The Kalahari Impacts Hypothesis for the Birth of the Moon: Did Morokweng Meteorite Impact (145 Ma) Break up the Gondwanaland and Ignite Volcanic Explosion to Form the Moon?

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Abstract: When gigantic meteorite impact sites in Southern Africa are plotted on the geological map of the region, they overlap with the SW-NE fault lines and it indicates that meteorite impacts have contributed to the geological structure of the region. The Morokweng Meteorite Impact of 145 Ma (Million years ago), at the J/K (Jurassic/Cretaceous) boundary, seems to have broken up the Gondwanaland. It is plausible that, at the time of continental break-up, seawater poured into Morokweng crater and ignited a gigantic volcanic eruption which delivered low viscose magma into the outer space to form the Moon. An extremely flat surface of the Megakalahari extending 3,800,000 sq. km at 800-1,200 m above sea level in the central and southern Africa seems to be the terrestrial residue of fluid magma at the end of the volcanic event.

Africa forms the Key.—Alexander L. du Toit [1].

Key words: Birth of the Moon, meteorite impacts, J/K boundary, Gondwanaland Break-up, Modern Human, Howiesons Poort, Plate Tectonics, volcanic eruption, large rapid sea level change.

1. Introduction: How I Conceived the Hypotheses

It took me for seven years to conceive the Kalahari Impacts Hypothesis for the Birth of the Moon. It was two-stage development of hypotheses: first, for the Gondwanaland Break-Up mechanism of meteorite impact origin, then for the Moon Formation by volcanic eruption ignited by a Meteorite Impact of 145 Ma.

1.1 Why Gondwanaland Was Broken up?

I became interested in the break-up mechanism of Gondwanaland shortly after my first visit to the KRM (Klasies River Mouth) Caves in April 2007 in the Eastern Cape Province of the Republic of South Africa.

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KRM caves are the oldest modern human site where the residence of anatomically modern human was confirmed for the period between 130 Ka (thousand years ago) and 60 Ka. It is supposed that the evolution of modern human unique Laryngeal Descent, for vocalization of vowels, took place in these caves just before the Howiesons Poort techno-complex era (58-66 Ka). In these caves, Modern Human seems to have acquired Vowel Accented Syllables, containing logics of phonemes and morae. Those logical properties of syllables enabled infinite number of concepts and automatic semantic modulation/demodulation of grammars.

KRM caves face the merging area of the Atlantic and the Indian Oceans. They are located in the middle of sandstone sea cliff, which is the Break-Up Edge of Gondwanaland generated 145 Ma. The sandstone is a part of Table Mountain sandstone layer which extends several hundred km from Cape Town with the thickness of 9 km.

Then a question arose: why the Gondwanaland was broken up? I realized that I was not aware of the break-up mechanism of such hard and thick sandstone layer, and looked for it in the books just to discover no plausible mechanism available for the Continental Drift and Gondwanaland Break-Up [3]. It was remarkable that Wegener was against the idea of Mantle Convection proposed by Joly.

UNESCO World Natural Heritage site of Vredefort Dome in South Africa is the oldest, back 2,023 Ma, the largest with a radius of 190 km and the most deeply eroded meteorite impact structure. When I was looking for any relevant information with the Earth Impact Database at Planetary and Space Science Centre (PASSC), I found another large meteorite impact, Morokweng, 200 km west to Vredefort Dome, which impacted at the center of Southern African hemi-circular coastline at the same timing with Gondwanaland break-up, 145 Ma. The timing and location of Morokweng convinced me with the close relevance between Morokweng impact and the Gondwanaland break-up.

1.2 Why There Are Two Separate Karoos in Southern Africa?

I made my second visit to KRM in December 2012-January 2013. After returning from the second visit, I was watching a regional geological map, where Karoos are separated into Botswana Kalahari Basin and Main Karoo Basin [4]. The map scale is very small

and thus the accuracy of the map is not high. Nevertheless I wandered why there are two separate Karoo Basins.

Then, all of a sudden, I got an idea that the separation was caused by the Morokweng Impact. At the time when Karoo was formed with Kgagodi Impact of 180 Ma, it should have been a single continuous body. Then 145 Ma, another gigantic impact hit its center and vaporized its major part. (Note: Compared with Fig. 5, Fig. 3 seems not accurate. And it is also possible that Bothwana Kalahari Basin was formed by Kgagodi impact, and that the Main Karoo Basin was by Vredefort Dome. See Fig. 5: K1, K2, V).

But what happened after the Morokweng impact? Although the impact seems to have been gigantic, there seemed no LIP (large igneous province) or lava dome associated with the event. Is it possible that the ejecta from Morokweng crater went up to the outer space and formed the Moon? The Kalahari Impact Hypothesis for the Birth of the Moon was conceived in this way.

Fig. 1 Map of Middle Stone Age caves with human residence in South Africa [2].

Fig. 2 Klasies River Mouth Caves No.1/2 facing Indian/Atlantic Oceans.

Fig. 3 Distribution of Karoo Basin in Southern Africa [4].

Fig. 4 Meteorite impact sites are overlaid on the great fault lines [7].

2. Development of the Gondwanaland Break-Up Hypothesis

2.1 Gondwanaland Breakup Hypothesis Refutes Plate Theory and Mantle Convection Theory

KRM are the most representative caves in Howiesons Poort Neolithic techno-complex, which flourished 66 Ka-58 Ka and marks the emergence of modern human with laryngeal descent and full linguistic ability [5]. The caves are incubated in very

hard sandstone cliff, and there is no trace of igneous intrusion. Both Plate Theory and Mantle Convection theories seemed irrelevant to the break-up mechanism.

As the Break-up of Gondwanaland, 145 Ma and the birth of the Moon, either 4.5 Ba or 145 Ma, took place much older than the birth of Modern Human, 66 Ka, they are beyond the limit of our imagination in terms of not only time-scale but also spatial dimensions. For such events, field survey is not so useful. Rather axiomatic thinking and rigorous logical inference are

Fig. 5 Overlaying meteorite impact sites on Topology Map (USGS GTOPO30).

Table 1 Meteorite impact in the Southern Africa (from the Earth Impact Database, PASSC) and subsequent relevant events.

	Lat.	Lon.	Ma.	Event
Vredefort	27°0'S	27°30'E	2,028	Evolution to Eukaryote
Highbury	17°04'S	30°07'E	1,034	(* in PASSC Potential List)
Luizi	10°10'S	28°00'E	573	
Kgagodi	22°29'S	27°35'E	180	Kakahari Lava Dome
Morokweng	26°28'S	23°32'E	145	Break up of Gondwanaland
Roter Kamm	17°04'S	30°07'E	2.5	Birth of Australopithecus
Kalkkop	32°43'S	24°26'E	0.25	
Tawaing	25°24'S	28°5'E	0.22	Birth of Modern Human

required. Until that time, I had never imagined that Plate Theory does not explain why Gondwanaland was broken up. Probably because it is beyond the limit of our imagination, this lack of break-up mechanism had been overlooked.

2.2 The Meteorite Impact Hypothesis for Gondwanaland Break-Up

Oberbeck indicated that “Continental crustal plate are rigid and of high strength; some mechanism is required to initiate continental breakup”, and he

suggested “prolonged impact cratering preceding breakup of Gondwanaland (indicated by Permo-Carboniferous tillites in South Africa, South America, India and Antarctica) could have extensively fractured the lithosphere and would have facilitated the final continental fragmentation” [6].

Vredefort, Highbury, Luizi and Kgagodi should be the preceding impacts located in the same region and presumably the final impact should be that of Morokweng. It is plausible that these impacts as a whole contributed to Gondwanaland Break-up (Table 1).

2.3 Overlaying Meteorite Impacts on the Geological Map

The close relevance between Meteorite Impact sites and geological structure of the region can easily be confirmed by overlaying Impact sites on the existing geology map. It is evident that Vredefort, Highbury, Kgagodi and Morokweng are on the great fault lines. Hemi-circle of the Southern coastline with its center at Morokweng as well as the Great Rift Valley show high relevance with meteorite impacts.

3. Development of the Kalahari Impact Hypothesis for the Birth of the Moon

3.1 There Is Not a Single Hypothesis to Explain the Birth of the Moon

To date, there are several very rough and primitive ideas for the Moon formation such as (i) Fission (the Earth is the Parent of the Moon), (ii) Capture (Stranger), (iii) Coaccretion (Brother) and (iv) Giant Impact (s), none of which has plausible procedural explanations, nor identification of specific impact site (s). All of them take it as granted without careful evaluation that the Moon was born 4.5 Ba (billion years ago) based on its geochemical properties.

According to Saiki, the most popular story as of today is the Giant Impact (s). However computer simulation of a collision of two celestial bodies concluded that, in that case, the Moon should consist of the fragments of extraterrestrial body, not of the Earth [8]. Thus it does not comply with the facts that (a)

geochemical properties of the Moon are similar to those of Earth mantles and (b) the oxygen isotope ratio of the Moon is same with that of the Earth.

3.2 Recent Capture Hypothesis from Comet Storm

Arthur Holmes credited that Frank B. Taylor was prior to Wegener in the Continental Drift theory. According to Holmes, Taylor postulated that the moon first became the earth's satellite during the Cretaceous, and that at the time of its close approach and capture it was very much nearer to the earth than it is today [9].

Taylor proposed an idea that the Moon was captured and became the satellite of the Earth recently, when the Solar system went through comet storm in the Sun's great orbit [10]. This capture theory can easily be modified to comet storm impacts hypothesis on the Earth with subsequent volcanic explosion for the birth of the Moon.

3.3 Very Flat without Water System

Kalahari basin is a desert like basin. But according to Du Toit, the word "basin" is not appropriate. "By quite a number of geographers it is usually referred to as a 'basin', but in the light of the foregoing description such a designation is not quite correct. It has been moulded, it is true, by warping out of a marvelously extended plain, but the deformation has not led to a common central dip. Comparison can more properly be made with a warped gramophone record unaffected at its centre but crinkled along its margins (Fig. 6). These crinkles are however not radially disposed, but oriented

View from two miles north of Dedebein in the Koranna Berg showing ranges of Matsap Quartzites rising out of the plain of red Kalahari sand. Note the "Inselberg" landscape.

Fig. 6 Inselberg: Flat like a gramophone record [11].

Fig. 7 Topology map of Africa based on USGS GTOPO30.

Fig. 8 Epitaph of Alexander Logie Du Toit in Cape Town at the Crematorium of Maitland Cemetery.

roughly in a north-east south-west direction” [11].

3.4 Sea Water Injection to Ignite Volcanic Explosion

Fig. 5 indicates that meteorite impacts prior to Morokweng, i.e. Vredefort, Highbury, Luizi and Kgagodi had formed lava domes, and then, Morokweng impacted the Kgagodi dome to vaporize its center and left K1 and K2 separated. As far as I interpreted the topology map of Africa (Fig. 7), Morokweng magma seems to have been of low viscosity and to have filled the gaps among domes for approx. 3,800,000 km².

While Vredefort and Kgagodi impacts generated lava domes with high viscosity, what happened with Morokweng impact? Is there any particular different

conditions at Morokweng? The answer came unexpectedly from Volcanology.

It is plausible that the availability of sea water, pouring into Morokweng crater thanks to continental break-up, made the Morokweng magma of low viscosity. “The role of water was thought to be crucial in generating explosive eruptions and to have an important effect on the viscosity of magmas... powerful agent was water, principally that of the sea, which communicates by passages with the roots of volcanoes. On reaching the subterranean fires it suddenly turns to vapor, and the elastic gas expands rapidly, causing volcanic explosions” [12].

It can be interpreted as follows: Impact origin magmatic uplift prior to the Gondwanaland breakup did not meet surface water and formed lava domes of high viscosity. When the Morokweng impact broke up Gondwanaland, ocean water poured into its crater and invoked gigantic explosive volcanic eruption.

Although there are no visible craters for Kgagodi and Morokweng, it is probable that they are bigger than PASSC estimated diameter, 3.5 km and 70 km respectively, and that the volcanic vent was as big as central Kalahari basin, from which voluminous Earth

Mass spouted out to form the Moon.

3.5 A Potential Answer to Puzzling Global Sea Water Level Change

To date, “ice-volume changes (glacioeustasy) are the only known mechanism for producing large, rapid sea-level change”. Therefore, it is puzzling that “large (10 s to 100 m), rapid (less than 1 Ma) sea-level changed occurred during the Triassic to middle Eocene (ca. 250-50 Ma), a time considered to be ice free Greenhouse” [13].

The Kalahari Impact hypothesis provides a totally new mechanism for such large rapid lowering of the sea-level. Because sea water was poured into the new Morokweng impact to ignite volcanic explosion, it is plausible that huge amount of sea water was vaporized for volcanic explosion, which should have caused global sea-level change.

4. Conclusions

The Break-up of Gondwanaland, 145 Ma, and the Birth of Moon, either 4.5 Ba or 145 Ma, took place much older than the birth of Modern Human, 66 Ka in Middle Stone Age (MSA) South Africa. As our individual life is 100 years and our body is 2 meter length at maximum, they are beyond the limit of our imagination in terms of not only time-scale but also spatial dimensions. For such events, field survey only is not sufficient to get a right answer. Interdisciplinary and axiomatic thinking is required.

The Kalahari Impact Hypothesis is new. But it is the only coherent and comprehensive hypothesis for the Gondwanaland break-up and the Moon formation. If this hypothesis is verified, it turns out that the Moon and the modern human were born in the same region on this planet related to the same Giant Meteorite Impact of 145 Ma. I cannot predict the exact meaning of this unexpected fact, but, without fail, it should be an encouraging coincidence and worth celebrating for us, modern humans.

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80 **The Kalahari Impacts Hypothesis for the Birth of the Moon: Did Morokweng Meteorite Impact (145 Ma)
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Kumon “Kimiaki” Tokumaru is a Japanese natural philosopher. He visited the Klasies River Mouth Caves in South Africa in 2007 and was interested in the origins of modern human and language of 66 Ka. He identified the phonemic and moraic elements contained in human speech sound stream, and clarified the logical and physiological mechanisms of immune cell networks inside ventricular system for complex logical concepts and automatic grammatical demodulation in his study of Digital Linguistics.