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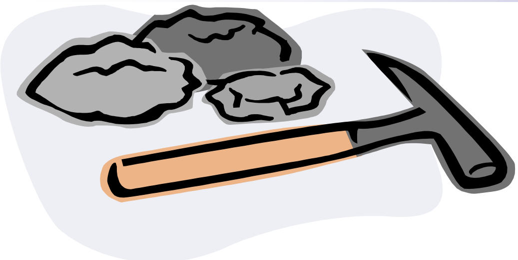
Page 1

P3A Geology Newsletter

Inside this issue:

It has been decided that future presentations will generally be focused more on Cyprus and its geology. There will still be subjects presented to broaden our general Geology knowledge (deserts, dams, fracking, mineralogy etc).

If you have any ideas regarding subjects that should be covered or you would like to present a particular subject, please send an email to (p3ageology@gmail.com).



- Anyone know any jokes about sodium deposits?
- Na

Paphos Third Age (P3A)

http://paphos3rdage.org/

Vienna Natural History Museum

At the beginning of June 2016, Gill and I made a spur of the moment trip to Vienna, flying direct from Paphos. The highlight for me, other than the Wiener Schnitzel and local micro-brewery was a trip to the Vienna Museum of Natural History. Gill's highlight of the museum visit was the café.

The museum is housed in a spectacular building and was opened to the public in 1889, from collections as far back as 1750. The museum is renown for its aesthetic and scientifically valuable minerals, ores, gemstones, rocks, rare fossils and the largest collection of meteorites in the world. There are 1,100 meteorites on display. As well as a display of impactites (including tectites) collected over a period of 500years.

The minerals are displayed in what I assume are the original display cases from the 1870's , in halls 1-5. Some of the samples are exceptional in their size and/or beauty. There is a giant Topaz weighing 117kg.

All objects are arranged in a systematic way (classified according to their chemical composition and crystal structure), in accordance with the Ramdohr-Strunz system. A minor drawback is that very little of the labelling is in English. Field trip???

Can animals help us predict earthquakes?

For many years animals have been used as 'sensors' - canaries detecting toxic gas and fish to detect water pollution are two examples. Evidence that animals can be used as 'intelligent sensors', to predict imminent earthquakes, continues to grow. In Peru's Yanachaga National Park, cameras captured changes in animal behaviour before the magnitude 7.0mag Contamana earthquake hit. 23 days before the earthquake the number of animal movements captured dropped from 15 to below 5. One week ahead of the event, it was down to zero. In July 2017 the ICARUS experimental equipment will be launched for installation on the International Space Station. This will track the movement of sensors fitted on many types of animals. The data will help in understanding the spread of diseases (zoonosis) and possibly earthquake prediction.

'Fossil' meteorite

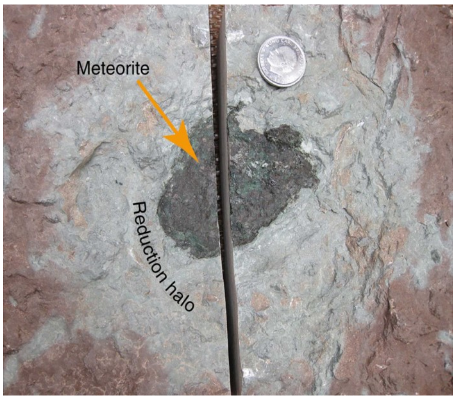
A totally new type of meteorite has been discovered in a Swedish limestone quarry, which produces floor tiles. The space rock is chemically different from any of the 50,000 meteorite samples held in collections around the world.

This unique meteorite has been named Österplana 65 (Ost 65).

By some means?? Scientists have determined that Ost 65 is the remnant of a huge collision in the asteroid belt (situated between Mars and Jupiter) 470 million years ago. This collision produced a large class of meteorites known as L Chondrites. This group make up 35% of all meteorites collected.

Ost 65 is possibly the first and only remnant of the 'other' asteroid body that smashed into the parent asteroid producing the L Chondrites meteorites.

Around 100 L Chondrite meteorites have been discovered in this Swedish quarry, which has been formed by sediments from the Ordovician age (488.3 MYA to 443.7 MYA). A time when north of the tropics was all ocean and most of the worlds land was in the southern hemisphere (Gondwana). A period when the trilobites flourished. Scientist determined that the L Chondrites



and Ost 65 had been exposed to space radiation for the same period of time. Concluding they are a product of the same cosmic collision.

How Old Is the Ocean Floor?

The Earth is around 4.5 billion years old. Oceans and hence ocean floors, cover 72% of the earths surface. The distribution is not even, with 80% of our oceans in the southern hemisphere.

The distinction between the oceanic crust and the continental crust is not just that one is covered by water. The oceanic crust is physically and chemically different to the continental crust. Oceanic crustal rocks, which make up the sea floor, consists of minerals collectively called basalt that have a dark colour. Most continental rocks are of general type called granite, which has a different mineral composition than basalt and is generally lighter in colour. Ocean crust is denser than continental crust, though both are less dense than the underlying mantle, upon which they 'float'. Fundamentally, the oceans are formed because the denser material sinks lower than the lighter continental crust material. Generally, the oldest oceanic crust is less than 200 million years old, quite young by geological standards. The sea floor is in a perpetual cycle of creation and destruction. As the plates split apart, magma rises from below the Earth's surface to fill in the empty void. The magma hardens and crystallizes as it latches onto the moving plate and continues to cool over millions of years as it moves farther away from the divergent boundary. Hence, the reason that oceanic rocks are considered 'young'. However, in 2007 a piece of oceanic crust found in Greenland was dated by scientists to be around 3.8 billion years old. The oceanic rock was identified as ophiolites. Continental rocks, on the other hand, can be as old as 3.8 to 4.4 billion years.

Following WWII extensive, detailed sonar and ship-borne magnetometer surveys identified the existence of a series of mid oceanic ridges and trenches around the world. Studies found that there's a great deal of geological activity around these features. Earthquakes are clustered at the ridges, for example, and volcanos are especially common near trenches. Beginning in 1968, a deep-sea drilling ship, the *Glomar Challenger*, obtained samples of the actual sea floor rock. It was found the further the rocks were, from the ridge crest, the older they were. It was also discovered that bands of rock had alternating normal and reversed magnetism, parallel to the ridges. These discoveries greatly assisted in the understanding of plate tectonics, that the surface of the earth is broken up into a number of plates. These plates, composed of the crust and the top parts of the mantle, make up the lithosphere. As new lithosphere is created at the mid oceanic ridges, old lithosphere is destroyed by subduction at the trenches.

Basic Rock Types—Igneous, Sedimentary and Metamorphic– an introduction.

to be continued in more detail

Over the next few issues of the newsletter, we will examine the different rock types:

* **Igneous** (formed by cooling and solidification of magma or lava)
* **Sedimentary** (formed through the deposition and solidification of sediment, especially rivers/ lakes/oceans, ice and wind)
* **Metamorphic** (has been changed by extreme heat and pressure)

A rock can be an aggregate of minerals or non-minerals (under some classifications coal is a non-mineral) and therefore does not have a specific chemical composition.

Some revision before we examine 'Basic Rock Types'. A mineral is:

1. Naturally occurring (formed by Geological processes)
2. Stable at room temperature
3. Represented by a chemical formula
4. Usually abiogenic (not resulting from the activity of living organisms)
5. Ordered in its atomic arrangement

The first three general characteristics are less debated than the last two.

Example of a Mineral

* **Natrolite** is a tectosilicate **mineral**.

* Occurs naturally

* Stable at room temperature.

* Chemical formula: $Na_2Al_2Si_3O_{10} \cdot 2H_2O$

* Abiogenic

* Crystalline structure

There are over 5,300 mineral species.

At a granular level, rocks are composed of grains of minerals. The types and amount of the various minerals in a rock are determined by the way the rock was formed. Many rocks contain silica (SiO_2); a compound of silicon and oxygen, that forms 74.3% of the Earth's crust.

Granite (igneous **rock**)
containing a 'mixture of potassium feldspar, plagioclase feldspar, quartz, and biotite and/or amphibole. No single chemical formula.

Rocks are geologically classified according to characteristics such as mineral and chemical composition, permeability, the texture of the constituent particles, and particle size. These physical properties are the end result of the processes that formed the rocks. Over the course of time, rocks can transform from one type into another, as described by the geological model called the rock cycle. These events produce three general classes of rock: igneous, sedimentary, and metamorphic.

The three classes of rocks are subdivided into many groups. However, there are no hard and fast boundaries between groups of similar rocks—that would be too easy. As the proportions of their constituent minerals increase or decrease in a rock, the rock type gradually 'merges' into another rock group.

Geobiology

Geobiology is a term used to describe the relationship between organisms and the Earth. The term was coined by Lourens Baas Becking in 1934. Geobiologists study the role of life in shaping the chemical and physical characteristics of the Earth and, conversely, the environmental forces that have shaped the evolution and function of life. Geobiology explores the concept of life as a geological agent and examines the interaction between biology and the earth system during the roughly 4 billion years since life appeared.

Glossary & General

Acknowledgements

- BBC News
- Geology.com
- Wikipedia
- British Geological Society
- Reference.com
- Science Focus
- National Geographic

If you have any suggestions for future P3A Geology Newsletter articles or would like to contribute a short article, please contact me via p3ageology@gmail.com.

I will be happy to help in the production of newsletter articles or creation of Power Point presentations.

Glossary: *To continue in the next issue*

M

Magnitude — A measure of the strength of an earthquake. There are several scales depending on which part of the seismogram is examined. These include Richter local magnitude (ML), Body wave magnitude (mb) and surface wave magnitude (Ms). Moment magnitude (Mw) is calculated from spectral analysis.

Maine transgressions — Advances of the sea over the land

Mantle — Inside the earth, the layer below the earth's crust but above the core.

Marine regressions — Retreats of the sea over the land.

Massive limestones — Limestones that are made of thick layers (called beds) of rock. In Britain, the Carboniferous Limestone is the best examples. Other limestones such as the Cretaceous chalk and Jurassic limestones of Central England are made of thin beds and can not described as massive.

Mesozoic — An era in which the Triassic, Jurassic and Cretaceous periods are grouped (65 to 248 million years ago).

Metamorphic rock — A 'changed rock', altered by heat and or pressure so that mineral grains are preferentially orientated or new types of crystals begin to grow.

Metamorphism — When a pre-existing rock is chemically or physically altered by heat, pressure or chemically active fluids.

Microseism — A motion in the Earth that is unrelated to an earthquake. It is caused by a variety of natural and artificial agents, for example wave action, wind, traffic and industrial noise.

Mogote — Like a hum, but in tropical areas. It is a residual hill sticking up through the sediment as a result of karstic processes.

Moraine — The material eroded by a glacier and carried along by the ice, before being dumped when the glaciers retreat. Till is one type of moraine. Erratics originated as moraine.

MSK — MSK intensity is the intensity scale used in Europe before the introduction of the EMS scale. It is a 12-grade scale ranging from not felt to complete devastation.

Mudstone — Muds and silts that have been compressed to form a hard, fine-grained rock.