

May 1, 2023

News and notes

Before going on to discuss how geology has affected the fate of Algeria, here are some news items I thought were interesting.

Plate Tectonics

- [Sedimentary and tectonic evolution of the Banquan pull-apart basin and implications for late Cenozoic dextral strike-slip movement of the Tanlu Fault Zone](#); Phys.org summary [here](#).
- [Precise U-Pb dating of incremental calcite slickenfiber growth: Evidence for far-field Eocene fold reactivation in Ireland](#).
- [Crustal Architecture Across Southern California and Its Implications on San Andreas Fault Development](#).

Mineralogy and Petrology

- Mineralogy of volcanic deposits: [Provenance and deposition of a lithified volcanic-rich layer \(VRL-5.5\) at 5.5 Ma from Central Apennines \(Italy\)](#).
- Petrology: [Exploring microstructure and petrophysical properties of microporous volcanic rocks through 3D multiscale and super-resolution imaging](#).

Paleontology

- [Mercury isotopes show vascular plants had colonized land extensively by the early Silurian](#); Phys.org summary [here](#).
- [“Antarctic on fire”: Paleo-wildfire events associated with volcanic deposits in the Antarctic Peninsula during the Late Cretaceous](#); Phys.org summary [here](#).
- [Ammonoid extinction versus nautiloid survival: Is metabolism responsible?](#)

Glaciers and Climate Change

- [Dramatic Carbon Loss in a Permafrost Thaw Slump in the Tibetan Plateau is Dominated by the Loss of Microbial Necromass Carbon](#); Phys.org summary [here](#).

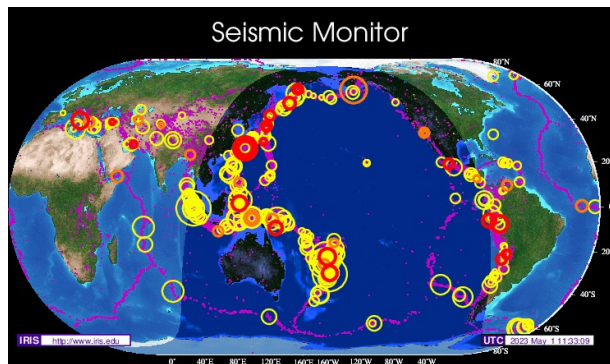
Environmental Geology and Hydrogeology

- The [May 2023 issue of Economic Geology](#) is entirely on environmental geology; most of it is behind a paywall, but you can read the abstracts for free.
- From the United States Geological Survey (USGS): [New science informs extent of hexavalent chromium groundwater plumes in Hinkley Valley](#).
- Geophysics and groundwater: [Isolating the Poroelastic Response of the Groundwater System in InSAR Data From the Central Valley of California](#); there is a plain language summary

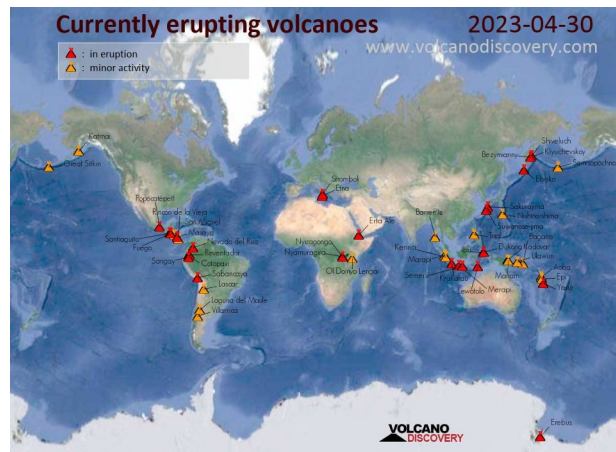
Energy and Mining

- [Crude Prices Up Over 2% on Rising U.S. Oil Demand and Lower Output.](#)
- [Big Change Coming For the Lithium Industry – ENERGYminute.](#)
- [Sphalerite as a non-traditional critical metal source: Correlative microscopy \(EPMA, EBSD, and APT\) of cobalt-enriched sulfides from the sediment-hosted copper-cobalt Dolostone Ore Formation deposit, Namibia.](#)
- [Imaging the subsurface architecture in porphyry copper deposits using local earthquake tomography.](#)
- [A new California gold rush? Local geologists are wary.](#)

Volcanoes, Earthquakes and Geohazards



Seismic Monitor



Active Volcano Map

- [Is Colombia's deadly Nevado del Ruiz on the verge of a major eruption?](#)
- Volcano research: [Assessing the Deep Carbon Release in an Active Volcanic Field Using Hydrochemistry, \$\delta^{13}\text{CDIC}\$ and \$\Delta^{14}\text{CDIC}\$](#) ; Phys.org summary [here](#).
- From the USGS: [Stratovolcano Flank Vents and the Origin of Black Butte](#).
- [Volcano Watch – Today's Family of Five USGS Volcano Observatories Began with HVO Over 111 Years Ago](#).
- Earthquake research: [Strong ground motion simulations of the 2016 Kumamoto earthquakes using corrected empirical Green's functions: methods and results for ESG6 blind prediction Steps 2 and 3 with improved parameters](#).
- Tsunami warning research: [Numerical validation of an effective slender fault source solution for past tsunami scenarios](#); Phys.org summary [here](#).

May 1, 2023

Geology and the Fate of Societies – Algeria

This week we'll take a look at the North African country of [Algeria](#). The [People's Democratic Republic of Algeria](#) has a population of approximately [45.8 million people](#) and a land area of [2,381,741 square kilometres](#). A large portion of the country is within the sparsely populated [Sahara Desert](#); most of the population lives along the shore of the Mediterranean Sea.

For those of you who look for patterns, I am going through the countries of the world in alphabetical order using the list of members of the [United Nations](#). In future postings, I expect to skip the [microstates](#) of the world. As well, I will combine some states into convenient or logical groups, such as the islands of the [Lesser Antilles](#) in the Caribbean Sea that form a coherent geological group..

Geology

Algeria sits on the northwest portion of Africa and can be divided into three main divisions:

- The [West African Craton](#) consisting of [Archean](#) granitic rocks and [Neoproterozoic](#) deposits.
- The [Tuareg Shield](#) consisting of Archean and [Proterozoic](#) deposits; and
- The [Algerian Alpine Belt](#) consisting of deposits ranging in age from [Paleozoic](#) to [Cenozoic](#).

Digging down (pun intended) in [Algerian geology](#), [Quaternary](#) deposits include [sabkhas](#), sand dunes and lake deposits. Older Cenozoic rocks include volcanic and marine deposits.

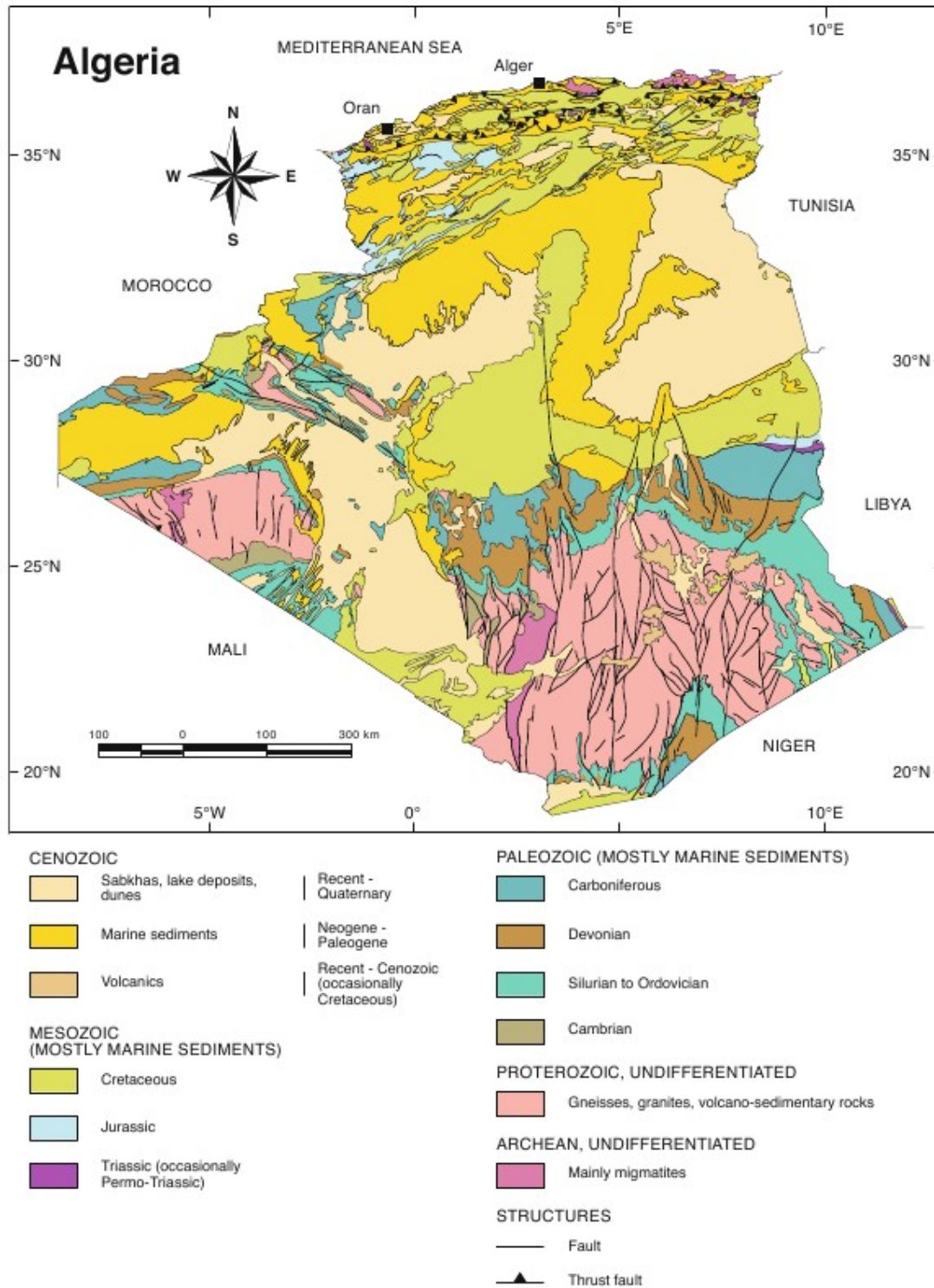
Beneath the Cenozoic deposits in Algeria are [Mesozoic](#) and Paleozoic marine sediments that were deposited in the [Neotethys](#) and [Paleotethys](#) Oceans. The movement of the [African Plate](#) northward created the Algerian Alpine Belt during the Cenozoic [Alpine Orogeny](#).

The [tectonic evolution](#) of the [Precambrian](#) rocks in Algeria is fairly complex, as might be expected when the time period they cover, the first 4 billion years of the Earth's existence. Briefly it can be divided into three main phases:

1. The evolution of the continental cores from the Archean to Early Proterozoic (including the West African Craton and Tuareg Shield);
2. Areas of remobilized continental crust ([mobile belts](#)) that metamorphosed during the late [Pan-African Orogeny](#); and
3. Oceanic terrain containing [volcano-sedimentary](#) and [ophiolite](#) sequences that overlie the first two phases.

To sum it up, in Algeria you can find some of the oldest rocks in the world, Archean, and some of youngest deposits in the world, [Holocene](#). With this variety we should expect a large selection of potential resources.

Figure 1, below, shows a geological map of Algeria.



Geological overview of Algeria (modified after Fabre et al, 1978)

Figure 1 – Geological Overview of Algeria

Credit: Figure 12 in [Cahyo, 2013](#)

**Based upon Fabre, J., Jonquet, B. & Bronner, G. (1978),
Carte géologique du nord-ouest de l'Afrique, SNED, Alger**

Resources

Agriculture

Historically, Algeria was a major grain producer, especially when it was part of the [Roman province of Africa](#). Agriculture is pretty much confined to the Mediterranean zone of the country, although animal husbandry is practised by the [Tuareg nomads in the Sahara](#).

In 2018, [Algeria produced](#):

- 4.6 million tonnes of potatoes (17th largest producer in the world);
- 3.9 million tonnes of wheat;
- 2 million tons of watermelon (6th largest producer in the world);
- 1.9 million tons of barley (18th largest producer in the world);
- 1.4 million tons of onions (16th largest producer in the world);
- 1.3 million tons of tomatoes (18th largest producer in the world);
- 1.1 million tons of oranges (14th largest producer in the world);
- 1 million tons of dates (4th largest producer in the world, second only to Egypt, Saudi Arabia and Iran);
- 860 thousand tons of olives (6th largest producer in the world);
- 651 thousand tons of peppers;
- 502 thousand tons of grapes;
- 431 thousand tons of carrots;
- 388 thousand tons of pumpkins;
- 262 thousand tons of tangerines;
- 242 thousand tons of apricots (4th largest producer in the world, second only to Turkey, Iran and Uzbekistan);
- 207 thousand tons of cauliflower and broccoli;
- 202 thousand tons of garlic;
- 200 thousand tons of pears;
- 193 thousand tons of cucumbers;
- 190 thousand tons of peaches;
- 186 thousand tons of peas;
- 181 thousand tons of aubergine (eggplant);
- 124 thousand tons of artichokes (5th largest producer in the world, losing only to Italy, Egypt, Spain and Peru);
- 118 thousand tons of oats;
- 111 thousand tons of plums (20th largest producer in the world); and
- 109 thousand tons of figs (4th largest producer in the world, second only to Turkey, Egypt and Morocco).

For a Muslim country, Algeria produces a surprising amount of wine. [In 2019](#), Algeria produced approximately 500,000 hectoliters of wine, mostly for export.

Mineral Resources

[Mineral resources in Algeria](#) include:

- Petroleum, approximately 12.2 billion barrels of oil reserves, with a daily production of approximately 1.1 million barrels;
- Natural gas, estimated reserves are 2.9 trillion cubic feet; natural gas production also includes helium production.
- Metals such as uranium, gold, mercury and iron.

Groundwater

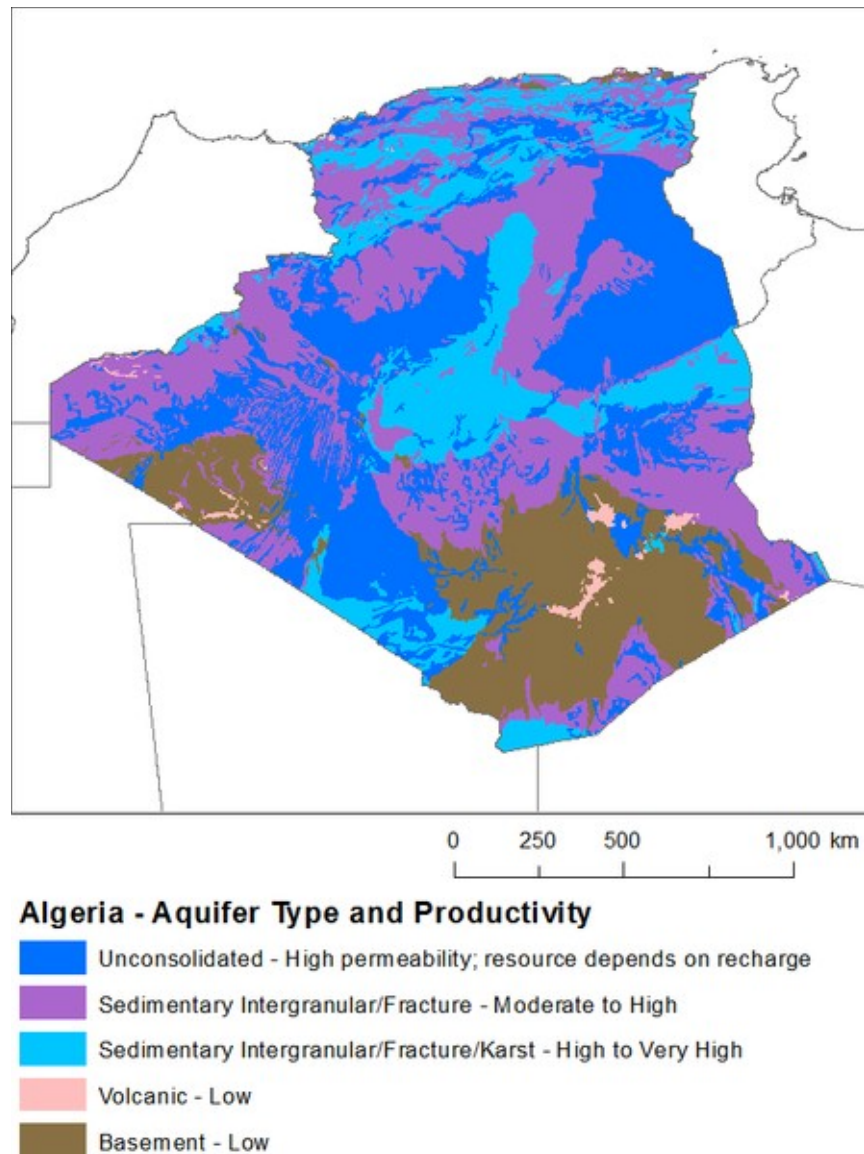


Figure 2 – Aquifer Map of Algeria

Credit: [British Geological Survey](#), [Creative Commons Attribution-Share Alike 3.0 Unported license](#).

As a dry country, most of Algeria is [dependent upon groundwater](#) for domestic and agricultural uses. One estimate of total groundwater production from all sources across the country is 4.3 billion m³/year. Sources include relatively shallow coastal aquifers, recharged by rainfall and deep aquifers in the south of the country that contain “fossil” water, not currently being recharged. Methods of extraction include borehole wells, dug wells, [foggaras](#) – water galleries - and natural springs.

Climate

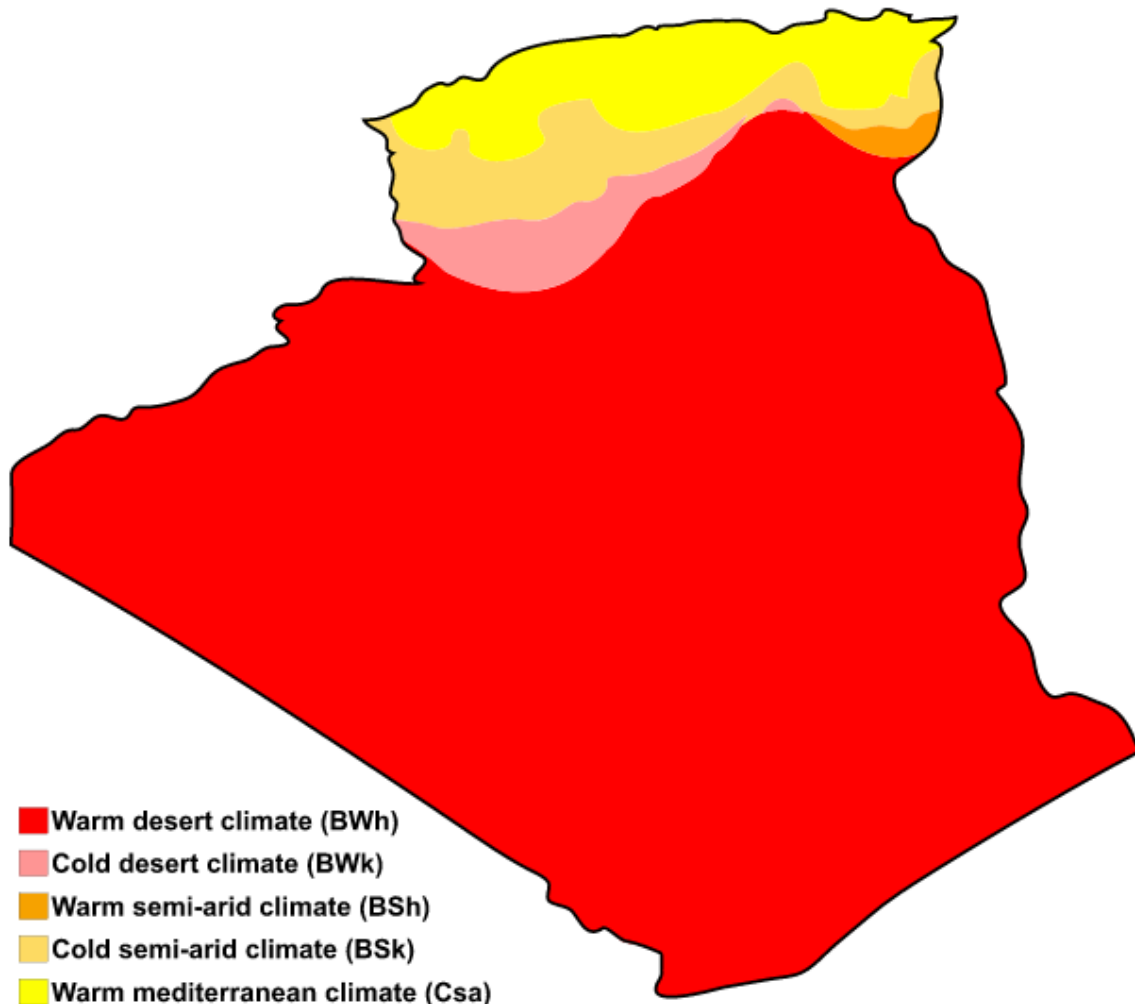


Figure 3 – [Köppen Climate Zones](#) in Algeria

Credit: [Ali Zifan](#), [Creative Commons Attribution-Share Alike 4.0 International](#) license

Most of Algeria is a hot, arid desert (BWh). Along the coastline is a zone of warm Mediterranean climate (Csa) with varying zones of cold desert (BWk), warm semi-arid (BSh) and cold semi-arid (BSk) in the [Atlas Mountains](#) between the coast and the desert.

An interesting feature about the Sahara is that it has not always been as [extensive or dry as it currently is](#). During the [African Humid Period](#), the land that is now a dry desert was a more humid [savanna](#) populated by the same array of animals as in other African savannas such as the [Serengeti](#). Desiccation of the region began about 6000 years ago and by 5000 years ago, the current Sahara Desert conditions prevailed.

History and Geopolitics

As the original home of human beings, Africa has been populated by [*Homo sapiens*](#) for a long time. The earliest *Homo sapiens* fossils came [from about 315,000 years ago](#) in northwest Africa, in nearby Morocco.

In more recent times, [Neolithic](#) farmers, ancestors to the [Berber](#) tribes, settled in Algeria around [12,000 years ago](#). Later, in antiquity, [Phoenicians](#) settled in nearby [Carthage](#), dominating the local Berber tribes ([Numidians](#)). The [Romans](#) then conquered the region following the [Punic Wars](#). At the [end](#) of the Western Roman Empire, [Germanic Vandals](#) conquered [Roman Africa](#), only to be later kicked out by an army led by [Flavius Belisarius](#) of the [Eastern Roman Empire](#). [Muslim Arabs](#) conquered Algeria in the 8th Century and various Muslim rulers, including the [Ottoman Turks](#), held the country until [France conquered the place in 1830](#). Following the [Algerian War](#) in 1962, Algeria became an independent country.

The geopolitical fate of Algeria is to be a rich country, with many resources to steal, in a vulnerable position. The country is next to an easily traversed sea, the Mediterranean, and an open desert that can also be crossed with only a little more difficulty. Difficult to defend, Algeria has attracted the attention of covetous conquerors throughout the ages. To add to their problems, ancient [disputes between Arabs and Berbers](#) continue to cause trouble in the country.

While it is currently independent, human nature almost ensures future trouble for Algeria from the greedy and/or desperate.

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.