Website Newsletter of the Cape Town Gem & Mineral Club

MARCH 2023

Afghanite in Calcite, Kokcha Valley, Afghanistan (courtesy of Dakota Matrix)

DIARY

March	*4*	*10:00–14:00*	*Open to the Public Day – Rocks, gems, jewellery, mineral specimens to look at, chat about, swap, sell or buy.*
	11	*14.00*	*ANNUAL GENERAL MEETING*
April	*1*	*10:00–14:00*	*Open to the Public Day – Rocks, gems, jewellery, mineral specimens to look at, chat about, swap, sell or buy.*
	8		*EASTER WEEKEND - CLUB CLOSED GEMBOREE AT AUGRABIES*

[The text of the following article was published originally in the August/September 2007 issue of *mind//shift* magazine. This version may not be reproduced without permission. All the photographs are by Jo Wicht.]

A geological take on 'sustainable development', by Duncan Miller

'Sustainability' has become the new marketing mantra, with 'sustainable development' its underpinning creed. But without a stated time-frame, both of these notions are empty.

Nothing we do is sustainable in the long run, so how can we give meaning to an inevitably transient activity? 'Development' usually implies improvement in material well-being, with a concomitant increase in the consumption of natural resources. So over what time period must any particular development be sustainable, to avoid its being a contradiction in terms? As an example, think about 'sustainable mining'. By definition mining is unsustainable, except over the life of the mine itself. World-wide, mining companies come in, dig out the goodies, if you are lucky they fill in the hole, and they depart, leaving an impoverished community to die off or disperse into the flux of mobile human labour.

To gain some insight into our transience let's start at the end. Our Sun is a middle aged, average sized, common star. In a few billion years' time it will expand to engulf the inner planets, including the Earth, roast or even melt the surface, and obliterate all traces of life. Having wrought its destructive final conflagration, the Sun will shrink into a cold, burned out husk. Everything we have done will have vanished, apart perhaps from a few of the minute space craft which we have flung into the cosmos. Nothing we conceivably can do will avert this final fate, so 'sustainability' in the very long run is wishful thinking. The consolation is that from a sidereal perspective, nothing matters, not even the crass mutilation of the Namaqualand coast in the wake of diamond mining. Long before the Sun's final paroxysm, all traces of human activity will have been swept off the continents and into the sea, through the ineluctable forces of erosion. Ironically, the last vestige of human activity on the Earth's surface might be the remnants of our deepest mines, excavated in our final vain attempts at extracting yet more gold. Eventually, even our dross on the seabed will be recycled into the Earth's interior, through the global vacuum cleaner of plate tectonics.

Coming closer in time, it is very probable that Earth will suffer some enormous geological cataclysm, as it does on average every 100 million years or so. This could be the impact of a huge meteorite, or massive volcanic eruptions, setting off continent-wide fires and clogging the atmosphere with ash and dust. It seems to have happened before, several times, leaving a legacy of sudden extinctions in the fossil record. All large animals choke to death. If we are still around, we would snuff it, and there is nothing we could do about it. So what time scale makes sense as a basis for rational environmental action, and what action makes sense given this time scale?

To answer this, we need to look at where we are in the trajectory of human history. If a human generation is taken as 25 years, the average age at which parents have children, then about 4 800 generations have passed since modern humans first started exploiting shellfish along the southern Cape sea shore about 120 000 years ago. It was only 10 000 years ago that some people settled down in farming communities in the Middle East, and started making pottery, and mining metals. Since then only 400 generations have passed, spanning the whole of modern technological history. We are in the throes of the technospasm, a very brief period in human activity on Earth.

Before the technospasm, humans relied on stones, bones, shells, wood, skins and teeth for their products; primarily tools, ornaments, and clothing. Animals were hunted and plants gathered for food, obliging most communities to be small and mobile. Human numbers were constrained by famine, disease, and internecine warfare. Our hunter-gatherer forebears left very sparse footprints, making very little impact on the environments in which they lived. Bar a future geological cataclysm, this kind of existence would be sustainable over millions of years. It wasn't to be. Alas, we committed agriculture, ate of the fruit of the Tree of Knowledge, and Adam and Eve were expelled from Paradise. The package of metals for tilling the soil and ceramics for storing surplus grain allowed settled communities to grow, and that sowed the seeds of our present dilemma.

It is an inescapable fact that the Earth is a closed sphere, with finite resources. Biological resources are potentially renewable, if they are not over harvested. Geological products are not. Our technology relies on metals, and in particular ones like copper, lead, zinc, gold, silver and uranium, which are found in economic quantities in concentrated ore deposits which took millions of years to form. We extract them at a rate far greater than the rate at which they can be replaced geologically. And we take this service from the Earth for granted. What modern humans do to fuel their economy is to mine naturally concentrated ores and spread the oxidized products thinly and irrecoverably over the surface of the globe. Because of the limited nature of these slow forming geological ores and our propensity to disperse them, no matter how slowly we consume them, and no matter how assiduously we recycle them, they will be depleted sooner or later. Unless you are a fantasist who believes in the prospects of mining on Mars or the asteroids, you have to acknowledge that our technology is doomed.

The former copper mine at Nigramoep, Namaqualand. Photo: Jo Wicht 2007

So in the murk of this Malthusian gloom, should we resort to a joyless orgy of consumption, like the participants of the medieval plague party in the Werner Herzog's classic film Nosferatu the Vampire? Eat, drink, and make merry, for tomorrow we die. A perverse case could be made for rampant consumption, to get the technospasm over and done with quickly, like a nasty epidemic, to give other life forms and small surviving human communities a chance - unless we deforest the planet and poison the oceans before then. No-one can advocate this strategy seriously. Most attempts at dealing with resource depletion are aimed at stretching out the stocks while they last, through economic primary resource management and recycling of essentially non-renewable materials. This is buying time, and might buy a lot of it, or at least enough for us not to have to think about the long term consequences of our cherished, profligate lifestyles.

I am not concerned here with short-term issues like global warming. That is already upon us; but we still have the technological resources to cope with it, no matter how unpleasant the experience will be for millions of individuals. For the vast majority of humans alive now, life is pretty unpleasant anyhow, and not likely to get much better in the foreseeable future. I am concerned with the prospects for long term sustainability of human society, and the steps we might need to take to ensure that. If we could arrive at a strategy that encompasses geological realities, that would be truly 'sustainable development'. So what might work?

We should plan actively for resource depletion, dropping the delusions that Earth's resources and human ingenuity at finding them are infinite. We need to acknowledge that the technospasm is transitory, its ultimate duration determined by the rate at which we diminish our dependence on scarce geological resources. We need to acknowledge that our activities inevitably will constrain the quality of life that our descendants can possibly achieve. We need to admit that the idea that "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" is a reassuring and self-serving myth. The idea is tenable only in the very short term. We need to realise that the Earth's carrying capacity for humans in the long run is very much lower than the current population. As we work towards the run-down of the technospasm we need to scale down the population accordingly to the carrying capacity for subsistence farmers. I think of this as 'radical sustainable development' - but I don't think it will happen through rational planning, nor do I think this time frame will be taken seriously by contemporary society. Humans are emotionally ill-equipped to think seriously beyond the immediate; necessarily so, or our knowledge of the inevitability of our individual deaths might cripple all action. Few corporations, governments, or societies manage to plan beyond five years ahead, let alone five millennia. A bleak view is that each generation might blunder ahead, consuming voraciously, making do as crucial resources reach terminal depletion, sooner rather than later being forced into declining numbers through a catastrophic collapse of our technological civilization. This is the stuff of much gothic science fiction. So let's be more positive, try to be practical, and consider the medium short-term.

Waste granite blocks abandoned at the Concordia Granite Quarry, Namaqualand. Photo: Jo Wicht 2007.

In the wake of the First World War, H. G. Wells wrote in his book The Outline of History that "Human history becomes more and more a race between education and catastrophe". Some might think we are losing the race, but the race is definitely picking up pace. Current generations need to understand the consequences of their actions, and only education can bring this about. It is only the combined pressure of educated individuals who want to see their descendants inherit a planet brimming with vitality, diversity, and opportunity that will change the policies of governments and corporations, and force them to implement conservative measures to nurture our non-renewable resources and resist over-exploitation of the renewable ones. With luck this may turn the tide of greed and despair that characterise the wealthy and the poor respectively, and leave each successive generation with a progressively less despoiled planet on which to scratch out a living. How the individuals of each generation will do so, is up to them. All we can do is try to leave as rich a resource base as possible, to help them survive as best they can in a depleted environment. It's damage limitation. At least we can leave a tidy table for the next sitting at the party, even if we have eaten the best goodies already. If slogans like 'sustainability' and 'sustainable development' help to achieve this, then they are useful, despite their remaining conveniently woolly without any specified time frame or trajectory for the 'development'. But let's not kid our kids, or ourselves, that they will inherit the same resources we did. Too much has gone up in smoke, or down in rust for that.

The key to education in environmental responsibility is the emerging academic discipline of Earth Stewardship Science, aimed at researching the many interactions between humans and natural Earth systems that need to be understood to give us any hope of managing the planet rationally. This amalgam of geology, economics, sociology, geography, zoology, botany, archaeology, and meteorology draws upon multiple fields of research, crossing traditional disciplinary boundaries, and is explicitly aimed at intervention, providing the science to back environmental activists' lobbying industry and government. In academia the really exciting new ideas always originate in the interstices. Earth Stewardship Science will be an increasingly interesting space to watch.

Toxic acid mine drainage stained green by copper salts seeps out of the former Tweedam tungsten mine, Namaqualand. Photo: Jo Wicht 2007

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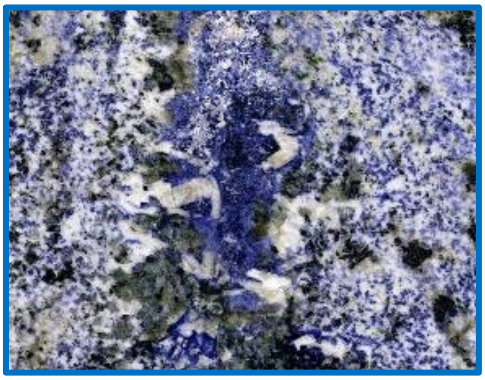
Next….

The Feldspathoids

The Feldspathoids



By Peter Rosewarne

Introduction

Welcome back to a serious subject for this article after the degeneration of the last few into the realms of fantasy. I've been for therapy so that phase is behind me, for now, and this article is testament to the wonders of modern medicine. However, be warned, I've lapsed recently in my fight against addiction to buying mineral specimens on the internet so how long the wacky article abstinence will last is anyone's guess.

At first glance, the *feldspathoids* might seem an obscure place to start on my road to recovery but we've all heard of and seen *sodalite* on Open Day (e.g. Rockey's table), and probably have heard of *leucite* and *nepheline*, though not all of you will have heard of *haüyne*, let alone know how to pronounce it correctly? So, they are not so obscure after all and if you make it to the end of this article, they won't be obscure at all, although the minerals are often opaque.

Feldspathoids are related to the *feldspars* but contain less silica and are typical minerals of under-silica-saturated alkali igneous rocks such as the *syenites* and their volcanic equivalents, e.g. *trachytes* and *phonolites*. In igneous rock terminology they are abbreviated as *foids* and do not occur in rocks with free *quartz*. They have a fond place in my memory as I well remember a rare moment of fame as an undergraduate geologist when our igneous petrology/mineralogy lecturer put up some slides of thin-sections of feldspathoids and I identified leucite and *nosean*, much to his and the class's amazement. Fortuitously, I'd been reading up on these minerals in a textbook (no internet then) and there were two diagnostic illustrations that, once seen, you couldn't mistake (see **Figure 1**). The lines in the leucite thin-section are due to twinning. The nosean crystals show dark rims of magmatic corrosion and internal 'canals' and trails of gas bubbles.

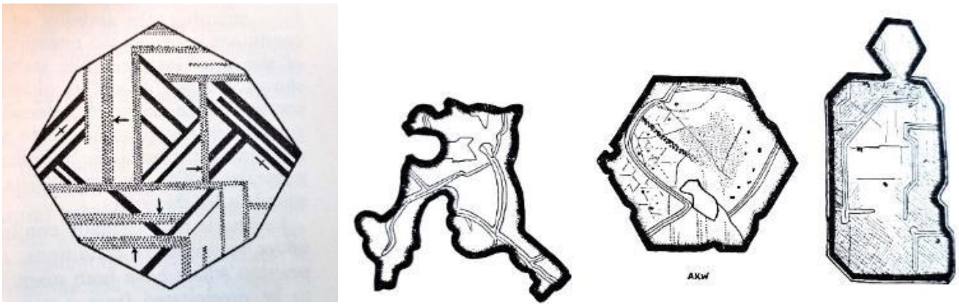


Figure 1: Leucite (left) and Nosean (right) in Thin Section (from Hatch, Wells and Wells, 1961)

The Minerals

In alphabetical order, the main[1] feldspathoid minerals consist of:

- *Afghanite*
- *Analcite/Analcime* (also classified as a zeolite so not described herein)
- *Cancrinite*
- Leucite
- Nepheline
- Sodalite group
    - Haüyne

[1] For the purist, this list should include kalsilite, melilite, petalite and tugtupite

- Lazurite
- Nosean
- Sodalite (gem var. *Hackmanite*)

Many of these minerals have complex chemical formulae so only major indicator constituents are shown in those cases. They all contain *aluminium/silicate*. These minerals commonly form interstitial grains or aggregates filling between other crystals in rocks but can also form striking and diagnostic crystals, such as leucite in some Vesuvian lavas.

Afghanite (sodium, calcium, chloride and sulfate)
This is a rare mineral originally discovered in the lazurite deposits of Sar-e-Sang, Afghanistan, hence the name. It crystallises in the trigonal system and has a hardness of 5.5 - 6.0. A lovely lustrous blue crystal is shown in **Figure 2**.

Figures 2: Afghanite in Calcite, Kokcha Valley, Afghanistan (courtesy of Dakota Matrix)

Cancrinite (calcium, sodium, carbonate)
Colour is often a poor indicator of mineral identity but if you see a yellow interstitial mineral with a vitreous lustre in an igneous rock there's a very good chance it is cancrinite. It is also fairly special amongst silicates in that it effervesces with dilute HCL owing to the presence of the *carbonate* ion. It only gets one mention in 50 Years of What's New in Minerals (The Mineral Record, 2020) which gives an idea of its rarity as a mineral specimen. The specimen in **Figure 3** is from Litchfield Township, Maine, USA.

Figure 3: Cancrinite, Maine, USA (internet photo)

Leucite ($K[AlSi_2O_4]$)

Is roughly equivalent to the alkali feldspar orthoclase and occurs as prominent crystals in alkali volcanic rocks such as those of the Rhineland, Germany and Rome Province, Italy (see **Figure 4**). It usually contains some sodium as well. It is sometimes included in the zeolite group. It has a complex crystallography which is temperature dependent and varies between cubic/pseudo-cubic to tetragonal. It has a hardness of 5.5.

Figure 4: Leucite, Vico Lake, Latvium Province, Italy (Wikipedia)

Nepheline (sodium, some potassium)

It is commonly a nondescript white or grey colour in hand specimen, as seen in the nepheline syenite in **Figure 5**, from the Pilanesberg Igneous Complex at Sun City. In this rock it is present as grey interstitial patches accompanied by *aegirine* (black) and sodic *plagioclase* feldspar (elongated off-white lathes and patches). It is also a major constituent of the Aris phonolites quarried for road metal next to the B1 about 25 km south of Windhoek. Anyone fossicked around there looking for rare minerals such as *villiaumite* and *tuperssuatsiaite* (and you thought that haüyne was a tricky name) in vesicles? Hexagonal crystals are sometimes found, such as at Bou Agrao, Morocco, as shown in **Figure 6**. It has a hardness of 5.5 – 6.0 and is used in the glass and ceramics industries.

Figure 5 left: Nepheline Syenite, Pilanesburg Igneous Complex
Figure 6 right: Nepheline on Schorlomite, Bou Agrao, Morocco (internet photo)

Sodalite Group

This group comprises four members, mostly blue in colour in hand specimen but with differing anions, sulfate or chloride, being present with sodium and/or calcium.

Haüyne (sodium, calcium, sulfate)

This foid is characteristically bright blue in colour and is found typically in alkali volcanic rocks e.g. of the Eifel region of Germany and Afghanistan (see **Figure 7**). It is normally present as small grains and crystals but is occasionally of sufficient size to be used as a gemstone.

Figure 7: Haüyne, Badakhshan, Afghanistan (internet photo)

Lazurite (sodium, calcium, chloride and sulfate)

Forms from contact metamorphism of limestones and forms the bulk of the semi-precious stone, lapis lazuli. It crystallises in the isometric system and has a hardness of 5.0 - 5.5. A nice example from the Rosey Collection shown in **Figure 8** and an even better specimen in **Figure 9**, which is on sale for US$9 000.

Figure 8 Lazurite on Marble, Sar-e-Sang, Afghanistan

Figure 9: Lazurite on calcite, Sar-e-Sang, Afghanistan (courtesy of Hummingbird Minerals)

The specimen in **Figure 10** shows lazurite pseudomorphing a white sodalite crystal.

Figure 10: Lazurite Pseudomorphing Sodalite, Sar-e-Sang, Afghanistan (courtesy of The Mineral Record)

Nosean (sodium, sulfate)
Virtually always occurs as blue to colourless grains in alkaline volcanic rocks such as those of the Eifel area of Germany (see **Figure 11**). Crystals are very rare but it crystallises in the isometric system and has a hardness of 5.5 - 6.0.

Figure 11: Nosean in Phonolite, Shelkopf, Rhineland, Germany (courtesy of Dakota Matrix)

Sodalite (sodium, chloride)
This is one of the stock 'semi-precious' coloured minerals/stones used in lapidary for carvings and polished eggs/spheres. It is most commonly found as massive deposits but crystallises in the cubic system and has a hardness of 5.5 - 6.0. Just about everyone will have heard of the 'local' deposit at Swartbooisdrif on the Kunene River in far northern Namibia. This deposit has been attributed to a carbonatite/alkali igneous intrusion or metasomatism, with the latter origin being favoured as far as I understand it. I am sure there are many of you who have visited the site and know far more than me about it so please write in with whatever updates you can add and especially some site photographs. I went past the area on my quest to see an Angolan Cave Chat (a bird, not a mineral) in the Zebra Mountains back in 2013 but unfortunately we didn't visit the sodalite deposit. **Figure 12** is a sodalite carving done by Jo Wicht.

Figure 12: A Whoppa Hoppa! (courtesy of Jo Wicht)

The gem form of sodalite is called hackmanite but apparently the International Mineral Association doesn't recognize this name anymore. However, we won't let a mere technicality get in the way of this article. It was featured as a curiosity in the December 2021 Minchat. Hackmanite exhibits *tenebrescence*, whereby the colour of the mineral is changed by exposure to sunlight. Interestingly, hackmanite from Mount St-Hilaire, Canada, changes from violet on being freshly mined to a dull grey/greenish grey on exposure to sunlight, whereas hackmanite from Afghanistan changes from creamy white to violet. An example from the latter country is shown in **Figure 13**. It is still available if anyone fancies shelling out US$2 000 for it.

Figure 13: Hackmanite, Kokcha Valley, Afghanistan (courtesy of Hummingbird Minerals)

We'll end with a possibly new term for many of you, *epitaxis*, wherein a crystal overgrows an existing crystal of a different mineral and its orientation is determined by one of the planes of the existing crystal. The example in **Figure 14** is of sodalite overgrowing nepheline.

Figure 14: Sodalite in Epitaxic Overgrowth of Nepheline, Sar-e-Sang, Afghanistan (courtesy of The Mineral Record)

Concluding Remarks

In these more serious articles on minerals, we've now covered the tourmaline and garnet groups, fluorite, beryl, lapis lazuli and radioactive, fluorescent and botryoidal minerals. In this article you may have heard of some new mineral names and new terms such as tenebrescence and epitaxy. Next month we'll have a quiz to see how much you have taken in from all these articles; The answers will be leaked beforehand but the pass mark will still be a stiff 30%.
I used to have a full house of feldspathoids in my collection, apart from nosean and afghanite, but now only have the nepheline syenite, which will probably be turfed soon, and the only photograph is of the lazurite.

My internet abstinence relapse was caused by being exposed to inappropriate photographs on Weinrich Minerals and The Mineral Gallery websites (see **Figure 15**) but the real surprise was that the two specimens from the former actually survived handling by the SA Post Office. This suggests that the solution to Rosey's *General Law of Postaldynamics Eq 1* put forward in the June 2022 Minchat is not unique. There are also a couple of eligible 'singles' here, meanwhile I'll try and live my life one specimen at a time. 😊

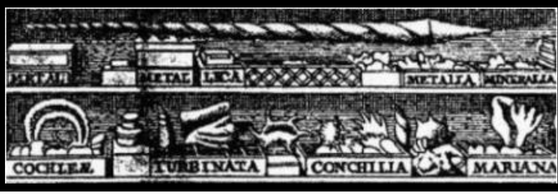
Figure 15: Cuprite, Fluorapatite and Elbaite

References

Hatch, FH. Wells, AK. and Wells, MK. (1961), *Petrology of the Igneous Rocks*. 12TH Ed. George Allen & Unwin Ltd. London.

The Mineralogical Record (2020), *50 Years of What's New in Minerals: 1970-2019*. Tucson.

From the Cabinet of Curiosities



This month's curiosity is **Mineral-themed Playing Cards from Heritage**. I was browsing the Internet for information on mineral names when I came across this entry for minerals/gems-themed playing cards (**Figure 1**). Nothing much to say here apart from it is a regular pack of cards with colourful pictures of well-known minerals and gems. A topical game to play would be Black-Jack, using poker-chip calcite crystals (**Figure 2**) for bets. Any other card games with minerals in their name? **PR**

Figure 1, left: Gems and Minerals Playing Cards (Internet picture)
Figure 2: Poker Chip Calcite Crystals (courtesy of John Betts Fine Minerals)

Facetips

"FACETIPS – A Gem Cutter's Notebook" by Duncan Miller. The faceting articles published over the past few years in the Mineral Chatter have now been compiled into a single 128-page document. The pdf file is available for download from http://ctminsoc.org.za/articles.php for those interested in having all the articles together.

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