepared



African trypanosomiasis aka Sleeping sickness
Parasites on blood smear

Image Credit: CDC commons.wikimedia.org/wiki/File:Trypanosoma_sp._PHIL_613_lores.jpg

Explorer Classroom | Rainforest Discovery with "Canopy Meg" Lowman

Image Credit: youtube.com/watch?v=_PJ54qcEEy0

Space

Image Credit: NASA , Public domain)

What’s Out There

Exploration

Space Exploration

- American and Russian Space Race
  - Late 1960s to early 1970s
- Moon landings
  - Soviet Union
  - United States
  - China
- The International Space Station
  - USA, Russia, Europe, Canada and Japan
- Mars
  - Soviet Union
  - United States
  - China

Image Credit: NASA images.nasa.gov/details-as15-88-11866.html

Exploration

Space Exploration

- New Challenges
  - Getting there
    - How do you get there safely?
  - Surviving
    - No Air
    - No Water
    - Radiation
    - Cold
    - No gravity
  - Logistical nightmare

Cosmonaut Alexander Skvortsov

Image Credit: NASA www.nasa.gov/mission_pages/station/spacewalks

Exploration

Space Exploration

- New ways to explore
  - Human spaceflight
  - Robotic probes
  - Constantly expanding possibilities

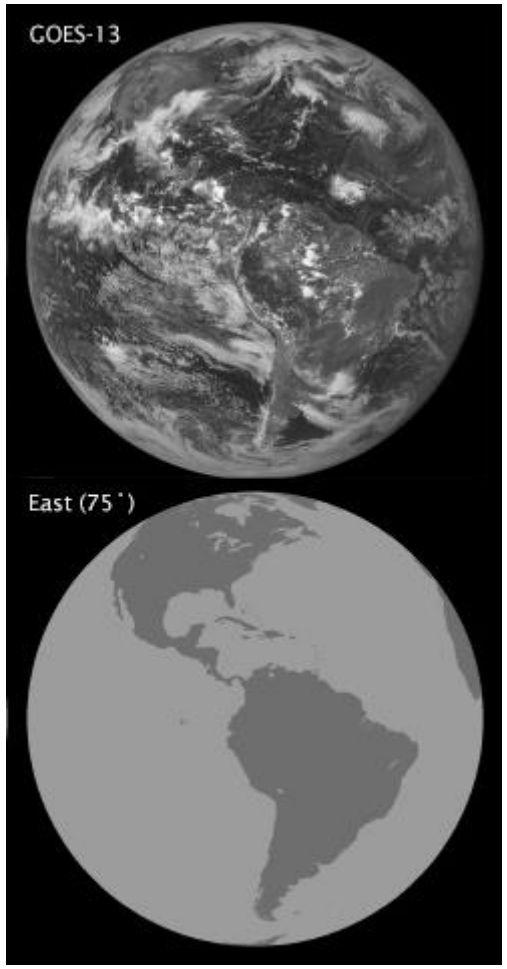
NASA's R5 robot

Image Credit: NASA www.nasa.gov/feature/nasa-looks-to-university-robotics-groups-to-advance-latest-humanoid-robot

Exploration

Space Exploration

- Discoveries and Tech
  - Satellite technology
  - Discover new celestial bodies
  - Artificial limbs
  - Scratch-resistant lenses
  - Insulin pump
  - Firefighting equipment
  - DustBusters
  - LASIK
  - Shock absorbers for buildings
  - Solar cells
  - Wireless headsets

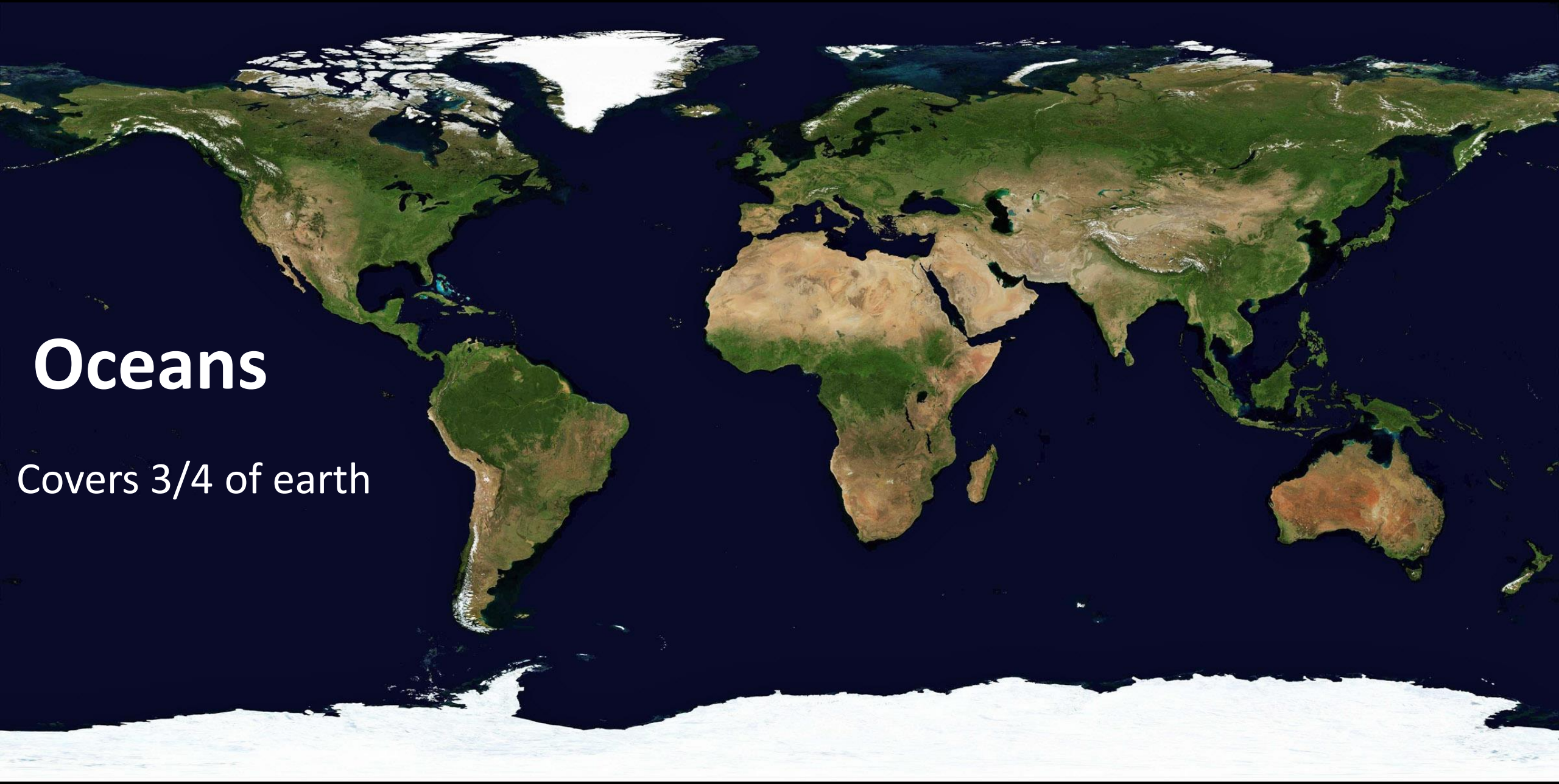


2012 Hurricane Season

Image Credit: NASA earthobservatory.nasa.gov/images/79383/spare-weather-satellite-proves-its-worth

Space Race (Full Episode) | Explorer

Image Credit: youtube.com/watch?v=32B2HuMtSGE



Oceans

Covers 3/4 of earth

NASA

What’s Down There

Exploration

Ocean Exploration

- Previously unimagined ecosystems
- Areas devoid of sunlight
- New mineral deposits
- Insights into the ocean and life on Earth

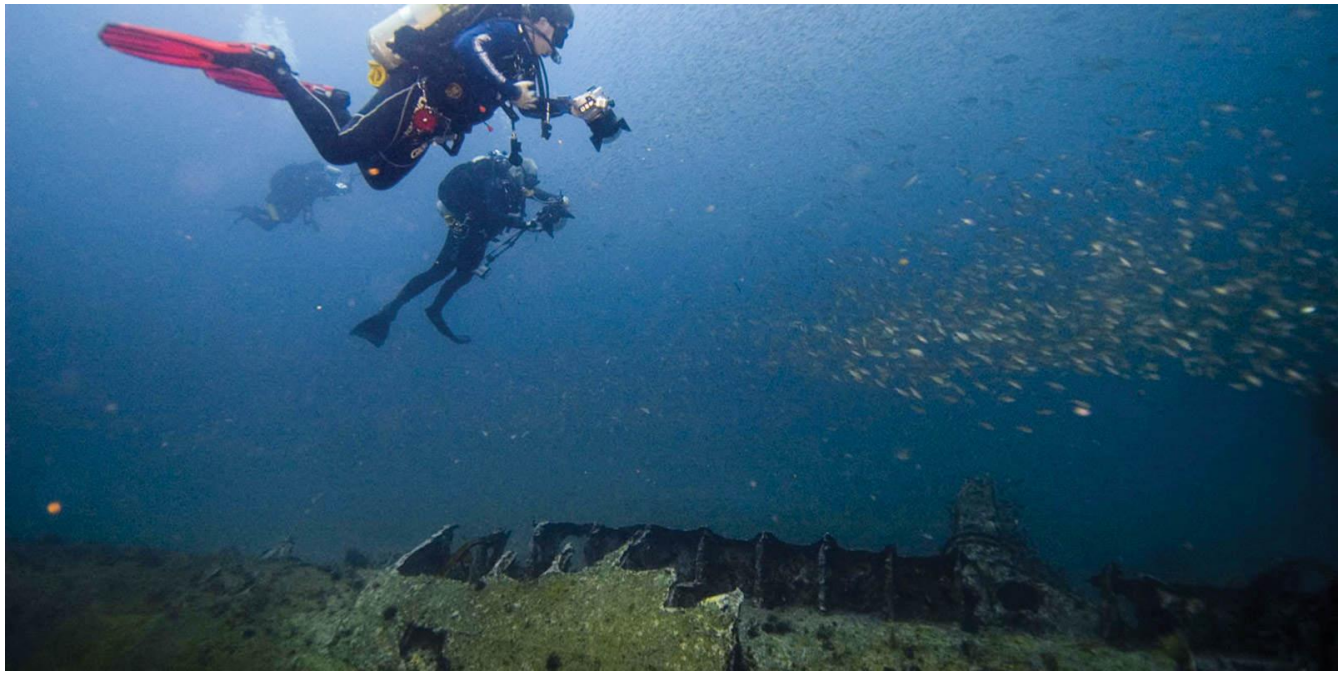
The Stellwagen Bank National Marine Sanctuary whale tagging boat

Image Credit: NOAA sanctuaries.noaa.gov/magazine/1/sanctuary-science/

Exploration

Ocean Exploration

- Challenges
  - Can’t breathe underwater
  - Great pressures at depth
  - Storms
  - Logistical support at sea
    – No Amazon Prime



Divers from the Office of National Marine Sanctuaries and Eastern Carolina University photograph the German U-boat U-352 off the coast of Morehead City, North Carolina.

Image Credit: NOAA sanctuaries.noaa.gov/magazine/1/sanctuary-science/

Exploration

Ocean Exploration

- Exploration Jobs:
  - Locating and ID Historic Shipwrecks
  - Seeking sustainable fishing and food sources
  - Studying ocean pollution
  - Studying ocean currents
  - Studying amazing life and ecosystems

Image Credit: NOAA sanctuaries.noaa.gov/magazine/1/sanctuary-science/

Exploration

Ocean Exploration

- Tools and Techniques
  - Research vessels
  - Submersibles
  - Remotely operated vehicles
  - Buoys
  - Trawls (nets)
  - Technical Diving
  - Free-swimming robots
  - Sonar
  - Photogrammetry and Geographic Information System (GIS)

Image Credit: Kip Evans/NOAA sanctuaries.noaa.gov/magazine/1/sanctuary-science/

National Geographic Explorer Dr. Kakani Katija

Image Credit: Deep Sea Exploration - 360 | Into Water youtube.com/watch?v=XDZ39JJsSp0

Science Lab

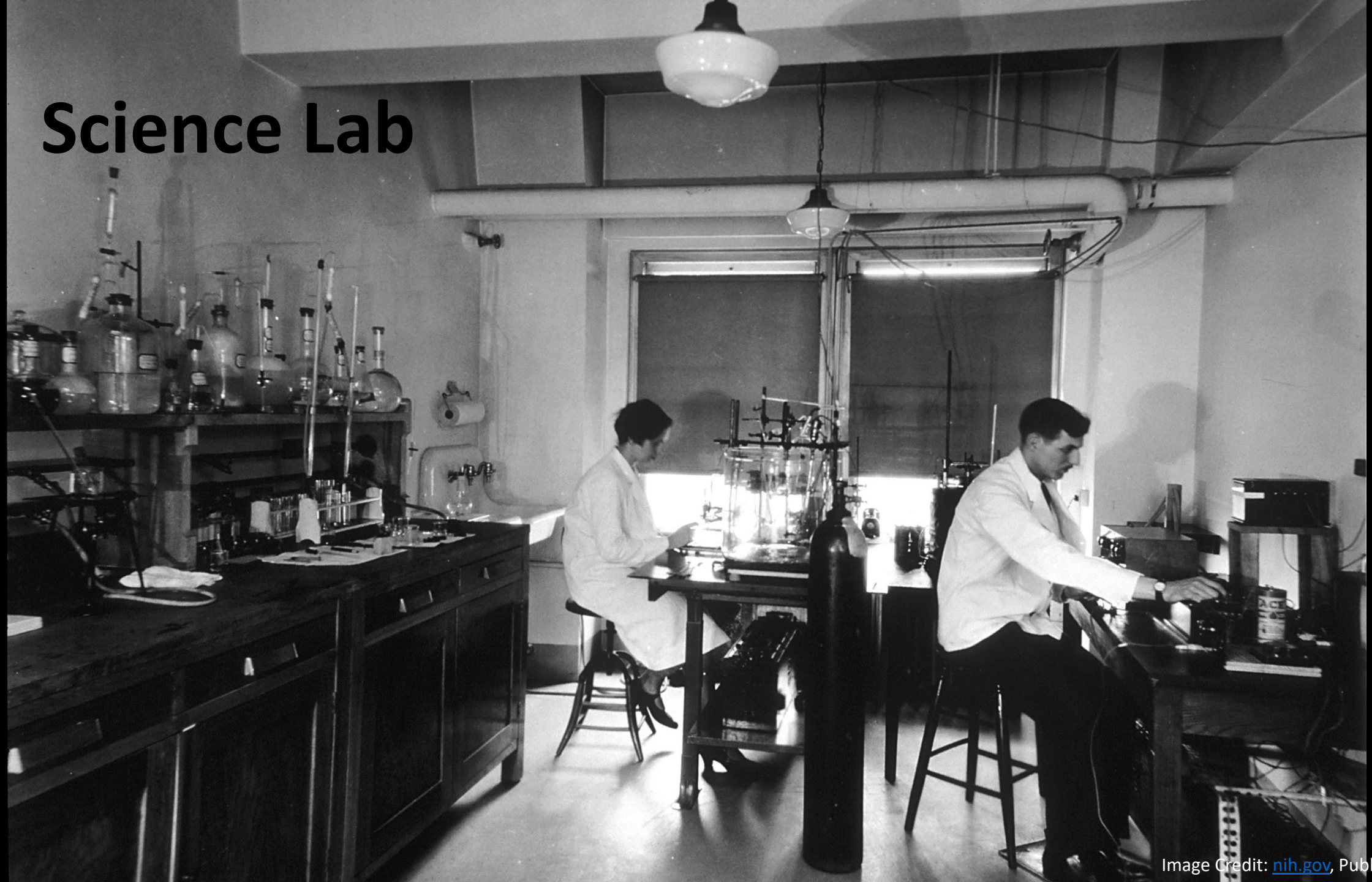
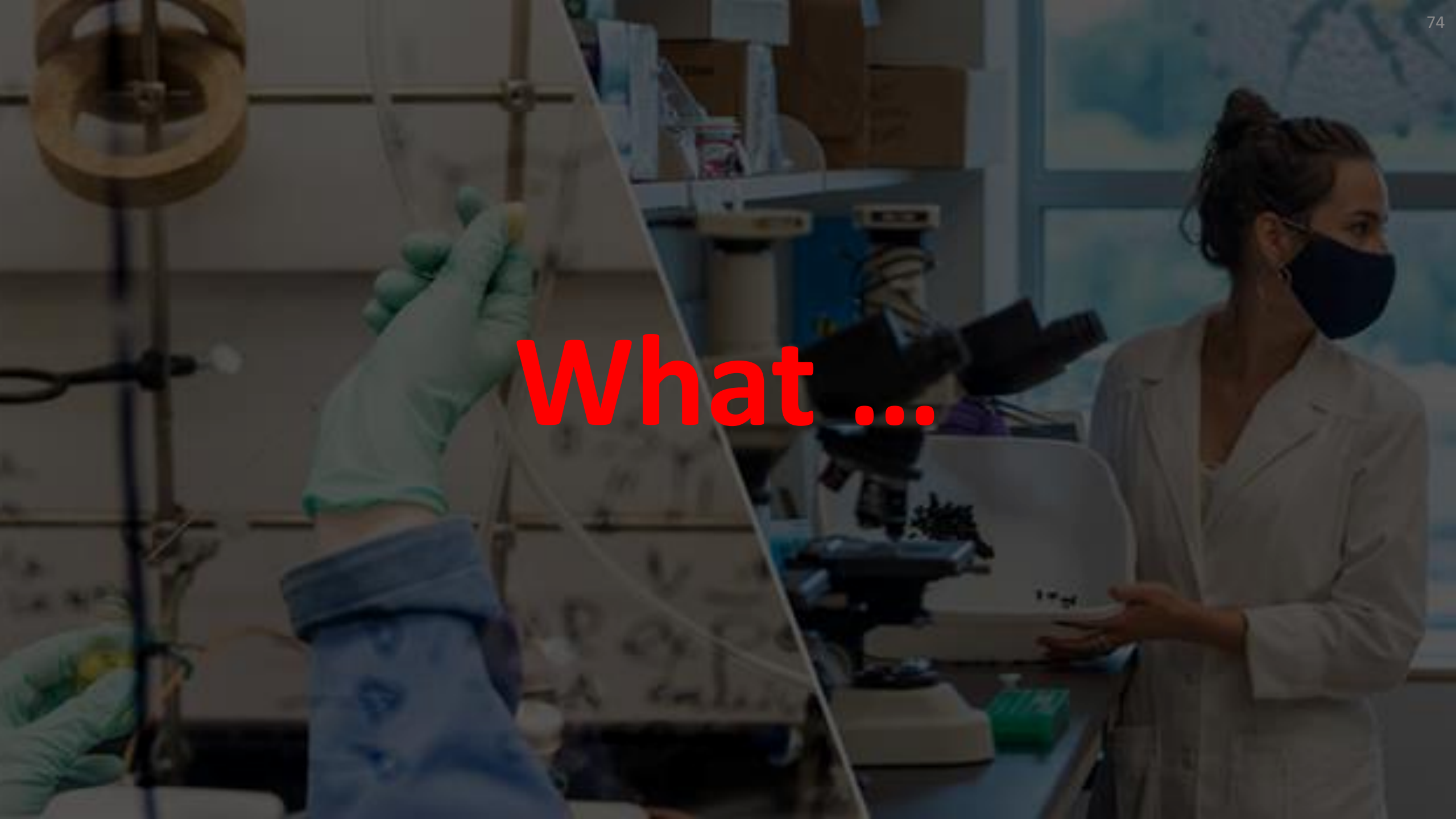


Image Credit: nih.gov, Public domain)



What …

Exploration

Science Lab Exploration

- What discoveries can be made in lab?
  - New Chemicals
  - Radiation
  - Gene technology
  - New energy sources
  - New robotics
  - New understanding on human psyche
  - New medical treatments

Vice President Joe Biden tours a laboratory at Sloan Kettering Rockefeller Research Labs

Image: Executive Office of the President of the United States https://commons.wikimedia.org/wiki/File:Joe_Biden_at_Sloan_Kettering_Rockefeller_Research_Labs_in_2016.jpg

Exploration

Science Lab Exploration

With every Exploration in the Lab
There is a New Discovery

Exploration

Science Lab Exploration

With every Exploration in the Lab
There is a New Discovery

Some are Small

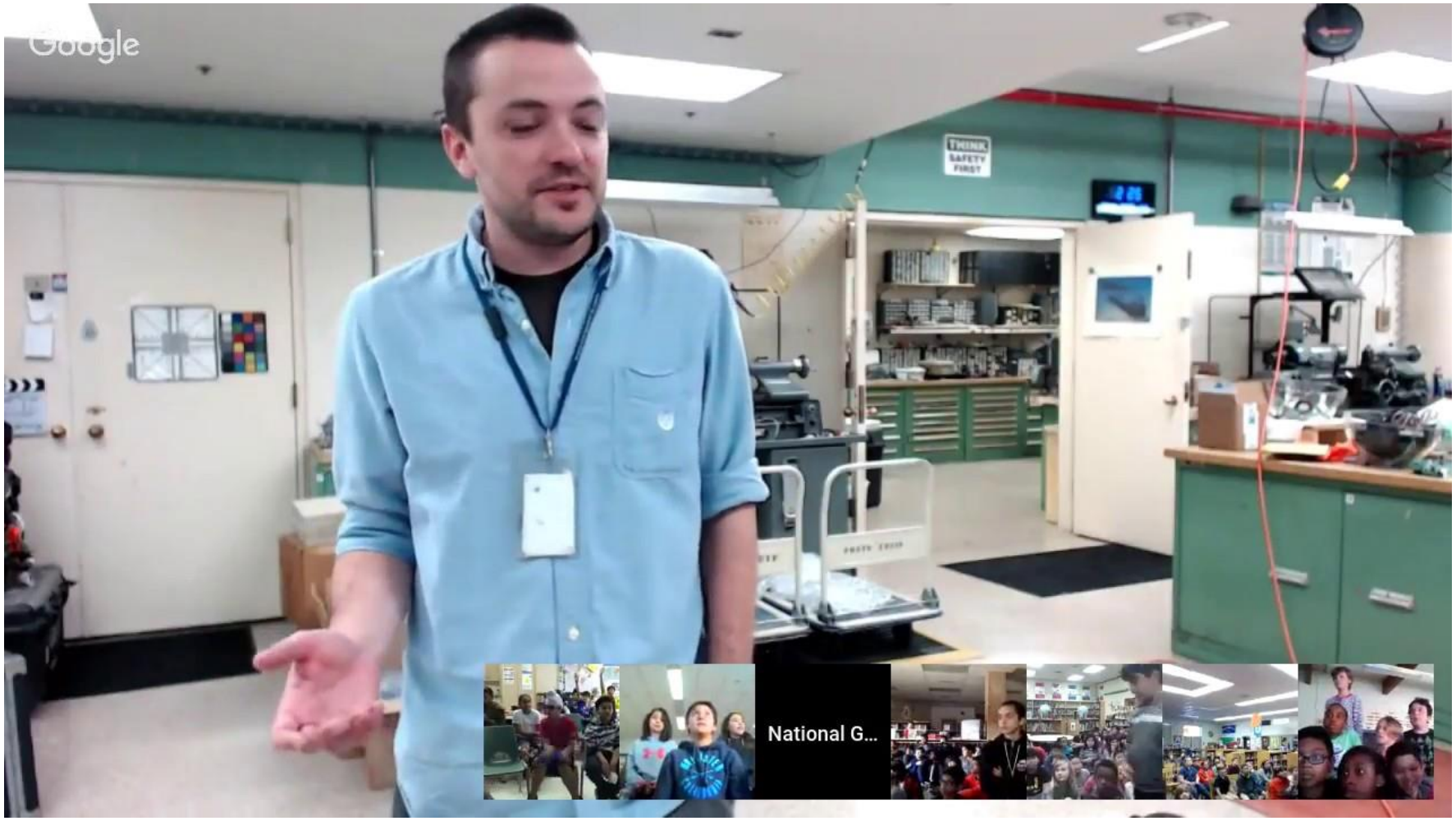
Exploration

Science Lab Exploration

With every Exploration in the Lab
There is a New Discovery

Some are Small

Some will Change the
Course of Human Existence and Thinking



Explorer Classroom | Nat Geo Exploration Technology Lab | Michael Shepard

Image Credit: youtube.com/watch?v=1Mo0BjUjZ-8

Exploration

Requirement 2 – History of Exploration

Discuss with your counselor the history of exploration.

Select a field of study with a history of exploration to illustrate the importance of exploration in the development of that field (for example, aerospace, oil industry, paleontology, oceanography, etc.).

Exploration

History of Exploration - Genetics

- Genetics is a branch of biology concerned with the study of
  - Genes
  - Genetic variation
  - Heredity in organisms

Exploration

History of Exploration - Genetics

- Genetics has been observed for millennia
- Wasn't until the 19th century that it was studied scientifically
- Since then, understanding Genetics has dramatically evolved
- Future of field holds great potential

Image: USGS https://apps.nationalmap.gov/viewer

Exploration

Charles Darwin finds birds with different beaks on each of the Galapagos Islands

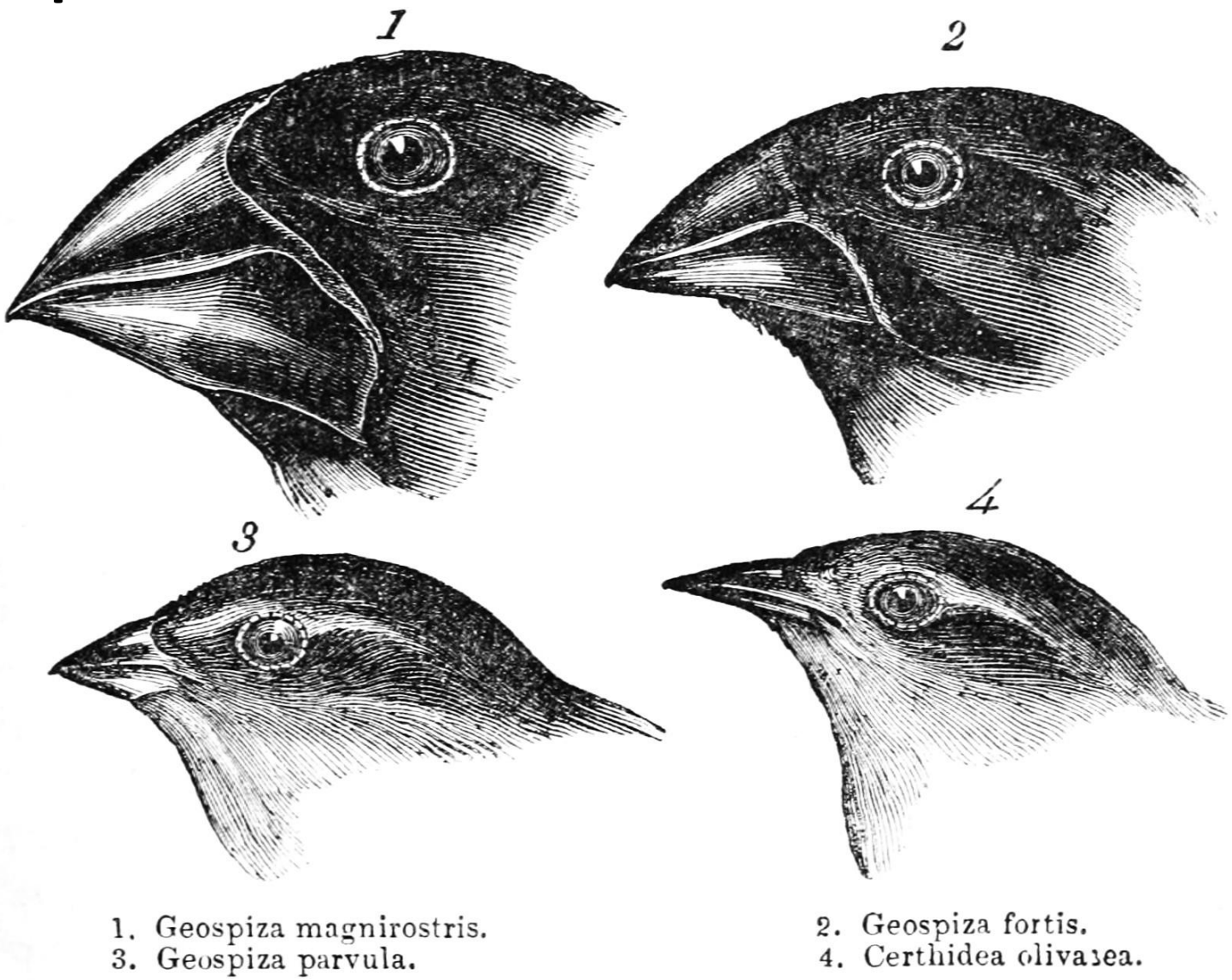
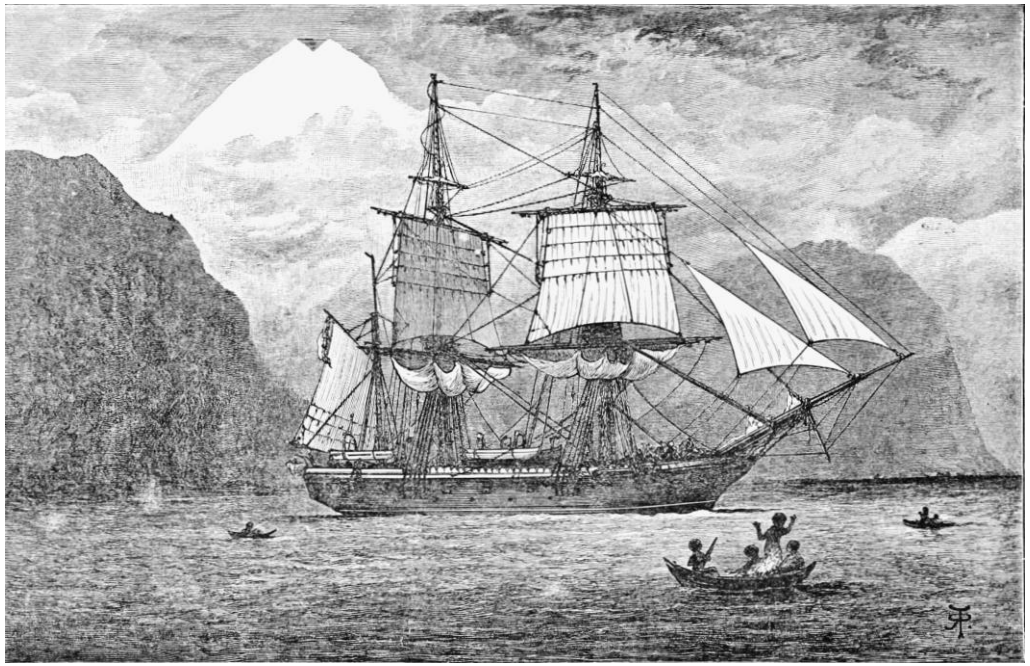


Image: Richard Leakey and Roger Lewin commons.wikimedia.org/wiki/File:Charles_Darwin_by_G._Richmond.png
and John Gould commons.wikimedia.org/wiki/File:Darwin%27s_finches_by_Gould.jpg

Exploration

Various Discoveries

- 1859 - **Charles Robert Darwin** publishes
  - On the Origin of Species
    - Evolution resulted from a process that he called natural selection



HMS Beagle in the Straits of Magellan

Image: commons.wikimedia.org/wiki/File:PSM_V57_D097_Hms_beagle_in_the_straits_of_magellan.png

Exploration

Various Discoveries

- 1869 - **Friedrich Miescher** discovers “nuclein”
  - Isolated pure sample of salmon sperm
  - Pupil Richard Altmann names it “nucleic acid”

Image: commons.wikimedia.org/wiki/File:Friedrich_Miescher.jpg

Exploration

Gregor Mendel

- Austrian monk and botanist 1822-1884
- Performed many scientific experiments with plants to study inheritance
- Experimented on thousands of pea plants for 8 years
- Forced to give up research when became abbot

- Gregor Mendel - YouTube
- Gregor Mendel Biography
- The Friar and the Pea

Image: Wellcome Library, London commons.wikimedia.org/wiki/File:Gregor_Mendel_oval.jpg

Exploration

Gregor Mendel

- Punnett square
  - One of Mendel's crosses
  - Homozygous pea plants purple/white color alleles
  - Purple Dominant over White

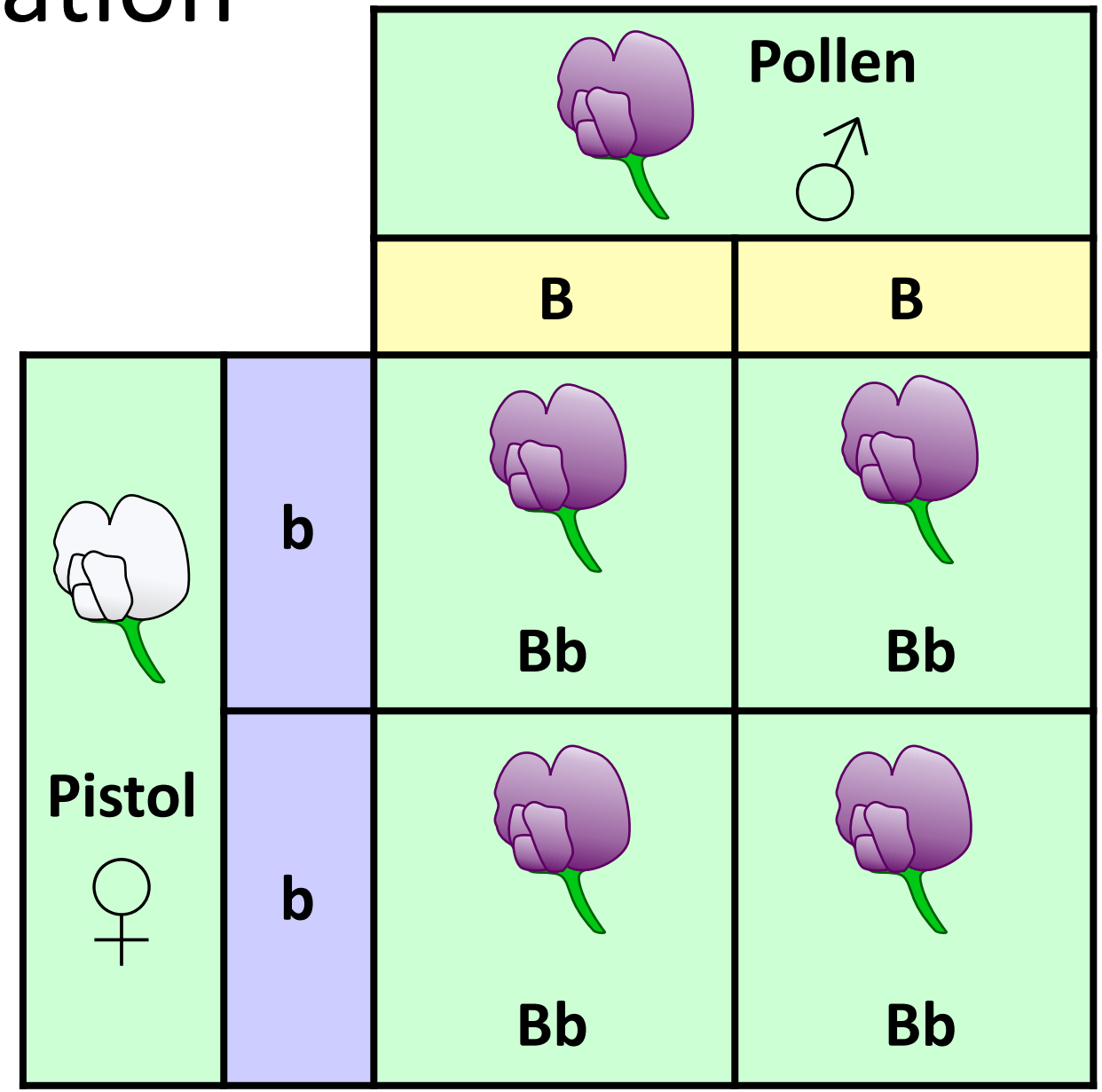


Image: Madprime commons.wikimedia.org/wiki/File:Punnett_square_mendel_flowers.svg

Exploration

Gregor Mendel

- Punnett square
  - One of Mendel's crosses
  - Heterozygous pea plants purple/white color alleles

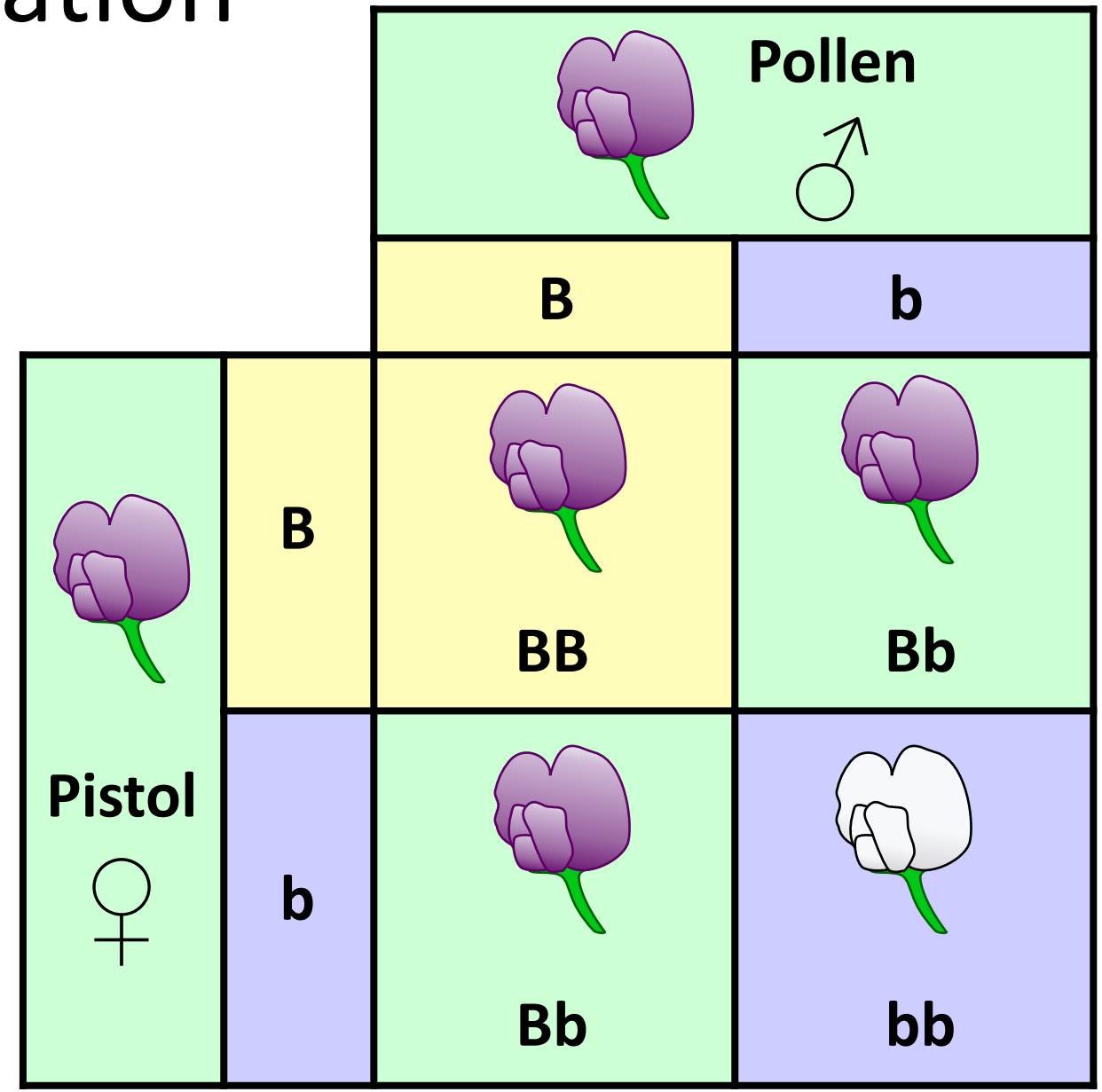


Image: Madprime commons.wikimedia.org/wiki/File:Punnett_square_mendel_flowers.svg

Exploration

Hugo de Vries, Carl Correns, and Erich von Tschermak

- Dutch, German and Austrian scientists
- Also studied plants
- Discovered similar findings as Mendel

Exploration

Hugo de Vries, Carl Correns, and Erich von Tschermak

- **Hugo de Vries** (1889) suggested the concept of
  - Mutations
  - Mutation theory - based on a modified version of Charles Darwin's theory of Pangenesis
  - Genes ("pangen")

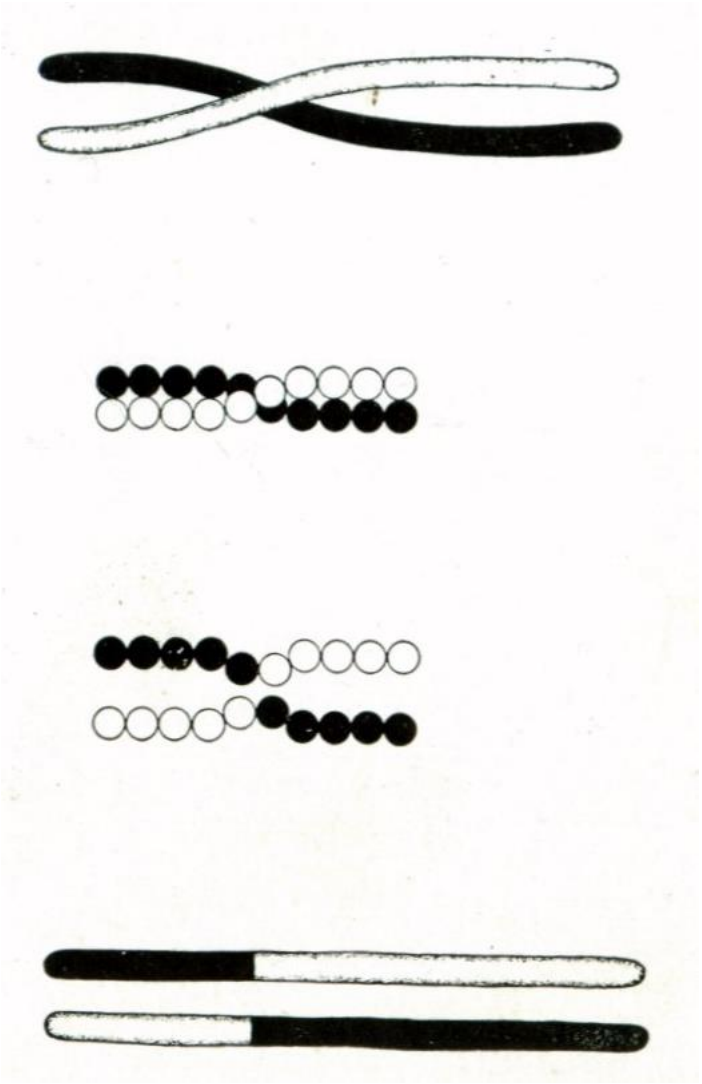
- **Carl Correns** (1909) discovered
  - Cytoplasmic inheritance
    - Some inheritance depends on which parent had trait

- **Erich von Tschermak** (1900 inheritance publication) later developed
  - New disease-resistant crops, including wheat-rye and oat hybrids

Exploration

Various Discoveries

- 1910 - **Thomas Hunt Morgan** showed
  - Genes reside on specific chromosomes
  - Proposed concept of recombination
  - Recombination dependent on gene proximity
  - Started the first chromosomal map of the fruit fly (*Drosophila*)



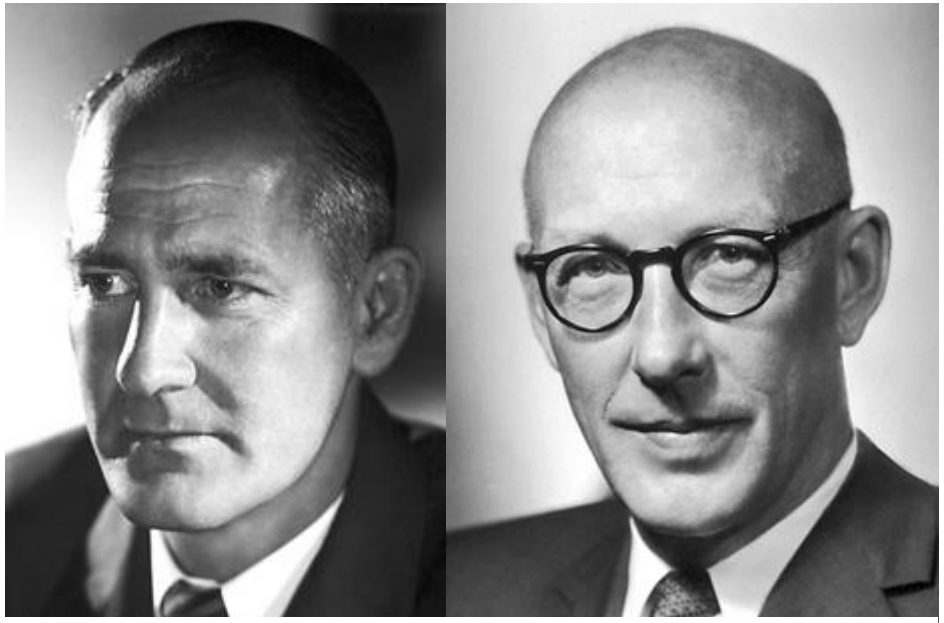
Morgan's illustration of crossing over
1916 *A Critique of the Theory of Evolution*

Image: commons.wikimedia.org/wiki/File:Morgan_crossover_1.jpg

Exploration

Various Discoveries

- 1951 - **George Wells Beadle** and **Edward Lawrie Tatum**
  - Found mold *Neurospora crassa* exposed to x-rays causes mutations



The Nobel Prize in Physiology or Medicine 1958

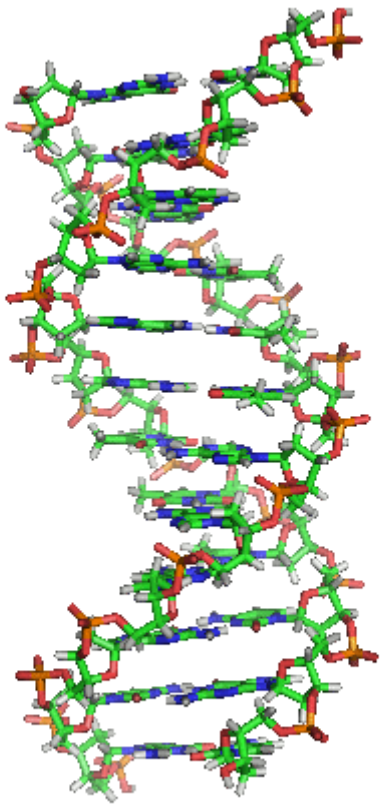
Image: nobelprize.org en.wikipedia.org/wiki/File:George_Wells_Beadle.jpg en.wikipedia.org/wiki/File:Edward_Lawrie_Tatum_nobel.jpg

Exploration

James Watson and Francis Crick

- Crick 1916-2004
  - British molecular biologist, biophysicist, and neuroscientist
- Watson 1928-
  - American molecular biologist, geneticist and zoologist

- 1953 Proposed
  The double helix structure of the DNA molecule



- Discovery of the structure of DNA

Image: Zephyris commons.wikimedia.org/wiki/File:DNA_orbit_animated.gif

The Discovery of the Structure of DNA

Exploration

James Watson and Francis Crick

- Concept of how DNA constructed
- Theory on how DNA can be copied
  - Adenine links only with Thymine
  - Guanine links only with Cytosine
  - Split the strand and fill in gaps

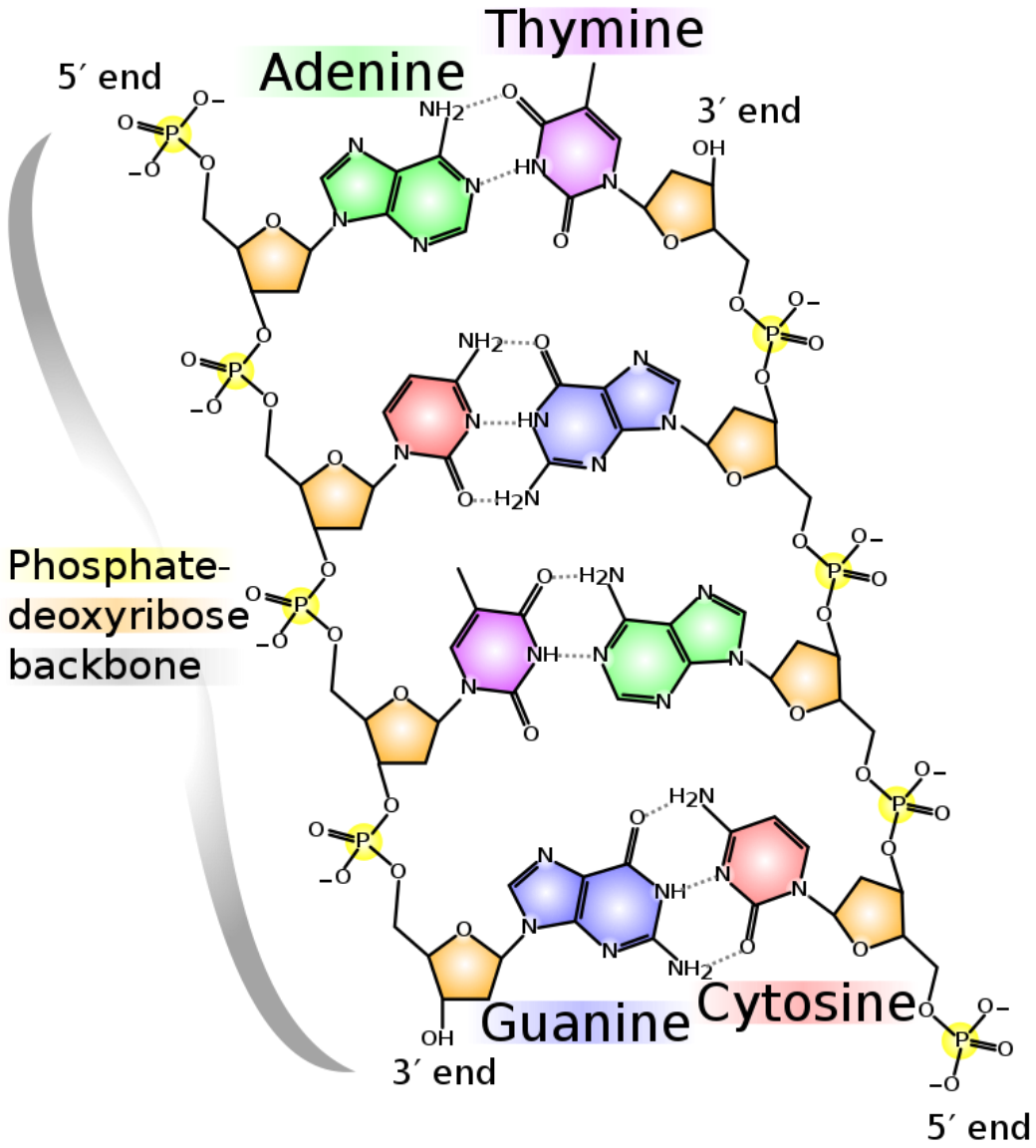


Image: Madprime commons.wikimedia.org/wiki/File:DNA_chemical_structure.svg

Exploration

Human DNA Sequencing

- **2001** - first human genome sequences published (nearly complete)
  - Human Genome Project
  - Celera Corporation
  - 341 gaps could not be sequenced with current technology

- **2018** - the diploid genomes of over a million humans determined
  - Using next-generation sequencing

- **2021** - T2T consortium reports complete sequencing of human DNA
  - Filled in all the gaps

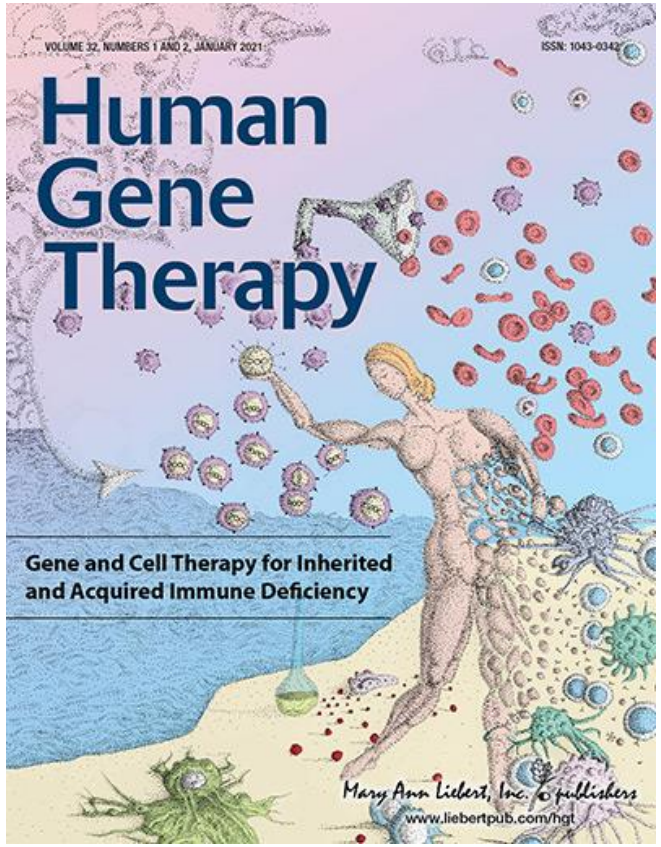
Exploration

Genetics – What Next?

- **Map out Genetic Disease?**
  - Help treat/cure problems early in life
  - Already being used

- **mRNA Treatment**
  - mRNA used to instruct cells to produce proteins
  - Covid-19 Vaccines

- **Gene Therapy**
  - Thought to be able to cure many genetic disorders
  - Thousands of clinical trials
  - Already being used to treat a handful of diseases



Human Gene Therapy V32, Issue 1-2 January 2021
liebertpub.com/toc/hum/32/1-2

Exploration

Genetics – Exploration?

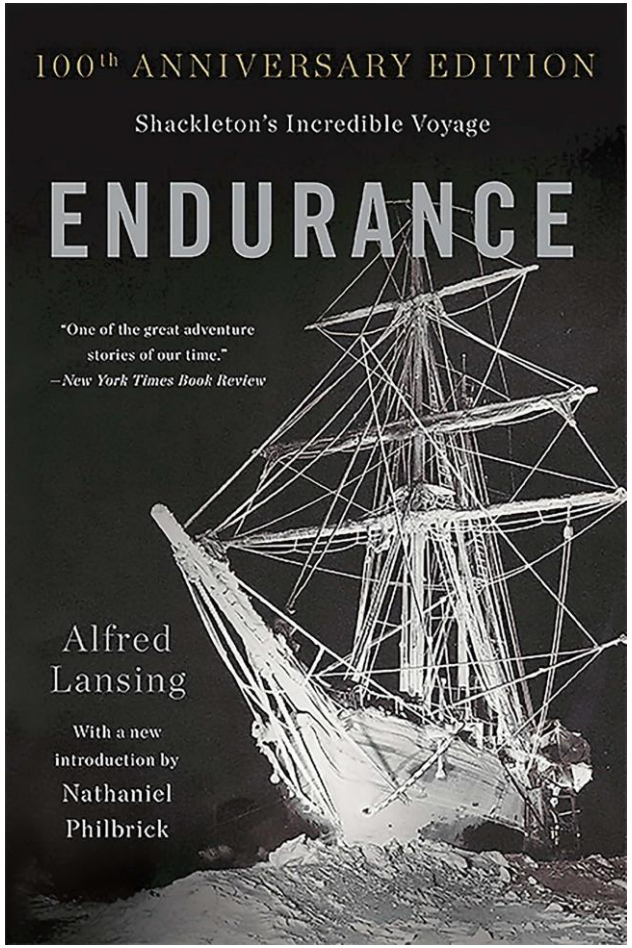
- Is Lab Work and Research Exploration?

Exploration

Exploration

- What about Legendary Explorers
  - Impossible and epic journeys into unknow lands
  - Risk of death
  - The Fedora

- Read about Sir Ernest Shackleton



Exploration

Requirement 2 – History of Exploration

Discuss with your counselor the history of exploration.

Select a field of study with a history of exploration to illustrate the importance of exploration in the development of that field (for example, aerospace, oil industry, paleontology, oceanography, etc.).

Back to the Requirement

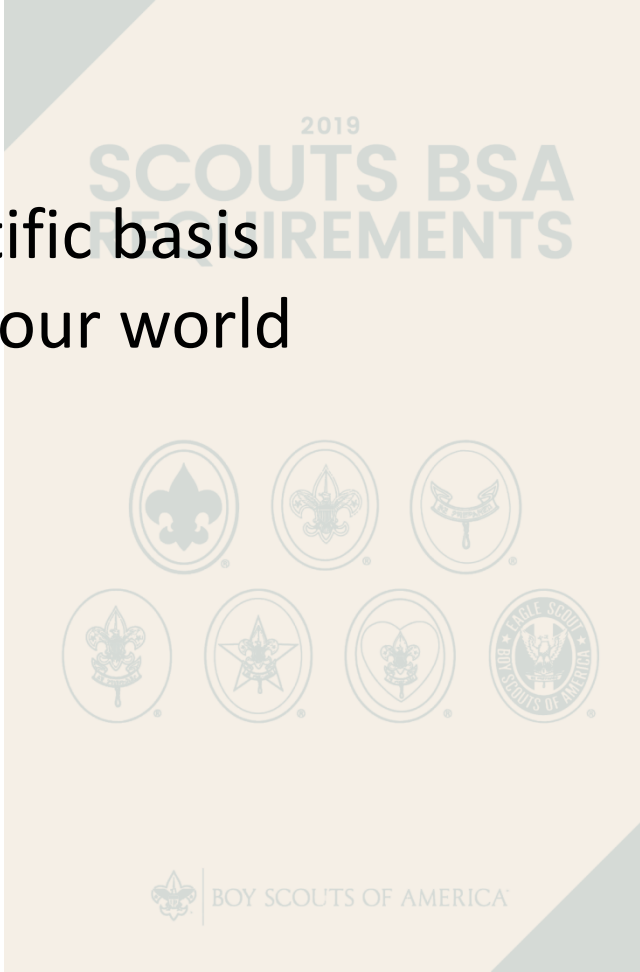
Exploration

Requirement 3 – Importance of Exploration

Explain to your counselor why it is important to explore.

Discuss the following:

a. Why it is important for exploration to have a scientific basis
b. How explorers have aided in our understanding of our world
c. What you think it takes to be an explorer



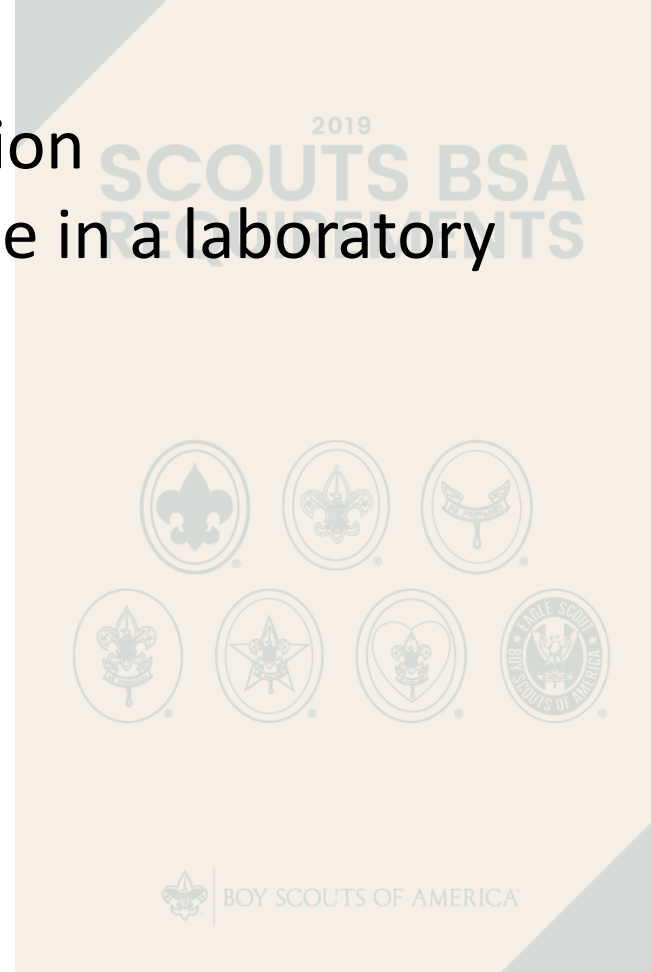
Homework

Exploration

Requirement 4 – Real-Life Exploration

Do ONE of the following:

a. Learn about a living explorer.
b. Learn about an actual scientific exploration expedition
c. Learn about types of exploration that may take place in a laboratory or scientific research facility.



Homework

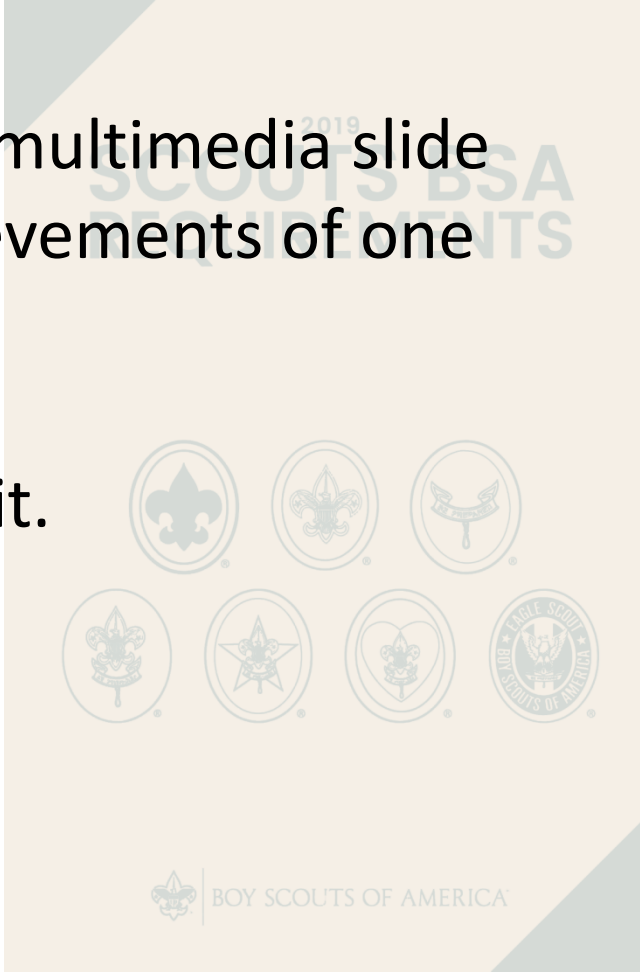
Exploration

Requirement 4a – Real-Life Exploration

Learn about a **living explorer**.

Create a short report or presentation (verbal, written, or multimedia slide presentation) on this individual's objectives and the achievements of one of the explorer's expeditions.

Share what you have learned with your counselor and unit.



Exploration

Requirement 4b – Real-Life Exploration

Learn about an **actual scientific exploration expedition**.

Gather information about the mission objectives and the expedition's most interesting or important discoveries.

Share what you have learned with your counselor and unit.

Tell how the information gained from this expedition helped scientists answer important questions.

Exploration

Requirement 4c – Real-Life Exploration

Learn about **types of exploration that may take place in a laboratory or scientific research facility** (medicine, biology, chemistry, physics, astronomy, etc.).

Explain to your counselor how laboratory research and exploration are similar to field research and exploration.

Exploration

Requirement 5 - Exploration in Lab and Field

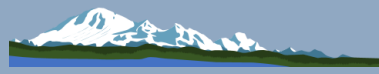
Do ONE of the following, and share what you learn with your counselor:

a. With your parent's permission and counselor's approval, visit either in person or via the internet an exploration sponsoring organization (such as The Explorers Club, National Geographic Society, Smithsonian Institution, Alpine Club, World Wildlife Fund, or similar organization). Find out what type(s) of exploration the organization supports.

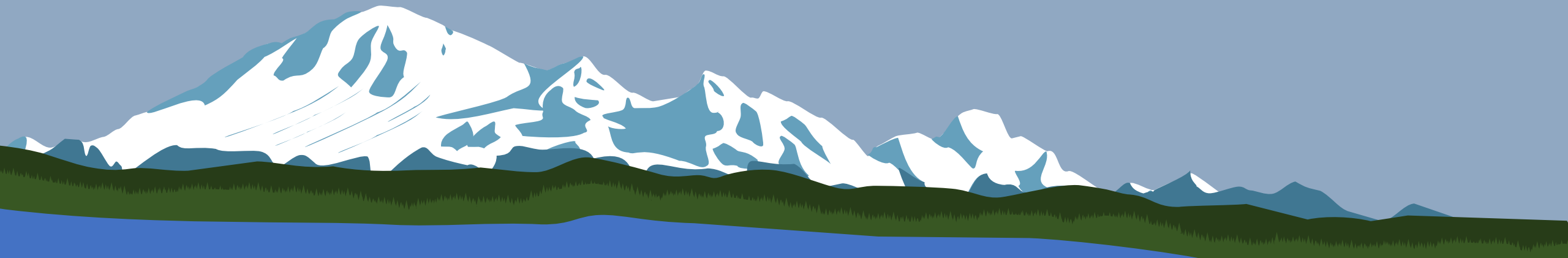
b. With permission and approval, visit either in person or via the internet a science lab, astronomical observatory, medical research facility, or similar site. Learn what exploration is done in this facility.

Homework

Index



Expedition



Expedition

Exploration vs Expedition

Exploration

- Goal is simply to find out more about something

Expedition

- Scientists or explorers have some background knowledge
- Seek evidence, or data, to help answer specific questions
- Expeditions are about getting out there

Expedition

Expedition

Expeditions are widely variable.

You do not have to climb Mount Everest or go to a jungle to be an explorer.

For this merit badge, an expedition should be viewed like a field trip or science project.

While you cannot just hike some place and call it an expedition, you can hike to a location and study an aspect that interests you.

Expedition

Expedition

The major difference between an expedition and a field science trip is that you (with your counselor's guidance) have to plan everything.

You have to formulate objectives and plan an agenda.

As needed, you will need to do things like confirm transportation, arrange communication, plan for food and medical supplies, acquire all food and other supplies, construct safety and possible evacuation procedures, manage any adverse events, and prepare a report after the expedition.

Excerpt from Exploration Merit Badge Pamphlet

Expedition

Expedition

Evaluating the effects of a storm on the local forest or nature preserve, the effects of a drought on a field used by birds and mammals, changes in butterfly populations due to loss of wildflower habitat, incursions by invasive plant or animal species, insect diversity, and presence or absence of amphibians or fish are just some of the examples that can be studied and reported.

Your imagination is your only limitation.

Expedition

Requirement 6 – Expedition Planning

Discuss with your counselor each of the following steps for conducting a successful exploration activity. Explain the need for each step.

a. Identify the objectives (establish goals).
b. Plan the mission. Create an expedition agenda or schedule. List potential documents or permits needed.
c. Budget and plan for adequate financial resources. Estimate costs for travel, equipment, accommodations, meals, permits or licenses, and other expedition expenses.
d. Determine equipment and supplies required for personal and mission needs for the length of the expedition.
e. Determine communication and transportation needs. Plan how to keep in contact with your base or the outside world, and determine how you will communicate with each other on-site.
f. Establish safety and first aid procedures (including planning for medical evacuation). Identify the hazards that explorers could encounter on the expedition, and establish procedures to prevent or avoid those hazards.
g. Determine team selection. Identify who is essential for the expedition to be successful and what skills are required by the expedition leader.
h. Establish detailed recordkeeping (documentation) procedures. Plan the interpretation and sharing of information at the conclusion of the expedition.

Homework

Expedition

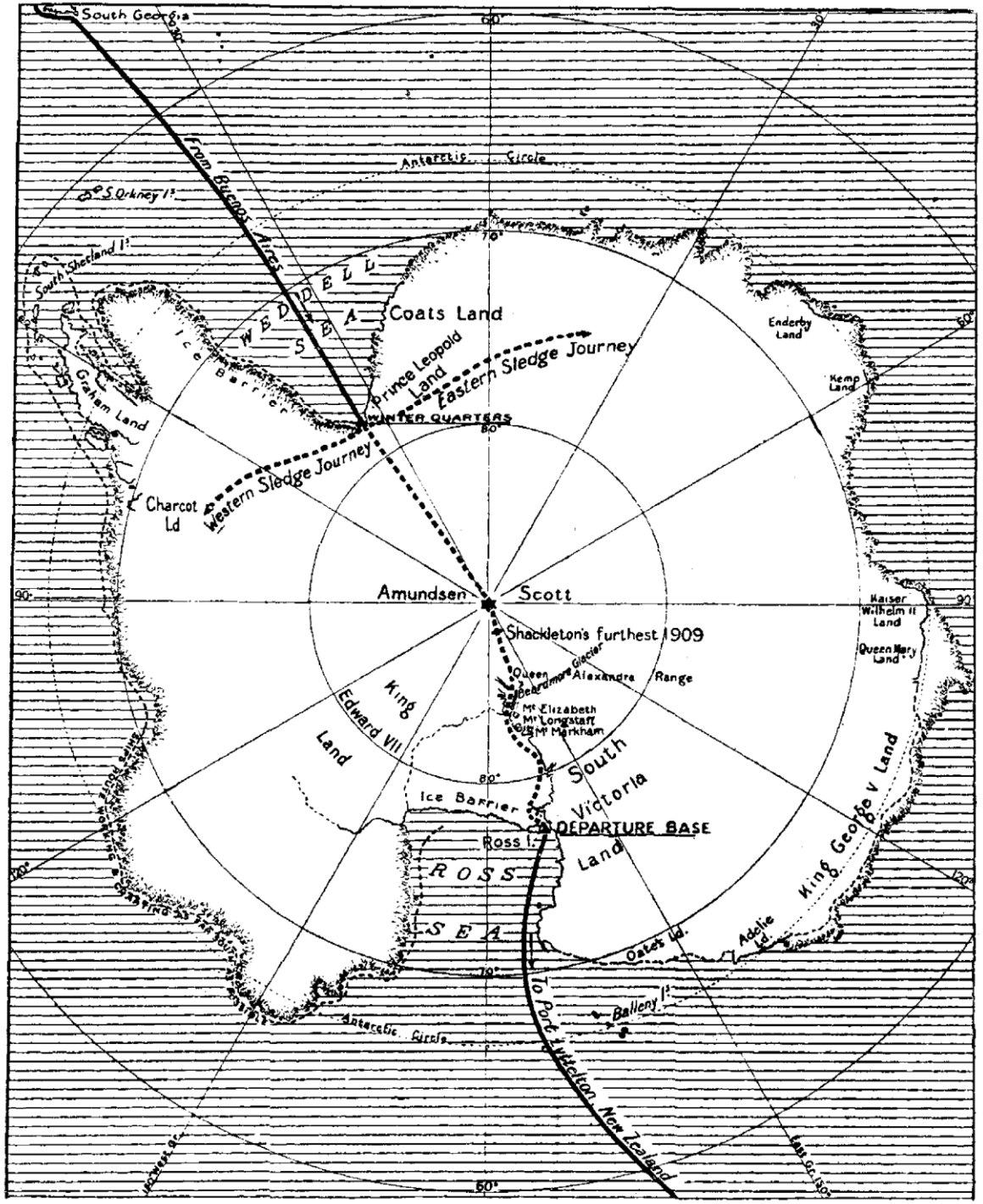
Requirement 6a – Expedition Planning – Goals

Identify the objectives (establish goals).

Expedition

Expedition Planning – Goals

- Develop a Concept
  - Longstanding interest or sudden curiosity
  - Define concept further
  - What is your objective?
  - What are you hoping to learn?



Ernest Shackleton's Imperial Trans-Antarctic Expedition

- Cross South Polar Continent
  - Weddell sea to Ross sea
- Scientific Work
  - Sledging party to Graham Land
    - Determine if Andes extends to Victoria Land
  - Sledging party to Enderby Land
  - Base Camp Research
  - Ship dredging

Image: *The Relief of the Shackleton Antarctic Expedition* . Nature 97, 241–243 (1916).

Expedition

Requirement 6b – Expedition Planning – Agenda

Plan the mission.

Create an expedition agenda or schedule.

List potential documents or permits needed.

Expedition

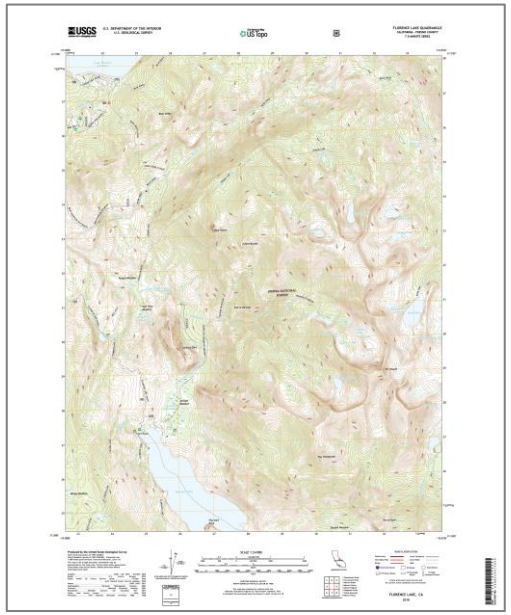
Expedition Planning – Agenda

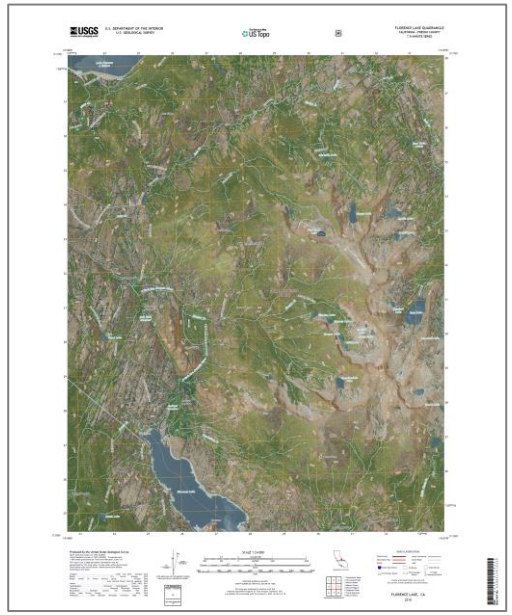
- Do Your Research
  - To more fully understand what you're trying to learn and why

Expedition

Expedition Planning – Agenda

- Do Your Research
  - Reconnaissance
    - Seeing the area is one of the most important part of planning
    - Go there or talk to someone who has
    - Minimum – perform a map reconnaissance





Expedition

Expedition Planning – Agenda

- Do Your Research
  - Determine best timing
    - Geography and climate
    - Hazards to team?
    - Best places and best timing to collect data

Expedition

Expedition Planning – Agenda

- Do Your Research
  - Check on local laws and restrictions that might limit your project
    - Visas
    - Permits
    - Taxes
    - Fees
    - Off limits areas

Expedition

Expedition Planning – Agenda

- Do Your Research
  - If the area is unfamiliar
    - Find out about cultural issues
      - Suspicion or Animosity to outsiders?
      - Dress codes
      - Social norms and taboos
    - Find out about current events
      - Local unrest

Expedition

Expedition Planning – Agenda

- Do Your Research
  - Determine resources at the site
  - What must you bring that can’t be procured locally

Expedition

Expedition Planning – Agenda

- Create an Agenda
  - Serves as a guide during preparation
  - Provides a frame-work for the activities planned
  - Outlines what needs to be done after you return
  - Helps organize your expedition
    - Identify areas where obstacles may arise
    - Assist in dealing with unexpected delays

Expedition

Expedition Planning – Agenda

- Create an Agenda
  - Schedule time for each part of mission
  - **Backward Planning**
    - Start at end of mission
      - Debriefs and Final Report
      - When is mission supposed to end?
    - Work back
      - How long does each step take?
      - Travel times, permits, meetings?
      - Adequate field time?
      - Account for delays due to equipment failure and weather
    - End schedule at the beginning – do you even have enough time?

Expedition

Expedition Planning – Agenda

- Create an Agenda
  - Assigns tasks
    - Determine appropriate use of personnel
    - Team members share work
    - Helps shorten preparation and exploration times
  - Share your agenda with someone not going on the expedition

Expedition

Requirement 6c – Expedition Planning – Budget

Budget and plan for adequate financial resources.

Estimate costs for travel, equipment, accommodations, meals, permits or licenses, and other expedition expenses.

Expedition

Expedition Planning – Budget

- Expedition Financing
  - How do we pay for this?
  - Often a showstopper

Expedition

Expedition Planning – Budget

- Determine
  - A rough budget
  - Alternate sources of funding
  - Gifts and Grants
    - From organizations and individuals

Expedition

Requirement 6d – Expedition Planning – Equipment

Determine equipment and supplies required for personal and mission needs for the length of the expedition.

Expedition

Expedition Planning – Equipment

- Determine Equipment and Supplies needed
  - Equipment will vary due to:
    - Ability to resupply
    - Location
    - Climate
    - Season
    - Altitude
    - Number of people

Nimrod Expedition (1907-09) to the Antarctic

Image: Ernest Henry Shackleton commons.wikimedia.org/wiki/File:Shackleton_nimrod_79.jpg

Expedition

Expedition Planning – Equipment

- Determine Equipment and Supplies needed
  - Discuss Equipment and Supply plans with team
    - Consensus on what is brought
    - Nothing left out
    - All team members know what is being brought
    - All team members know what is NOT being brought
      - No assumptions

Expedition

Expedition Planning – Equipment

- Determine Equipment and Supplies needed
  - Expedition gear
    - Sleeping, Trekking and Eating
  - Travel gear
    - Vehicles, mules, canoes
  - Communication gear
  - Medical gear
  - Research gear
  - Documentation gear
  - Survival gear
  - Security gear
    - Lock boxes and Locks

Ernest Shackleton's 'Endurance'

Image: Frank Hurley commons.wikimedia.org

Expedition

Expedition Planning – Equipment

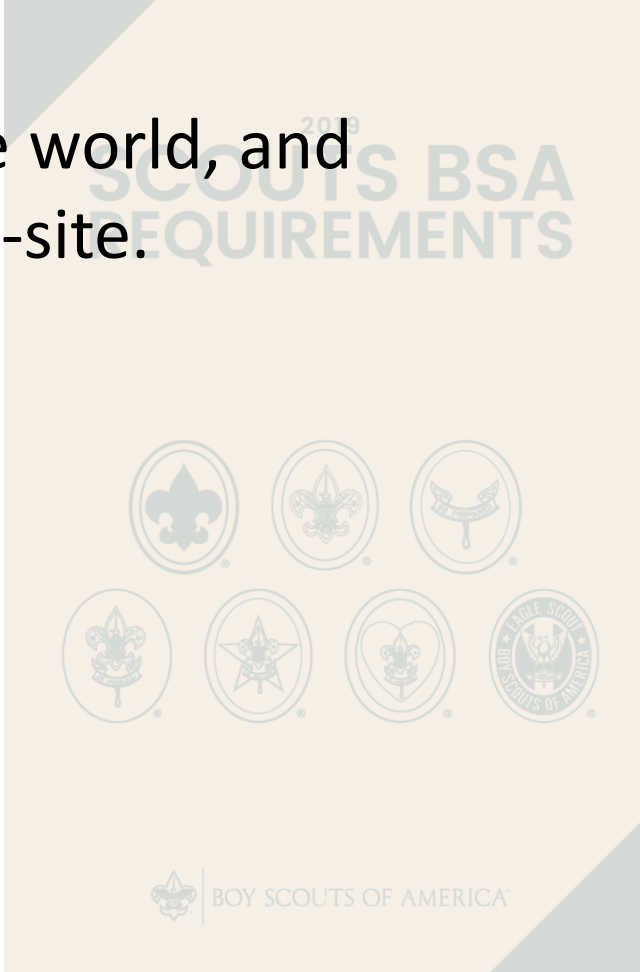
- Determine Equipment and Supplies needed
  - Consider extra:
    - Batteries
    - Bulbs
    - Digital camera
    - Memory card
    - Cords
    - Mission essential equipment
    - Spare parts

Expedition

Requirement 6e – Expedition Planning – Communication

Determine communication and transportation needs.

Plan how to keep in contact with your base or the outside world, and determine how you will communicate with each other on-site.



Expedition

Expedition Planning – Communication

- Communication Plan is Essential
  - Required for safety reasons
  - Terrain is a factor

Expedition

Expedition Planning – Communication

- Communication Plan is Essential
  - Mobile phone
    - Must be configured for the local mobile network
    - Most common and versatile communication tool
  - Requires proximity to cell towers
    - Mobile phones generally work in urban areas
    - Rural areas have less cell reception
    - Steep terrain can block cellular coverage
    - Wilderness areas often do NOT have cell coverage

Expedition

Expedition Planning – Communication

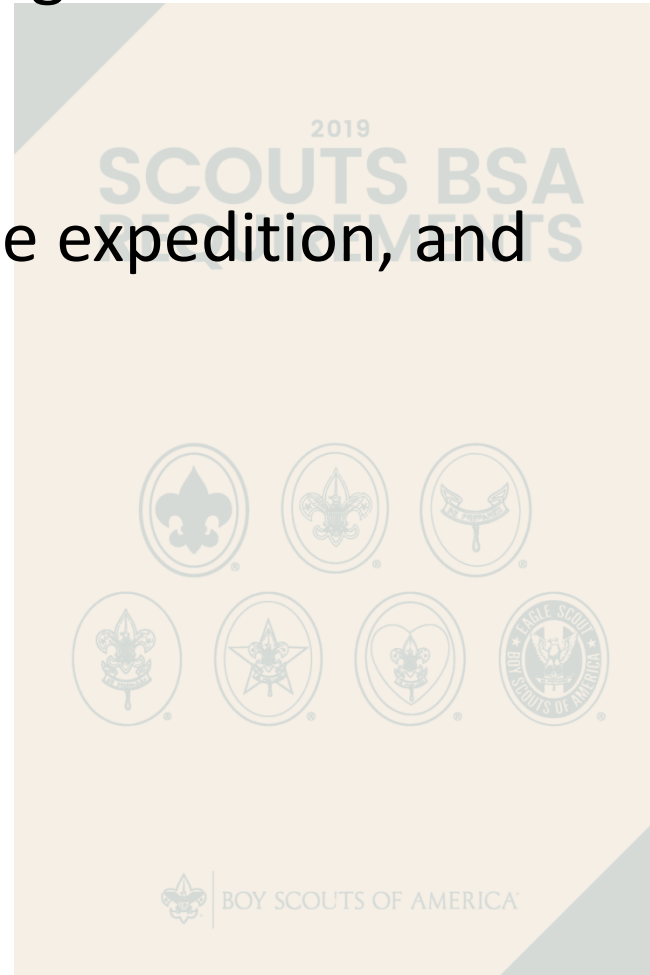
- Communication Plan is Essential
  - Satellite phones and GPS
    - Don’t requires proximity to cell towers or “the grid”
    - Have advantages but require line of sight to the sky
    - Blocked by canyons and rain-forest canopies
    - Expensive

Expedition

Requirement 6f – Expedition Planning – Safety

Establish safety and first aid procedures (including planning for medical evacuation).

Identify the hazards that explorers could encounter on the expedition, and establish procedures to prevent or avoid those hazards.



Expedition

Expedition Planning – Safety

- Identify Hazards
  - Weather
  - Terrain
  - Diseases
  - Flora
  - Fauna
  - Hostiles

Expedition

Expedition Planning – Safety

- Weather and Terrain
  - Proper gear for travel
  - Proper clothing
  - Proper shelters
  - Emergency gear

Expedition

Expedition Planning – Safety

- Diseases
  - CDC Travelers' Health
  - Vaccines?
  - Non-Vaccine-Preventable Diseases
    - Eat/Drink safely
    - Prophylactic Medications

Expedition

Expedition Planning – Safety

- Medical Plan
  - Medical training
  - Medical equipment and supplies
  - Medical insurance
    - Care and evac can be insanely expensive
  - Medical evac plan

Expedition

Expedition Planning – Safety

- Security Plan
  - Assess Security Threats
    - US State Department Travel Advisories

Expedition

Expedition Planning – Safety

- Security Plan
  - Assess Security Threats
    - Animals
      - Goats and Moose known to charge and kill people
      - Large predators may hunt people for food
    - Crime
      - Theft/Robbery
      - Kidnapping
      - Assault/Murder
    - Terrorism
      - Kidnapping/Murder

Expedition

Expedition Planning – Safety

- Security Plan
  - Mitigate Risks – Basic Precautions
    - Lock up gear
    - Hide money and passports
    - Travel in groups
    - Avoid travel at night
    - Know about off-limits areas, places and zones

Expedition

Expedition Planning – Safety

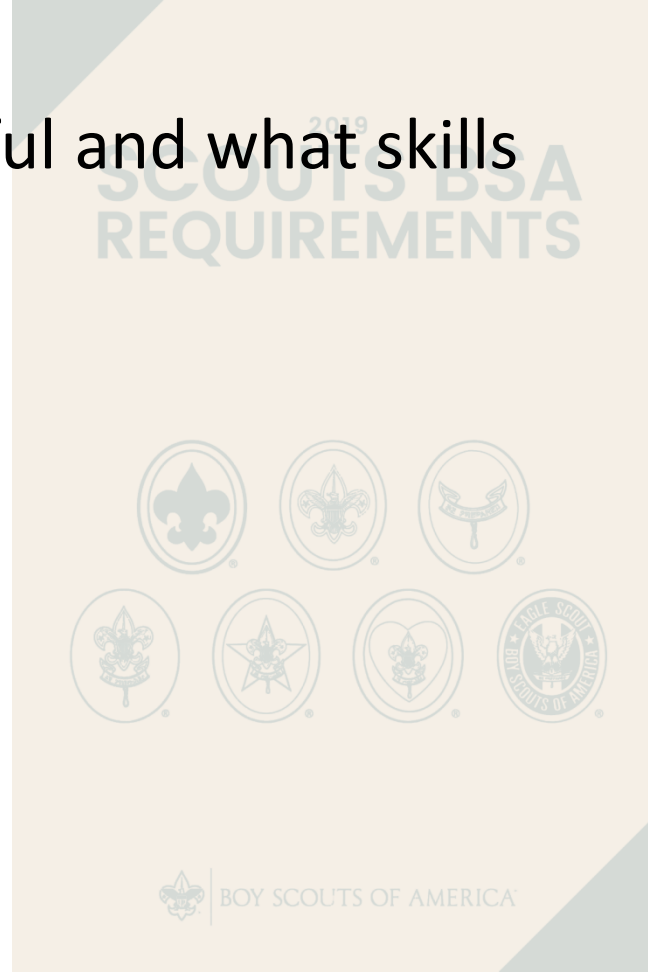
- Security Plan
  - Mitigate Risks - Advanced
    - Speak with security consultant
    - Maybe your team needs more help
      - Guide Service
      - Security Team
      - Police Escort

Expedition

Requirement 6g – Expedition Planning – Team

Determine team selection.

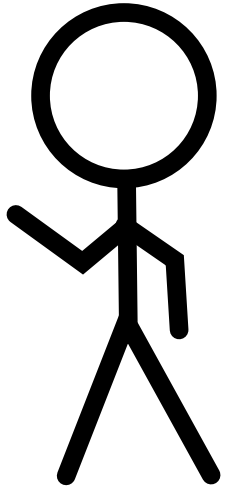
Identify who is essential for the expedition to be successful and what skills are required by the expedition leader.

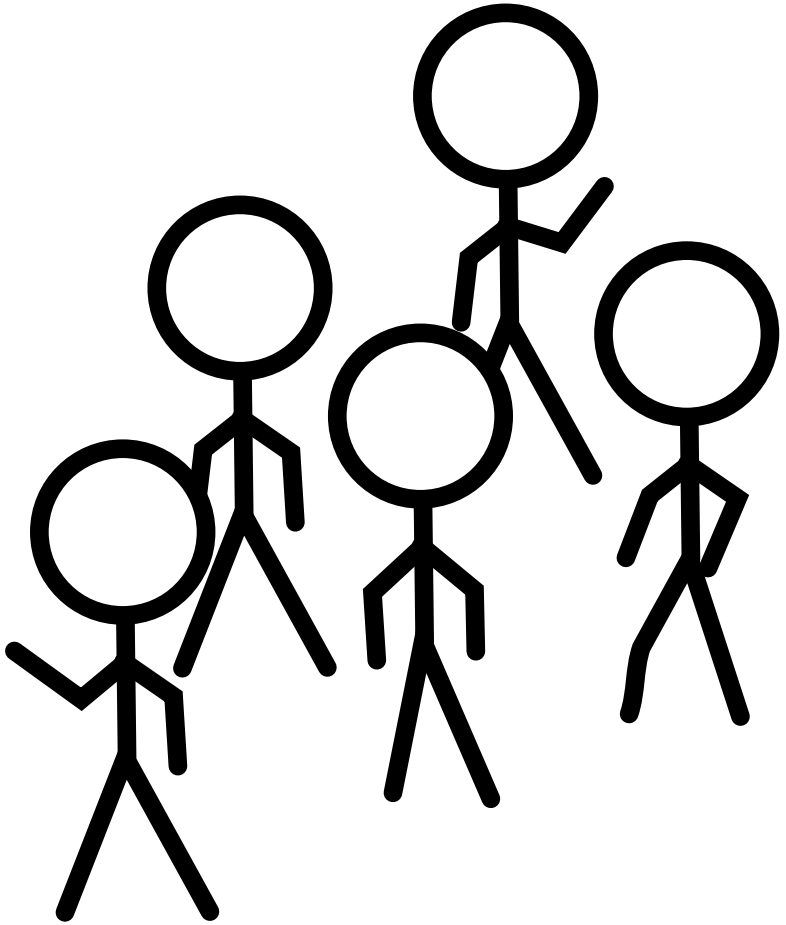


Expedition

Expedition Planning – Team

- Select Your Team
  - Solo Expedition
    vs
  - Expedition Team



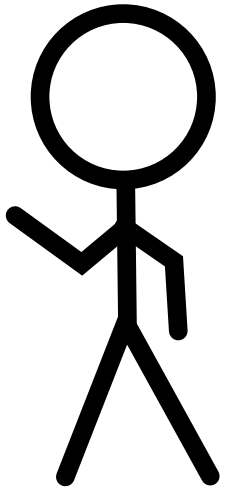


Expedition

Expedition Planning – Team

- Select Your Team
  - Solo Expedition
    - You have all the adequate skills necessary for safe expedition

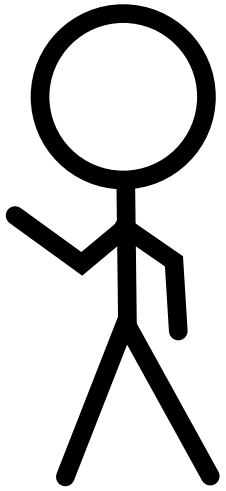
      Still need Adult supervision per BSA Guidelines
    - Solo travel is quicker
    - Solo Expeditions are less expensive
    - Planning is generally much simpler



Expedition

Expedition Planning – Team

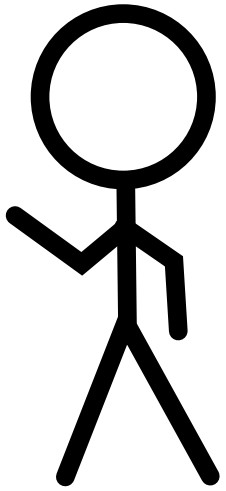
- Select Your Team
  - Solo Expedition
    - You'll have to do everything yourself
      - Most expeditions need various skill sets
      - You can only carry so much on your back
      - This may NOT be possible



Expedition

Expedition Planning – Team

- Select Your Team
  - Solo Expedition
    - Safety in Numbers
      - Solo explorers are targets for:
        - Robbers
        - Kidnappers
        - Other predators

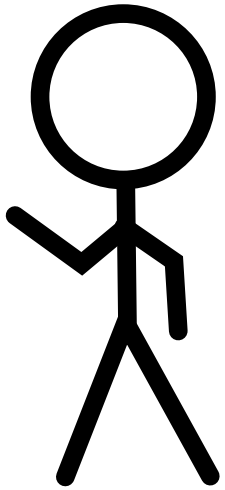


Expedition

Expedition Planning – Team

- Select Your Team
  - Solo Expedition
    - What if you get injured or need help?
      - No one is there to care for you
      - Minor injuries can be lethal in wilderness

Traveling Solo can be Extremely Dangerous



Expedition

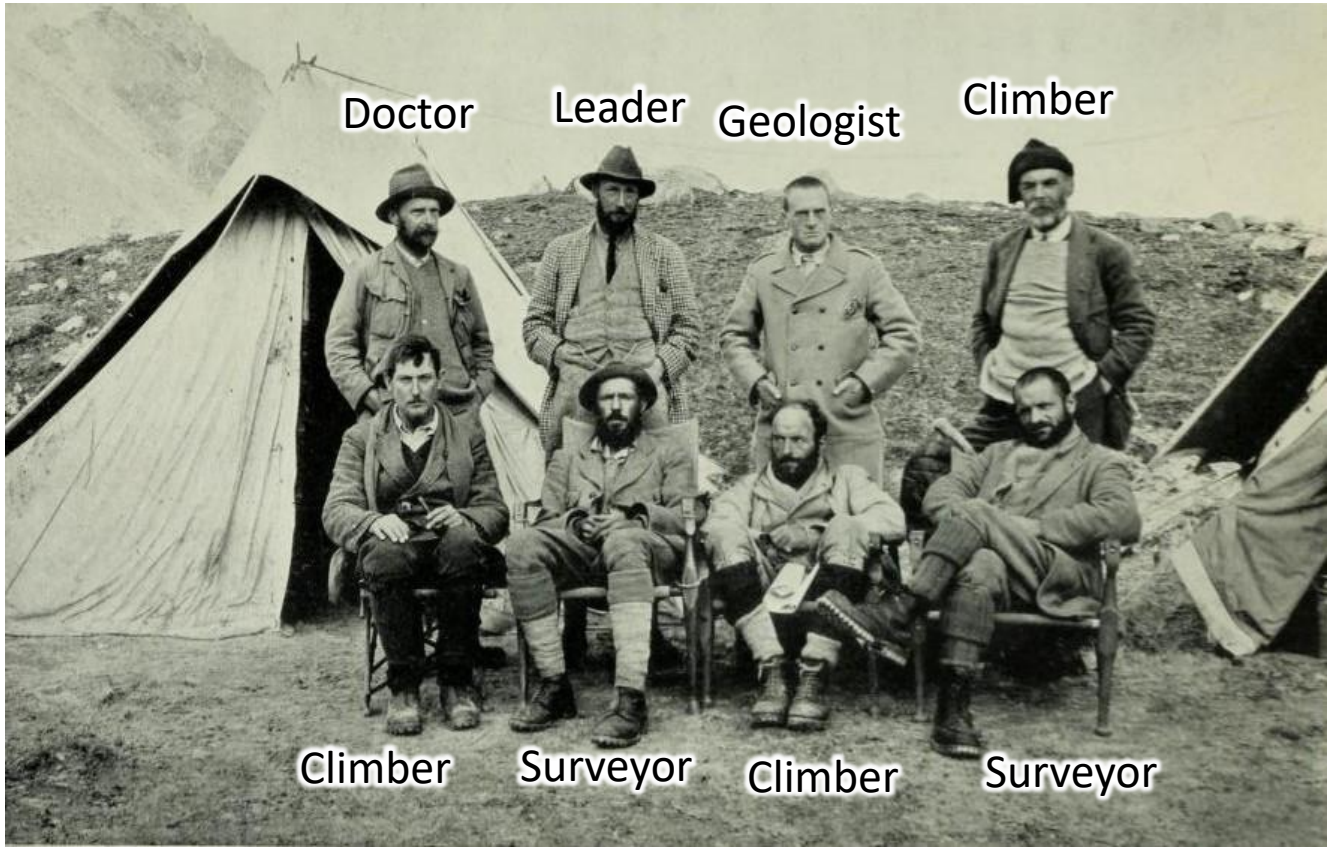
Expedition Planning – Team

- Select Your Team
  - Expedition Team
    - More expensive to fund (but might be less expensive per person)
    - More difficult to organize
    - Workload is shared
    - Pooling of skillsets
    - Redundancy of skills (good for backup and efficiency)
    - Safety in numbers

Expedition

Expedition Planning – Team

- Select Your Team
  - Expedition Team
    - Leader
    - Guide
    - Interpreter
    - Scientist(s)
    - Tech Specialist(s)
    - Communications
    - Logistics
    - Medic
    - Security



1921 British Mount Everest reconnaissance expedition
Standing: Wollaston, Howard-Bury, Heron, Raeburn.
Sitting: Mallory, Wheeler, Bullock, Morshead.

Image: Alexander Frederick Richmond "Sandy" Wollaston https://commons.wikimedia.org/wiki/File:1921_Mount_Everest_expedition_members_(cropped).jpg

Expedition

Expedition Planning – Team

- Consider:
  - Skills
    - Multiple skill sets are desirable
    - Skill redundancy is good
  - Personality
    - Can make or break a team
  - Team chemistry

Shackleton's Elephant Island party, 1916

Image: Frank Hurley commons.wikimedia.org/wiki/File:Elephant_island_party.jpg

Expedition

Expedition Planning – Team

- Keep in mind:
  - Availability of each team member
  - Expeditions can be stressful
    - Some people can’t cope with stress
    - Get to know everyone’s personalities
    - Try and spot any warning signs

Apollo 11 Crew
Neil A. Armstrong, Michael Collins and Edwin E. Aldrin Jr

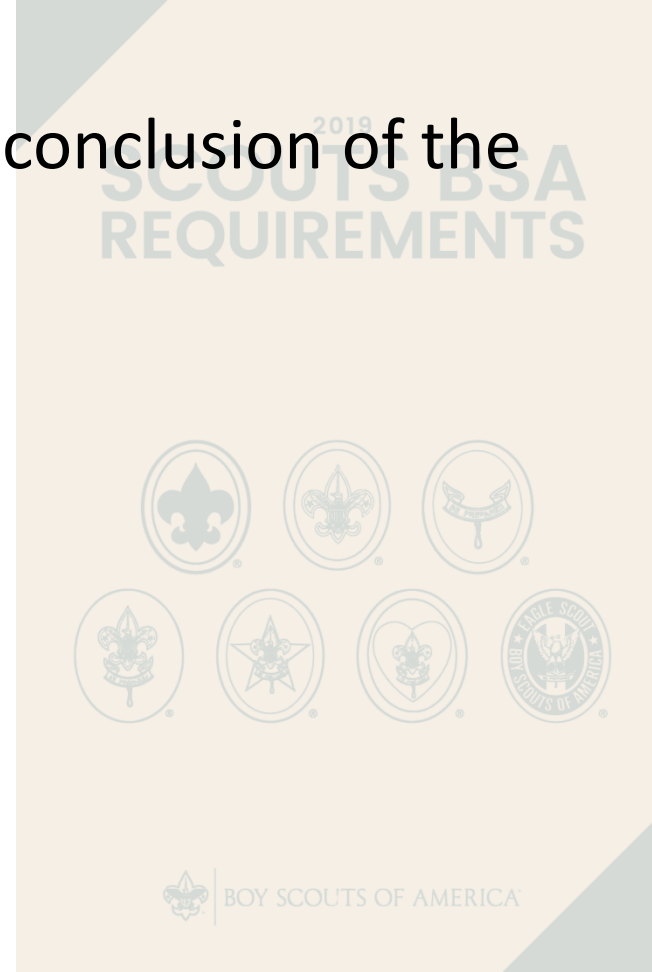
Image: NASA www.nasa.gov/topics/people/galleries/armstrong_may1969.html

Expedition

Requirement 6h – Expedition Planning – Records

Establish detailed recordkeeping (documentation) procedures.

Plan the interpretation and sharing of information at the conclusion of the expedition.



Expedition

Expedition Planning – Records

- Records are important
  - Document research
  - Finances
  - Legalities
  - Help you complete final reports
  - Helps with planning of future expeditions
  - Help you with funding proposals later on
  - Helps you write a great expedition novel

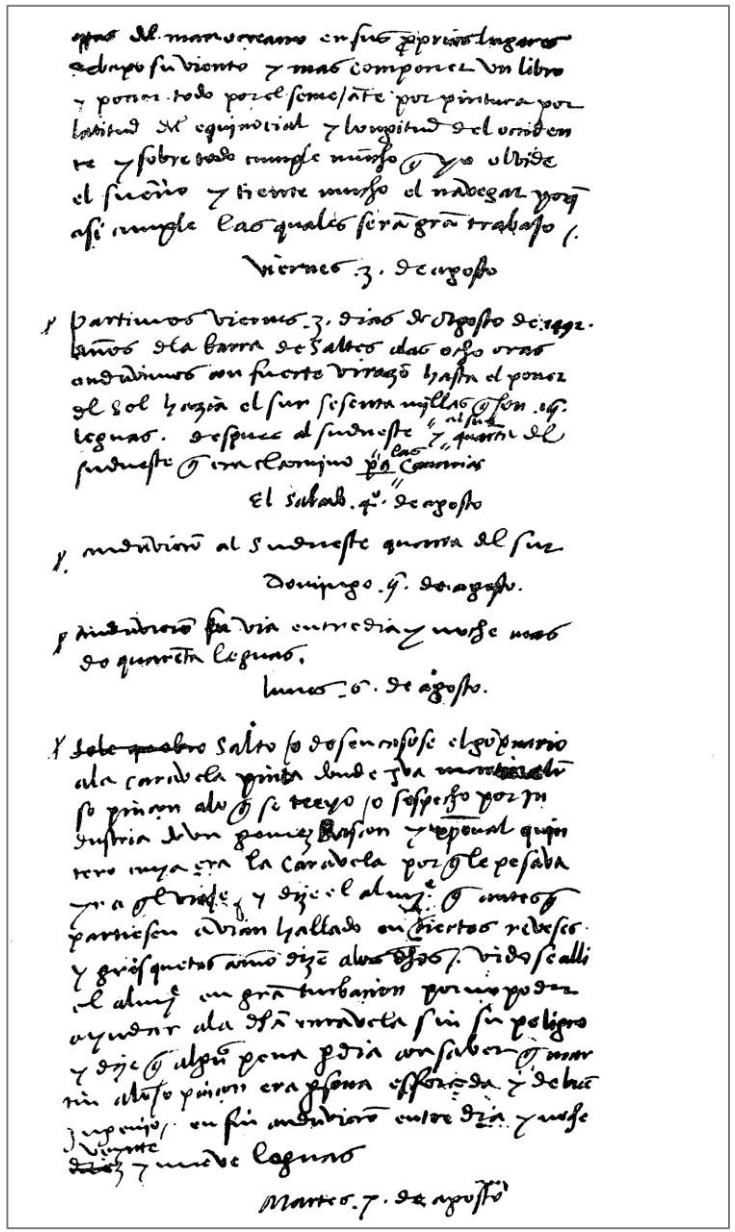


Image: Christopher Columbus' journal by Bartolomé de las Casas commons.wikimedia.org/wiki/File:Copy_of_the_abstract_from_Columbus%27_journal_by_Bartolom%C3%A9_de_las_Casas.jpg

Expedition

Expedition Planning – Records

- Records are important
  - Don’t expect to remember every detail of the expedition
  - You need notes later
    - Journals and logs
      - Log of your thoughts and observations
        - Gives chronological order of events
        - Useful for papers, presentations, etc.
      - Supply Lists
      - Medication lists and logs
      - Other lists

Expedition

Requirement 7 – Prepare for an Expedition

With your parent's permission and counselor's approval, prepare for an actual expedition to an area you have not previously explored; the place may be nearby or far away. Do the following:

a. Make your preparations under the supervision of a trained expedition leader, expedition planner, or other qualified adult experienced in exploration (such as a school science teacher, museum representative, or qualified instructor).
b. Use the steps listed in requirement 6 to guide your preparations. List the items of equipment and supplies you will need. Discuss with your counselor why you chose each item and how it will be of value on the expedition. Determine who should go on the expedition.
c. Conduct a pre-expedition check, covering the steps in requirement 6, and share the results with your counselor. With your counselor, walk through the Sweet Sixteen of BSA Safety for your expedition. Ensure that all foreseeable hazards for your expedition are adequately addressed.

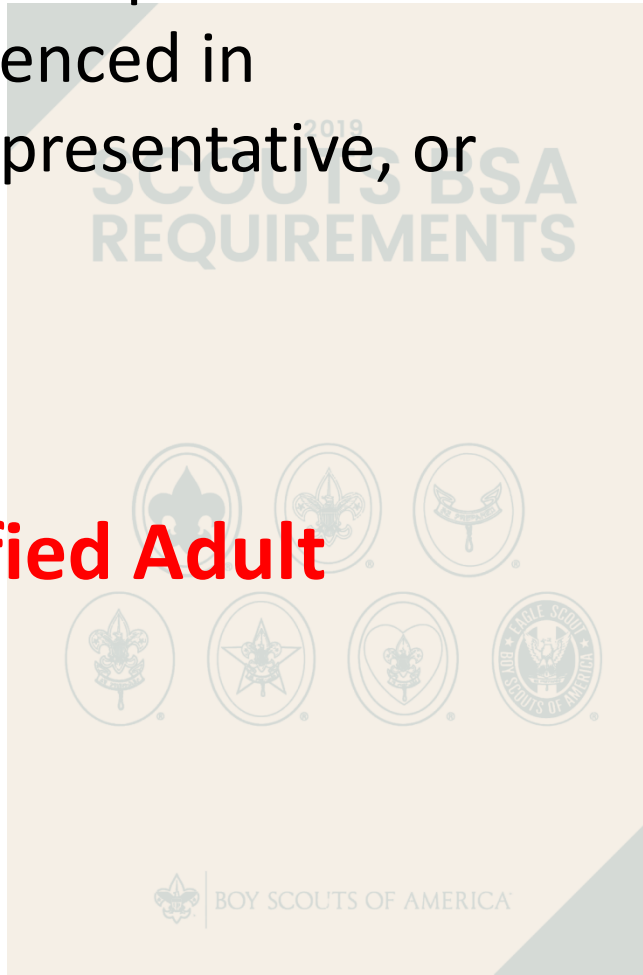
Homework

Expedition

Requirement 7a – Prepare for an Expedition – Guide

Make your preparations under the supervision of a trained expedition leader, expedition planner, or other qualified adult experienced in exploration (such as a school science teacher, museum representative, or qualified instructor).

Expedition MUST be Supervised by a Qualified Adult



Expedition

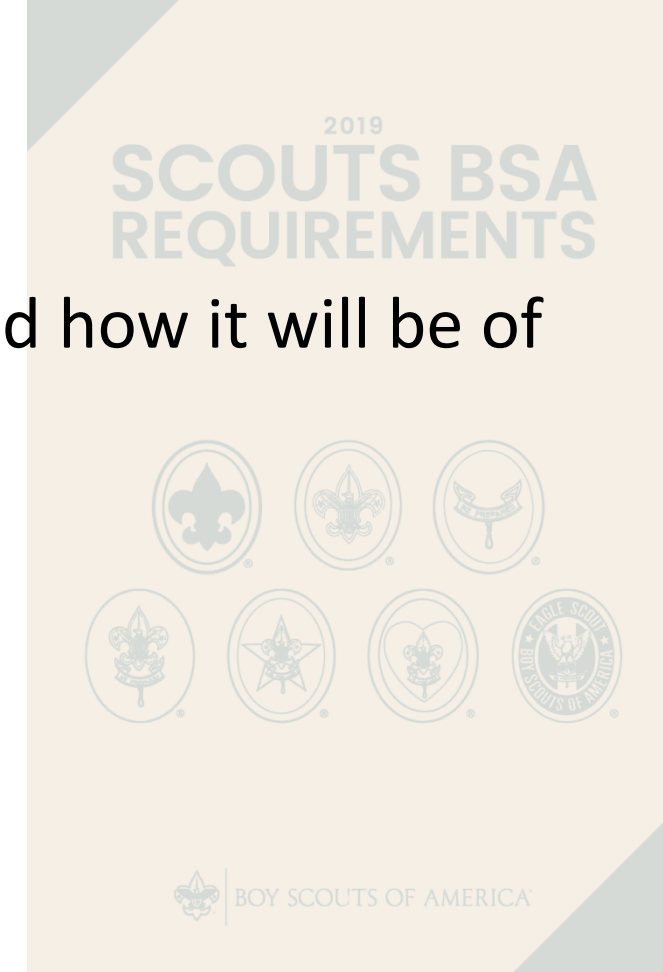
Requirement 7b – Prepare for an Expedition – Outfitting

Use the steps listed in requirement 6 to guide your preparations.

List the items of equipment and supplies you will need.

Discuss with your counselor why you chose each item and how it will be of value on the expedition.

Determine who should go on the expedition.



Expedition

Prepare for an Expedition – Outfitting

- What should you bring and why?

- Don’t forget the 10 essentials

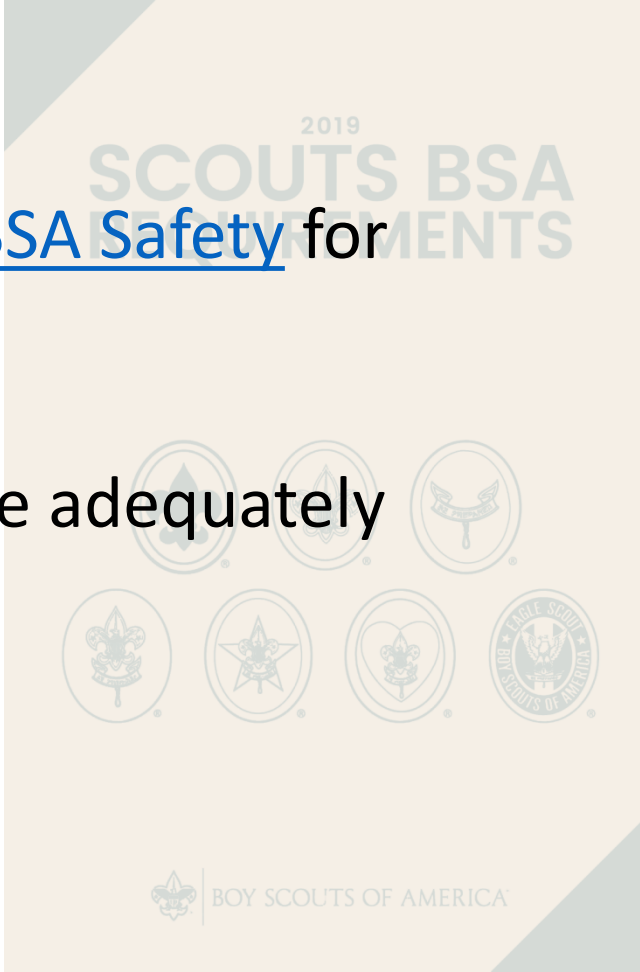
Expedition

Requirement 7c – Prepare for an Expedition – Checklist

Conduct a pre-expedition check, covering the steps in requirement 6, and share the results with your counselor.

With your counselor, walk through the Sweet Sixteen of BSA Safety for your expedition.

Ensure that all foreseeable hazards for your expedition are adequately addressed.



Expedition

Prepare for an Expedition – Checklist

Sweet Sixteen of BSA Safety

1. Qualified Supervision
2. Physical Fitness
3. Buddy System
4. Safe Area or Course
5. Equipment Selection and Maintenance
6. Personal Safety Equipment
7. Safety Procedures and Policies
8. Skill Level Limits
9. Weather Check
10. Planning
11. Communications
12. Plans and Notices
13. First-Aid Resources
14. Applicable Laws
15. CPR Resource
16. Discipline

www.scouting.org/health-and-safety/gss/sweet16

Expedition

Requirement 8 – Go on an Expedition

Complete the following:

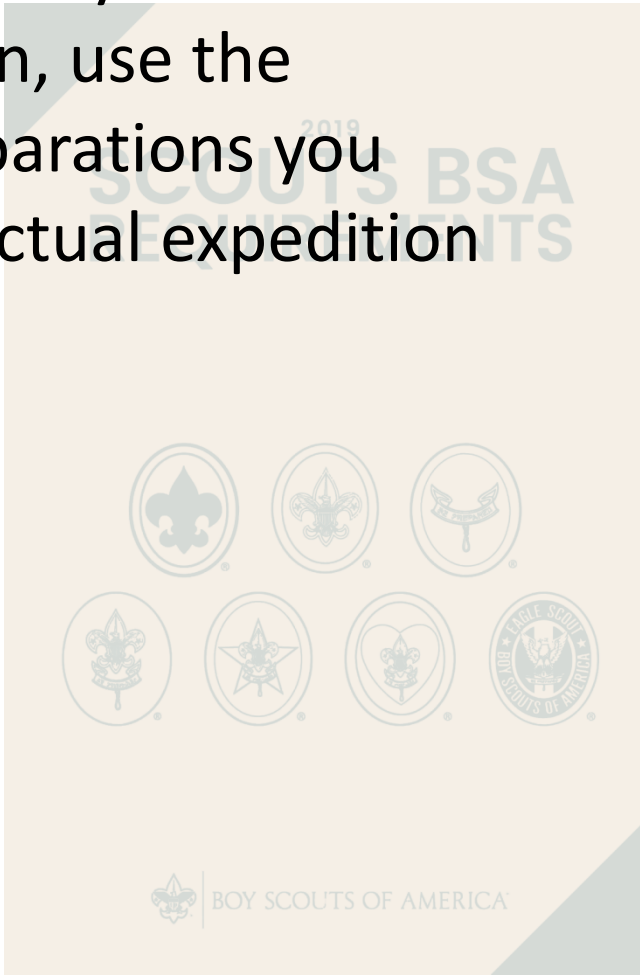
a. With your parent's permission and under the supervision of your merit badge counselor or a counselor-approved qualified person, use the planning steps you learned in requirement 6 and the preparations you completed in requirement 7 to personally undertake an actual expedition to an area you have not previously explored.
b. Discuss with your counselor what is outdoor ethics and its role in exploration and enjoying the outdoors responsibly.
c. After you return, compile a report on the results of your expedition and how you accomplished your objective(s). Include a statement of the objectives, note your findings and observations, include photos, note any discoveries, report any problems or adverse events, and have a conclusion (whether you reached your objective or not). The post-expedition report must be at least one page and no more than three; one page can be photos, graphs, or figures.

Homework

Expedition

Requirement 8a – Go on an Expedition – Deployment

With your parent's permission and under the supervision of your merit badge counselor or a counselor-approved qualified person, use the planning steps you learned in requirement 6 and the preparations you completed in requirement 7 to personally undertake an actual expedition to an area you have not previously explored.



Expedition

Requirement 8b – Go on an Expedition – Ethics

Discuss with your counselor what is outdoor ethics and its role in exploration and enjoying the outdoors responsibly.

Expedition

Go on an Expedition – Ethics

The Leave No Trace Seven Principles

1. Plan Ahead and Prepare
2. Travel and Camp on Durable Surfaces
3. Dispose of Waste Properly
4. Leave What You Find
5. Minimize Campfire Impacts
6. Respect Wildlife
7. Be Considerate of Other Visitors

Expedition

Go on an Expedition – Ethics

Tread Lightly Principles

1. Travel Responsibly
2. Respect the Rights of Others
3. Educate Yourself
4. Avoid Sensitive Areas
5. Do Your Part

Expedition

Requirement 8c – Go on an Expedition – Report

After you return, compile a report on the results of your expedition and how you accomplished your objective(s).

Include a statement of the objectives, note your findings and observations, include photos, note any discoveries, report any problems or adverse events, and have a conclusion (whether you reached your objective or not).

The post-expedition report must be at least one page and no more than three; one page can be photos, graphs, or figures.

Homework

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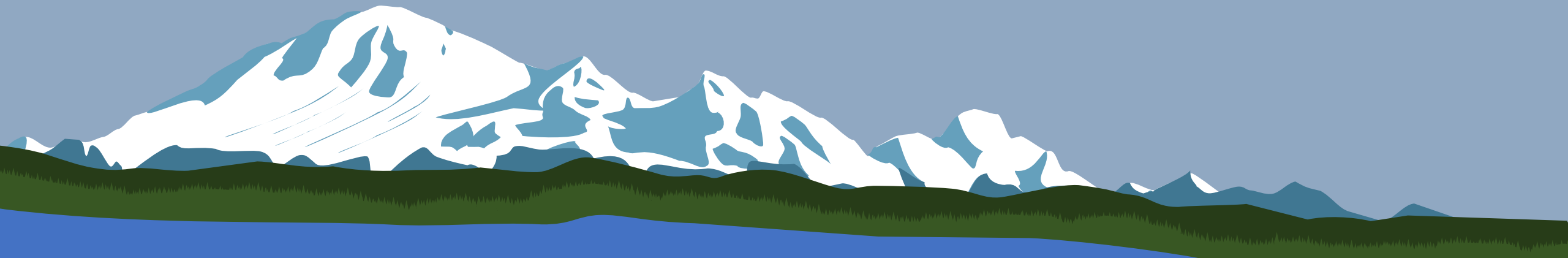
Career Opportunities



Career Opportunities

Requirement 9 – Career Opportunities

Identify three career opportunities in exploration.

Pick one and explain to your counselor how to prepare for such a career.

Discuss what education and training are required, and why this profession might interest you.

Homework

Career Opportunities

Career Opportunities

- Archeologists
- Anthropologists
- Geoscientists
- Biologists
- Medical Scientists
- Physicists
- Astronomers
- Photographers
- Writers and Authors
- Law Enforcement and Detectives
- Ocean Exploration
- Military

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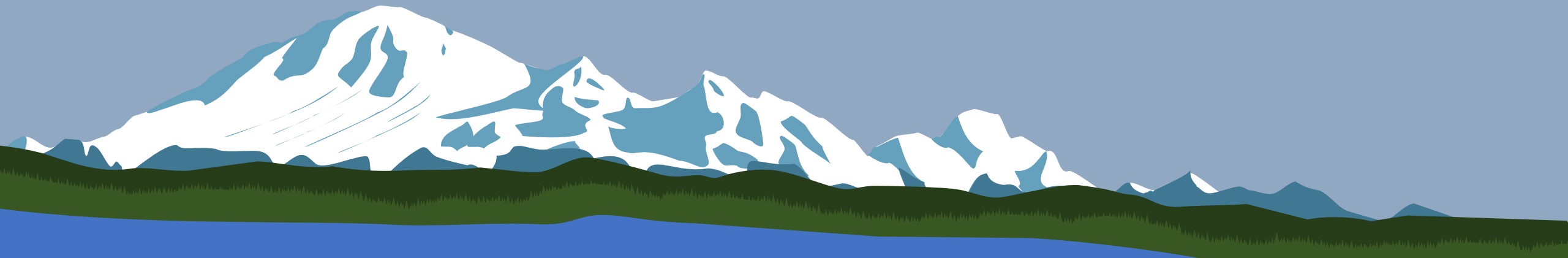
Final Thoughts



Final Thoughts

Merit Badge Requirement Checklist

- ❑ Show completion of work
  Ideally - **Turn in complete Workbook**
- ❑ **Expedition – Needs to be Supervised by an Appropriate Adult**

- ❑ **Turn in complete Workbook**

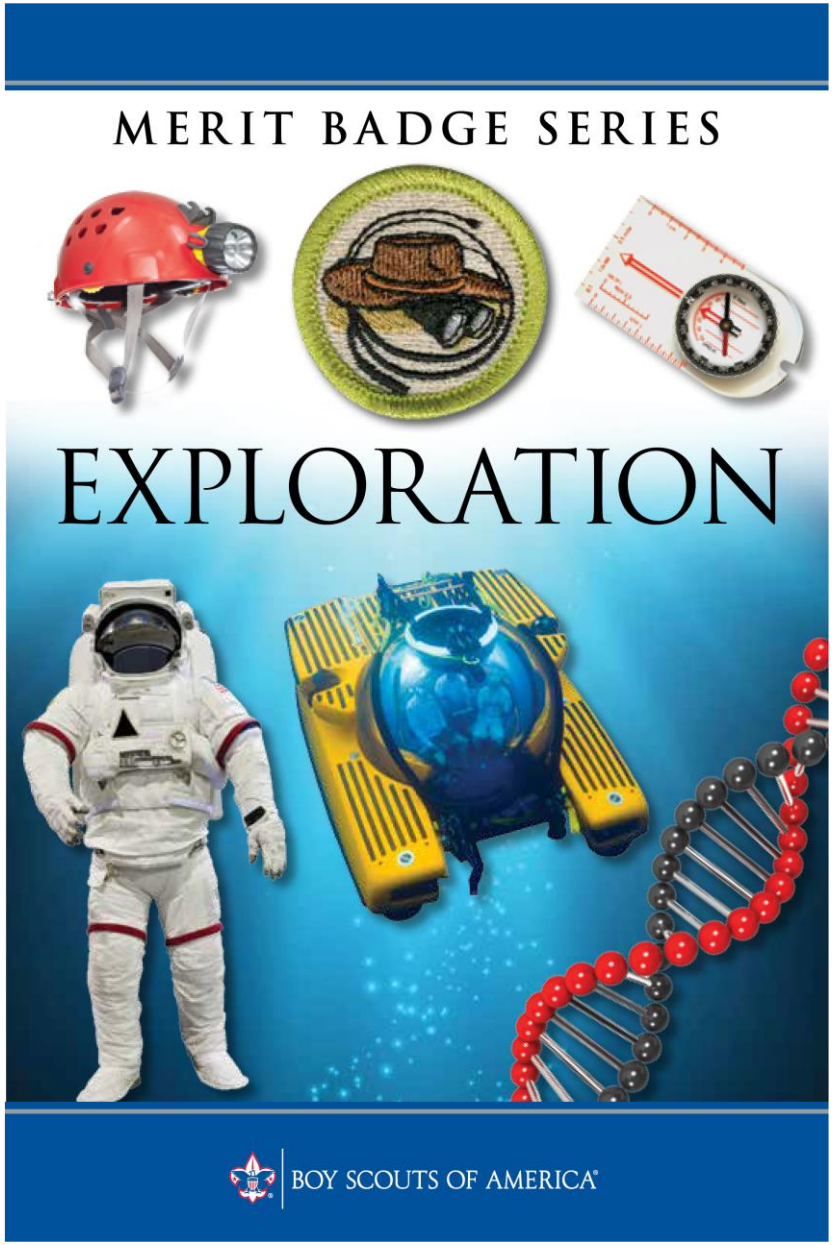
Final Thoughts

Final Thoughts

Final Thoughts

Looking for More?

- Merit Badge Pamphlet is a great resource
- 2018 NEAS World Explorers



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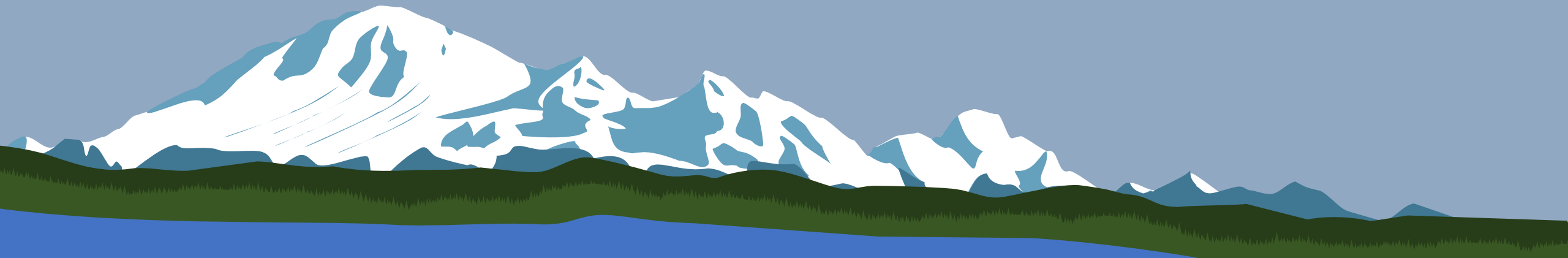
Resources



Resources

Resources – Books

- Aronson, Marc, and John W. Glenn. ***The World Made New: Why the Age of Exploration Happened and How It Changed the World***. National Geographic Children's Books, 2007.
- Ballard, Robert D., and Rick Archbold. ***The Lost Ships of Robert Ballard: An Unforgettable Underwater Tour by the World's Leading Deep-Sea Explorer***. Thunder Bay Press, 2005.
- Dickmann, Nancy. ***Exploring Beyond the Solar System***. Rosen Central, 2015.
- Douglas, Ed. ***Mountaineers: Great Tales of Bravery and Conquest***. DK Publishing, 2011.
- Hanbury-Tenison, Robin. ***The Great Explorers***. Thames & Hudson, 2010.

Resources

Resources – Books

- Hanbury-Tenison, Robin. ***The Modern Explorers***. Thames & Hudson, 2013.
- Hanbury-Tenison, Robin. ***The Seventy Great Journeys in History***. Thames & Hudson, 2006.
- Knauer, Kelly. Great Discoveries: ***Explorations That Changed History***. Time, 2009.
- Lansing, Alfred. ***Endurance: Shackleton's Incredible Voyage***. Basic Books, 2014.
- MacLeod, Alasdair. ***Explorers: Great Tales of Adventure and Endurance***. DK Publishing, 2010.
- Manyak, Michael J., M.D., Joyce J. Johnson, D.O., and Warren J. Young. ***Lizard Bites & Street Riots***. WindRush Publishers, 2014.

Resources

Resources – Books

- Matthews, Rupert. ***DK Eyewitness Books: Explorer***. DK Publishing, 2012.
- Miller, Ron. ***Curiosity's Mission on Mars: Exploring the Red Planet***. 21st Century, 2014.
- Porti, Andrea. ***Explorers: The Most Exciting Voyages of Discovery—From the African Expeditions to the Lunar Landing***. Firefly Books, 2011.
- Ross, Stewart. Into the Unknown: ***How Great Explorers Found Their Way by Land, Sea, and Air***. Candlewick, 2014.

Resources

Resources – Organizations

- **American Alpine Club**
  710 10th St., Suite 100
  Golden, CO 80401
  Telephone: 303-384-0110
  Website: http://www.americanalpineclub.org
- **American Museum of Natural History**
  Central Park West at 79th Street
  New York, NY 10024-5192
  Toll-free telephone: 800-462-8687
  Website: http://www.amnh.org

Resources

Resources – Organizations

- **The Explorers Club**
  46 E. 70th Street
  New York, NY 10021
  Telephone: 212-628-8383
  Website: http://explorers.org
- **National Aeronautics and Space Administration**
  NASA Headquarters
  300 E. Street SW, Suite 5R30
  Washington, DC 20546
  Telephone: 202-358-0001
  Website: http://www.nasa.gov

Resources

Resources – Organizations

- **National Eagle Scout Association (NESA)**
  Boy Scouts of America
  1325 West Walnut Hill Lane
  P.O. Box 152079
  Irving, TX 75015-2079
  Telephone: 972-580-2000
  Website: http://www.nesa.org

Resources

Resources – Organizations

- **National Geographic Society**
  1145 17th Street NW
  Washington, DC 20036-4688
  Toll-free telephone: 800-647-5463
  Website: http://www.nationalgeographic.com/Explorers
- **National Oceanic and Atmospheric Administration**
  1401 Constitution Avenue, NW
  Room 5128
  Washington, DC 20230
  Telephone: 301-713-1208
  Website: http://www.noaa.gov

Resources

Resources – Organizations

- **National Science Foundation**
  4201 Wilson Blvd.
  Arlington, VA 22230
  Telephone: 703-292-5111
  Website: http://www.nsf.gov
- **Smithsonian Institution**
  P.O. Box 37012
  SI Building, Room 153, MRC 010
  Washington, DC 20013-7012
  Telephone: 202-633-1000
  Website: http://www.si.edu

Resources

Resources – Organizations

- **World Wildlife Fund**
  P.O. Box 97180
  Washington, DC 20090-7180
  Telephone: 202-293-4800
  Website: http://www.worldwildlife.org

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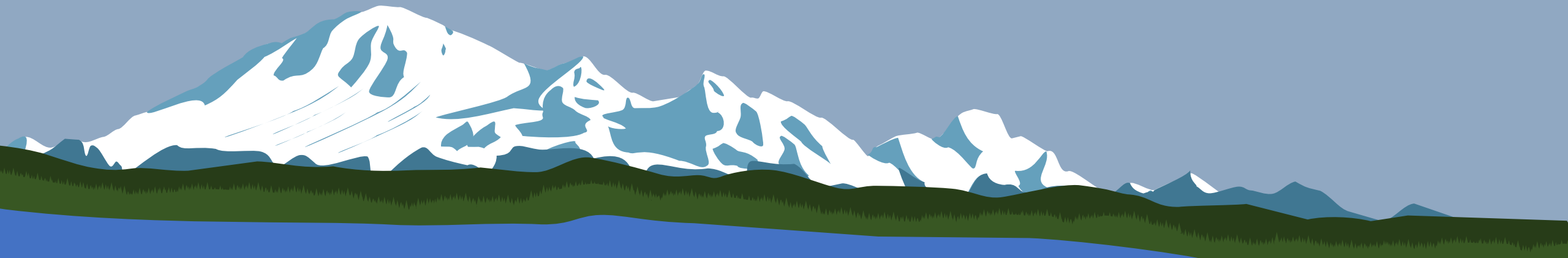
Instructor’s Corner



Instructor’s Corner

Instructor’s Corner

- Thank you for teaching our scouts the Exploration Merit Badge.

Instructor’s Corner

Instructor’s Corner

- It is possible to teach the entire course in 2 hours with one 5 min break
  - First 45 minutes takes you up to the Expedition Requirements
  - 45-50 minutes for the remainder of the requirements
  - Rest for questions