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P3A Geology Newsletter

"There is no thrill like the thrill of discovery.."

C.B. Glasscock

Paphos Third Age (P3A)

http://paphos3rdage.org/

Inside this issue:

Northern Lion Suspends Exploration Activities, Republic of Cyprus

News Release. Wed Oct 15, 2014 Vancouver, British Columbia: Northern Lion Gold Corp. (the "Company") announces that it has received notice from its joint venture partner, Centerra Gold (KB) Inc., a subsidiary of Centerra Gold Inc. (collectively "Centerra"), that Centerra is terminating the previously announced option agreement (reported April 4, 2013). Pursuant to the option agreement, Centerra had an option to earn up to 70% interest in a number of the Company's exploration permits located in the Larnaca and Paphos Districts of the Republic of Cyprus by paying US$100,000 (paid) and incurring an aggregate of US$6,000,000 in exploration expenditures.

Centerra completed a drill program (reported January 22, 2014), surface exploration program (reported June 21, 2014), follow-up drill program (reported July 7, 2014) and advised the Company of its termination of the option agreement. Centerra commented: *"Unfortunately, after some promising results last year, the drilling this year failed to provide any further encouragement and, as the majority of the targets of interest to us have now been tested, we have made the decision to terminate the Option Agreement."*

Sandstone shapes 'forged by gravity'

Geologists have discovered the secret that gives dramatic natural sandstone monuments their shape: gravity.

By studying cubes of sand in the lab, they showed that areas squeezed by vertical stress are protected from erosion, while others wash away.

The process had proved difficult to study, because natural slabs of sandstone erode over millions of years.

The key to the experiments, published in Nature Geoscience, was an unusual

"locked sand" dug from a Czech quarry.

Dr Bruthans sandwiched small cubes of sand under various weights and submerged them in water.

The sides of the cube started to fall away within minutes, leaving fewer and fewer grains of sand to bear the weight.

As that process continued, eventually the pressure on the remaining column caused the grains to lock together and resist further erosion.

What is a Maar?

A maar is a shallow, broad, flat floored volcanic crater with steep sides that is surrounded by tephra deposits. The tephra deposits are thickest near the crater and decrease with distance from the crater.

A maar is formed by one or more underground explosions that occur when hot magma or lava comes into contact with shallow ground water to produce a violent steam explosion.

Evolutionary Pause Tied to Earth's Stuck Plates

The so-called boring billion refers to the span from 1.7 billion years to 750 million years ago when algae and microbes had the run of Earth. The long pause

comes after these single-celled creatures mastered photosynthesis, so they could absorb energy from the sun instead of munching rocks and metal. After that extraordinary leap, there was little evolutionary advancement for another billion years, until the first complex life emerged.

Scientists have long sought an explanation for this big hold-up. Now, researchers think they've found a possible cause: the planet itself. It turns out plate tectonics also had a boring billion, according to research.

Study authors Peter Cawood and Chris Hawkesworth of the University of St. Andrews in Scotland looked at how the continents behaved in the past by analyzing indicators of tectonic activity such as volcanic eruptions, global glaciations and giant gold and sulfur deposits. They found the continents grew quickly on the early Earth, had a stable middle age and are now entering a midlife crisis.

The transition from stability to destruction, which marks an uptick in tectonic motion, took place 750 million years ago, the same time as the emergence of complex life.

"This increase in activity could have kick-started a myriad of changes, including changes to levels of key elements in the atmosphere and seas, which in turn may have induced evolutionary changes in the life forms present."

According to the study, on the hot, young Earth, continents grew quickly, with about 70 percent of the "scum of the Earth" forming by 3 billion years ago. But the mantle, the hotter layer between the crust and the core, was still too warm for modern plate tectonics to rev up. Big fragments of continents couldn't subduct into the mantle. So when the first supercontinent formed, the plates stuck together in a massive jam for a billion years while the mantle continued to cool off. During the boring billion, the continents were adding bulk to their bottom layer as the mantle and crust continued to gradually cool.

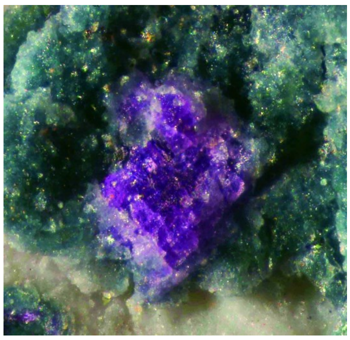
Finally, about 750 million years ago, the supercontinent started to break up when tectonics shifted into overdrive. The researchers think this time period is when the mantle was finally cold enough for Earth's crustal plates to be destroyed at subduction zones. The supercontinent started to tear apart, creating new ecosystems for life to occupy.

Newfound Purple-Pink Mineral Is Like No Other

A new purple-pink mineral that has a chemical composition and crystalline structure unlike any of the known 4,000 minerals has been discovered at a mining site in Western Australia,

Putnisite is a mineral composed of strontium, calcium, chromium, sulphur, carbon, oxygen and hydrogen. It was discovered on the Polar Bear Peninsula in Shire of Dundas, Western Australia in 2007 during mining activity. Following identification and recognition the mineral was named after mineralogists Andrew and Christine Putnis.

Putnisite has unique chemical and structural properties, and does not appear to be related to any of the

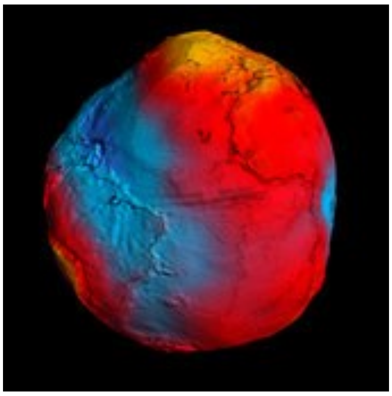


existing mineralogical families. Crystals are translucent purple, but show distinct pleochroism (from pale purple to pale bluish grey, depending on the angle of observation) and leave pink streaks when rubbed on a flat surface.

Putnisite occurs as small (< 0.5 mm) cube-like crystals in volcanic rock. The mineral formed during the oxidation environment within komatiite to dioritic bodies containing sulfide minerals.

Building a picture of the Earth's Gravity Field

Launched in March 2009, the Gravity field and steady-state Ocean Circulation Explorer satellite – GOCE – has mapped variations in Earth's gravity with unrivalled precision. The result is the most accurate shape of the 'geoid' – a hypothetical global ocean at rest – ever produced, which is being used to understand ocean circulation, sea level, ice dynamics and Earth's interior.



GOCE mapped these variations in the gravity field with extreme detail and accuracy.

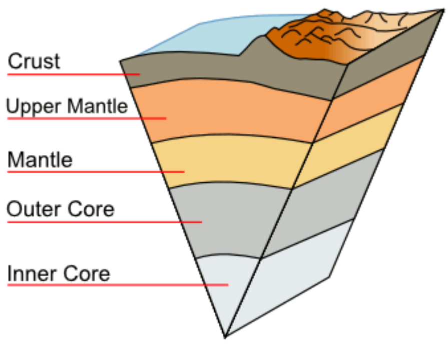
This resulted in a unique model of the 'geoid', which is the surface of equal gravitational potential defined by the gravity field – crucial for deriving accurate measurements of ocean circulation and sea-level change, both of which are affected by climate change. GOCE-derived data are also being used to understand more about processes occurring inside Earth and for use in practical applications such as surveying and levelling.

A number of interesting features have been discovered including major mantle plumes in the Pacific and S.E. Africa. Also visible are ancient subduction zones deep under Asia and along the Americas. These are probably buried remnants of old tectonic plate material. The satellites gravity data contains a residual signal from the former Tethys Ocean. The sub-ducted material can be seen stretching from the Mediterranean to the Himalayas. The Tethys Ocean is thought to have closed in the past 40-50 million years. The satellite burnt up in the Earth's atmosphere at the end of 2013 but the data is still being studied.

Composition of Earth's mantle revisited

The largest part of the Earth by volume is the mantle. New research has suggested that previous assumptions about its composition may be incorrect.

In the field of seismology and the study of earthquakes, it is essential to understand as accurately as possible the composition of the mantle. This understanding will give a better idea of the movements taking place below the Earth's surface and possibly explain previously unexplained seismic phenomena.



The mantle is the largest of the earth's layers, and gives off the most heat. It starts from around 400 miles below the Earth's surface to 1,800 miles (1,440 miles thick). The maximum depth that drilling has reached is only 7.5 miles into the Earth. The composition of the mantle is therefore the result of calculations and the limited information available to scientists. The entire lower mantle was thought to be composed entirely of ferromagnesian silicate, arranged in a type of structure called Perovskite.

Pressure in the mantle is extremely high and the temperature is around 2,000 degrees Centigrade. These conditions are expected to change the properties of materials, making them quite different to how they would exist on the surface.

Researchers at the Advanced Photon Source, at the Argonne National Laboratory, placed a sample in a high pressure anvil made from two diamonds and heated it with high powered lasers. The arrangement of the atoms is then determined by beaming powerful X-rays at the sample and measuring the scatter. The results have found that depths below about 1,200 miles underground, the ferromagnesian silicate Perovskite breaks into two separate phases. One contains nearly no iron, while the other is full of iron. The iron-rich phase, called the H-phase, is much more stable under these conditions. The chemistry of the H-phase is not fully understood and it is possible that there are further unidentified phases. The findings need to be taken into account in existing geodynamic models to give a better understanding of seismology and movements of material within the mantle.

Physical Properties of Minerals continued — Colour

Colour is one of the physical properties most commonly used to describe minerals, but it is not a very good property to use to identify them. Some minerals are nearly always the same colour like azurite (blue) and sulphur (yellow).

Many minerals come in a variety of colours – the changes are caused by slight chemical impurities or through exposure to heat.

Colour can change when the surface is exposed to moisture & air – it tarnishes or oxidizes. Some minerals have common names that describe a specimen with a certain colour e.g.. Quartz – rock crystal (colourless), smoky quartz (brown), citrine (yellow), amethyst (violet), rose quartz (pink).

Colour can be described as metallic or non-metallic and is often described along with lustre though they are 2 different characteristics.

Rocks are often distinctive or named because of a certain colour which occurs because of their mineral content.

Other words to describe the intensity of colours:

- dark, very dark, light, pale
- deep
- dull, shiny
- bright

Words that describe how colour is distributed:

- streaked
- splotchy, mottled, speckled, layered, banded.

Some minerals fluoresce with a distinctive colour under ultraviolet light.

Play of Colour can be more helpful than the colour itself. Characteristics such as opalescence, iridescence, chatoyancy and asterism are peculiar to a limited number of minerals.

Acknowlegments:

- Wikipedia
- BGS (British Geological Society)
- About.com
- Northern Lion Gold Corp.
- Live Science
- ESA

Glossary: *To continue in the next issue*

G

Gap — In limestone landscapes, this is a break in a ridge of hills.

Glacial — Characterised or produced by the presence or action of ice. A period of glaciation. See Interglacial.

Glacier — A mass of ice and snow which can deform and flow under its own weight. A 'river' of ice that flows down valleys towards the sea. In Britain glaciers formed during the last Ice Ages and caused erosion in upland areas (forming the typical U-shaped profile of valleys). The eroded rock debris was dumped when the ice melted to form moraine.

Gneiss — (pronounced 'nice'). A metamorphic rock that has been subjected to such great pressures that new crystals have replaced the original ones. The original rock approached melting point, and, as a result, changed to this granite-like rock with banding of different crystals.

Gorge — A steep sided valley cut by rivers often during periglacial conditions. Several in Britain (e.g. Cheddar Gorge) were thought to have formed when caverns collapsed, but this is now known not to be the case.

Granite — A hard igneous rock that formed deep (several kilometres) underground. It formed from magma that cooled slowly so that the crystals grew to a large size (these are mainly quartz, feldspar and mica). The granites we see at the surface today were exposed when overlying rocks were worn away by erosion.

Greenhouse effect — The natural 'trapping-in' of heat by greenhouse gases present in the atmosphere.

Greenhouse gas — A greenhouse gas is so-called because it absorbs infrared radiation emitted by the Earth's surface (the original energy source for this radiation is solar radiation), the absorbed radiation is trapped as heat in our atmosphere. Greenhouse gases in our atmosphere are: carbon dioxide, water vapour, methane, nitrous oxide, ozone and CFCs.

Grit — A sediment comprising coarse sand grains.

Gritstone — A coarse-grained sandstone.

Groundwater — Water found underground within porous soils and rocks.

Gryke — Fissures in a limestone pavement. These fissures were formed beneath a soil cover by chemical weathering and are sometimes over a metre in depth. Grikes may form a microenvironment where unusual plant may grow, including alpine plants that have managed to live in this protected environment since the last Ice Ages.