

## Talk

1) Greetings! At this late hour, I'd like to speak of tektites and their relationship to their causal astroblemes.

2). Coined in German from the Greek *tēktos* or "molten.", Tektites are glassy objects which have been excavated by a cosmic impact into terrestrial strata, processed in a cosmic cauldron into spherical blobs of melted silicate, ejected through a blown-out atmosphere on a low-turbulence weightless suborbital trajectory where they homogenized chemically, de-volatized and solidified and then were subjected to atmospheric reentry and deposition at a distal point.

Well, that's one definition.

Of over 200 Impact structures confirmed on Earth, only 4 are convincingly linked to macro tektite strewn fields

These are very special events, suggesting a special class of cosmic impacts (Oblique? Hydrous Target?)

Tektites have been known since pre-historic times by early humans who collected them as talismans; only recently have they been correlated with Earth's impact structures

The 66-Million-year-old Chicxulub Impact generated macro tektites based on fossilized finds in Haiti and a global spherule layer.

The 85 km Chesapeake Bay Impact produced tektites in North America ~35 Ma

The 25 km Ries Impact structure is correlated with the Central European strewn field ~ 15 Ma

11 km Bosumtwi Impact crater in Ghana is correlated with the Ivory Coast tektites, occurring only 1 million years ago.

Excepting Ries, each event also produced a vastly larger distal microtektite strewn field, shown in yellow here, as opposed to the small green macro tektite footprints.

The impact crater for the largest and most recent tektite strewn field has not been convincingly found. It would seem appropriate to inspect the geospatial relationships of the confirmed pairings

3) ...and see if they provide any clues to follow so as not to be drawn offside.

- After all, while history does not actually repeat itself, it sure seems to rhyme.

4) one could easily assume these fields, surrounding Prague, came from an impact there.

- The Czech tektites are now comfortably associated with the Ries, Germany crater. Note the asymmetric distribution from the crater site.

5) Shining the spotlight on the Ivory Coast strewn field does not tell us where the impact was.

- The Ivory Coast tektites are now comfortably associated with the Lake Bosumtwi impact 300 kilometers to the east. Note the asymmetric distribution from the crater site.
- 6) I believe this is the largest assemblage of Ivory Coast Tektites, and even it has been dispersed due to their value. These small spheres did not travel 300 km through the atmosphere. They traveled there on a suborbital trajectory through a blown-out atmosphere.

When some suggest that this single field is serendipity of discovery, I remind myself that Africa has the longest history of human occupation. The event was no doubt witnessed by our distant ancestors. If widespread, why were they not collected and treasured as they were elsewhere?

7) The spiral patterns here are from Dobrovolskis, 1981 and represent the ground tracks of ejecta traveling on suborbital trajectories over a rotating planet. Walter Alvarez did a similar geodynamics exercise, driven by his interdisciplinary approach to solving the K-Pg iridium laced spherule layer enigma. My research partner Thomas Harris has engineered a more robust and user-friendly tool kit for drawing such maps. Its available *Open Access* in GSA Special Papers 553 Chapter 23.

8) Here is one of Tim's tools applied to Bosoumtwi's distal tektites found in Atlantic Ocean cores.

- Zooming in, the red dashed line is for 80° launch elevation and green is for 30°. Sequences start at 30% Earth escape velocity and each dash along the ground track reflects a 1% increase in velocity, up to 45% Earth Escape.

Why the wide range of elevations tested? Well, the impactor did not carry along a computer to calculate for minimum transit time nor minimum energy trajectories, as typically applied in modeling. Those two figures are certainly the LEAST likely parameters for a real event.

9) Shining the spotlight on the two disparate fields of the North American Strewn Field. Considering the one in SE Texas

- and one in Northern Georgia, does not inform us where the impact was.
- The Kilmichael crater was once considered since it was equidistant.
- An asymmetric distribution at significant distances is what empirical evidence provides.

10) Here's a scenario run by Tim for the Chesapeake Bay impact. It demonstrates how slightly different velocities at nearly vertical elevations can populate all the known Strewnfield components.

11) Empirical Evidence of Tektite Distribution shows that

- No tektites found within 20 crater radii
- They demonstrate a highly asymmetric tektite distribution
- Distal scale increases with crater diameter
- Some impact specialists dismiss such correlation as artifacts of "serendipity"

12) During the Mid Pleistocene Transition – Geologically "Yesterday" - a cosmic impact produced the vast the Australasian Strewn Field, but efforts to locate a compatible astrobleme have come up emptyhanded. The macro and micro tektite distribution is commonly portrayed as a 3-lobe field dispatched from an a priori impact location in Southeast Asia ...

13) as suggested by Stauffer's 1978 conference paper, likely the most cited tektite paper despite its rarity in print. I located a copy of the conference book at the NY State University Stony Brook Library, so I could get these images showing how he leveraged Copernicus' radial ejecta display. That would look a lot less "radial" if the Moon rotated 27 times faster, as the Earth does.

14) Tim and I suggest a failed 50-year-old a priori designation should be set aside.

15) We should consider digging elsewhere.

16) This map includes recent additions of additional microtektite finds in the Antarctic, and a speculative addition of the ODP Hole 175 finds. It demonstrates the enormity of the strewn field compared to the others. This distribution conflicts with the established tri-lobe pattern, but is ultimately limited by the number of ODP cores available (Glass and Simonson, 2013)

17) The Bounty of Data regarding the Australasian Tektites was noted 20 years ago.

*immense progress has been made in understanding tektites but rather than providing elucidation, the large amount of research ... seems to have multiplied the constraints to be surmounted*

This assertion is even more appropriate today, 2 decades later.

18) the "distal" term for ejecta applies for emplacement beyond 5 crater radii...except for the evidenced Australasian Strewn Field and the favored a priori crater. Could that exception be a desire to support an old a priori designation?

19) Physical evidence shows the scale of the Australasian Tektite event defies convention. There may be more grams of tektites on Dean Chapman's table than has been recovered from some strewn fields. A value "30 to 60" billion tons has been derived from the empirical evidence of tektite mass in the ocean cores alone. These massive tektites are the "Layered Type". Their sheer size has led the consensus to accept that they could not lofted a thousand kilometers

20) ... but they were. Here is Wymark's distribution map for these so called "Muong Nongs".

- YES, they are a bit less homogeneous than the splash form, but they are both found intermingled across this range.

- If a cosmic force can loft these across a 1,400 km field, why not 14,000 ?

21) ...and they have the same water content as North American finds. Any chance they are just “tektites?”

22) Kicking the can down the road, the Bolaven volcanic field has been implicated by Sieh, et al.

Extending these few issues I have with it, Dr. Mizera’s latest report debunks that location, and just about all Southeast Asia.

23) There have been attempts to correlate with impacts elsewhere.

24) A half century ago the concept of a distant crater was accepted by two respected scientists.

*Lin: one may postulate a point of impact far removed from the Australasian region ... The evidence of impact crater must then be sought on other continents.*

*Urey: The residual crater may be very difficult to identify; but it might well be looked for while keeping some flexible ideas as to what its properties may be.*

25) I maintain we should not be trying to fit a square peg into a round hole. As time passes, the proposed impact structures are getting smaller,

- and the strewn field is getting larger.

26) certainly, impact science has come a long way in the 8 decades since the President of Columbia’s Geology Department asserted that the largest meteorite to hit the earth was under 20 ft in diameter.

And Hoba did not even excavate a crater!

Despite the valiant efforts over the last half-century to codify what a cosmic impact looks like, is it still possible to surprise ourselves when reality hits?

27) .. like it did in 1992 when SL-9 hit Jupiter? The community had two years to prognosticate on the event’s outcome.

- They all fell short. some predicted 1 km comets would just go pfft.

- I just LOVE, Boslough & Crawford's "*much richer array of consequences than anyone had anticipated*". I feel that diplomatic string of words applies to the Australasian Impact.

28) Was anyone else in the room surprised that an impacting refrigerator-sized vehicle could eject enough dust to produce a 6,000-kilometer solar wind tail visible from Earth?

29) So, using that bounty of data, Tim Harris and I propose that the Australasian Tektite event "*produced a much richer array of consequences than anyone has thus far anticipated.*"

30) If the science rhymes, we refute the a priori impact site

- and propose an impact into an antipodal hemisphere where a continental ice sheet was existent.
- And distribute tektites across 30% of the Earth

31) ... We speculate an impactor made a grazing regime trajectory across the limb of the Earth,

- excavated an unconventional astrobleme and created a vast cloud of hydrated debris and a billions of tons of tektites.

The continental Ice sheet provided low impedance shielding to avoid a planetary-scale extinction event. Over the intervening 800,000 years it provided numerous glacial transgressions to remodel the shallow impact basin.

32) In summery

1. This presentation offers observations and an unconventional framework
2. The a priori Southeast Asian designation should be retired after 50 years
3. Tektite strewn fields contain DISTAL ejecta
4. All tektites, including layered examples, are distal
5. We challenge the term "More Proximal" for Muong Nong types
6. Tektite strewn fields are found primarily in an asynchronous direction
7. The Earth rotates 1° every 4 minutes during suborbital transit of tektites
8. Identified tektites trait groupings may be applicable to an antipodal impact
9. A North American antipodal impact into MIS20 ice sheet is suggested

33) Acknowledgements