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P3A Geology Newsletter

"Geology gave us the immensity of time and taught us how little of it our own species has occupied." — Stephen Jay Gould,

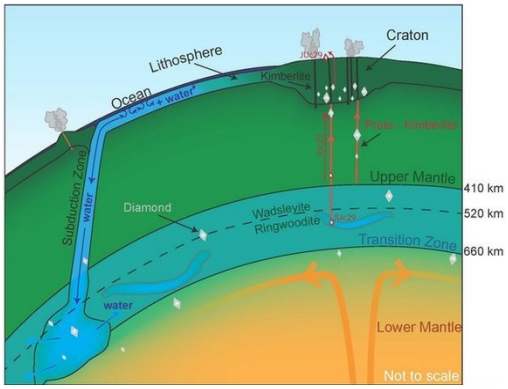
Paphos Third Age (P3A)

http://paphos3rdage.org/

Inside this issue:

Bright Blue Mineral hints at water deep in the Earth

Minerals preserved in diamond have revealed bright blue rocks that exist deep within the Earth.
They also provide the first direct evidence that there may be as much water trapped in those rocks as there is in all the oceans.
The diamond, from central-west Brazil, contains minerals that formed as deep as 600km down and that have significant amounts of water trapped within them.
The study suggests water may be stored deep in the interiors of many rocky planets. Diamonds, brought to the Earth's surface in violent eruptions of deep volcanic rocks called Kimberlite, provide a tantalising window into the deep Earth. They noticed that it contained a mineral, Ringwoodite, that is only thought to form between 410km and 660km beneath the Earth's surface, showing just how deep some diamonds originate. While Ringwoodite has previously been found in meteorites, this is the first time a terrestrial Ringwoodite has been seen. But more extraordinarily, the researchers found that the mineral contains about 1% water.
This is the first physical evidence that water can be stored in the deep interiors of planets and solves a 25-year-old controversy about whether the deep Earth is dry, wet, or wet in patches.



Crystal is 'oldest scrap of Earth crust'

Zircons are tough pieces of old rock incorporated into newer material
A tiny 4.4-billion-year-old crystal has been confirmed as the oldest fragment of Earth's crust.
The zircon was found in sandstone in the Jack Hills region of Western Australia.
Scientists dated the crystal by studying its uranium and lead atoms. The former decays into the latter very slowly over time and can be used like a clock.

Chile's stunning fossil whale graveyard

It is one of the most astonishing fossil discoveries of recent years - a graveyard of whales found beside the Pan-American Highway in Chile.
And now scientists think they can explain how so many of the animals came to be preserved in one location more than five million years ago.
The evidence strongly suggests the whales all ingested toxic algae.
It was well known that this area in Chile's **Atacama Desert** preserved whale fossils. 40 individual Rorquals - the type of large cetacean that includes the modern blue, fin and minke whales have been found.
Chile's Fossil Graveyard

Geology field trip 4th February

14 intrepid would be Geologists rendezvoused at 10.00am on Tuesday 4th February in Letymbou.
Of course all the chit chat was about the earthquake the previous evening and we were all devastated to learn from Keith that the seismograph had been offline.
Undeterred we doubled up in vehicles and set off for the field of Gypsum rosettes (similar to Fig 41 page 85 in Greensmith or Fig 6.12d page 165 in Edwards et Al) These were an impressive sight.
We then doubled back to collect the other cars and drove on to Armargeti via Lemona with interesting brecciated gypsum and Marmara along the way.

Once again we parked up and took a few cars down to Ambelia to view the Gypsum dome formation.
Back yet again to collect the other cars and on to Eledio with excellent examples of swallowtail Gypsum. (Fig 6.12a Page 164 and 6.12 page 172 Edwards et al)
Then we took a very short drive down the hill to examine an expanse of Marmara. (Fig 6.12c Page 165, Fig 6.13 page 168, stop 6.13 page 169 Edwards et al.)
Lastly back to The Spring of Life in Armargeti for refreshments including an excellent mini meze which included chips with cheese as well as a delicious orange chicken.

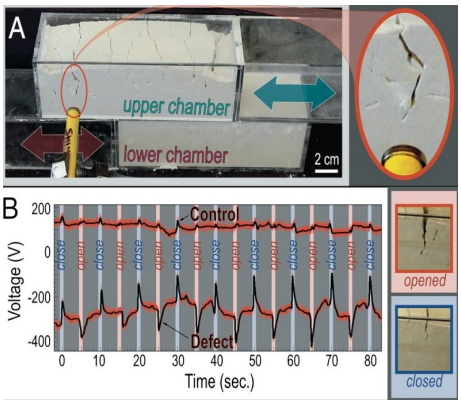
Bibliography

Classic Geology in Europe 7: Cyprus by Edwards S et al Terra Publishing 2010
ISBN 13:978-1-903544-15-0
Southern Cyprus Geologists Association Guide No.50 by Greensmith T. 1998 ISBN 0-900717-67-X.

Article By: Adrian & Terri Curtis,
Group photo: Roger Kent

Clue to earthquake lightning mystery

Mysterious lightning flashes that appear to precede earthquakes could be sparked by movements in the ground below. On 17 January 1995, there were 23 reported sightings in Kobe, Japan, of a white, blue, or orange light extending some 200 meters in the air and spreading 1 to 8 kilometres across the ground.
Unidentified glowing objects were spotted moments before major quakes in China and Italy recently.



These flickers could be triggered by shifting soil layers which generate huge electrical charge, say scientists.
Using a tub of plain kitchen flour, they discovered an entirely new physical phenomenon.
"Our first suspicion was this has got to be a mistake. There must be something stupid we are doing," said Professor Troy Shinbrot, of Rutgers University, New Jersey.
"We took a Tupperware container filled with flour, tipped it back and forth until cracks appeared, and it produced 200 volts of charge.
"There isn't a mechanism I know that can explain this. It seems to be new physics. "
Repeat experiments with other granular materials produced the same voltage phenomenon.
If it occurs along geological fault-lines, sliding and cracking of soil grains could be generating millions of volts of electrostatic charge.
This in turn could seed lightning in the air above - creating a natural "early-warning system" for impending earthquakes.
Earthquake lightning

Geologic time scale

The **geologic time scale** (**GTS**) is a system of chronological measurement that relates stratigraphy to time and is used to describe the timing and relationships between events that have occurred throughout Earth's history. Different spans of time on the GTS are usually delimited by changes in the composition of strata which correspond to them, indicating major geological or paleontological events, such as mass extinctions. For example, the boundary between the Cretaceous period and the Paleogene period is defined by the Cretaceous–Paleogene extinction event, which marked the demise of the dinosaurs.

The largest defined unit of time is the **supereon**, composed of **eons**. Eons are divided into **eras**, which are in turn divided into **periods**, **epochs** and **ages**. The terms eonothem, erathem, system, series, and stage are used to refer to the layers of rock that correspond to these periods of geologic time in earth's history.

Geologists qualify these units as Early, Mid, and Late when referring to time, and Lower, Middle, and Upper when referring to the corresponding rocks.

The identification of strata by the fossils they contained, enabled geologists to divide Earth history more precisely. It also enabled them to correlate strata across national (or even continental) boundaries. If two strata (however distant in space or different in composition) contained the same fossils, chances were good that they had been laid down at the same time.

Detailed studies between 1820 and 1850 of the strata and fossils of Europe produced the sequence of geological periods still used today. The process was dominated by British geologists, and the names of the periods reflect that dominance. The "Cambrian", (the classical name for Wales) and the "Ordovician", and "Silurian", named after ancient Welsh tribes, were periods defined using stratigraphic sequences from Wales. The "Devonian" was named for the English county of Devon, and the name "Carboniferous" was simply an adaptation of "the Coal Measures", the old British geologists' term for the same set of strata. The "Permian" was named after Perm, Russia, because it was defined using strata in that region by Scottish geologist Roderick Murchison. However, some periods were defined by geologists from other countries. The "Triassic" was named in 1834 by a German geologist Friedrich Von Alberti from the three distinct layers (Latin *trias* meaning triad). The "Jurassic" was named by a French geologist Alexandre Brogniart for the extensive marine limestone exposures of the Jura Mountains. The "Cretaceous" (from Latin *creta* meaning 'chalk') as a separate period was first defined by Belgian geologist Jean d'Omalius d'Halloy in 1822, using strata in the Paris basin and named for the extensive beds of chalk (calcium carbonate deposited by the shells of marine invertebrates).

Camels	**C**ambrian
Often	**O**rdovician
Sit	**S**ilurian
Down	**D**evonian
Carefully	**C**arboniferous
Perhaps	**P**ermian
Their	**T**riassic
Joints	**J**urassic
Creak	**C**retaceous

Wastewater Injection Triggered Earthquake Cascade

A US Geological Survey report indicates that a 2011 Oklahoma earthquake of M5.0, produced by injection of waste water, may have triggered the larger M5.7 earthquake less than a day later. "The observation that a human-induced earthquake can trigger a cascade of earthquakes, including a larger one, has important implications for reducing the seismic risk from wastewater injection," said a USGS seismologist. The research suggests that the foreshock, by increasing stresses where M5.7 main shock ruptured, may have triggered the main shock, which in turn, triggered thousands of aftershocks along the Wilzetta fault system. All earthquakes of magnitude 5.0 and greater along the Wilzetta fault exhibited strike-slip motion at three independent locations along the fault, suggesting that three separate portions of the Wilzetta fault system were activated.

Physical Properties of Minerals continued — Streak

The **streak** (also called "powder colour") of a mineral is the colour of the powder produced when it is dragged across an un-weathered surface. This trail's color generally is much more consistent than that of its parent mineral and therefore is an important mineral identification tool. If no streak appears, then the mineral's streak is said to be white or colourless.

The apparent colour of a mineral can greatly vary because of trace impurities or a disturbed macroscopic crystal structure. Dragging the specimen to produce a streak results in randomly oriented microscopic crystals, reducing the small impurities colour effect.

The surface, over which the mineral is dragged, is called a "streak plate" and generally is made from unglazed porcelain tile. The back of a glazed tile can be used.

Because the trail left behind results from the mineral being crushed into powder, a streak can only be made of minerals softer than the streak plate, around 7 on the Mohs scale of mineral hardness. The color of harder minerals' powder can be determined by filing or crushing with a hammer a small sample, which is then usually rubbed on a streak plate. Most harder minerals have an unhelpful white streak.

Such minerals as cinnabar and lazurite leave a streak that resembles their natural colour. Other minerals leave surprising colours: fluorite always has a white streak and can appear in purple, blue, yellow, or green crystals. Hematite, leaves a red streak that accounts for its name, which comes from the Greek word "haima," meaning "blood."

Acknowlegments:

- BBC Science & Environment
- US Geological Survey
- Wikipedia
- British Geological Survey

Glossary: To continue in the next issue

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Fault — A fracture in the rock along which movement takes place.

Fengcong — A Chinese form of tower karst. Hills or towers are joined at their base and have deep depressions between.

Fenglin — Similar to Fengcong, but the towers are not joined at the base, but have valleys around.

Flint — A rock composed of the cryptocrystalline form of silica. In Britain it is often associated with Chalk.

Floodplain mires — Developed on waterlogged, periodically inundated river and stream floodplains and on coastal plains behind beach barriers and salt marsh. Often very extensive and include one or more buried peat sequences.

Foraminifera — Single-celled organisms (Protists) with a hard shell. Minute single celled 'armoured amoeba' (Protoctista) that secrete a calcareous shell and live in the sea.

Fossil — Originally meaning anything dug from the ground, the term fossil is now restricted to naturally preserved evidence of an ancient organism. These include preserved parts of the original organism (such as bones, skin, hair, shell, teeth, leaves, bark, pollen), an imprint of a body part (such as the hollow left by a dissolved shell, or a footprint), or some other trace (such as mineralised dung, worm-casts or burrows).

Fossil fuels — A stored energy source, originally of organic (living) origin, that can be used as a fuel; includes coal, oil, natural gas, and peat.

Fringing reef — A coral structure that is built up along the coast of an island or land mass.