The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance.

UNIT 1: WATER SYSTEMS ON EARTH

CHAPTER 2: OCEANS CONTROL THE WATER CYCLE

ORIGINS OF OCEAN WATER

- OCEANS HAVE FILLED OVER HUNDREDS OF MILLIONS OF YEARS
- SCIENTISTS BELIEVE THE OCEANS ARE MORE THAN **3 BILLION YEARS OLD**.
- WATER MAY HAVE ORIGINALLY BEEN RELEASED FROM **VOLCANIC ERUPTIONS** WHEN THE VAPOUR FROM THE ERUPTIONS **COOLED** AND **CONDENSED**.
- SOME BELIEVE THE WATER CAME FROM **ICE COMETS**.



EARTH'S OCEANS - PAGE 38



Oceans Assignment

OCEAN BASINS:

THERE ARE FOUR PROCESSES THAT LEAD TO THE DEVELOPMENT OF OCEAN BASINS:

1.PLATE TECTONICS

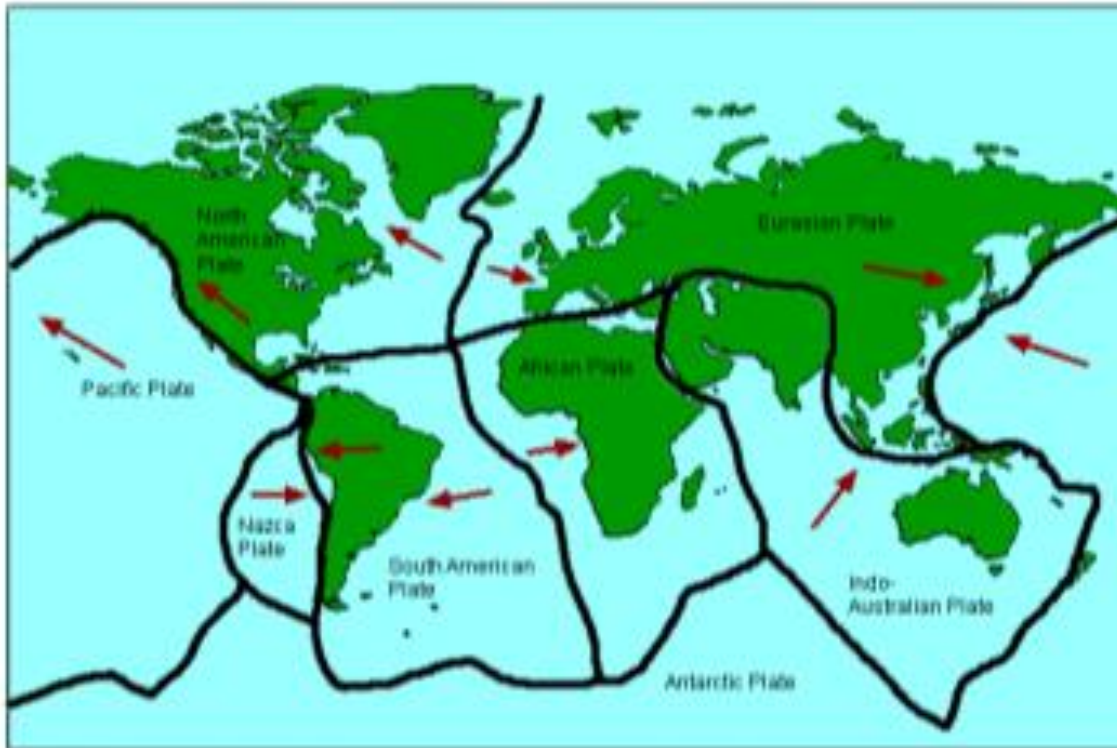
2.VOLCANIC ACTIONS

3.EROSIONS

4.GLACIATION

1. PLATE TECTONICS

- PIECES OF THE LAND MOVE OVER THE EARTH'S SURFACE
- CHANGES POSITION OF **THE CONTINENTS**
- INFLUENCED WHERE **OCEAN BASINS** ARE LOCATED

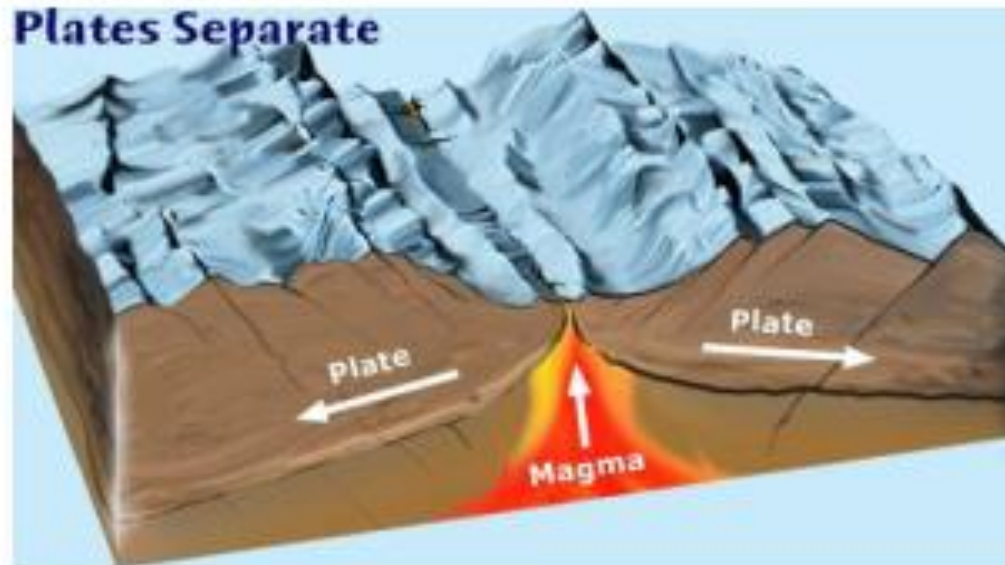


[Video Clip 1](#)

[Video Clip 2](#)

2. VOLCANIC ACTION

- UNDERWATER VOLCANOES ARE GENERALLY FOUND AT **THE EDGES OF TECTONIC PLATES**
- WHEN VOLCANOES ERUPT UNDERWATER, NEW OCEANIC CRUST (**OCEAN FLOOR**) IS FORMED BY THE HOT MOLTEN ROCK SLOWLY COOLING AND SOLIDIFYING
- VOLCANOES HAVE BUILT OCEAN FLOOR ALONG **MID-OCEAN RIDGES** IN AREAS WHERE PLATES SEPARATE
- VOLCANOES HAVE HELPED BUILD **CONTINENTAL DIVIDES** IN AREAS WHERE PLATES HAVE COLLIDED AND MOUNTAIN BUILDING OCCURS



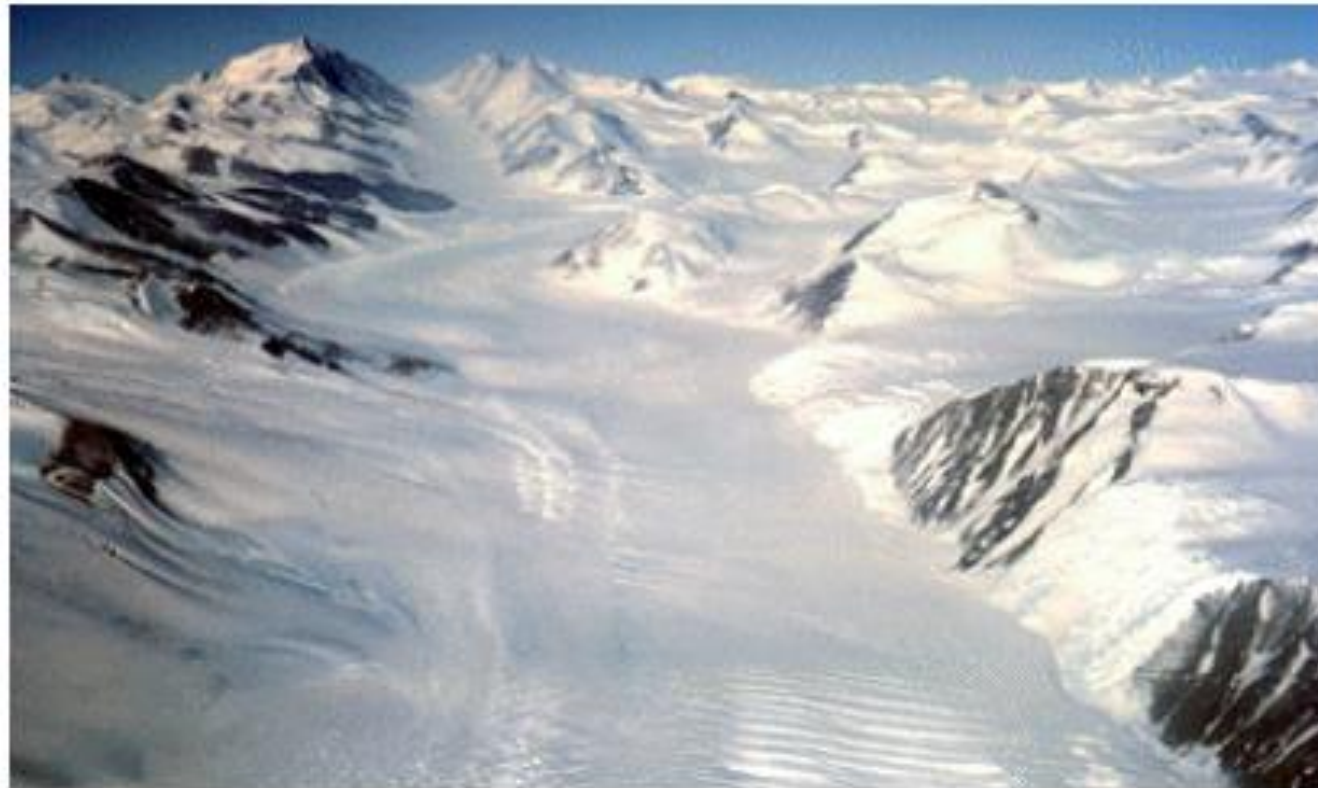
3. EROSION

- THE PROCESS BY WHICH THE SURFACE OF THE EARTH IS WORN AWAY BY THE ACTION OF WATER, GLACIERS, WINDS, WAVES, ETC.
- EROSION HAS FURTHER DEVELOPED CONTINENTAL DRAINAGE SYSTEMS AS MATERIAL IS REMOVED AND DEPOSITED INTO THE OCEAN BASINS.



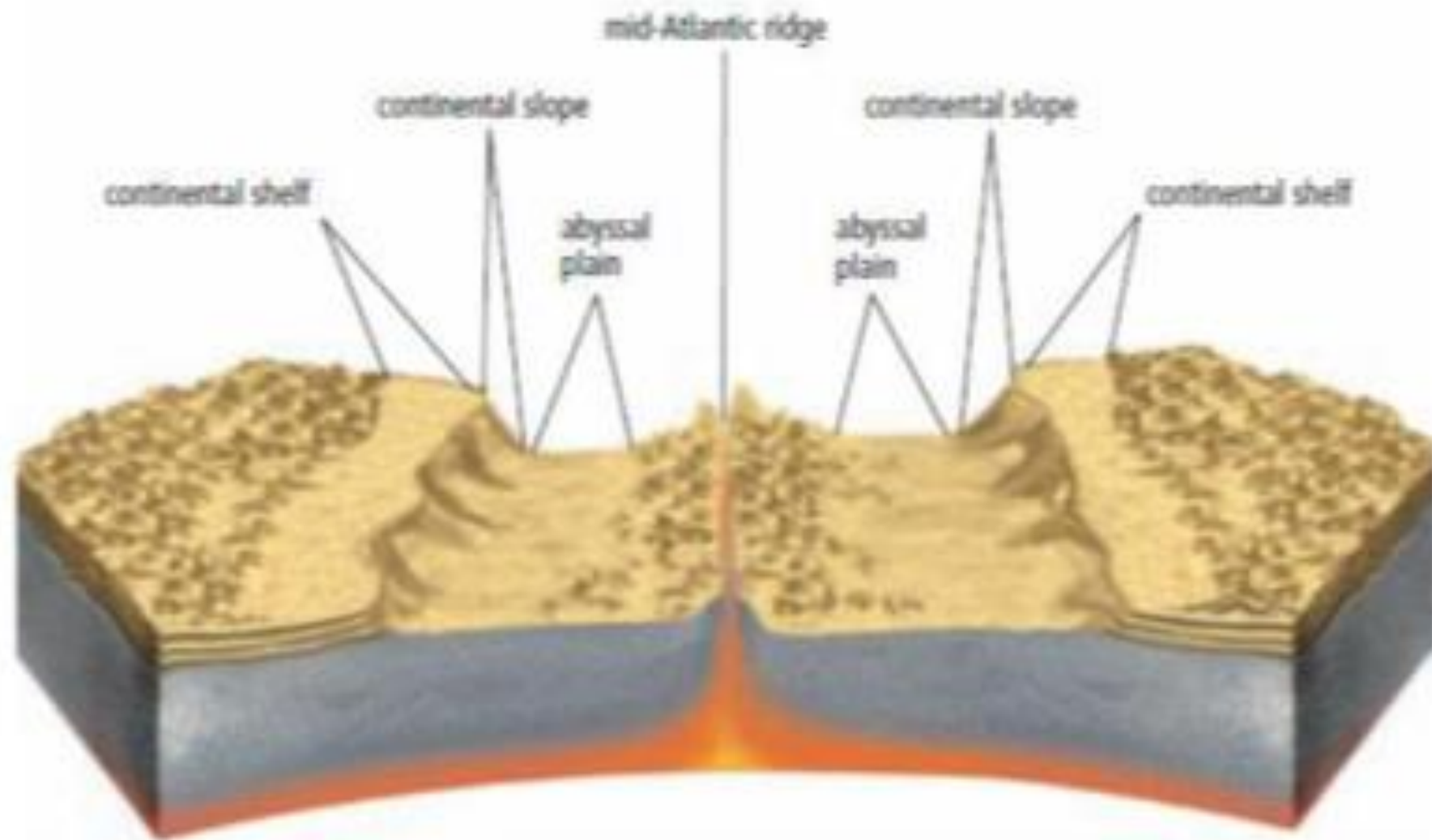
4. GLACIATION

- A FORCE OF EROSION IN THE DEVELOPMENT OF CONTINENTAL DRAINAGE SYSTEMS.
- WHEN GLACIERS MELT, **THE WATER** THAT THEY RELEASE WEARS AWAY THE EARTH AS IT FLOWS DOWN TO **THE OCEANS AND OTHER DRAINAGE BASINS.**



THE OCEAN BASINS - PAGE 41

1. **THE CONTINENTAL SHELF:** FROM THE EDGE OF THE WATER TO THE "DROP-OFF" ZONE.
2. **THE CONTINENTAL SLOPE:** THE "DROP-OFF" (FROM THE PELAGIC ZONE TO THE BENTHIC ZONE)
3. **THE ABYSSAL PLAIN:** THE WIDE, FLAT AREAS OF THE OCEAN FLOOR, THEY ARE MADE UP OF SEDIMENT FROM EARTHQUAKES THAT CAUSE UNDERWATER LANDSLIDES, OR SIMPLY BY GRAVITY.
4. **MID-OCEAN RIDGE:** OCEAN RIDGES ARE FORMED WHEN TWO TECTONIC PLATES ARE PUSHED APART. MAGMA OOZES UP THROUGH THE GAP AND FORMS A MOUNTAIN CHAIN (LIKE A SCAB). THE LARGEST IS THE MID-ATLANTIC RIDGE.



EXAMPLES OF CANADIAN INSTITUTIONS THAT DO RESEARCH INVOLVING OCEANS:

- ENVIRONMENT CANADA
 - FEDERAL FISHERIES
- OCEAN SCIENCE CENTRE FOR COLD OCEAN RESEARCH
 - C-CORE @ MEMORIAL UNIVERSITY

Ocean Floor Assignment

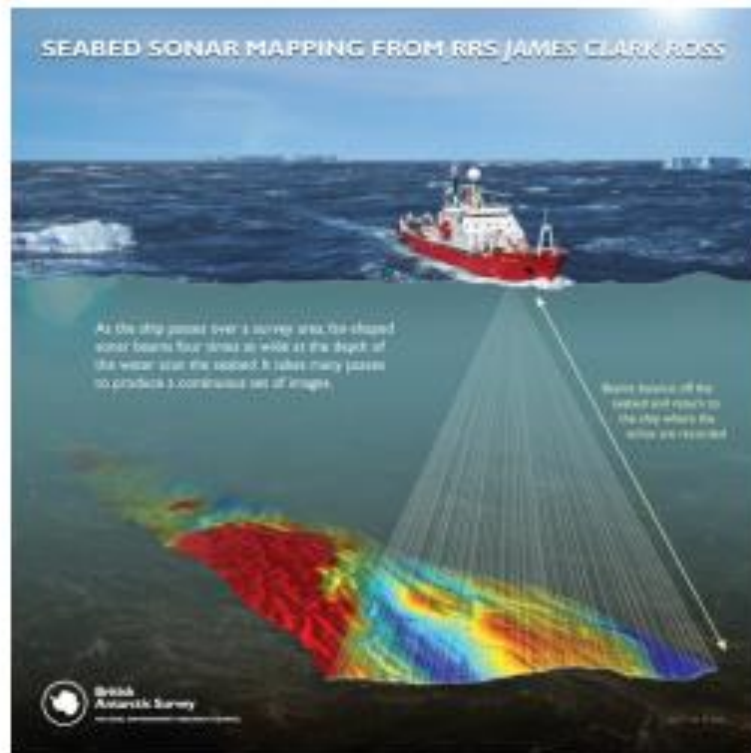
TECHNOLOGIES USED TO RESEARCH THE OCEAN FLOOR:

1. **SONAR**
2. **SATELLITES**
3. **UNDERWATER PHOTOGRAPHY/VIDEOGRAPHY**
4. **SUBMERSIBLES**
5. **DIVING**



1. SONAR:

- **SOUND** WAVES ARE SENT DOWN FROM A SHIP
- CAN BE USED TO MAP UNDERWATER MOUNTAINS, VALLEYS, AND CANYONS ON THE OCEAN FLOOR.



[Video clip](#)

2. SATELLITES:

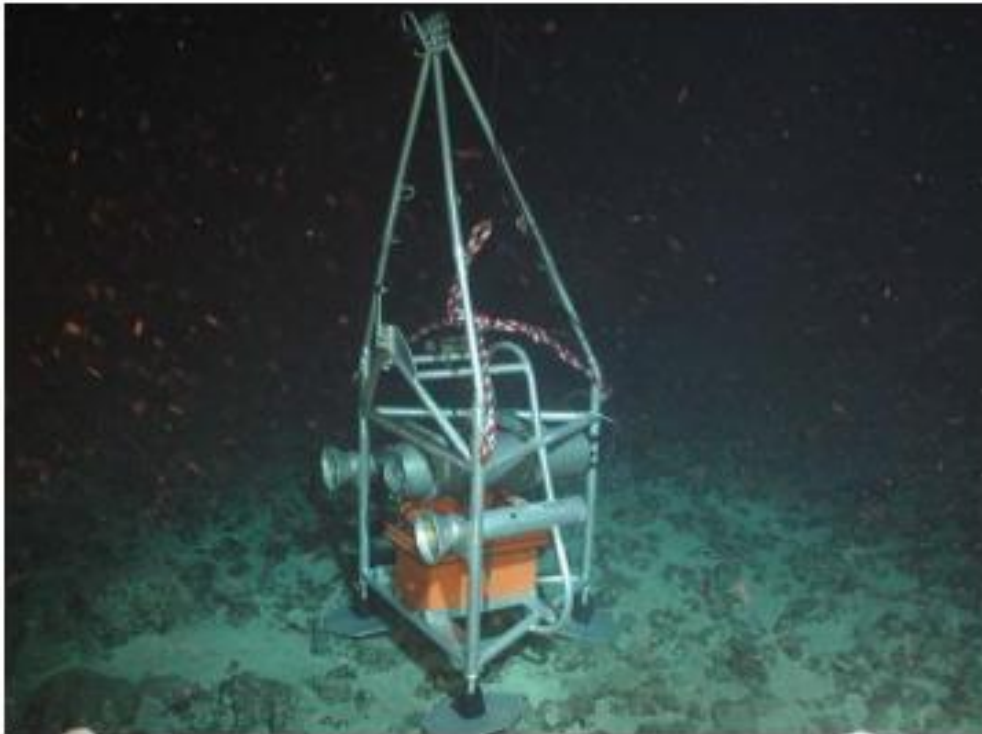
- ORBIT THE EARTH, USE **RADAR, INFRARED LIGHT**, OR OTHER TECHNOLOGIES TO MEASURE FEATURES ON THE OCEAN FLOOR.
- SURVEYS **LARGE** AREAS OF OCEANS IN A SHORT PERIOD OF TIME.
- GATHERS INFORMATION FROM **BUOYS** ABOUT WATER AND AIR TEMPERATURE FOR WEATHER STATIONS.



[Video Clip](#)

3. UNDERWATER PHOTOGRAPHY/VIDEOGRAPHY:

- CAMERAS TAKE HIGH RESOLUTION (CLEAR) UNDERWATER PHOTOS AND VIDEOS.
- CAN GO UP TO **6000M** BENEATH THE SURFACE.



4. SUBMERSIBLES (SUBMARINES):

- SMALL BUT EXTREMELY STRONG VEHICLES (BECAUSE OF THE HIGH PRESSURE UNDERWATER) THAT ARE CAPABLE OF TRAVELLING TO GREAT DEPTHS.

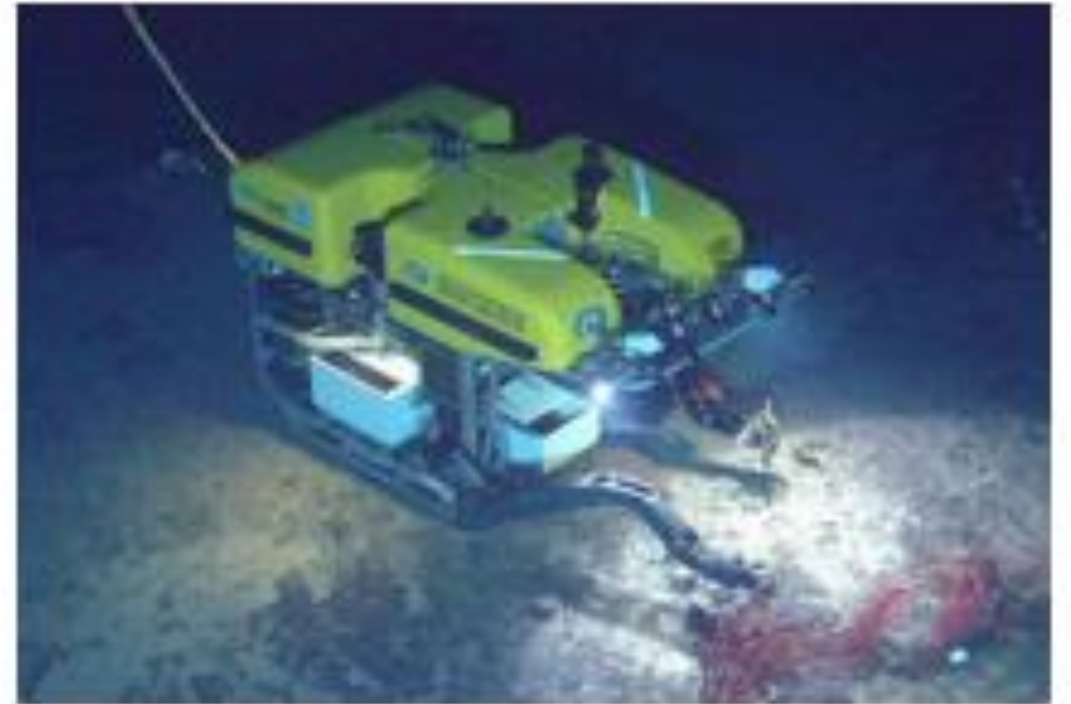
- **2 TYPES:**

1. **REMOTELY-OPERATED VEHICLES (ROV):**

- PEOPLE CONTROL IT FROM A SHIP
- ADVANTAGE: CAN STAY DOWN FOR LONG PERIODS OF TIME AND GO TO FURTHER DEPTHS THAN MANNED SUBMERSIBLES

[Video Clip 1](#)

[Video Clip 2](#)



2. MANNED SUBMERSIBLES: CARRY PEOPLE INSIDE

- ADVANTAGE: PEOPLE CAN MAKE THEIR OWN OBSERVATIONS OF THE DEEP SEA.

[Video Clip](#)



5. DIVING:

- NEW TECHNOLOGY ALLOWS PEOPLE TO DIVE DEEPER THAN EVER BEFORE, BUT THEY STILL CANNOT GO AS DEEP AS OTHER TECHNOLOGIES.
- ADVANTAGE: **PEOPLE CAN MAKE THEIR OWN OBSERVATIONS.**



NOTE: Although all of these technologies help our understanding, **NO** single data collection method provides a complete picture of the ocean floor.

STSE: Undersea Adventure

PRACTICE

- PAGE 43: #'S 1-4
- PAGE 51: #'S 1-8, 11
- TECHNOLOGY PROJECT

OCEAN CURRENTS

- A LARGE AMOUNT OF OCEAN WATER THAT MOVES IN A PARTICULAR AND UNCHANGING DIRECTION.

[Video Clip](#)



Grand Bank, NL



- THERE ARE MORE THAN 20 MAJOR CURRENTS IN THE WORLD
- LARGEST: **ANTARCTIC CIRCUMPOLAR CURRENT**



Figure 2.13 There are many different currents on the ocean surface.

LOCAL OCEAN CURRENTS:

1. **LABRADOR CURRENT: COLD** WATER FROM NEAR GREENLAND.
2. **GULF STREAM: WARM** WATER FROM THE TROPICS.

THESE CURRENTS RUN BY THE COAST OF NEWFOUNDLAND AND LABRADOR THROUGH THE ATLANTIC OCEAN.

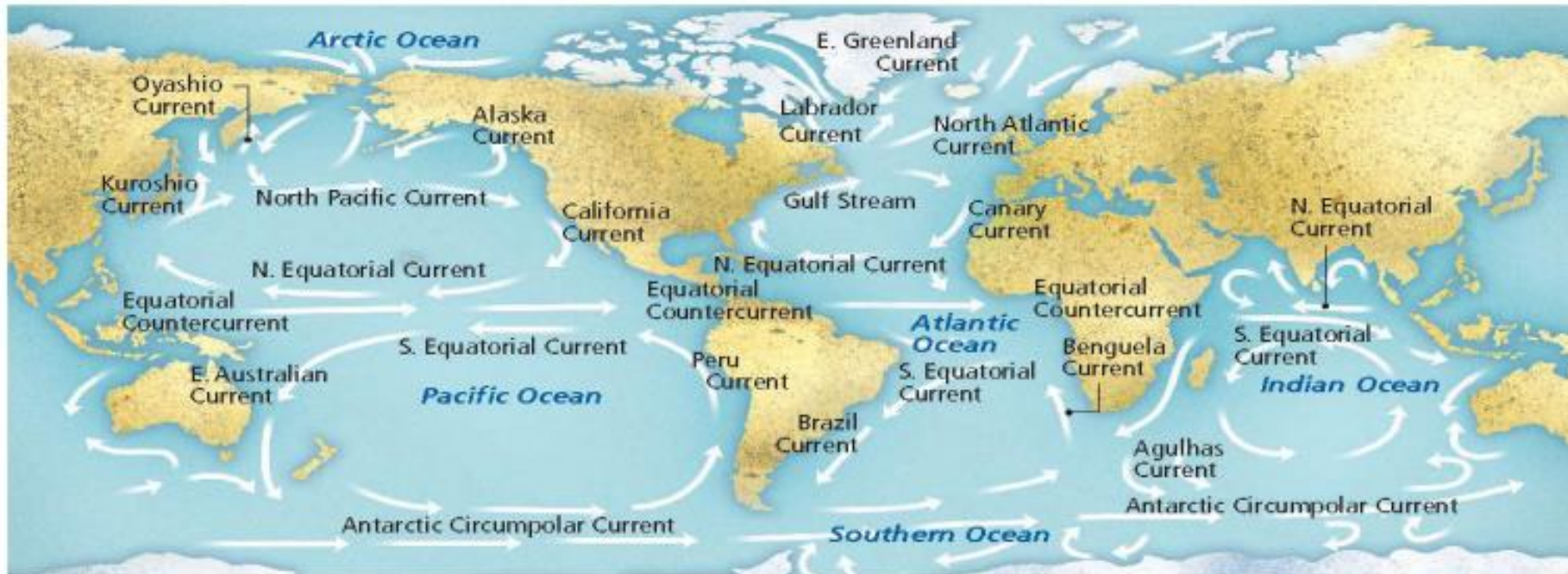


Figure 2.13 There are many different currents on the ocean surface.

- THE WARM GULF STREAM CURRENT MIXES WITH THE COLD LABRADOR CURRENT AND MAKES **HEAVY FOG.**

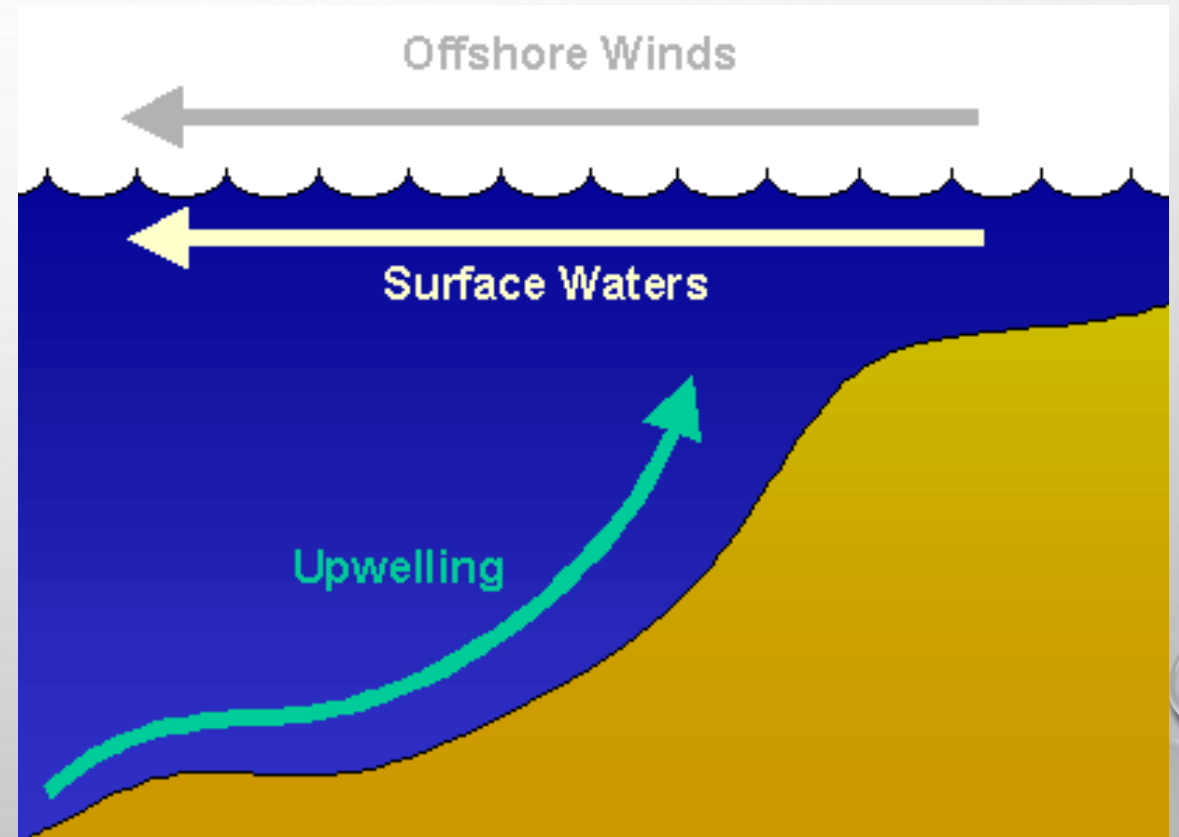


[Video Clip](#)

UPWELLING

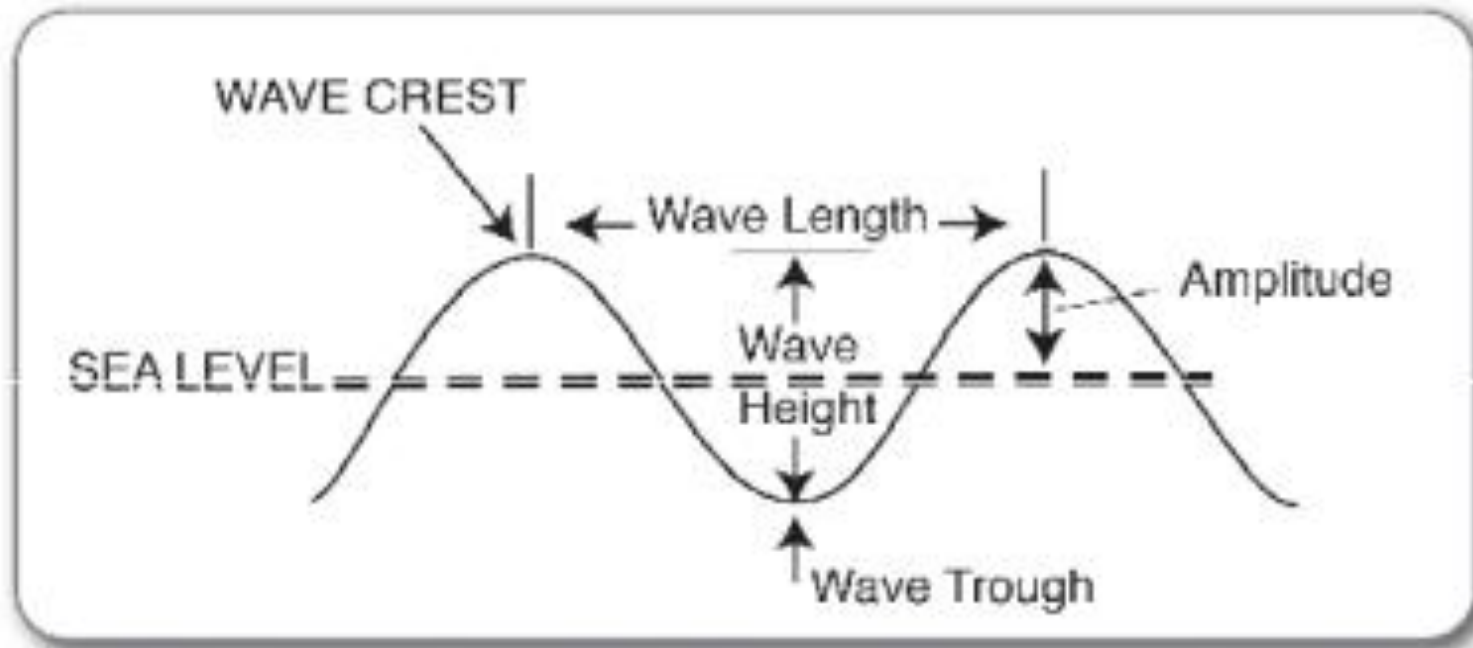
- STRONG WINDS BLOW OFFSHORE AND PUSH SURFACE WATER AWAY FROM THE LAND. COLD, DEEP WATER THEN RISES FROM BELOW TO REPLACE THE SURFACE WATER THAT HAS BEEN MOVED OUT TO SEA.
- UPWELLING WATER CONTAINS LOTS OF **NUTRIENTS**.
- EXAMPLE: THE GRAND BANKS

[Video Clip](#)



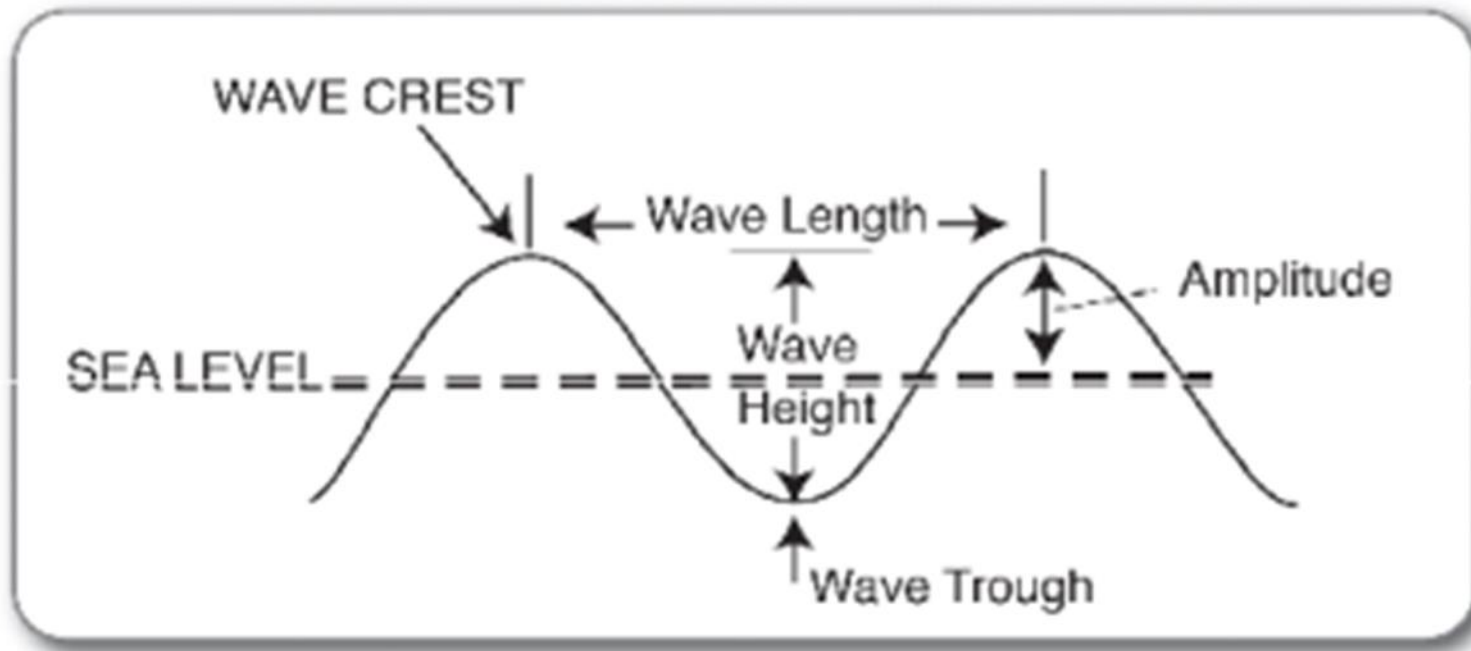
WAVES:

- **LARGE RIPPLES SET IN MOTION BY STEADY WINDS.**
- WAVES ON THE SURFACE OF WATER ARE THE RESULT OF A TRANSFER OF ENERGY FROM MOVING AIR TO THE WATER.



- **CREST:** THE HIGHEST PART OF A WAVE.
- **TROUGH:** THE LOWEST PART OF A WAVE.
- **WAVELENGTH:** DISTANCE FROM CREST TO CREST OR TROUGH TO TROUGH.
I.E LENGTH OF A WAVE BEFORE IT REPEATS ITSELF.

- **WAVE HEIGHT:** THE DISTANCE FROM TROUGH TO CREST OF A WAVE.



[Bill Nye Waves Video](#)

TSUNAMIS:

- GIANT WAVES THAT CAN BE SENT IN MOTION BY **EARTHQUAKES** ON THE OCEAN FLOOR, LANDSLIDES OR VOLCANIC ERUPTIONS NEAR THE SHORELINE.

Newfoundland had a tsunami in 1929

[Video Clip 1](#)



[Video Clip 2](#)



Waves Assignment

EROSION & DEPOSITION

- **WEATHERED:** THE BREAKDOWN OF ROCKS INTO SMALLER PARTICLES.
- **EROSION:** THE MOVING OF SEDIMENT (WEATHERED PARTICLES).
- **DEPOSITION:** WHEN ERODED MATERIAL IS DROPPED OR LEFT BEHIND.
- EROSION AND DEPOSITION HAVE A HUGE IMPACT ON OUR SHORELINES.

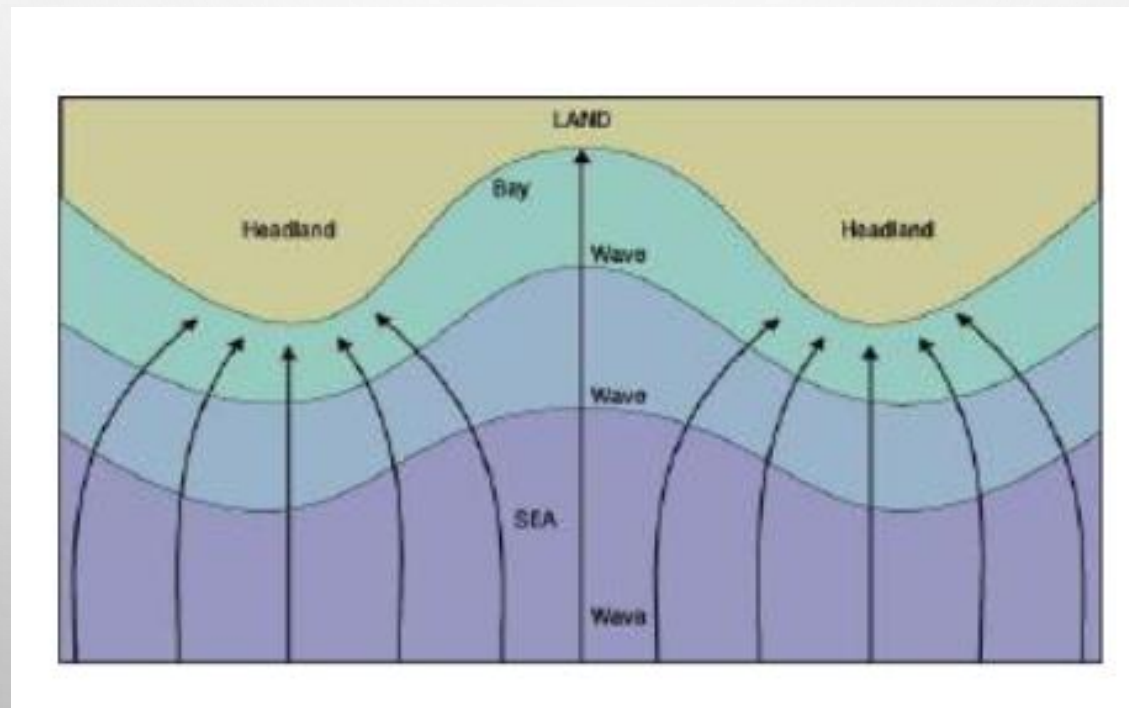
[Video Clip](#)



HOW WAVES INTERACT WITH SHORELINES

1. THE SHAPE OF THE SHORELINE.

- WAVE ENERGY IS CONCENTRATED ON **HEADLANDS** AND SPREADS OUT AS IT REACHES **BAYS**.
- **HEADLANDS** ARE THE PARTS OF THE SHORE THAT STICK OUT FURTHEST IN THE WATER. **BAYS** ARE THE PARTS THAT STICK IN THE MOST.



2. THE SLOPE OF THE SHORELINE

- AS ROCKS RUB AGAINST EACH OTHER IN THE WAVE WATER, FRAGMENTS OF ROCKS ARE **SMOOTHED OUT AND GROUND DOWN** TO SMALLER PIECES (PEBBLES/SAND).
- IF THE SHORELINE HAS A **STEEP** SLOPE, THE FRAGMENTS WILL GET WASHED OUT TO SEA, LEAVING A VERY ROCKY SHORELINE.
- IF THE SHORELINE HAS A **MORE GRADUAL** SLOPE, THE ROCK FRAGMENTS WILL BUILD UP, CREATING A SANDY BEACH.

3. THE TYPE OF ROCK MATERIAL

- DEPENDING ON THE TYPE OF ROCK THAT THE SHORELINE IS MADE OF, **THE WAVES** CAN ERODE THE SHORELINE MORE QUICKLY.
- **SOFTER ROCK**, LIKE SANDSTONE, WILL ERODE AT A FASTER RATE THAN MORE **RESISTANT TYPES**, SUCH A SHALE.

EX: THE RED ROCKS FOUND IN ST. GEORGE'S ERODE FASTER THAN THE CLIFFS OF BELL ISLAND IN CONCEPTION BAY.

- IF A SHORELINE IS MADE OF **BOTH TYPES** OF ROCK, YOU WILL SEE UNEVEN EROSION. THIS IS HOW HEADLANDS AND BAYS ARE FORMED.
- HEADLANDS ARE ALWAYS MADE OF A **HARDER** MATERIAL THAN BAYS ARE.

[Simulation](#)

4. THE WAVE ENERGY:

- **HIGHER** WAVE ENERGY WILL ERODE A SHORELINE MORE **QUICKLY** THAN LOWER WAVE ENERGY WILL.
- PLACES THAT HAVE **MORE** WIND WILL HAVE STRONGER WAVES WITH **MORE** ENERGY.



HOW EROSION AND DEPOSITION AFFECT...

- **BEACHES**

- SAND AND SEDIMENT ARE ALWAYS BEING REMOVED (**ERODED**) AND **DEPOSITED** BY WAVES. SEDIMENTS ARE DEPOSITED BY SIZE.

- **SHOALS & SAND BARS**

- DEPOSITION OF SEDIMENTS RESULTING IN LOCALIZED SHALLOWING OF THE WATER.

- **SEA CAVES**

- HEADLANDS ARE **ERODED** PART WAY THROUGH THE HEADLAND.

- **SEA ARCHES**

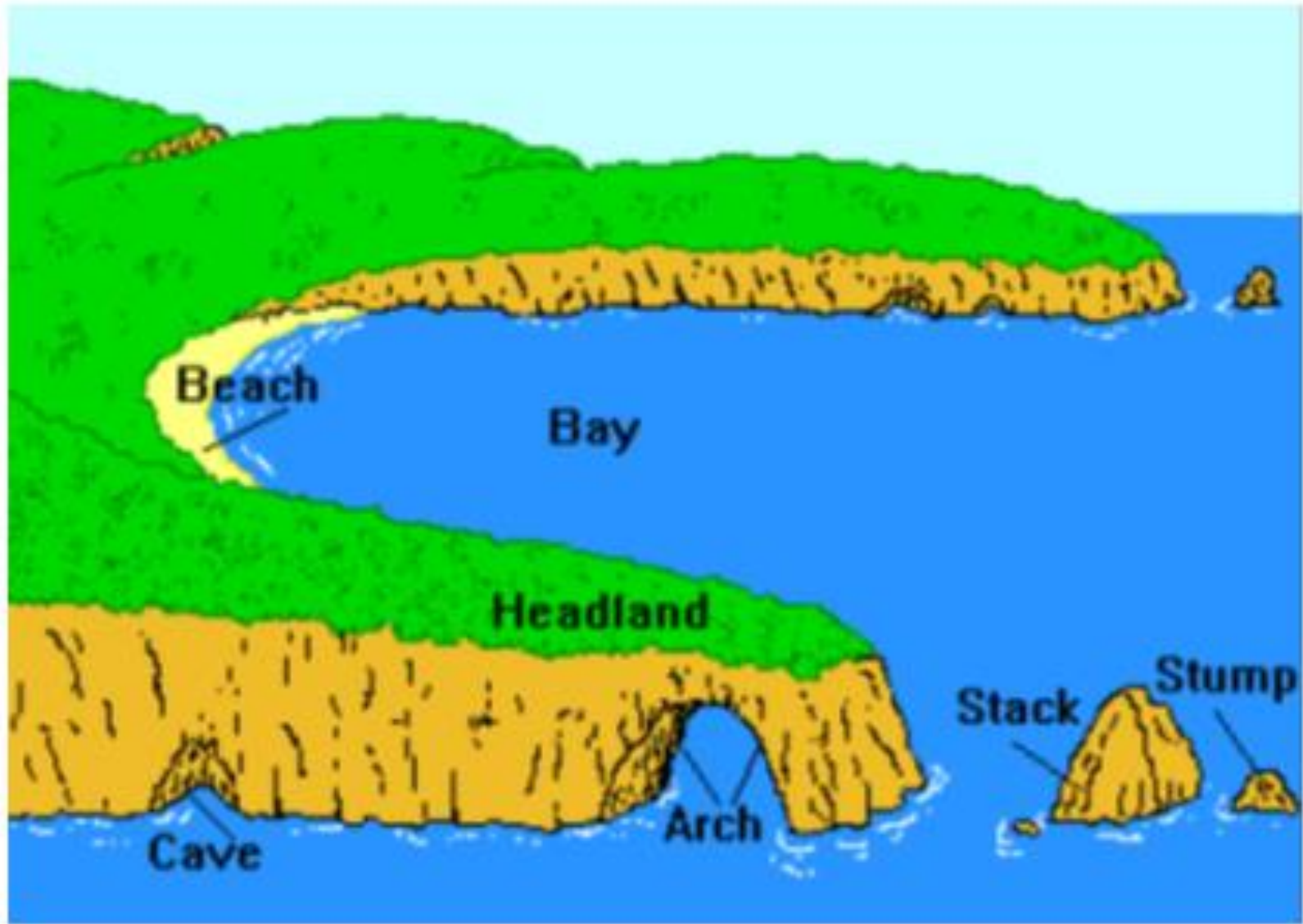
- OCCURS WHEN A SEA CAVE IS **ERODED** ALL THE WAY THROUGH THE HEADLAND.

- **SEA STACKS**

- OCCURS WHEN THE TOP OF A SEA ARCH BECOMES WEAK AND CAVES IN (EROSION).

HEADLAND → SEA CAVE → SEA ARCH → SEA STACK





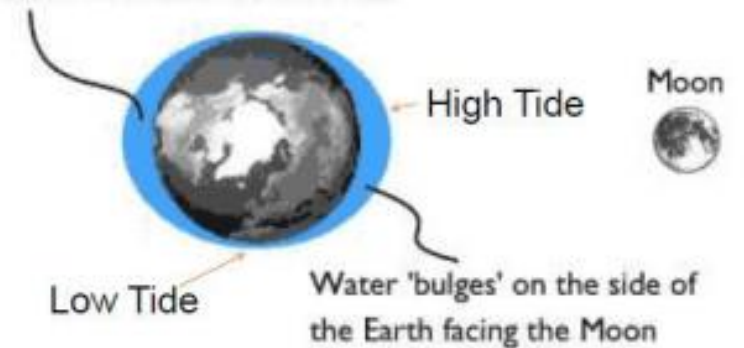
PRACTICE

- PAGE 69 #'S 1-5
- PAGE 77 #'S 1-2, 4-5, 9
- EROSION AND LANDFORM ASSIGNMENT

TIDES

- THE SLOW RISE AND FALL OF THE WATER LEVEL OF THE OCEAN.
- THE UPPER AND LOWER EDGES OF A BEACH ARE DETERMINED BY THE HIGH-AND-LOW TIDE MARK.
- CONNECTED TO THE MOTION OF THE **MOON** AND SPINNING OF THE **EARTH**
- MOON EXERTS A GREATER FORCE OF PULL THAN SUN SINCE IT IS **CLOSER** TO THE EARTH.
- **TIDAL RANGE:** THE DIFFERENCE BETWEEN HIGH AND LOW TIDES

Water 'bulges' on the opposite side of the Earth to the Moon



TYPES OF TIDES:

1. SPRING TIDE

- OCCURS TWICE A MONTH WHEN EARTH, SUN AND MOON ARE **IN A LINE**.
- TIDAL RANGE IS **GREATEST**.
- CAUSES EXTRA HIGH AND LOW TIDES.
- EXTRA PULL MEANS EXTRA TIDAL DIFFERENCE



2. NEAP TIDE

- OCCURS TWICE A MONTH WHEN SUN AND MOON ARE AT **RIGHT ANGLES** TO ONE ANOTHER.
- WATER IS GETTING PULLED IN **TWO DIRECTIONS**, WHICH CANCELS OUT THE OVERALL EFFECT.
- TIDAL RANGE IS **SMALLEST**.



[VIDEO](#)

TECHNOLOGIES DESIGNED TO CONTAIN DAMAGE DUE TO WAVES:

1. **BREAKWATERS:**

- A BARRIER THAT PROTECTS A HARBOR OR SHORE FROM THE FULL IMPACT OF WAVES.



2. **JETTIES/WHARVES:**



- A STRUCTURE (PIER), THAT PROJECTS INTO A BODY OF WATER TO INFLUENCE THE CURRENT OR TIDE OR TO PROTECT A HARBOR OR SHORELINE FROM STORMS AND EROSION.

3. VEGETATION:

- PLANTS ALONG THE SHORELINE CAN KEEP EROSION FROM AFFECTING SHORELINE.



In image, roots of the trees block erosion forces from damaging coast.

4. SEA WALLS:

- PROTECTIVE STRUCTURES OF STONE OR CONCRETE.
- EXTEND FROM SHORE INTO WATER TO PREVENT BEACH FROM WASHING AWAY.



PRACTICE

- TIDES AND TECHNOLOGY ASSIGNMENT
- SEE YOUR NOTES AND TEXT BOOK TO ANSWER THESE QUESTIONS:
- PAGE 77: #'S 1, 3, 4, 5, 8, 10, 11
- PAGE 78: #'S 2, 3, 4, 6, 7, 11, 12, 13, 14, 15, 17, 21, 22, 24