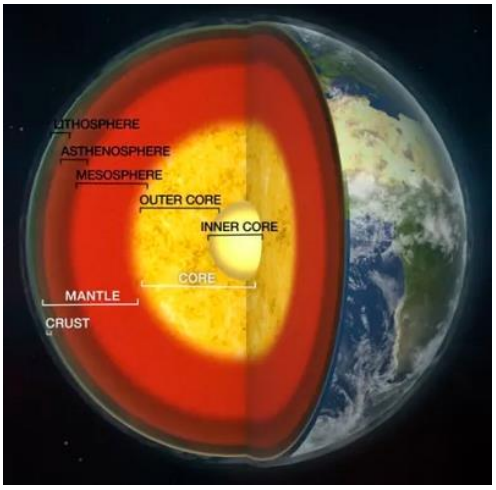
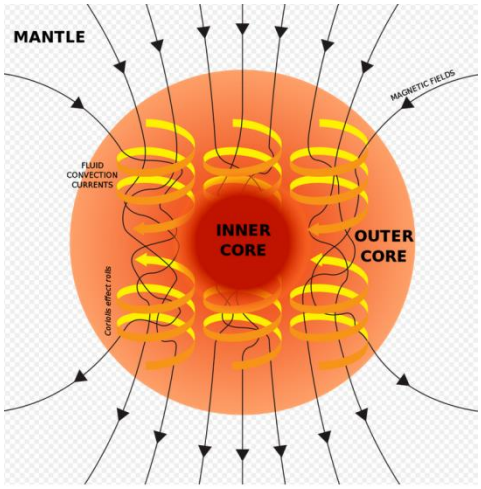
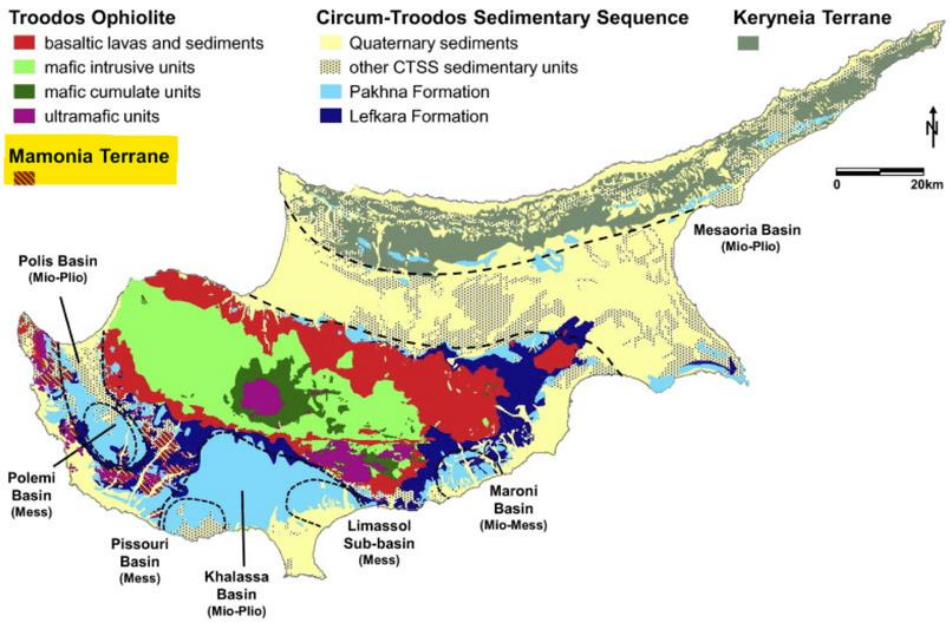
- **Earth's Inner Core Might Be Reversing** - The Earth's core is divided into two parts: the outer core, which is liquid and made up of molten iron and nickel; and the inner core, which is a solid ball of iron-nickel alloy. The inner core has a radius of about 1,220 km (760 mi), which is about 20% of Earth's radius. There are no samples of Earth's core accessible for direct measurement, as there are for Earth's mantle. Information about Earth's core mostly comes from analysis of seismic waves and Earth's magnetic field. The solid inner core rotates within the liquid outer core. In 2010, it was determined that the average magnetic field in the liquid outer core is about 40 times greater than the maximum strength at the surface. It is a known fact the Moon and Sun cause tides in the liquid outer core, just as they do on the oceans on the surface. It was observed that motion of the liquid through the local magnetic field creates electric currents that dissipate energy as heat. The magnetic field of the inner core is presumed to have a similar strength. Scientists at the Peking University measured changes in both the waveform and travel time of seismic waves from earthquakes that passed through the inner core since the 1960s. They discovered that "temporal changes in the waveform shape simultaneously and consistently disappeared" around 2009, suggesting that the inner core stopped rotating. However, they also observed a "slight but robust opposite trend" in waveforms, which suggests that the inner core might have begun reversing its rotation. The authors believe that this could be a part of a seventy-year cycle in which the core spins and reverses. This cycle coincides with the periodic fluctuations observed in Earth's magnetic field. The reversal also won't strongly affect Earth's magnetic field and is too small to result in the Earth's magnetic poles reversing. Earth's inner core may have reversed direction.





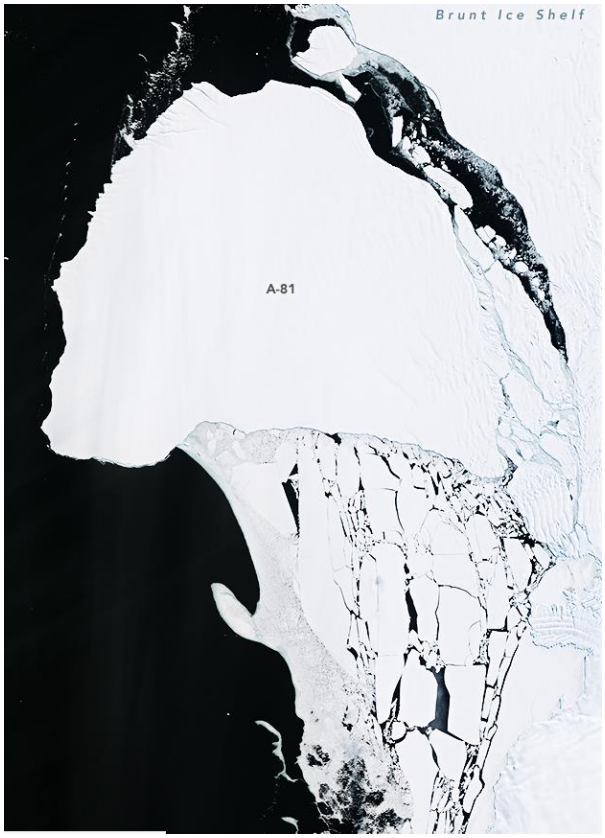
- **The British Geological Survey (BGS):** Established in 1835 the BGS is the oldest Geological Survey in the world. They have made available a series of articles called Discovering Geology which introduces a range of geoscience topics to learners of all ages. Explore these pages to discover the fascinating processes and properties that shape our dynamic planet.

- **The Mammonia Terrane** of Cyprus is a geological formation located in the Troodos Mountains of Cyprus. It is made up of a variety of rock types, including gabbros, diorites, and granites, and is thought to have formed during the Late Cretaceous period, around 90 million years ago. The Troodos Mountains are a result of tectonic activity that occurred during the late Oligocene and early Miocene. The complex was formed when the African plate collided with the Eurasian plate, resulting in the uplift of the Troodos Mountains. The collision caused the earth's crust to be thickened and caused the rocks to be intruded by magma. The magma solidified to form the Mammonia Complex. One of the most interesting features of the Mammonia Complex is the presence of a variety of rock types. Gabbros, which are dark-coloured and coarse-grained, make up the majority of the complex. These rocks are thought to have formed from the slow cooling of magma deep beneath the earth's surface. Diorites, which are medium-grained and also dark-coloured, are also present in the complex. These rocks are thought to have formed from the rapid cooling of magma at shallower depths. Granites, which are light-coloured and fine-grained, are also found in the complex. These rocks are thought to have formed from the slow cooling of magma at shallow depths, near the earth's surface. The Mammonia Complex is also known for its mineral wealth. The complex is rich in copper, which has been mined in the area for centuries. The Mammonia Complex also contains other minerals such as chromium and iron. The complex is considered a key area for studying the tectonic processes that formed the Troodos Mountains. The different rock types found in the complex provide insight into the cooling and solidification of magma at different depths and temperatures. The minerals found in the complex can also provide information about the chemical composition of the magma that formed the complex.



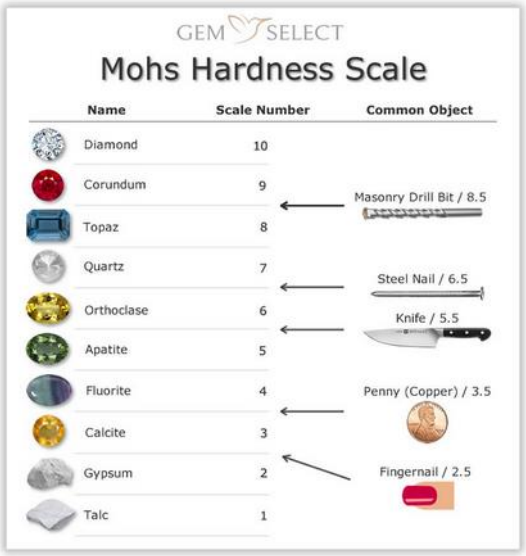
- **The Worlds Largest Meteorite** - The Hoba Meteorite of Namibia weighs 66 tons and is the largest meteorite ever found. It lies on a farm *Hoba West* in Namibia. Due to its weight, it has never been moved. It is the largest known meteorite (as a single piece) and the most massive naturally occurring piece of iron known on Earth's surface.

Antarctic Iceberg on the Move - On January 22, 2023, the British Antarctic Survey reported that a new iceberg had broken from Antarctica's Brunt Ice Shelf. Two days after the iceberg first broke off, NASA's Terra satellite acquired a wide view of the region. The image shows the iceberg drifting in the Weddell Sea. The berg, which named Iceberg A-81, measured about **1550 square kilometers** (600 square miles). The main berg is surrounded by smaller icebergs, sea ice, and a composite mix of ice types covered in snow called mélange (Ice-melange: mixture of sea ice types, icebergs, and snow without a clearly defined floe). Satellite images indicate that the front of the Brunt Ice Shelf is now more than 20 kilometers back from its position in early 1973. The British Antarctic Survey's (BAS) Halley Research Station, which was relocated farther inland in 2016, is now only 15 kilometers from the new front of the ice shelf but was unaffected by the recent break. Iceberg A-is now drifting southward with the clockwise motion of the Weddell Gyre. A previous berg that broke from the ice shelf in February 2021 now drift more than 500 kilometers away from Brunt Ice Shelf. A-81 Ice-Berg on the move.

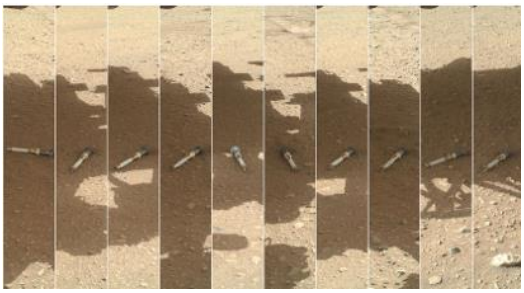


The Mohs Hardness Scale – is a test to help in the identification of minerals in the field. A mineral's hardness is its ability to resist scratches. The Mohs scale of mineral hardness is based on the ability of one natural sample of mineral of a known or defined hardness to scratch another mineral visibly. The scale was devised in 1812 by the German mineralogist Friedrich Mohs. If a sample can be scratched by Fluorite but not by Apatite you know it has a hardness between 4 and 5. The P3A Earth Science group has a Mohs Harness test kit. However, if you are in the field without the kit, there are commonly available alternatives as shown in the table on the right. So, if a sample can be scratched by a fingernail (lacquered?), it has a hardness of 2 or less. The Mohs Hardness Scale.

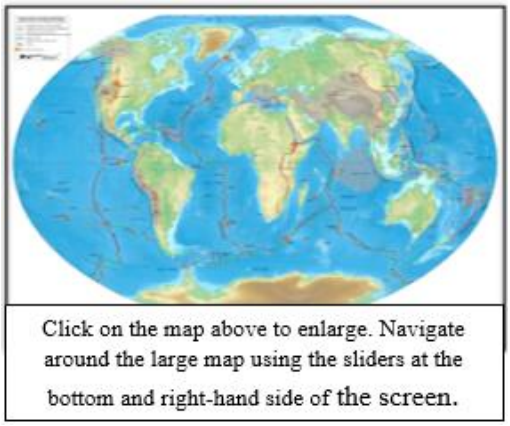
Mohs Hardness Scale Minerals	
Mineral	**Hardness**
Talc	1
Gypsum	2
Calcite	3
Fluorite	4
Apatite	5
Orthoclase	6
Quartz	7
Topaz	8
Corundum	9
Diamond	10

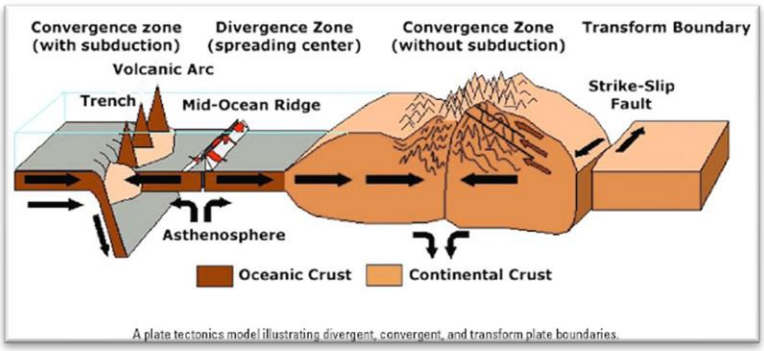


- **Mars Rock Samples** - On December 21st, 2022, a titanium tube containing a Mars rock sample, was dropped onto the surface of the planet by the NASA Perseverance Mars rover, ready for collection later. Over the next two months, the rover deposited a total of 10 tubes. The WATSON camera, located at the end of the rover's robotic arm, checked to be sure that the tube hadn't rolled into the path of the wheels. The sample container is the size of a stick of chalk The first sample to drop was a core of igneous rock informally named "Malay," which was collected on Jan. 31, 2022, in a region of Mars' Jezero Crater called "South Séítah." The rover currently has another 17 samples (including one atmospheric sample) stored internally. The plans to return the samples are extremely challenging and are shown in this short animation: Mars Sample Return. The 10 sample tubes dropped to the surface are a back-up to those samples stored in the Perseverance rover. A key objective for Perseverance's mission on Mars is astrobiology, including the search for signs of ancient microbial life. The rover will characterize the planet's geology and past climate by providing scientists with samples of Martian rock, atmosphere and regolith (broken rock and dust). Mars rock samples and system tests.



- **New map of tectonic plates boundaries** – The Earths tectonic plates have a relative movement ranging from zero to 10cm/yr. This new map shows in detail the tectonic plate boundaries with their movement vectors and selected hotspots. The Earth's rigid outermost shell is the lithosphere (the crust and upper mantle). This is broken into seven or eight major plates (depending on the 'plate' definition used) and many minor "platelets". The plate movement is the result of the convective circulation of Earth's heated interior. Where the plates meet, their relative motion determines the type of plate boundary: convergent, divergent, or transform. Typically, it is along these plate boundaries we find Earthquakes, volcanic activity, mountain-building and oceanic trench formation. The majority of the world's active volcanoes occur along plate boundaries, with the Pacific Plate's Ring of Fire being the most active and widely known today. Some volcanoes occur in the interiors of plates, and these have been variously attributed to internal plate deformation and to mantle plumes.

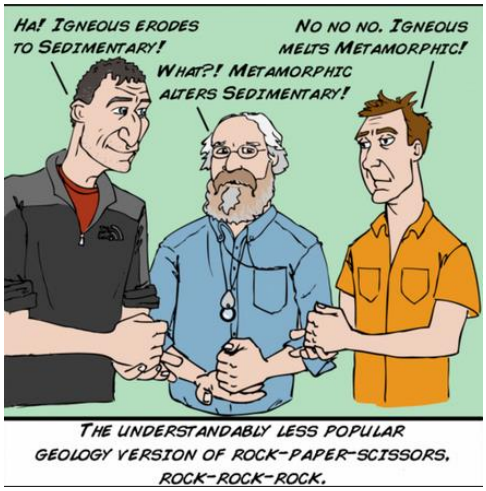




Quiz

- **The image below is what??** The answer is at the end of the ES eNews on page 6.

- Name That Geologic Interval ← **Click link (My result - 50% correct ☹)**
- How the Earth Works ← **Click link (Much better 😊)**
- General Science Fact or Fiction ← **Click link (Not too bad 😉)**



- A reminder that the ***P3A Earth Sciences Group*** website can be found **here**.
  Contact details can be found for the Group Leaders and copies of previously issued '**Geology Newsletters',** which preceded the current '**ES eNews'.** There is also a link to an Earth Science Glossary with terms that are more specifically related to Cyprus geology.

I asked ChatGPT 'Write a 500-word geology article on the Mammonia Complex of Cyprus'. The article it wrote had many geological terms associated with Cyprus but not necessarily related to the Mamonia Terrane. The article below is taken directly from the Cyprus 'Geological Survey Department'. More details can be found at: Mamonia Terrane.

The Mamonia Terrane

Extensive areas of the Paphos region are covered by a series of allochthonous rocks of Triassic to Upper Cretaceous age, that formed in areas south of Cyprus and were later emplaced to their present position, due to the collision of the African with Eurasian tectonic plates during the Maastrichtian, approximately 70 million years ago. This series of rocks, known as the Mamonia Complex, consists of sedimentary rocks such as sandstones, mudstones, siltstones, limestones and radiolarites, volcanic rocks (pillow lavas) and recrystallized limestones, as well as metamorphic rocks, which include amphibolites, phyllites, schist and marbles. The coloured grits, used by the mosaic's creators at Kourion and Paphos, are mainly derived from the variegated rocks of the Mamonia Complex.

The large number of landslides occurring in Paphos district, are observed within the sediments of the Mamonia Complex and the bentonitic clays of the Kannaviou Formation.

Answer to the picture quiz is below

The photograph is of the Tarim Basin in the Xinjiang region of western China. It typically receives little or no snow in winter. But after a storm in January 2023, the south western portion of the basin looked more like the snow-covered peaks that surround it.

The image shows a detailed view of snow-covered desert sand dunes near the Keriya River.

Acknowledgements