THE MOUNTAINS, THE ROCKS THE OIL & GAS

"THE MOUNTAINS, THE ROCKS, THE OIL AND GAS"
Second Edition, May 2007
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Credit; First edition of this poster donated by the Canadian Oilmen's Executive Association - 53rd Oilmens' Island Explorers, 2003.

WE'VE BEEN PUSHED AROUND

The theory of 'plate tectonics' explains that the crust of the Earth is made up of a series of solid, moving rock plates. Over millions of years of geologic time, our North American plate has drifted from south of the equator and rotated into it's present position, and has split away from the continents of Europe and Africa. (See maps below)

At times, North America has been flooded and it has received great thicknesses of sedimentary deposits. It has seen both extreme climate changes and periods of dramatic mountain building; all resulting in a great variety of very different rock types being formed (see diagrams on back side).

DO YOU KNOW THAT GEOLOGIC TIME COVERS BILLIONS OF YEARS AND IT IS DIFFICULT TO GRASP ITS ENORMITY?

However, earth scientists have been able to age-date each event that occured during the history of the Earth and have been able to place these events in the sequence in which they occured.
(see the Stratigraphic Column)

Pliocene – Pleistocene time geography
(5.5 to 0.1 million years ago)
Time of the ice ages when Canada was completely ice covered. The last expansion of the polar ice sheets took place about 18,000 years ago. Humans evolved during this time.

Late Cretaceous geography
(65 million years ago)
The Rocky Mountains were formed in several pulses between 170 to 40 million years ago (see back panel). North America drifted north and pulled away from Europe and Africa. Location of Chicxulub meteor impact site, caused global climate change and killed the dinosaurs and many other forms of life at the Cretaceous / Tertiary (K/T) boundary – 66 million years ago. Sandstone and shales deposited in Western Canada.

Middle Jurassic geography
(175 million years ago)
The first signs of continental breakup and the Atlantic Ocean started as a narrow opening separating Africa from Eastern North America.

Early Permian geography
(265 million years ago)
Continents collide and Appalachian mountains formed. 99% of all life perished in a mass extinction at the end of Permian time.

Early Carboniferous geography
(325 million years ago)
Extensive coal swamps formed near the equator. First insects evolved 320 million years ago. Thick limestones deposited in Western Canada.

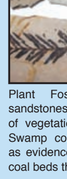
Middle Devonian geography
(385 million years ago)
Coral reefs grew in shallow warm seas. The first fish appeared 436 million years ago and vertebrates 495 million years ago. Land plants began to colonize the barren continents.

Early Cambrian geography
(540 million years ago)
Animals with hard shells, such as trilobites, appeared in great numbers for the first time.

Maps above reproduced from Hitchon, B. "Alberta Beneath Our Feet," geosci@telusplanet.net

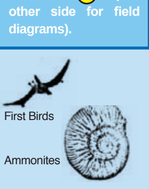
FOSSIL HUNTING

There has been life on Earth for billions of years. Animals and plants live and die and their remains are often buried and preserved as fossils. Thousands of species have been identified by paleontologists, and their study tells a fascinating story of the evolution of life over time, as well as age-dating the rocks and providing clues to the environment in which these creatures lived for example, on land or at the shoreline in warm or in shallow water, etc. Plants are compressed and are now preserved as coals, and buried marine animal organic matter has generated our oil and gas.



Humans evolve

Woolly Mammoths roamed North America during the ice ages. Skeleton at Tyrell Museum.

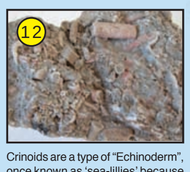


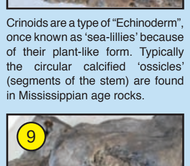
Mammals

Triceratops

Mass Extinction. 50% of all species, including dinosaurs, disappear.

Dinosaurs

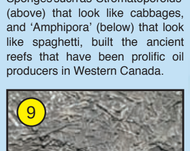




Large Ammonite shells were common in Cretaceous and Jurassic time. Some developed an outer coating which is sold today as Ammolite jewelry these fossils found in the Upper Cretaceous Bearpaw Formation. Ammonites have an intricate internal fabric of chambers.

DO YOU KNOW WHICH LAYERS PRODUCE OIL AND GAS?

Look for the red boxes with yellow letters: these are some of our best 'reservoir' rocks, and they contain large oil and gas traps under the Plains and Foothills. The letters define 5 major oil and gas fields, for example 'J' is Jumping Pound Gas Field, 'P' is Pembina Oil and Gas Field and they produce out of the Rundle Group (12) or the Cardium Formation (15). (see other side for field diagrams).



Plant Fossils in Cretaceous sandstones confirm the abundance of vegetation during this period. Swamp conditions were present as evidenced by the presence of coal beds thoughout the section.

First Birds

Ammonites

Pelecypods similar to modern day clams from the Triassic of Williston Lake, BC.

First Mammals

First coniferous tree

Mass Extnction 85% of all species dissapear

Crinoids are a type of "Echinoderm", once known as 'sea-lillies' because of their plant-like form. Typically the circular calcified 'ossicles' (segments of the stem) are found in Mississippian age rocks.

First Reptiles

First winged insects

Crinoids

Sponges such as 'Stromatoporoids' (above) that look like cabbages, and 'Amphipora' (below) that look like spaghetti, built the ancient reefs that have been prolific oil producers in Western Canada.

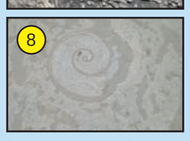
First Land Plants

Corals

Stromatoporoids (Sponges)

First Fishes
First Vertabrates
First Amphibians

Nautiloids



Mass Extnction soft bodied animals of the Burgess Shale disapear

Brachiopods

Jellyfish

Tribolites

Trilobites were the first animal to secrete a hard shell. Found in the Burgess Shale located above Field, BC, a World Heritage Site which is the stratigraphic equivalent of the Stephen Shale in Alberta.

Stromatolites

WHAT IS A STRATIGRAPHIC COLUMN?

Over millions of years of geologic time, great thicknesses of soft sediments were deposited and subsequently buried, and eventually compacted into the stratified layers of rock that we see in the mountains and in our wells today. Each layer is unique and they are shown in the stratigraphic column below, which shows in condensed form, the age, rock type (lithology), names and thickness of each unit. The oldest rocks are at the bottom and the youngest are on top; this is the way we find them under the undeformed Plains area. However in the mountains these layers are complexly folded and faulted and often the stratigraphic succession is rearranged by mountain building. The study of these layers is called 'stratigraphy'. The important rock units are given numbers (1) - (19)

DO YOU KNOW HOW OLD THE EARTH IS?

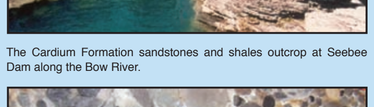
The Earth is believed to have been formed 4.6 billion years ago. Rocks dated between 570 million years and 4.6 billion years are called PreCambrian.

EVERY ROCK TELLS A STORY

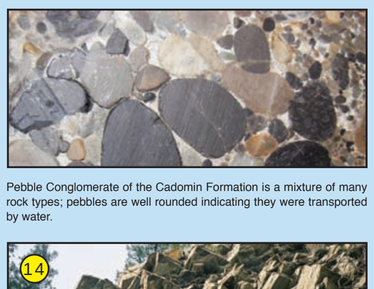
To a geologist, the rocks we see in outcrop and the samples we get from oil and gas wells tell us a fascinating story. Like detectives, we figure out their mineral composition, their age, how they were formed, and any changes that may have occurred.

Some rocks are igneous, i.e. granites, basalts and some are sedimentary (sandstones, limestones, shales) and are the most interesting in the search for oil and gas. Some are metamorphic, or rocks that have been changed by heat and pressure, such as slates and marbles.

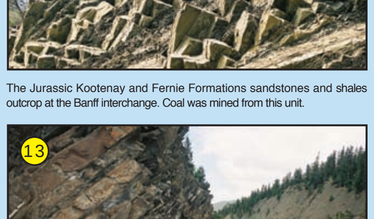
We look for fossils, valuable minerals, organic material, porosity (holes in the rock that could contain oil and gas), and we map their aerial distribution and their structural attitude (folds and faults).



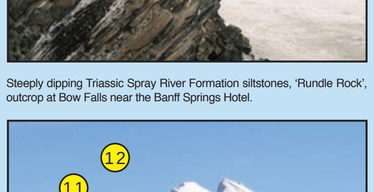
Glacial gravels like this streamlined drumlin at Morley, AB were formed under the ice as it advanced from the mountains across the Foothills.



Cross-bedded Paskapoo Sandstone on the Big Hill above Cochrane. The first consolidated rock layer that we drill through in Central Alberta. It was quarried locally as a building rock.

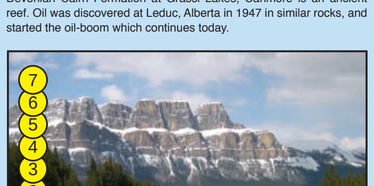


Inclined shales and sandstones of the Belly River Group along the TransCanada Highway west of Jumping Pound, mark the eastern edge of the Foothills.



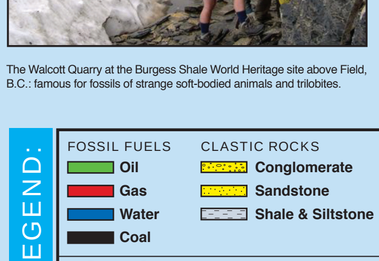
The Cardium Formation sandstones and shales outcrop at Seebee Dam along the Bow River.

Pebble Conglomerate of the Cadomin Formation is a mixture of many rock types; pebbles are well rounded indicating they were transported by water.



The Jurassic Kootenay and Fernie Formations sandstones and shales outcrop at the Banff interchange. Coal was mined from this unit.

Steeply dipping Triassic Spray River Formation siltstones, 'Rundle Rock', outcrop at Bow Falls near the Banff Springs Hotel.



Mount Rundle (2846 m), illustrates the classic 'Rocky Mountain sandwich' of Rundle / Banff / Palliser units.

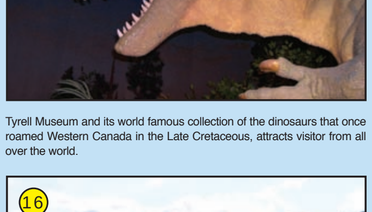
Devonian Cairn Formation at Grassi Lakes, Canmore is an ancient reef. Oil was discovered at Leduc, Alberta in 1947 in similar rocks, and started the oil-boom which continues today.

Layered Cambrian limestones and shales at Castle Mountain represent some of the oldest rocks in the Banff area.

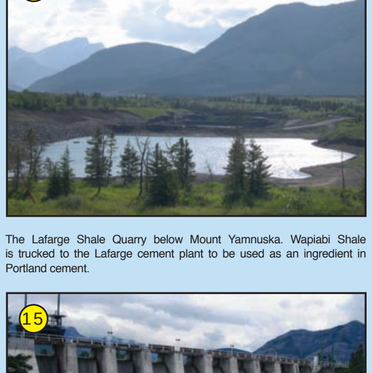
The Walcott Quarry at the Burgess Shale World Heritage site above Field, B.C.: famous for fossils of strange soft-bodied animals and trilobites.

WHAT USE ARE THEY?

The rocks and mountains of Western Canada are an incredibly valuable resource. They have many uses including construction materials such as gravels, cement and decorative stone and they provide industrial products like oil, gas, sulphur, lime and gypsum. Their recreational and educational opportunities abound, with our national parks, skiing, hiking, rock climbing, hot springs and museums, supporting a valuable tourist industry.

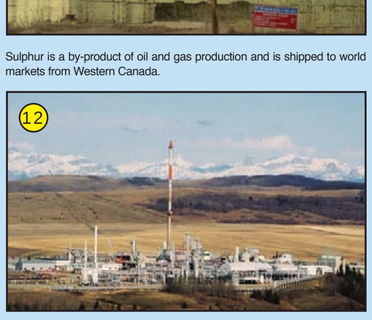


Surface gravel pits provide a valuable construction material.

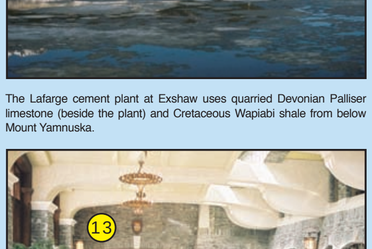


The Paskapoo Sandstone provided the primary building stone for schools, banks, churches and government buildings in Western Canada in the early 1900's.

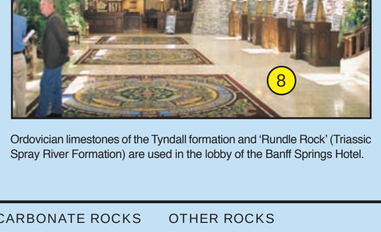
Tyrell Museum and its world famous collection of the dinosaurs that once roamed Western Canada in the Late Cretaceous, attracts visitor from all over the world.



The Lafarge Shale Quarry below Mount Yamnuska. Wapiabi Shale is trucked to the Lafarge cement plant to be used as an ingredient in Portland cement.



TransAlta hydroelectric dam at Seebee is built on the resistant Cardium Formation.



Sulphur is a by-product of oil and gas production and is shipped to world markets from Western Canada.

Shell Canada gas plant processes sour gas from the Foothills fields such as Jumping Pound.

The Lafarge cement plant at Exshaw uses quarried Devonian Palliser limestone (beside the plant) and Cretaceous Wapiabi shale from below Mount Yamnuska.

Ordovician limestones of the Tyndall formation and 'Rundle Rock' (Triassic Spray River Formation) are used in the lobby of the Banff Springs Hotel.

THE CHANGING LANDSCAPE

Three very distinct geographic areas make up our changing landscape, namely the Interior Plains, the Foothills and the Rocky Mountains.

The Interior Plains comprise a flat, gently rolling grassland topography, and the surface slowly gains elevation towards the mountains. The Plains are underlain by layers of undeformed rocks that are essentially flat-lying, and the deeper layers are slightly inclined to the west, and are made up of a westward thickening wedge of sediments.

The Foothills are characterized by tree-covered rolling hills and valleys, and the underlying rocks are primarily Cretaceous in age. They are complexly thrust-faulted with the more resistant sandstone layers being the ridge-formers at the surface.

West of the Foothills, the majestic wall of the Rocky Mountains is a spectacular feature, with jagged glaciated peaks and valleys. The mountains are underlain by westwardly-inclined thrust faults with the resistant carbonate rocks of Cambrian to Permian age forming high linear ridges. The valleys are underlain by more easily eroded Triassic to Cretaceous Shales. Subsequent glaciation of this structurally complex area has sculpted one of the most strikingly beautiful areas of the world.

Calgary, located on the plains along the Bow River.

Seven different terrace levels document the glacial melt run-off when the Bow River was a much larger river.

Hoodoos are common in the 'badlands' on the Plains.

Ridge-forming resistant Cretaceous Sandstones form northwest trending low-lying hills in the Foothills.

Mount Yamnuska represents the eastern edge of the Rocky Mountains where older limestones of the Cambrian Eldon Formations have been thrust over younger Cretaceous sandstones and shales of the Belly River Formation along the McConnell Thrust Fault.

The jagged outline of Mount Rundle (2846 m), dominates the town of Canmore where rocks of Mississippian age are thrust westwards along the Rundle Thrust at the base of the mountain and is thrust over the folded Canmore Coal Basin of younger Jurassic age.

The spectacular mountain road to Spray Lakes climbs through Whiteman Gap, the location of Grassi Lakes Devonian Reef section. The dominant Ha Ling Peak (2408 m) rises south of the gap.

Vertical beds of the Mississippian age rocks form the jagged peaks of the Sawback Range of Banff National Park.

Cascade Mountain illustrates the classic "Rocky Mountain Sandwich" of Rundle/Banff/Palliser units.

Castle Mountain, Banff National Park. Flat-lying layer-cake stratigraphy riding eastward on the Castle Mountain Thrust.

The imposing grey cliffs of the Front Ranges of the Rockies tower above the Foothills and greet visitors along the TransCanada Highway. Mount Yamnuska is in center foreground.

LEGEND:

FOSSIL FUELS	CLASTIC ROCKS	CARBONATE ROCKS	OTHER ROCKS	SYMBOLS
Oil	Conglomerate	Limestone	Salts	Unconformity
Gas	Sandstone	Dolomite	Metasedimentary Clastics	Thrust Fault
Water	Shale & Siltstone	Reef	PreCambrian Crystalline Basement, Granite	Formation Boundary
Coal				

(1) - (19) Important rock units in the sedimentary basin. Also shown on photos and diagrams to designate their stratigraphic position

P Important oil and gas producing horizons and fields (e.g. Pembina Oil Field)

IT TOOK A BILLION YEARS TO FORM THE WESTERN CANADIAN SEDIMENTARY BASIN, AND IT OCCURRED IN 4 STAGES.

2.SEDIMENTATION

Cambrian to Mid-Jurassic sediments (570 to 180 million years old) were deposited in a warm continental sea, into a slowly subsiding sedimentary basin.

This resulted in a westward thickening sequence of basal sandstones - eroded from the underlying crystalline basement overlain by carbonates (limestones and dolomites) and salts.

Much of Western Canada's oil and gas is found in ancient Devonian reefs and in Mississippian carbonates.

There were no Rocky Mountains yet!

1.EROSION

The ancient billion year old Precambrian crystalline basement has been eroded to an almost flat surface, and then depressed below sea level.

4.GLACIATION

A final stage in the last 2 million years has been the sculpting and gouging of the Rocky Mountains by ice.

The magnificent mountain scenery of the Banff area is a combination of both the underlying geological structure and the subsequent erosion by ice and rivers.

3.MOUNTAIN BUILDING

Starting approximately 170 million years ago, the North American continent moved westward as the Atlantic Ocean opened and collided with Pacific crustal plates.

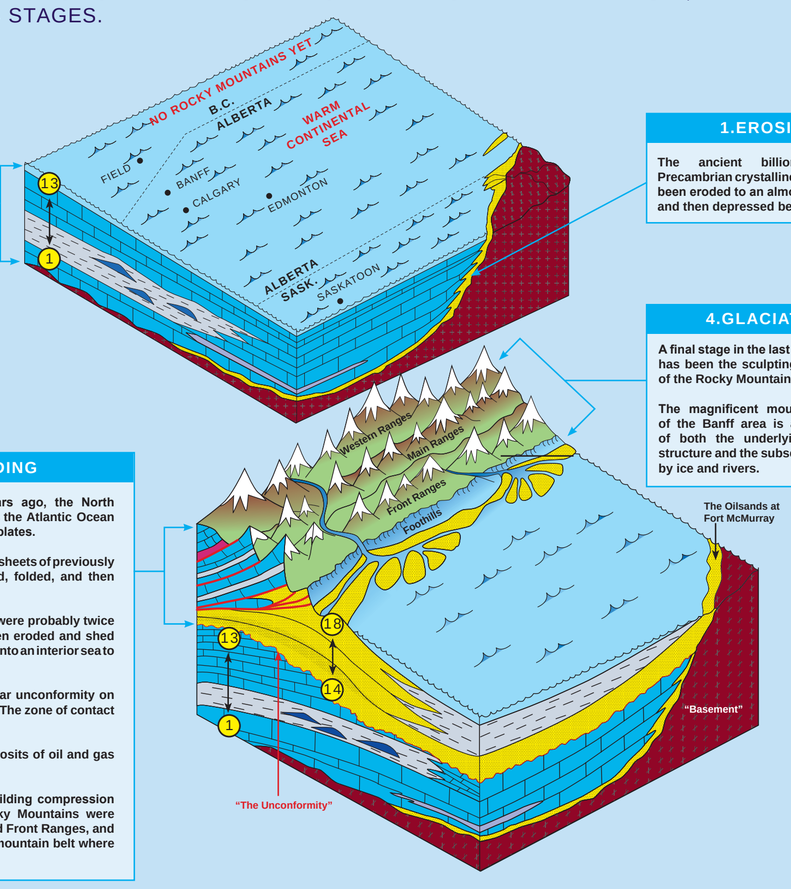
This collision caused compression where sheets of previously undeformed rock were pushed eastward, folded, and then thrust faulted.

The Ancestral Rockies were formed and were probably twice as high as they are today. They were then eroded and shed clastic sediments (sandstone and shales) into an interior sea to the east.

The younger clastic rocks sit with angular unconformity on top of the eroded underlying carbonates. The zone of contact is called 'the unconformity'.

The clastics are the host to valuable deposits of oil and gas including the Oilsands.

During the final stages of mountain building compression continued from the west and the Rocky Mountains were formed comprising the Western, Main and Front Ranges, and the Foothills. The Foothills are the only mountain belt where oil and gas have been found.



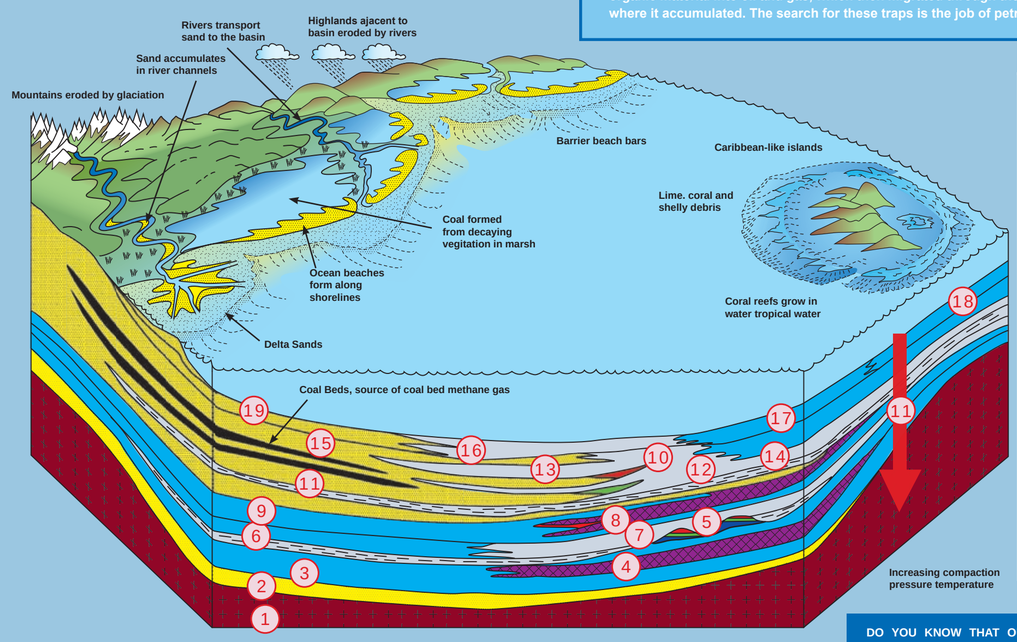
WHAT ARE THE DYNAMICS OF A SEDIMENTARY BASIN AND HOW IS OIL AND GAS FORMED AND TRAPPED?

Over the last 570 million years, the sea level of the Basin has risen and fallen many times. The Basin has also experienced:

a) Changes in the position of its shorelines
b) Drastic climate changes
c) The changing evolution of life
d) The deposition of a variety of different rock types

DID YOU KNOW THAT OIL AND GAS COMES FROM ANCIENT MARINE ANIMALS AND PLANTS?

Over time marine animals and plants have lived and died, then settled to the seafloor, and were eventually buried and fossilized. Increasing burial, pressure and temperature converted the organic material into oil and gas, which then migrated through the rock layers into porous traps where it accumulated. The search for these traps is the job of petroleum geologists.



DO YOU KNOW WHAT A SEDIMENTARY BASIN IS?

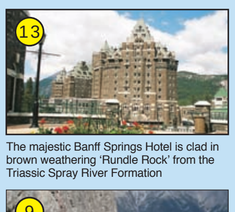
A sedimentary Basin is a low-lying area, formally the bed of an ancient sea, where layer upon layer of sediments were deposited. Increasing compaction, temperature and pressure compressed the soft sediments into a variety of sedimentary rocks (sandstones, limestone, shales, coals, salt, etc.). Some sedimentary rocks that are rich in organic matter are called 'source rocks'. They generate the oil and gas, which then migrates into sponge-like porous rocks called 'reservoir rocks', and if we are lucky, it gets 'trapped' before it escapes to the surface. It's the explorationists job to find these oil and gas traps.

9 Fossiliferous limestone (crinoids)
8 Gas accumulates in pinch-out of porous limestone (trapped by surrounding salt)
7 Shale surrounds the underlying ancient reefs and traps oil and gas
6 Oil and gas source rock, oil and gas migrates from shale into reef
5 Ancient reefs are one of our best oil and gas reservoirs and have been incredible storehouses of hydrocarbons
4 Salt beds caused by evaporation
3 Dolomite (rock) formed by groundwater altering limestone (adding magnesium)
2 Basal sandstone (lies on top of crystalline basement)
1 Crystalline basement comprised of very old igneous rocks such as granite
19 Recent shallow water delta sand (unconsolidated)
18 Recent lime sand and coral reef debris (unconsolidated)
17 Recent lime muds washed from reef (unconsolidated)
16 Recent black mud (unconsolidated)
15 Compacted beach sandstone
14 Compacted limestone
13 Shale (compacted mud)
12 Oil and gas source rock (rich in organic matter)
11 Heat and pressure convert organic matter to hydrocarbons, which overlying reservoir sandstones
10 Oil and gas accumulate at pinch-outs of porous sandstones (trapped by surrounding shales)

DO YOU KNOW THAT OUR UNDERSTANDING OF THE WESTERN CANADIAN SEDIMENTARY BASIN IS BASED ON 100 YEARS OF MAPPING IN THE ROCKY MOUNTAINS, THE FOOTHILLS AND THE PLAINS?

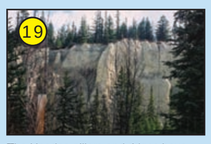
We are able to combine this knowledge with information from the drilling and analysis of some 500,000 wells. The result is that the Western Canadian Sedimentary Basin (WCSB) is likely the best studied oil and gas producing area in the world.


The Upper Hot Pools' mineral-rich water at the base of Sulphur Mountain is heated at depth and emerges at the surface along the Sulphur Mountain Thrust.


The majestic Banff Springs Hotel is clad in brown weathering 'Rundle Rock' from the Triassic Spray River Formation


The cliffs above Grassi Lakes at Canmore provide excellent rock climbing. The handholds are often the vuggy porosity cavities in this well exposed Devonian Reef.

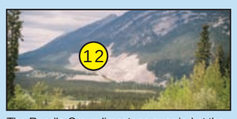

Old coal cars are a reminder of the history of the Canmore coal basin active between 1883 and 1979, and the coal towns of Canmore, Bankhead and Anthracite.

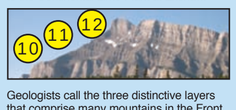

The Hoodoo pillars and ridges have been carved by running water and are distinctive features in mountain valleys and in the Drumheller badlands.

DO YOU KNOW WHAT THE 'ROCKY MOUNTAIN SANDWICH' IS?

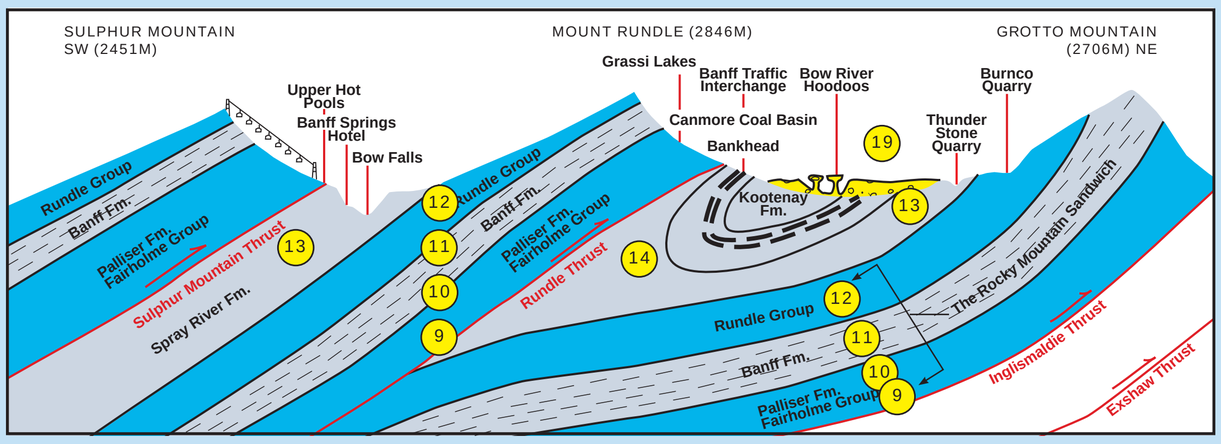
You can find it on Sulphur Mountain, Mount Rundle and Grotto Mountain.


Thunderstone Quarry at Pigeon Mountain where the slab-like "Rundle Rock" (Triassic Spray River Formation) is quarried.


The Rundle Group limestone quarried at the Burnco Quarry at Grotto Mountain is trucked to the Continental Lime Plant at Exshaw.


Geologists call the three distinctive layers that comprise many mountains in the Front Ranges the 'Rocky Mountain Sandwich'. The resistant limestone cliffs comprise the Rundle Group on top, and of the Palliser Formation on the bottom, and the 'ham in the sandwich' in the middle, is more easily eroded Banff Formation.

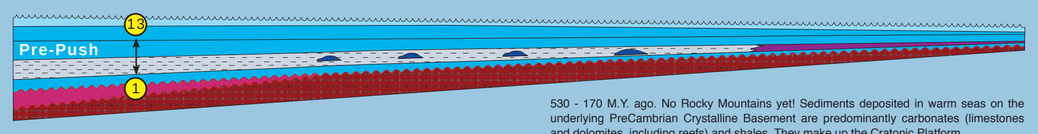
DIAGRAMATIC CROSS SECTION SHOWING THE MOUNTAIN-BUILDING THRUSTS OF THE FRONT RANGES



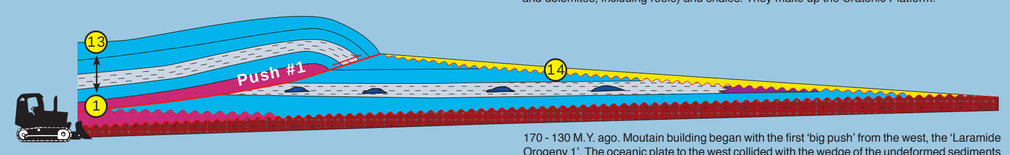
DO YOU KNOW THAT OUR UNDERSTANDING OF THE WESTERN CANADIAN SEDIMENTARY BASIN IS BASED ON 100 YEARS OF MAPPING IN THE ROCKY MOUNTAINS, THE FOOTHILLS AND THE PLAINS?

We are able to combine this knowledge with information from the drilling and analysis of some 500,000 wells. The result is that the Western Canadian Sedimentary Basin (WCSB) is likely the best studied oil and gas producing area in the world.

THE ROCKY MOUNTAINS WERE PUSHED FROM THE WEST!



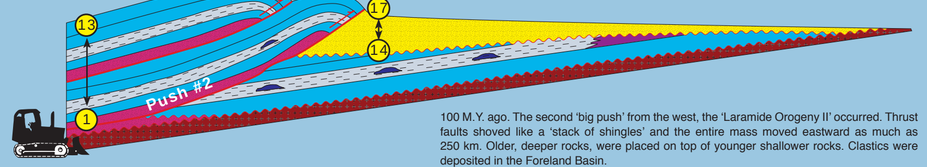
530 - 170 M.Y. ago. No Rocky Mountains yet! Sediments deposited in warm seas on the underlying PreCambrian Crystalline Basement are predominantly carbonates (limestones and dolomites, including reefs) and shales. They make up the Cratonic Platform.



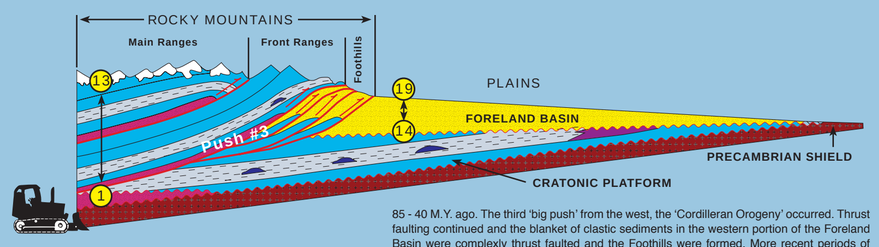
170 - 130 M.Y. ago. Moutain building began with the first 'big push' from the west, the 'Laramide Orogeny 1'. The oceanic plate to the west collided with the wedge of the undeformed sediments on the cratonic platform. Imagine a bulldozer pushing and compressing the sediments until they broke into sheets along enormous thrust faults.

DID YOU KNOW THAT THE ROCKY MOUNTAINS HAVE NOT ALWAYS BEEN HERE?

Rather, we believe the rocks that comprise the Rocky Mountains were pushed from the west by enormous tectonic forces within the Earth's constantly moving crust. The rocks were first folded then they faulted and were piled up, slice upon slice, along enormous thrust faults to form the present-day Rocky Mountains.



100 M.Y. ago. The second 'big push' from the west, the 'Laramide Orogeny II' occurred. Thrust faults shoved like a 'stack of shingles' and the entire mass moved eastward as much as 250 km. Older, deeper rocks, were placed on top of younger shallower rocks. Clastics were deposited in the Foreland Basin.



85 - 40 M.Y. ago. The third 'big push' from the west, the 'Cordilleran Orogeny' occurred. Thrust faulting continued and the blanket of clastic sediments in the western portion of the Foreland Basin were complexly thrust faulted and the Foothills were formed. More recent periods of glaciation sculpted the present-day topography of our mountains.

LEGEND:

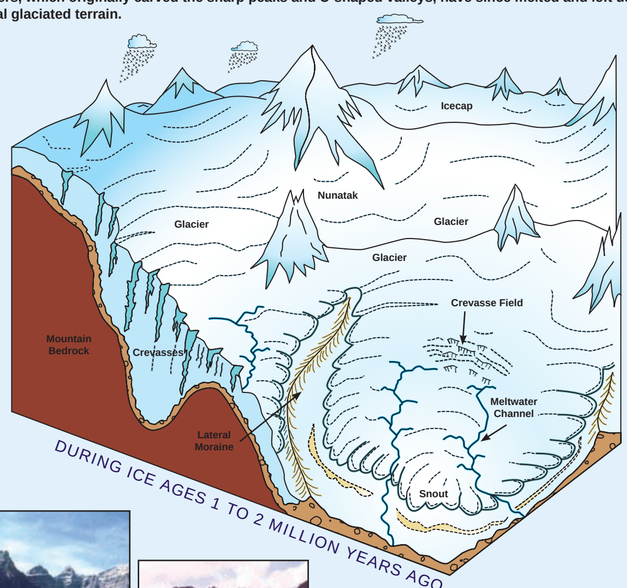
FOSSIL FUELS	CLASTIC ROCKS	CARBONATE ROCKS	OTHER ROCKS	SYMBOLS
Oil	Conglomerate	Limestone	Salts	Unconformity
Gas	Sandstone	Dolomite	Metasedimentary Clastics	Thrust Fault
Water	Shale & Siltstone	Reef	PreCambrian Crystalline Basement, Granite	Formation Boundary
Coal				

1 - 19 Important rock units in the sedimentary basin. Also shown on photos and diagrams to designate their stratigraphic position

P Important oil and gas producing horizons and fields (e.g. Pembina Oil Field)

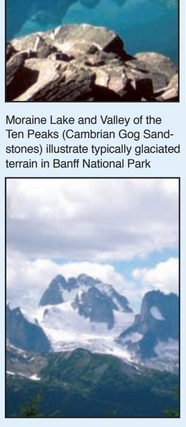
HOW DID GLACIATION SHAPE OUR PRESENT-DAY LANDSCAPE?

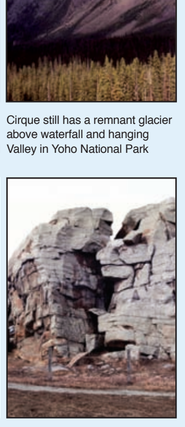
Glaciers, which originally carved the sharp peaks and U-shaped valleys, have since melted and left us with typical glaciated terrain.

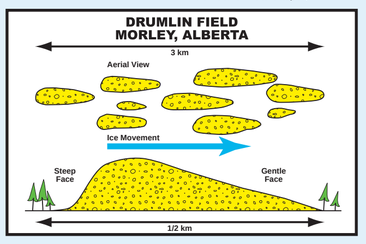



Moraine Lake and Valley of the Ten Peaks (Cambrian Gog Sandstones) illustrate typically glaciated terrain in Banff National Park


Cirque still has a remnant glacier above waterfall and hanging Valley in Yoho National Park


Glaciated terrain of the Bugaboo Range, BC


The Big Rock Glacial Erratic, southwest of Okotoks, AB, was transported by glaciers from Mount Edith Cavell near Jasper, AB

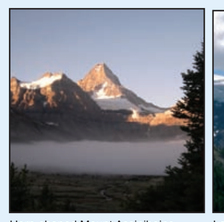


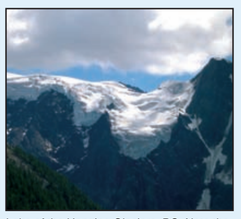
Drumlin: The streamlined drumlins at Morley, Alberta are comprised of unsorted glacial gravel deposits pushed and overridden by advancing ice sheets.

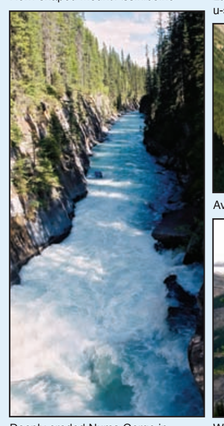

Complex folding and faulting and subsequent glaciation combine to form the spectacular Three Sisters above Canmore, Alberta

DO YOU KNOW WHAT CAUSED OUR MAGNIFICENT MOUNTAIN SCENERY?

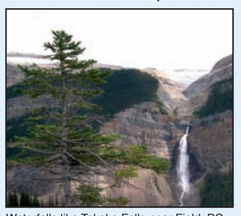
During the ice ages, one to two million years ago, glacial ice advanced and retreated out of the mountains and over the Plains. The mountain valleys were filled with ice, and only the mountain peaks, 'nunataks', protruded above the thick blanket of ice. The unyielding bulldozing of the advancing ice sheet sculpted and gouged the mountains and left a trail of evidence of its unrelenting journey. The magnificent mountain scenery of Banff and Jasper National Park is the result of both the complex underlying geological structure and the subsequent erosion by ice and rivers.

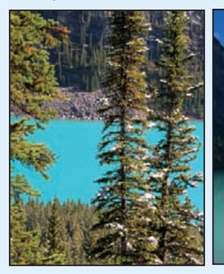

Horn-shaped Mount Assiniboine


Lake of the Hanging Glaciers, BC. Note the u-shaped valey

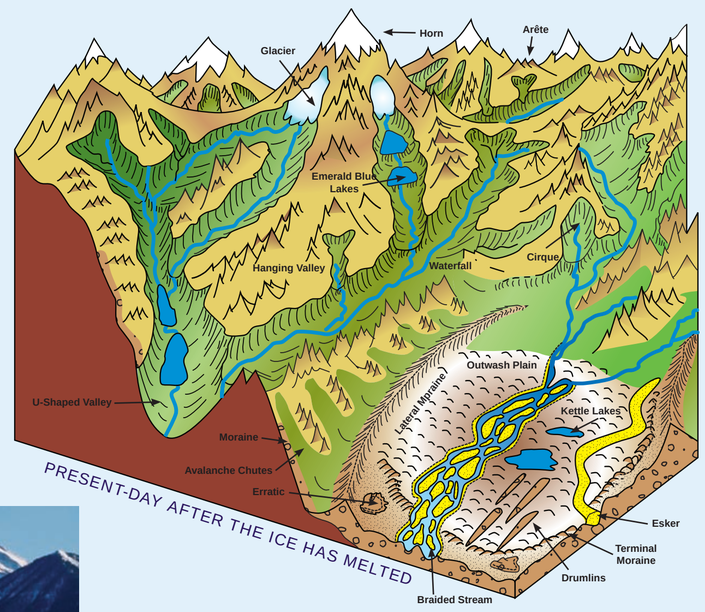

Deeply eroded Numa Gorge in Kootenay National Parks


Avalanche chutes in Kootenay National Park


Waterfalls like Takaka Falls near Field, BC are common in glaciated valleys

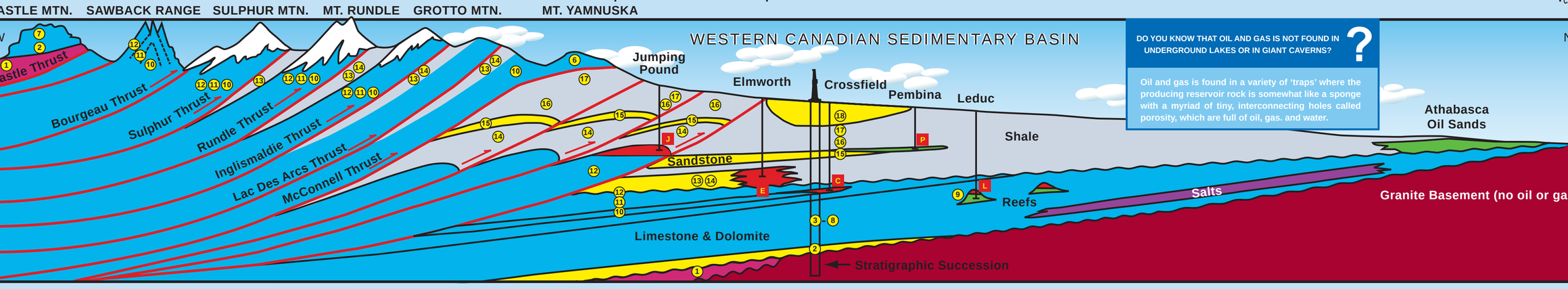

The spectacular emerald-blue color of Moraine Lake in summer in Banff National Park

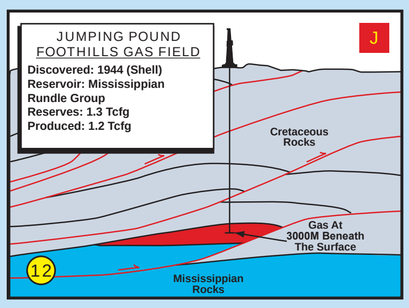

Lake Louise, Banff National Park. On a summer's day you can hear large pieces of ice spalling off the advancing Victoria Glacier

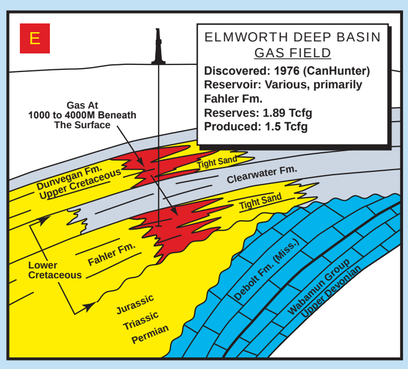


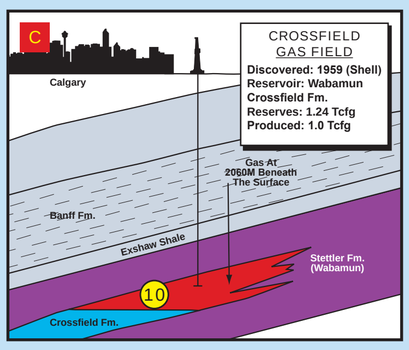
DO YOU KNOW THAT OIL AND GAS IS NOT FOUND IN UNDERGROUND LAKES OR IN GIANT CAVERNS?

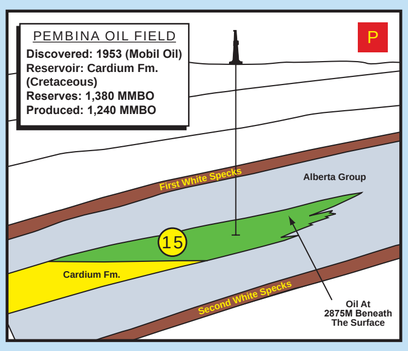
Oil and gas is found in a variety of 'traps' where the producing reservoir rock is somewhat like a sponge with a myriad of tiny, interconnecting holes called porosity, which are full of oil, gas. and water.

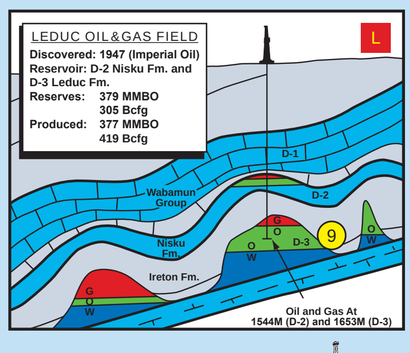


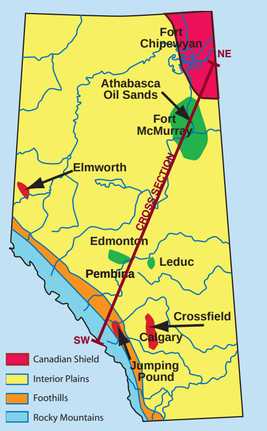












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