

**October 18, 2021**

## **News and Notes**

Before we get looking at some more metamorphic rocks, here are some news items that I thought were interesting:

- Research into past catastrophes: [Did the Earth tip on its side 84 million years ago?](#) The original scientific paper is [here](#).
- From the United States Energy Information Administration: [Annual U.S. coal-fired electricity generation will increase for the first time since 2014](#).
- Dorian Abbot's [lecture that was cancelled at M.I.T.](#) has been scheduled for 4:30 Eastern, October 22, via Zoom from Princeton University, to register go to this site : [Climate and the Potential for Life on Other Planets](#).
- La Palma volcano on the Canary Islands continues to erupt copious quantities of lava, as CBS News reported: ["Lava tsunami" seen flowing from erupting Cumbre Vieja volcano as evacuations continue](#). You Tube videos of the eruption [here](#) and here.
- From Hawai'i, [Photo and Video Chronology – Kīlauea – October 12, 2021](#).
- Other volcanoes: [Popocatépetl \(Mexico\)](#), [Aso \(Japan\)](#), [Suwanose-jima \(Japan\)](#), [Lewotolo \(Indonesia \)](#), [Kerinci \(Indonesia\)](#), [Semisopochnoi \(Aleutian Islands, AK, USA\)](#), [Fuego \(Guatemala\)](#), [Nevado del Ruiz \(Colombia\)](#), [Sangay \(Ecuador\)](#), [Reventador \(Ecuador\)](#), [Sabancaya \(Peru\)](#), and [Nevados de Chillán \(Central Chile\)](#).
- Also related to volcanoes, recent research at the Yellowstone Caldera in Wyoming, U.S.A.: [Temperature Loggers Shed Light on Past and Future Yellowstone Geyser Activity](#).
- More research n climate change: [Deep-Ocean Cooling May Have Offset Global Warming Until 1990](#).
- [Meteorite crashes through B.C. roof, just missing sleeping woman](#).
- Also in the sky, a [coronal mass ejection](#) that hit the earth on October 12 led to spectacular aurora displays [Huge Solar Flare Strikes Earth, Dynamic Northern Lights Visible Worldwide](#).

- Earthquake news you can use from the USGS: [ShakeOut 2021: Earthquake Awareness Enables Community Preparedness](#). The earthquake news site for the USGS is [here](#) and the Earthquakes Canada site is [here](#).
- [The Mines and Geology Division \(MGD\) of the Jamaican Ministry of Transport and Mining will be testing cannabis for heavy metal contamination](#).
- Congratulations to the new members of the [Canadian Mining Hall of Fame](#): Patricia Dillon, David Elliott, William Gladstone Jewitt, Steven D. Scott, and Mary Edith Tyrrell ([press release here](#)).

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### **More Metamorphic Rocks**

Last week we looked at a series of metamorphic rocks that formed in a series. Let's look at some others, in alphabetical order.

#### **Anthracite**



**Figure 1 - Anthracite**

**Credit: [Amcyrus2012](#), [Creative Commons Attribution 4.0 International](#) license**

Coal that has been deeply buried and subjected to high pressures will become [anthracite](#). The highest grade of coal, it is almost pure carbon (greater than 90% carbon content). At one time, its use was restricted to powering the steam engines in battleships. We'll look at coal and other energy minerals in more detail in upcoming postings.

## Hornfels



**Figure 2 - Hornfels from Novosibirsk, Russia**  
**Credit: Fed, public domain**

Hornfels rocks are formed by [contact metamorphism](#), that is, where an intrusion of molten rock comes in contact with pre-existing country rock. Essentially, the country rock has been baked.

## Lapis Lazuli



**Figure 3 - Lapis Lazuli**

**Credit: HappyDonkey64, Creative Commons Attribution 4.0 International license**

A rare metamorphic rock, [lapis lazuli](#) has been prized for its deep blue colour. Another product

of contact metamorphism, lapis lazuli forms near igneous intrusions where limestone or marble has been altered by or hydrothermal metamorphism. The blue mineral in lapis lazuli is [lazurite](#) although [sodalite](#) may also be present.

Lapis lazuli is used in jewelry and decorative art. It has also been ground up to be used as a bright blue pigment in paint .

## Marble



**Fig 4 - Marble Quarry at Carrara, Italy**

**Credit: [Harald Bischoff](#), [Creative Commons Attribution-Share Alike 3.0 Unported](#) license**

Formed by the metamorphosis of carbonate rocks such as limestone, [marble](#) is a prized building material. In addition to [calcite](#), marble rocks may also contain [mica](#), [corundum](#), [ruby](#) and [sapphire](#). The most common metamorphic environment for the metamorphosis of carbonate rocks into marble are at [converging plate boundaries](#).

## Novaculite



**Figure 5 - Arkansas Sharpening Stone**

**Credit: [Funkdoctor](#), [GNU Free Documentation License](#), Version 1.2**

A uniform, fine-grained hard rock mostly composed of extremely fine-grained to cryptocrystalline quartz, [novaculite](#) is created by the metamorphism of fine grained siliceous sediments such as [diatomaceous earth](#).

When siliceous sediments are buried under the normal temperature and pressure conditions that lead to [regional metamorphism](#), the first change in the sediments will be [diagenesis](#) to form [chert](#). Then as the burial progresses to low-grade metamorphism, novaculite will form.

The most important use for novaculite is in high quality sharpening stones such as the Arkansas whetstone shown in Figure 5.

## Quartzite



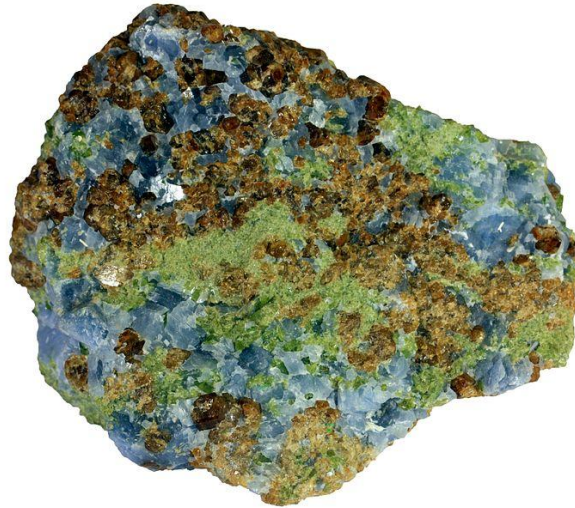
**Figure 6 - Quartzite**

**Credit: James St. John, Creative Commons Attribution 2.0 Generic license**

Another metamorphic rock commonly formed at convergent plate boundaries, [quartzite](#) is made up of fused quartz grains from the burial and metamorphism of sandstones.

Quartzite is used as dimension stone and crushed stone in construction, as a source of high purity silica and even as a gemstone. Stone tools were also made using quartzite since it can fracture to produce sharp edges.

## Skarn



**Figure 7 - Grossular Calcite Augite Skarn**

**Credit: [Siim Sepp](#), [Creative Commons Attribution-Share Alike 3.0 Unported license](#)**

Formed by contact metamorphism and the action of hydrothermal fluids, [skarn](#) rocks are defined not by their mineral content, but by their texture and location. Skarn typically forms around the edges of magma intrusion in the surrounding country rock. [Garnets](#), such as [grossular](#), [ruby](#) and [sapphire](#) can be found in skarn rocks.

### **Standard Caveat**

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

**In science, the only authority is the evidence.**