

Impact! King Tut's pectoral

The story of the scarab in King Tut's pectoral brought up-to-date in the 21st century...

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What is the mysterious substance of which the centre inlay of King Tutankhamun's pectoral was made? And why do I care? And with a little help from my friends.

My personal hobby (in addition to being co-founder of the online, educational, free and open to all Google Group, Beads-L* and it's co-moderator for over 18 years) is to make beads and jewellery from as many different materials as possible.

In the last several years, I have been aided in my quest by Grant Pearson, an Australian gemmologist with an equal desire for knowledge, albeit he is not quite as 'slanted' towards beads as myself. Grant is a former opal miner and discoverer of the largest pocket, ever, of opal pineapples (that's another story). He is a published author with articles in several gemmological journals and an accomplished photographer – using a camera through the lens of a microscope.

Grant does free gemstone identification at local gem and mineral shows. He has also given various talks on minerals used for beads to a local group of bead enthusiasts in Melbourne, Australia – where both he and I live.

Grant once brought up the topic of Libyan glass and mentioned King Tut's pectoral in an email and I was hooked! I then hesitantly (well, somewhat) asked Grant – who is also skilled at lapidary work, primarily focusing on the opal from his past mines – if he could make me a reproduction of King Tut's pectoral.

Never one to balk at a challenge, Grant said 'yes!' And then our road to discovery began. But first we had to go backwards into the story of this mysterious substance before we could go forwards into beadmaking.

Only in the late 20th century did tests determine that the scarab in King Tut's pectoral (Fig 1) was made from Libyan Glass – before that time, everyone thought the pendant was chalcedony. So the pendant isn't chalcedony, it's Libyan Desert Glass – so what is that?

If you want to have fun – watch this online video BEFORE reading on:
<https://www.youtube.com/watch?v=zORURnKcI>
<http://news.bbc.co.uk/2/hi/sciencenature/5196362.stm>

Here are two images of 'raw' Libyan Desert Glass (Figs 2 & 3) and look for



more information about it here:
https://en.wikipedia.org/wiki/Libyan_desert_glass

Let's take a side trip to Tunguska...

"On 30 June 1908, an explosion ripped through the air above a remote forest in Siberia, near the Podkamennaya Tunguska river. The fireball is believed to have been 50–100m wide. It depleted 2000 sq km of the taiga forest in the area, flattening about 80 million trees. The earth trembled. Windows smashed in the nearest town over 35 miles (60km) away. Residents there even felt heat from the blast, and some were blown off their feet."

The YouTube Tunguska story has now been intermixed with tales (true or false?)

of UFOs – the original video I watched is now offline...

If you take one of these videos with a grain of salt, you will get an idea of the dimensions of the impact, regardless of the cause (human, conspiracy, UFO)...

Or you can look at this website from the Planetary Science Institute:
<https://www.psi.edu/epo/siberia/siberia.html>
 This what it has to say:

"In 1996 in the Egyptian Museum in Cairo, Italian mineralogist Vincenzo de Michele spotted an unusual yellow-green gem in the middle of one of Tutankhamun's necklaces. The jewel was tested and found to be glass, but intriguingly it is older than the earliest Egyptian civilisation.

Fig 1 Tutankhamun's jewelled pectoral containing a scarab made from Libyan Desert glass.

Figs 2 & 3 Two pieces of raw Libyan Desert glass.





Working with Egyptian geologist Aly Barakat, they traced its origins to unexplained chunks of glass found scattered in the sand in a remote region of the Sahara Desert (Fig 5). But the glass is itself a scientific enigma. How did it get to be there and who or what made it?

A BBC Horizon programme – *Tutankhamun's Fireball*, made by production company TV6, was broadcast on BBC Two on Thursday 20 July 2016 and reported an extraordinary new theory linking Tutankhamun's gem with a meteor.

An Austrian astrochemist, Christian Koeberl, had established that the glass had been formed at a temperature so hot that there could be only one known cause: a meteorite impacting with Earth. And yet there were no signs of a suitable impact crater, even in satellite images.

American geophysicist John Wasson is another scientist interested in the origins of the glass. He suggested a solution that came directly from the forests of Siberia. "When the thought came to me that it required a hot sky, I thought immediately of the Tunguska event," he told Horizon.

In 1908, a massive explosion flattened 80 million trees in Tunguska, Siberia. Although there was no sign of a meteorite impact, scientists now think an extraterrestrial object of some kind must have exploded above Tunguska. Wasson wondered if a similar aerial burst could have produced enough heat to turn the ground to glass in the Egyptian desert.

The first atomic bomb detonation, at the Trinity site in New Mexico in 1945, created a thin layer of glass on the sand. But the area of glass in the Egyptian desert is vastly bigger. Whatever happened in Egypt must have been much more powerful than an atomic bomb.

A natural airburst of that magnitude was unheard of until, in 1994, scientists watched as comet Shoemaker-Levy collided with Jupiter. It exploded in the Jovian atmosphere, and the Hubble telescope recorded the largest incandescent fireball ever witnessed rising over Jupiter's horizon.

Fig 4 An artist's impression of an aerial burst which could have produced enough heat to create glass in the Egyptian desert.

Fig 5 Lumps of raw Libyan Desert glass can be found scattered in the Western Desert in Egypt in the 'Great Sand Sea'.

Mark Boslough, who specialises in modelling large impacts on supercomputers, created a simulation of a similar impact on Earth. The simulation revealed that an impactor could indeed generate a blistering atmospheric fireball, creating surface temperatures of 1800° C, and leaving behind a field of glass.

"What I want to emphasise is that it is hugely bigger in energy than the atomic tests," said Boslough. "Ten thousand times more powerful."

The more fragile the incoming object, the more likely these airborne explosions are to happen. In Southeast Asia, John Wasson has unearthed the remains of an event 800,000 years ago that was even more powerful and damaging than the one

in the Egyptian desert; one which produced multiple fireballs and left glass over three hundred thousand square miles, with no sign of a crater.

"Within this region, certainly all of the humans would have been killed. There would be no hope for anything to survive," he said.

According to Boslough and Wasson, events similar to Tunguska could happen as frequently as every 100 years, and the effect of even a small airburst would be comparable to many Hiroshima bombs.

Now here is the question... Did a Tunguska event (in the deep, dark past) create the Libyan Glass used to make King Tut's pectoral? Some say 'yes' (Wasson & Moore 1998; de Michele 1998)

Wasson & Moore say:

"Libyan Desert glass (LDG) consisting of samples ranging in size up to 22kg is found in a region with dimensions of 50km E-W and 130km N-S in the Western Desert of Egypt. The process that formed these high (980 mg/g) SiO₂ glassy objects is poorly understood. Although most past researchers have attributed LDG to formation during a cratering event, there remains serious doubt that impact cratering can create such clast-free materials. We suggest that an aerial burst, similar to Tunguska but 10⁴ times larger, may have been responsible. ...

"We suggest that the atmosphere has heated by a Tunguska-like event that generated turbulence to elevate desert sand and produce a radiation background that melted these particles. ...to form a thin melt sheet and keep it hot enough to flow it is essential to heat the entire atmosphere, in which case the extra amount of heat necessary to melt one a few mm of aeolian sediments temporarily suspended in the atmosphere is negligible."

de Michele says:

"Libyan Desert Silica Glass (LDSG) is a natural glass mainly consisting of silica. In December 1932 Patrick A. Clayton



observed its occurrence in the Great Sand Sea, a wide sandy region in the Western desert of Egypt, not far from the Libyan border.....Pieces of glass up to 26kg in weight occur scattered on the soil surface of interdune channels. Colour is mainly greenish yellow, at times varying from whitish to dark green or blackish....Bubbles and swirls (flow texture) formations are frequent”

“...The true nature of the scarab material (in Tutankhamen’s pectoral) had not been established with certainty until now... The intricate motifs of the pectoral denote a complex symbology, related to the journey of the sun and the moon across the heavens. The scarab forms the body of a falcon with outstretched wings. The falcon-scarab holds in each talon the *shen* sign, symbol of eternity, to which on the left is tied the open lily and on the right a lotus flower. The scarab’s front legs push a bark which carries two *uraei* flanked by the *udjat* eye. The eye supports a this gold crescent and a silver moon. Within the moon are three figures, the god pharaoh together with Thot and Horus.”

“Autoptic observations, inclusions and optical properties all point to LDSG being the raw material used to carve Tutankhamen’s scarab. This material obviously reached the Nile Valley from a remote area more than 700km distant, to be used as a rarity by the New Kingdom pharaohs. The findings in King Tutankamen’s tomb evidence the appreciation the young pharaoh reserved to the latest technological discoveries and resources of the mineral world”.

Back to beads!

But before we go back to beads, I have to share one of my favourite sayings – and yes, you heard it first from me: “The most important thing you can know about anything, is that it exists!”

April 2014 – an email from Grant Pearson to the author:

“As earlier indicated, herewith attached for your inspection and amusement is a selection of some photomicros and macros of some of the inclusions in a selected portion of thin-sliced & polished typical Libyan Desert Glass, the same material from which the central large carved scarab is fashioned in that pectoral ornament of the Pharaoh Tutankhamun, and which is found exclusively in the Great Sand Sea.

This specimen is relatively transparent except for numerous small white opaque spheroids and abundant quite intense ‘swirl striae’, ie swirls of slight changes and rippling gradients in its refractive index.

“It’s a pale yellow portion with a silky and mostly monodirectional flow pattern of the striae suggesting a rather slow and probably gravity-induced flow of a viscous quiescent & poorly compositionally-homogenised melt of the original glass over



Figs 6–8 Views of the front and back of the scarab pendant Grant Pearson made for the author from Libyan Desert glass.

perhaps a substantially prolonged period.

The occurrence of small approximately-spheroidal accumulations of gas bubbles, and their interpretation may lead to a better definition of the necessary range of thermal & chronological conditions that were necessary to develop this glass and therefore suggest more conclusively and convincingly what were the possible mechanisms for its development.

Continued:

"Have again been fooling around with this piece of Libyan glass, this time microscopically checking out its other side (the not-deliberately polished side, ie natural, as found surface), and have run off just a few more micros while thinking about the possible origin of the little spheroids (the mystery tantalises & frustrates me!), as an indicator to the possible origin & occurrence of this material. It's gemmological significance is well established of course, even though its 'rediscovery' is really quite recent, so that I suspect that increasing public familiarity with this unusual material will develop a demand for it for lapidary purposes, especially in view of its known ancient use in Ancient Egyptian artefacts.

"...my observations are reasonably consistent with the meteoritic airburst scenario for the glass formation as described by Barakat, Koberl, Wasson et al, (per the BBC documentary online)"

April 2014 email from author to Grant:

"Can you carve me a replica Scarab with Libyan glass?"

April 2014 email from Grant to author:

"Silicate glasses are relatively quite easy to work and I routinely use my lapidary equipment to fashion, alter, repair etc



various components in materials often including various glass varieties. Cutting and polishing opal and even repairing clients' damaged opals in jewellery, (opal being almost identical in physical properties to ordinary soda-lime-silica glass anyway, ie bottles, windows etc) is an activity that I undertook part-time for a city jeweller.

So, working glasses into simple shapes like scarabs is really not much more difficult than cutting and polishing a simple cabochon (the standard symmetrical oval shape with ovoid profile) of a polished stone variety, and just incorporating a little more detail, be it manmade glass (easy) or moldavite, various agates or chalcedonies or jasper, or opal or lapis or Libyan glass or any of the myriads of the different multi-crystalline rocks with interesting colour and texture patterns that are used in lapidary applications".


Nov 2014 email from Grant to author:

"Anyway, I've just had (ie filched from other tasks!) a few hours to be able to devote to finishing off your scarab from Libyan Desert glass, same stuff that the Tut item is made from, but which is just a little



Figs 9–10 Two views of another piece of Libyan Desert glass cut into a scarab. This example was sold at an online auction in February 2017 for £238.

larger than this one I think, which is also rather flatter, ie about 8–10mm thick at the widest spot, and about 25 × 35mm oval. Anyway, it's ready for you, just hope that you're not expecting too much of it! I've also drilled a small hole through the rear end, between the 'wing cases' so that it can be worn as a bead (upside down!), per your earlier request, as well."

And so here (Figs 6–8) is my 21st century version of King Tut's pectoral, with a little help from my friends. 

A VERY big thank you to my friend, Grant Pearson, for sharing knowledge and skills. Note – this story was first told in the Beads-L group, as the story unfolded... <https://groups.google.com/forum/#!forum/beads-l>

Bibliography

- de Michele, V. 1998 'The Libyan Desert Glass Scarab in Tutankhamen's Pectoral' *Sahara. Prehistory and History of the Sahara* 10, 106–110.
Wasson, J. T. & Moore, K. 1998 'possible Formation of Libyan Desert Glass by a Tunguska-like Aerial Burst' *61st Annual Meteoritical Society Meeting* (University of California, Los Angeles, USA)