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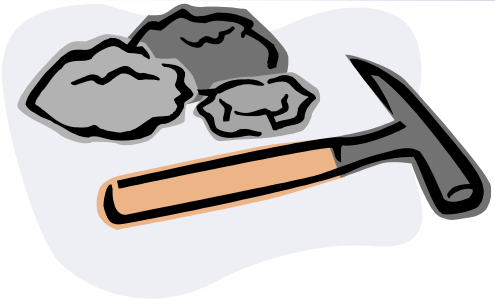
P3A Geology Newsletter



"Time is nature's way of making sure everything doesn't happen at once." - anonymous

Paphos Third Age (P3A)

http://paphos3rdage.org/

Inside this issue:

2015—A Great Year for Field Trips

We have had a number of great field trips this year, thanks to the efforts of our members. More recently, we were very pleased to have Dr Zomenia Zomeni, Head of General Geology, GIS and Cartography, from the Cyprus Geological Survey Department in Nicosia, to lead us on a field trip. There were 8 stops where we examined amongst other subjects, the Mammonia Complex, evaporate deposits of gypsum, the Pakhna Formation, pillow lavas, sediments of the Agios Fotios Group (part of the Episkopi formation) and the final stop at Petra tou Romiou. Full details of the trip can be found in the P3A online magazine *AdLib*.

In November we had a trip high into the Troodos mountains. 31 members travelled to *Teichia tis Madaris*, the second highest peak in the Troodos, to examine the *Sheeted Dykes.* As luck would have it, we bumped into Prof. Tony Morris with two other members of staff from Plymouth University, plus 4th year Msc students. Prof. Morris was good enough to give us a short but fascinating talk on the sheeted dykes. The group then moved on to the *Geopark Visitor Centre*, based in the old asbestos mine school building. This was followed by a visit to the Botanical Gardens, a separate facility but still in the old Asbestos mine complex. Our last stop was to inspect the '*Mohorovicic Discontinuity'.* Normally located 5 to 10 kilometres below the *ocean floor* and up-to 90 kilometres beneath typical *continents*. Here we were able to examine it at one of the rare surface exposures.

Mount Etna's Voragine crater erupts

For the first time in 2 years Mount Etna's Voragine crater has erupted. A giant plume of smoke and ash mark the eruption with spectacular displays of volcanic lightning, a poorly understood phenomenon common in many powerful eruptions. Etna is the tallest active volcano in Europe standing 3329m high. It is estimated that the volcano has been active for around 2.5m years. In recent years the towns and villages have been protected from lava by surrounding ditches and concrete dams. Volcanic activity in the region is driven by the collision of the African tectonic plate with the Eurasian plate. Magma from molten rock erupts as lava and ash and builds the volcano in the process.

Bid to drill deep inside Earth

In December 2015 Scientists will commence drilling in the Indian Ocean in an area known as the Atlantis Bank. The objective is the drill through the ocean floor to try to get below the Earth's crust for the first time. If successful they will sample the rock from the Earths mantle. The drill ship Jiodes Resolution will be operating in 700m of water.

Whereas the continental crust can be 25 to 70km thick, the average thickness of the oceanic crust is 7-10km. Due to faulting and erosion, the crust in the area targeted has been thinned to between 5 and 5.5 km thick..

It will still take a number of years to complete the drilling—if all goes well, with an expected completion some time in 2020.

The scientists hope to obtain samples of unaltered Peridotite, a rock rich in olivine minerals. Due to the thickness of the mantle this material makes up the bulk of the planets interior.

The drilling will also confirm or otherwise the existing models of the construction of the crust.

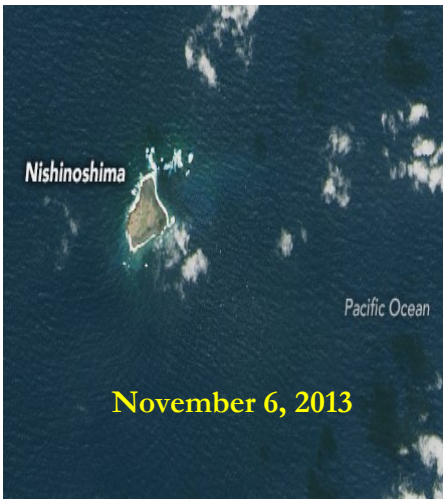
Of particular interest will be the Moho boundary. The discontinuity where the speed of seismic waves change abruptly. The Moho is the demarcation line between the igneous surface rocks such as granite, basalts and gabbros and the periodites of the earth's interior.

The scientists also hoping to determine to what depth water may have penetrated into the peridotites to produce serpentinite.

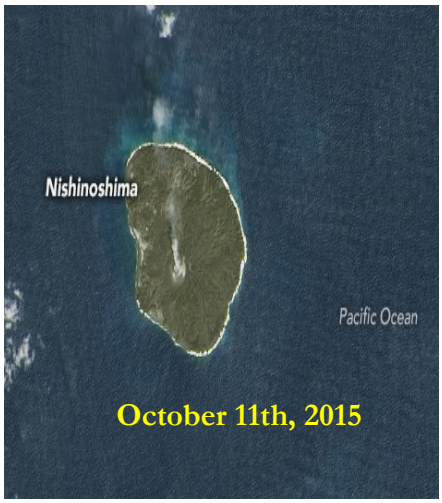
Typical peridotite sample (dunite, left) and large peridot crystal (right)


Serpentinite is made from mantle rock altered by water seeping through cracks in the seafloor

New Volcanic Island Swallows Nishinoshima



In just 2 years a new volcanic island, that rose out of the water 500m from the island of Nishinoshima, has swallowed its neighbour. The resulting island is 12 times larger than the original island. Nishinoshima is part of the Ogasawara Islands, 1,000kl south of Tokyo. Click here to go to th website then click on the VIEW IMAGE COMPARISON box below the separate images of the island—move the slider side-to-side



Physical Properties of Minerals continued—S.G. & Density

S.G and **Density** can be very useful tools to distinguish some minerals, when access to laboratory or optical techniques is not readily available.

Density is the mass of an object divided by its volume.

Density=Mass/Volume

A reasonably accurate measurement of mineral density can be made using simple implements. Click here to see a Youtube video of the technique.

Specific Gravity, or SG, is a measurement that determines the density of minerals. Two minerals may have the same volume (size), but their weight may be very different. The specific gravity of a mineral determines how heavy it is by its relative weight to water. The specific gravity value is expressed upon how much greater the weight of the mineral is to an equal amount of water. Water has a specific gravity of 1.0 at given conditions. If a mineral has a specific gravity of 2.7, it is 2.7 times heavier than water. Minerals with a specific gravity under 2 are considered light, between 2 and 4.5 average, and greater than 4.5 heavy. The Earth's crust is composed mostly of the minerals quartz, calcite and feldspar. These minerals have SG's around 2.75 and that is close to the average SG of the rocks on the outer surface of the Earth's crust. Non-metallic minerals tend to be of a lower density than metallic minerals, as would be expected. Generally, S.G. scales are split into non-metallic and metallic. The specific gravity may slightly vary within a mineral because of impurities present in the minerals structure.

This brings to an end the series of articles on *Physical Properties of Minerals*. We have covered: Mohs Hardness, Cleavage, Luster, Streak, Colour, Crystal Habit and S.G. & Density.

You can review the previous articles in the P3A Geology Newsletter or visit here.

Unscientific scale used for SG comparisons of crustal **non-metallic** minerals

- **1 -- 2 . . . . . very light**
- **2 -- 2.5 .. . . light**
- **2.5 -- 3 . . . average**
- **3 -- 3.5 .. . . slightly above average**
- **3.5 -- 4 . . . above average**
- **4 -- 5 . . . . . heavy**
- **5 -- 7 . . . . . very heavy**
- **7 -- 10 . . . . extremely heavy**
- **10+ . . . . beyond being extremely heavy**

Unscientific scale used for SG comparisons of crustal **metallic** minerals

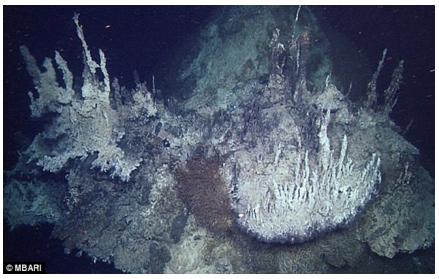
- **1 -- 3 . . . . . very light**
- **3 -- 4 . . . . . light**
- **4 -- 5 . . . . . average**
- **5 -- 6 . . . . . slightly above average**
- **6 -- 7 . . . . . above average**
- **7 -- 10 . . . . heavy**
- **10--20 . . . . very heavy even for metallic minerals**
- **20+ . . . . . must be platinum**

Shazam for Earthquakes

Detecting 'micro-quakes' could help identify the location of potentially much larger damaging earthquakes. Scientists have been inspired to develop an algorithm similar to that used by a music recognition 'app' called *Shazam*. The new algorithm is called Fingerprint And Similarity Thresholding (FAST). The software rifles through the continuous signals recorded by seismometers around the world, and splits the data in short segments of a few second each and recorded as 'fingerprints' which are easier to process by pattern recognition.

Astonishing undersea world found

An astonishing undersea world has been found 3,800m deep in the Pacific. These are the deepest high temperature, hydrothermal vents ever discovered in the Pacific and are approx. 150 kl, east of La Paz, Mexico. The new vent field extends for almost 400m along a fault line. They are the only vents in the Pacific known to emit superheated fluids rich in both carbonate minerals and hydrocarbons. Some of the vent chimneys are as much as 12m tall. Other hydrothermal vents found in the Pacific are made from a dark Sulphide based mineral, whereas these carbonate rich chimneys are light coloured. They are only the second vents of this type found anywhere in the world. Many of the hydrothermal chimneys in the Pescadero Basin were covered with dense colonies of Oasisia tubeworms.



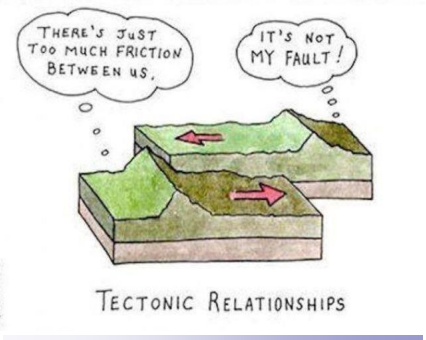
Acknowledgements

* Geology.com
* Wikipedia
* P3A AdLib Magazine
* BBC Science & Environment
* About Education—Geology
* Mail Online
* Members—Anneke & Keith
* Sandatlas

Riddle of Red Sea Cannon sounds solved

Mysterious booming sounds have been heard around Abu Dabbab, Egypt for many years.

Seismic tomography found a 540 million-year-old, 10 km thick dome-like structure of rigid igneous rock formed above an active fault which broadcasts the rumbles of the fault plates without distortion to the surface, much like an acoustic speaker.



TECTONIC RELATIONSHIPS

If you have any suggestions for future Newsletter articles, please let me know. *Ken Jones*

Glossary: *To continue in the next issue*

J

Joints — Fissures in rocks, often at right angles to each other and the bedding planes, formed as a result of deformation.

Jurassic — The period of time between 142 and 205 million years ago.

K

Karren — Small hollows on the surface of limestones (e.g. limestone pavements) caused by solution during chemical weathering.

Karst — The term given to a distinctive landscape created by the solution and erosion of a soluble rock such as limestone. Water is an essential ingredient in the formation of the characteristic topographical features (dolines, caves, dry valleys, etc).

Kufeng — Towers similar to fenglin, but isolated from the other towers by a flat plain.

L

Latitude — Circles drawn around the Earth parallel to the equator; their diameters diminish as they approach the poles. These parallels have an angle provided from the angle from the equator i.e. 0 degrees at the equator and 90 degrees at the poles.

Lava — Molten magma that extrudes onto the Earth's surface as a result of a volcanic eruption. The lava solidifies quickly to form a hard, very fine grained rock. Gases within the magma may form large voids, sometimes filled with minerals and crystals.

Lead_ore — A rock sufficiently rich in lead that it is mined.

Limestone — A hard sedimentary rock that is composed of over 50% carbonate minerals. A true limestone is over 90% calcite, but there are often other carbonates (including dolomite) and impurities in the form of sand grains, clay minerals, etc. Limestone is laid down in layers or 'beds' separated by 'bedding planes' and divided up into blocks by a series of joints (fissures created during the rock formation process) at approximately, right angles to each other.

Limestone pavement — A flat expanse of exposed limestone formed by a combination of erosion and chemical weathering.

Love wave — A major type of surface wave having a horizontal motion that is shear or transverse to the direction of propagation. It is named after A.E.H. Love, the English mathematician who discovered it.