

May 29, 2023

## News and notes



**[Popocatepetl](#) Volcano in Mexico erupting May 22, 2023  
Credit: [Erik Gomez Tochimani / AFP – Getty Images](#)**

Before going on to discuss how geology has affected the fate of [Argentina](#), here are some news items that I thought were interesting.

## Research

- Geological mapping: [A continent-wide detailed geological map dataset of Antarctica](#); Phys.org summary [here](#).
- Stratigraphy and sedimentology: [The Portofino Conglomerate \(Eastern Liguria, Northern Italy\): Provenance, Age and Geodynamic Implications](#).
- Coastal geology: [Restoring a barrier island forest may be key to protecting Miami from storm surge](#).
- More coastal geology: [Coastal vegetation and estuaries are collectively a greenhouse gas sink; behind a pay wall](#), Phys.org summary [here](#).
- Fluvial geology: [Diverse Responses of Alluvial Rivers to Periodic Environmental Change](#).

- Oceanography: [Evolution characteristics of the Atlantic Meridional Overturning Circulation and its thermodynamic and dynamic effects on surface air temperature in the Northern Hemisphere](#); behind a pay wall, Phys.org summary [here](#).

## Petrology

- Petrology and geological history: [Karst-bauxite formation during the Great Oxidation Event indicated by dating of authigenic rutile and its thorium content](#).
- Mantle petrology: [Transport and eruption of mantle xenoliths creates a lagging problem](#).
- More mantle petrology: [At long last, ocean drillers exhume a bounty of rocks from Earth's mantle](#)

## Plate Tectonics

- Subduction zone geology: [Links between large igneous province volcanism and subducted iron formations](#); behind a pay wall, Phys.org summary [here](#).
- [Deep subduction of the Philippine Sea slab and formation of slab window beneath central Japan](#).
- [Non-coaxial deformation of foreland basement involved in a fold-and-thrust belt: a strain partitioning approach to the Eastern Variscan orogen](#).

## Paleontology

- Early life: [Synthesis of prebiotic organics from CO<sub>2</sub> by catalysis with meteoritic and volcanic particles](#); Eureka alert summary [here](#).
- End Permian mass extinction: [Collapse of tropical rainforest ecosystems caused by high-temperature wildfires during the end-Permian mass extinction](#); behind a pay wall, Phys.org summary [here](#).
- More on the End Permian mass extinction: [Rapid turnover of top predators in African terrestrial faunas around the Permian-Triassic mass extinction](#); Phys.org summary [here](#).
- Evolution: [Erosion of heterogeneous rock drives diversification of Appalachian fishes](#); behind pay wall, Eureka Alert summary [here](#).
- [The first discovery of amber resin in Lichi Mélange, Eastern Taiwan](#).
- Book review: [New book eyes Earth's excavators, from microbes to elephants and dinosaurs](#).

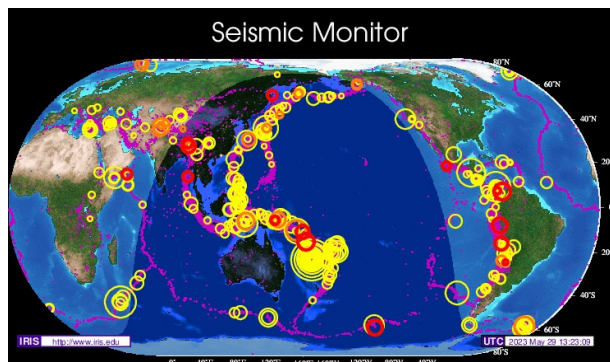
## Glaciers and Climate Change

- [In the Quest of a Parametric Relation Between Ice Sheet Model Inferred Weertman's Sliding-Law Parameter and Airborne Radar-Derived Basal Reflectivity Underneath Thwaites Glacier, Antarctica](#).
- [Acoustic Sensing of Glacial Discharge in Greenland](#); Phys.org summary [here](#).
- Permafrost: [Remotely sensed lake area changes in permafrost regions of the Arctic and the Tibetan Plateau between 1987 and 2017](#); behind a pay wall, Phys.org summary [here](#).

## Mining and Energy

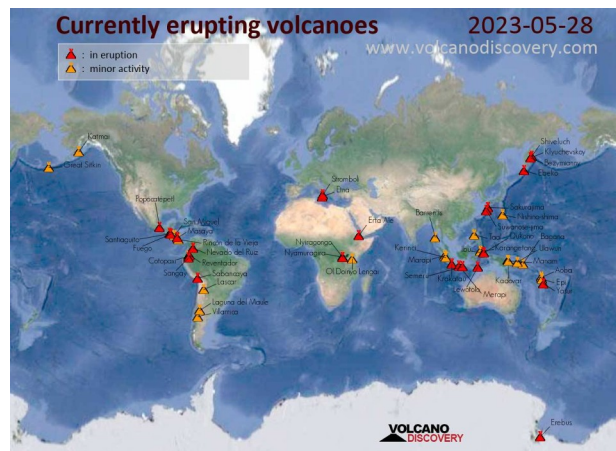
- [Ancient fluid in quartz provides key to finding new uranium deposits.](#)
- Deep sea mining: [Analysis-ready optical underwater images of Manganese-nodule covered seafloor of the Clarion-Clipperton Zone.](#)
- Coal and hydrogen storage: [Hydrogen sorption and diffusion in coals: Implications for hydrogen geo-storage](#); behind pay wall, Eureka Alert summary [here](#).
- Petroleum geology: [Cenozoic Clastic Deposits in the Thermaikos Basin in Northern Greece and Their Reservoir Potential.](#)
- [Aker BP Makes Big Oil Discovery In The North Sea.](#)
- [10-Year Production Outlook for Canadian Oil Sands Raised for First Time in More Than Half Decade.](#)
- [Oil Prices Rise as US Closes in on Debt Deal.](#)
- Exploration activity: [U.S. Oil & Gas Rigs Fall in May by Most in a Month Since 2020.](#)

## Volcanoes, Earthquakes and Geohazards



### [Seismic Monitor](#)

- From the United States Geological Survey (USGS): [Volcano Watch – Legends of Eruptions Past.](#)
- [Slow changes in lava chemistry at Kama'ehuakanaloa linked to sluggish mantle upwelling on the margin of the Hawaiian plume.](#)
- Hunga Tonga-Hunga Ha'apai Volcano, the gift that keeps on giving: [Generation of equatorial plasma bubble after the 2022 Tonga volcanic eruption](#); Phys.org summary [here](#).
- More on the Hunga Tonga-Hunga Ha'apai Volcano; [Ionospheric disturbances over South America related to Tonga volcanic eruption.](#)



### [Active Volcano Map](#)

- [Magma ascent and degassing processes of the 2011 and 2017–18 eruptions of Shinmoedake in Kirishima volcano group, Japan, based on petrological characteristics and volatile content of magmas.](#)
- [Youngest Iberian Holocene volcanic eruptions and paleoenvironmental evolution of a barrier-paleolake in the Garrotxa Volcanic Field \(NE Spain\); Phys.org summary \[here\]\(#\).](#)
- [M6.2 earthquake near Tokyo causes widespread but light shaking.](#)
- [More than 3 months after Turkey-Syria earthquakes, aftershocks continue to unnerve residents.](#)
- Earthquake research: [Upper crust anisotropy of the 2020 Jiashi MS 6.4 earthquake.](#)
- Flooding: [New maps reveal places at risk from sea-level rise](#); maps [here](#).

## Geopolitics

- [Pepe Escobar: Eurasian Heartland Rises to Challenge the West.](#)
- [No Truce With the Heartland.](#)

## People Acting Badly

- Online harassment: [Trolled in science: “Hundreds of hateful comments in a single day”.](#)
- Disputes: [Tear gas taints the air as TotalEnergies annual meeting rejects climate activist resolution.](#)
- Carbon offsets: [Destruction is at the heart of everything we do: Chevron’s junk climate action agenda and how it intensifies global harm](#); Guardian summary [here](#).

## Geologists in the News



- Congratulations to Jeff Young, P. Geo., [winner of the 2023 E.R. Ward Neale Medal](#) for sustained outstanding efforts in sharing Earth science with Canadians. [Jeff teaches at the University of Manitoba.](#)

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## Geology and the Fate of Societies – Argentina



**Figure 1 – Map of Argentina**  
**Credit: United Nations Food and Agriculture Administration, public domain**

### Introduction

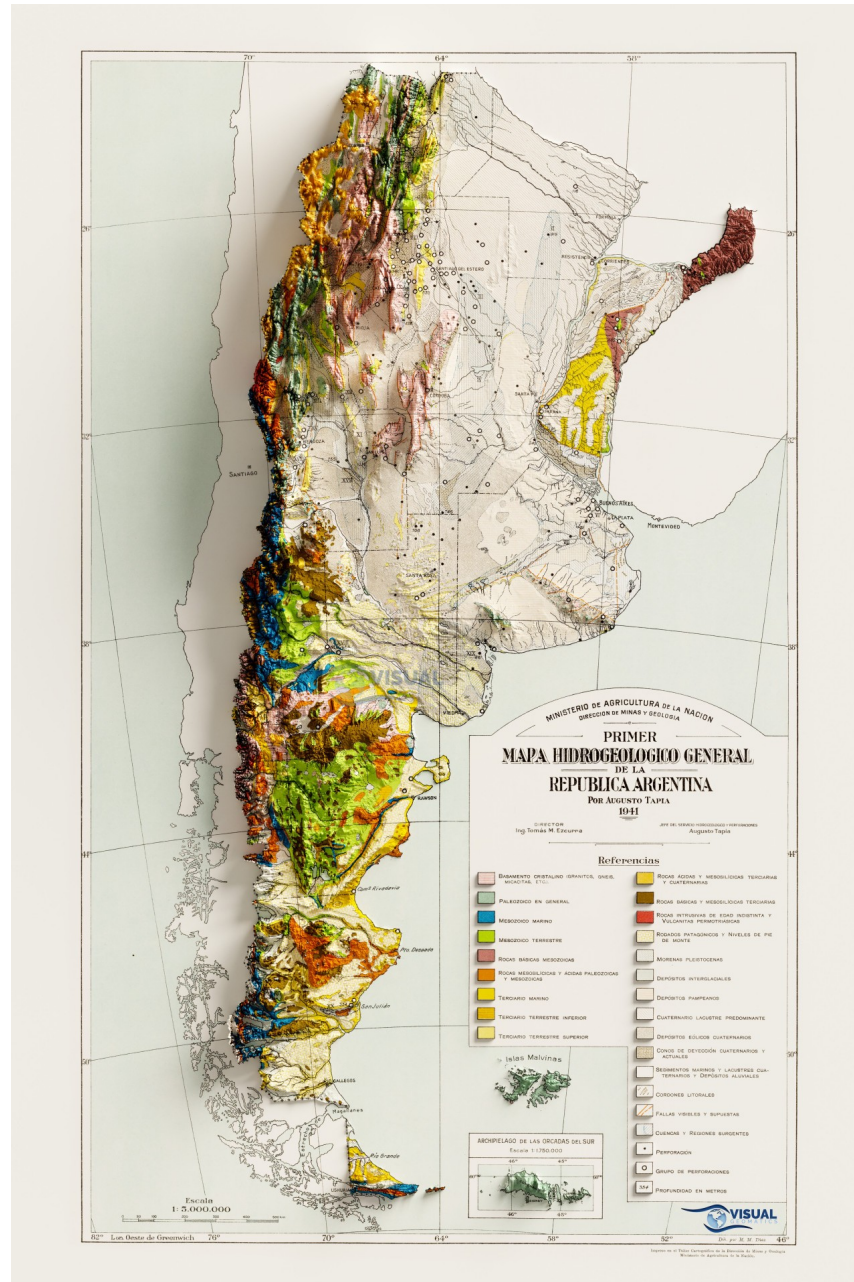
[Argentina](#), officially called the [República Argentina](#), sits on the south-east part of South America. There are about 46,622,000 people living there ([the current CIA estimate is 46,621,847](#)). It has a total area of 2,780,400 square kilometres (km<sup>2</sup>) of which 2,736,690 km<sup>2</sup> is land and 43,710 km<sup>2</sup> is water. Surrounding countries include: [Chile](#), to the west; [Bolivia](#) and [Paraguay](#), to the north; [Brazil](#), [Uruguay](#), and the South Atlantic Ocean, to the east.

Offshore, in the South Atlantic Ocean, Argentina claims sovereignty over the [Falkland Islands](#), the [South Georgia and the South Sandwich Islands](#) (claimed and administered by the [United Kingdom](#) as [British Overseas Territories](#)). Argentina also claims a portion of [Antarctica](#).

**Note:** the inhabitants of the Falkland Island [prefer to be British subjects](#).

Most of the people who live in Argentina are of Spanish and Italian ancestry. There are also people of other European ancestry as well as some of Indigenous and African ancestry.

## Geology



**Figure 2 – Geological Map of Argentina with Shaded Relief**  
**Credit: [visualgeomatics](#), public domain**

The [rocks in Argentina](#) range in age from the [Precambrian](#) to the [Quaternary](#). The oldest rocks in Argentina are [Neoproterozoic](#) aged [ophiolites](#) related to the assembly of the supercontinent [Rodinia](#).

During the [Paleozoic](#) Argentina was part of the supercontinent [Gondwana](#). Ice ages occurred in the [Carboniferous](#) and [Early Permian](#) as evidenced by the glacial deposits of the [San Eduardo Group](#).

Offshore basins on the western side of what is now Argentina filled with marine sediments during the [Mesozoic](#). These deposits are now part of the Andean foothills. The breakup of Gondwana during the Mesozoic created numerous depositional basins in the western portion of Argentina, many of which have [great potential](#) for hydrocarbon resources.



**Figure 3 – [Adinotherium](#) skull at the [Museum für Naturkunde](#), Berlin**  
**Credit: [FunkMonk](#), [Creative Commons Attribution-Share Alike 3.0 Unported](#) license**

An interesting feature of Argentine geology is the abundance of interesting fossils. These fossils include [dinosaurs](#), [early Cenozoic vegetation](#), [trace insect fossils](#), [Cenozoic ungulates](#) such as [Adinotherium](#) above, and [Pleistocene megafauna](#), among many others.

## Resources

### *Agriculture*

[Argentina](#) is blessed with abundant fertile land. Consequently, [Argentine food production](#), both for domestic consumption and export, has been the most important part of their economy.

Table 1, below, summarizes Argentine agricultural production:

Rank	Commodity	Area harvested (thousand ha)	Quantity produced (thousand tonnes)	Percent of world's total
1	<a href="#">Soybeans</a>	16150	47600	22.0
2	<a href="#">Maize</a>	2790	21800	2.8
3	<a href="#">Sugar cane</a>	305	20480	1.3
4	<a href="#">Wheat</a>	5507	14550	2.4
5	<a href="#">Sunflower seed</a>	2410	3605	13.4
6	<a href="#">Sorghum</a>	590	3000	4.6
7	<a href="#">Grape</a>	219	2779	4.2
8	<a href="#">Potato</a>	83	2558	0.8
9	<a href="#">Lemon</a>	42	1504	11.5
10	<a href="#">Barley</a>	338	1268	1.0
11	<a href="#">Apples</a>	40	1220	1.9
12	<a href="#">Rice, paddy</a>	170	1060	0.2
13	<a href="#">Orange</a>	51	938	1.5
14	<a href="#">Yerba mate</a>	166	783	50.3
15	<a href="#">Onion</a>	30	735	1.2
16	<a href="#">Tomato</a>	20	687	0.5
17	<a href="#">Groundnuts</a>	212	575	1.7
18	<a href="#">Cotton</a>	393	550	0.8
19	<a href="#">Pear</a>	19	510	2.5
20	<a href="#">Mandarin</a>	36	432	1.6
21	<a href="#">Beans</a>	251	328	1.7
22	<a href="#">Squash</a>	20	325	4.1
23	<a href="#">Green tea (India)</a>	36	292	0.8
24	<a href="#">Sweet potato</a>	18	281	0.2
25	<a href="#">Grapefruit</a>	12	273	5.4
26	<a href="#">Peach</a>	29	272	1.6
27	<a href="#">Carrot</a>	11	268	1.0
28	<a href="#">Oat</a>	138	243	1.0
29	<a href="#">Tobacco</a>	83	161	2.5
30	<a href="#">Garlic</a>	14	136	0.9

Table 1 – 30 most cultivated commodities by harvested production (2006–2007)  
Credit: [Agriculture in Argentina](#)

You would have to be very unlucky to starve in Argentina, [although it does happen](#).

### *Forestry*

[Forests in Argentina](#) encompasses some 50.9 million hectares mostly in the [northern part of the country](#). [Most production](#), is used for lumber, with some used for charcoal and firewood. Lumber production goes into building products, furniture, tannin (from the [red quebracho](#)) as well as pulp and paper.

### *Mineral Resources*

The [mineral resources of Argentina](#) include a wide variety of metallic, industrial and energy resources. Here are few examples:

## *Metallic Minerals*

- From 2012 to 2018 [copper production in Argentina](#) declined from 136,000 tonnes to 17,400 tonnes. Copper production from the main mine, [the Alumbreira Mine](#) has been on the decline. Other potential producers, such as the [El Pachón](#), [Taca Taca](#), and [Agua Rica](#) mines, are still in the development stage..
- [Gold production in in 2020](#) was 58,800 kilograms (kg). Important gold producers include the [Veladero](#) and [Cerro Negro](#) mines.
- In 2020, [silver production in Argentina](#) totalled 768,000 tonnes. The main production came from the [San José](#), [Vanguardia](#), and [Pirquitas](#) mines.
- Argentina [Iron production in 2020](#) was 1,460,000 tonnes. [Iron mines in Argentina](#) include: [Buenos Aires](#), [Catamarca](#), [Chubut](#), [Cordoba](#), [Jujuy](#), [La Rioja](#), [Mendoza](#), [Misiones](#), [Neuquen](#), [Rio Negro](#), [Salta](#), and [San Juan](#).
- [Zinc production in 2020](#) in Argentina was 15,000,000 tonnes. The major producer is the [Aguilar Mine](#) which also produces lead and silver.
- Although there are no bauxite deposits in Argentina, the Argentine aluminum company, [Aluar Alumino Argentina](#) produces approximately [460,000 tonnes of aluminum per year](#).

## *Industrial Minerals*

- [Lithium production](#) during 2019 in Argentina totalled 34,278 tonnes. Lithium mines included the [Salar de Olaroz](#) and [Salar del Hombre Muerto](#) mines. Future projects include the [Cauchari-Olaroz](#) and [Salar del Rrincón](#) projects. Argentina plans to produce [200,000 tonnes of lithium by 2025](#). Lithium production in Argentina is from enriched brines.
- Boron is another industrial mineral produced from brines in Argentina. The main boron producers are the [Sijes and Tincalayu](#) mines. The [United States Geological Survey](#) (USGS) estimated that Argentine boron production in 2020 was 70,000 tonnes.
- An [important](#), and often overlooked, industrial mineral resource is sand and gravel used for building and road construction. The [USGS estimates](#) that sand and gravel production in Argentina during 2022 was 3,900,000 tonnes.

## *Energy Minerals*

- [Petroleum production in Argentina](#) during 2021 507.34 thousand Barrels Per Day. [Liquified petroleum gas production in 2014](#) was 39.34 thousand Barrels Per Day Figure 4 shows the locations of the major petroleum bearing regions.
- [Argentine coal production](#) was 21,850 tons (19 822 tonnes) in 2020. There is one coal mine in Argentina, the [Yacimientos Carboníferos Río Turbio](#) Mine.
- Uranium is currently not being produced in Argentina. The [Bluesky Uranium Corp.](#) has exploration projects underway.



Figure 4 – Map showing the hydrocarbon-producing basins of Argentina  
 Credit: [Figure 1 in Curia et al, 2018](#)

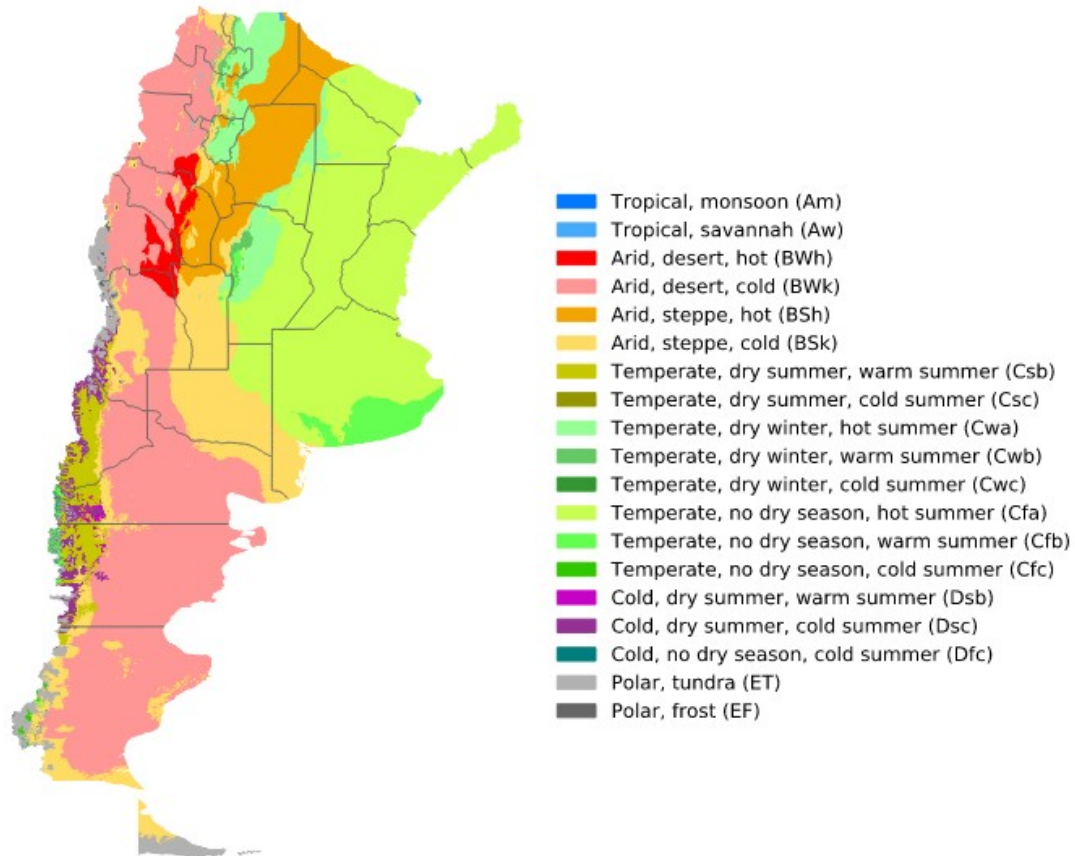
## Climate

[The Argentine climate](#) varies widely from temperate to polar. The climate is mostly pleasant and in much of the country, the nearby oceans moderate the climate.

The country north of Buenos Aires is generally temperate with varying hot, warm and cold winter and summer seasons. South of Buenos Aires, going into Patagonia, the climate is dry and becomes colder as you go further south.

If you want to, compare the climate zones in Figure 5 to the [Köppen–Geiger Climate](#) classifications.

Köppen-Geiger climate classification map for Argentina (1980–2016)



**Figure 5 – Köppen–Geiger Climate Classification Map for Argentina**  
**Credit: Beck et al, 2018, Creative Commons Attribution 4.0 International license**

## History

The [history of Argentina](#) begins with the [original inhabitants of the country](#) who lived primarily by hunting, gathering and limited agriculture. The first permanent European settlements of the country began in 1573, with a settlement organized by the Spaniard [Jerónimo Luis de Cabrera](#) and in 1580 with another settlement led by the Spaniard [Juan de Garay](#).

The Argentines secured independence from Spain in a [War of Independence](#) from 1810 to 1818. Following independence, the Argentines fell into a series of [internal civil wars](#) that were not resolved until 1862. A series of liberal, conservative, radical and military governments followed, culminating in the rise of [Juan Peron](#) as dictator in 1946. From 1946 until present various military dictatorships have changed places with democratic republics. At one point, in 1982, the military dictatorship attempted to shore up their unpopularity with a military adventure, namely the [“liberation” of the Falkland Islands](#), a.k.a the Malvinas. The ignominious defeat of Argentina at the hand of the United Kingdom led to the fall of that particular dictatorship and to the current series of democratic regimes.

## Geopolitics and Current Condition

In terms of [Halford John Mackinder](#)'s theory of [geopolitics](#), Argentina lies on the far outer reaches of the Outlying Islands, far from the [World Island of Eurasia](#). Consequently, her relations with rest of the world will be governed by the conditions of maritime trade. As an exporter of commodities, Argentina is at the mercy of world markets, and when those markets change, the people of Argentina suffer.

One of the consequences of this vulnerability to foreign markets shows up in the frequent financial crises, such as [the one Argentina is currently experiencing](#). A review of the [Economic History of Argentina](#) is worthwhile. From my, agreeably limited, understanding of the Argentine economy, there seems to a pattern:

- The demand for capital for development often exceeds local supply (based on savings). Also, foreign investors have often seen projects in Argentina as a good investment.
- Like almost every other country, there is always an unending demand for government funded services.
- When times are good, it is easy to raise money from foreign loans and/or investments.
- As surely as winter follows summer, markets change. However, the demands for money do not stop and the country continues to borrow, often with little rational expectation of re-paying the loans.
- Also, capital leaves the country as the foreign investors take their profits without necessarily re-investing them in the country; locals also get their money out if they can.
- Those with ability to make effective changes are often unwilling to take action since to do so would upset powerful internal and external actors e.g. investors and financial institutions.
- Debt defaults are almost certain, as is the suffering of those least able to endure the economic dislocations that result.
- The social unrest that results often leads to bloodshed, the overthrow of democratic governments by [military juntas](#), and other authoritarian responses that do not address the underlying structural weakness.

An interesting feature of the social upheavals in Argentina is the ideological framework that many people in the country use to respond to the problems. The liberal, educated, classes of Argentina have often adopted a [Marxist](#) analysis of their problems – with some justification since their problems are rooted in market conditions. Also, keep in mind that during much of the past 150 years, [Marxist thought has often been seen as progressive and beneficial](#), in spite of the many examples of [horrific behaviour](#) by [Marxist regimes](#). Marxism has many of the characteristics of a “[mind virus](#)”.

However, the conservative factions in Argentina, i.e. police, military officers, industrialists and landowners, see Marxists as the problem. This is easy to understand based upon the [history of Communism](#) and the activities of terrorist groups such as the pro-Marxist [Montoneros](#). When the military took power in the 1976, they pursued a [murderous suppression](#) of the people they deemed to be “the problem”.

Unfortunately for Argentina, neither [Marxist terrorism nor military death squads](#) could solve the underlying conditions that led to the economic problems. In fact, the responses probably made the situation worse.

The conundrum of the Argentine economy has inspired numerous speculations by pundits such as:

- [How Argentina went from one of the world's richest nations to 100 per cent inflation, with 'mountains of money worth nothing'](#);
- [Argentina's unprecedented economic boom-to-bust history](#); and
- [Argentina: A South American Power Struggles for Stability](#).
- [What's Wrong with Argentina?](#)

There are many more and I invite you, dear reader, to make up your own mind to answer the question: [Why Isn't Argentina Rich](#).

My own view is that economics is downstream of politics and politics, in turn, is downstream of culture. While there are many admirable features of [Argentine culture](#), some elements, primarily those espousing fashionable ideologies ([Corporatism](#), [Fascism](#), [Globalism](#), [Communism](#), [Neoliberalism](#)), have created a toxic politics that is unable to work around the many difficult structural economic problems that Argentina faces. Non-ideological approaches that concentrate upon improving people's lives might work, but human nature almost guarantees the corruption of such efforts. It is not like Argentina is somehow free of [corrupt practices](#). It can be very depressing to contemplate.

Still, all is not dark. Argentina's plight inspired the 1978 musical [Evita](#) and the subsequent in the [1996 Hollywood production](#), where the singer [Madonna](#) sang [Don't cry for me Argentina](#). Also, you really have to admire the Argentines for their [resilience](#) in the face of so much upheaval, and so much bad government. If all you need is good people, Argentina has them in abundance; so there is reason for optimism.

That's kind of it for our quick view of Argentina. It is only a brief view. There are many books on the [geology](#) and [history of Argentina](#); so, if the subject interests you, follow up with your own research on the matter.

### **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.