

# The mysterious Rising Star fossils

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Publication of the *Homo naledi* fossil material has generated considerable interest among evolutionists as to where this 'species' fits in their human evolutionary trees, as well as among creationists as to how it fits within the biblical framework of history. How the remains ended up in the inaccessible Dinaledi Chamber is also a topic of debate and interest. Rejecting the evolutionary view of history, this paper analyzes the skeletal features of *Homo naledi* in order to determine its most likely identity. Drawing certain parallels with *Homo floresiensis*, I conclude that *Homo naledi* possibly represents 'robust human' individuals that suffered from a non-genetic developmental pathology such as cretinism.

Publication of the Rising Star fossils (assigned the new species name *Homo naledi*) on 10 September 2015,<sup>1</sup> by a team of paleoanthropologists led by Lee Berger of Wits University, Johannesburg, generated worldwide interest. A companion paper by Dirks *et al.* described the physical context of the Dinaledi Chamber within the Rising Star cave system, Cradle of Humankind, South Africa, where the fossils were found.<sup>2</sup> I published a detailed examination of *Homo naledi* earlier,<sup>3</sup> and this paper revisits and summarizes aspects of that analysis, incorporating developments since then.

*H. naledi* is said to exhibit some anatomical features resembling those present in *Australopithecus*, other features resembling those in *Homo*, as well as several unique features.<sup>4</sup> As yet no stone tools have been associated with the *H. naledi* fossils.<sup>5</sup>

Almost as intriguing as the identity of the strange *H. naledi* fossils is how the remains ended up in the inaccessible Dinaledi Chamber. A deliberate body disposal scenario is considered the most plausible explanation by the authors.<sup>6</sup> Currently there is only evidence of there ever having been one entrance to the chamber, but if future findings reveal other entrances once existed, as suggested by Val,<sup>7</sup> making the chamber more accessible in the past, then that will have a bearing on interpretations of how the bones ended up in the chamber, and perhaps even on the interpretation of the fossils themselves. Already evidence is emerging indicating there likely was an additional entrance to the chamber.<sup>8</sup> This evidence is based on mysterious black spots (manganese dioxide) deposited on the *H. naledi* bones by, most likely, lichen, and as lichen needs light to grow, logically some light must have penetrated the Dinaledi Chamber in the past.<sup>9</sup> Either that, or the light exposed *H. naledi* bones with lichen/manganese dioxide were later placed in the chamber, long after soft tissue decomposition.

Currently no 'age' is associated with the bones, but the Berger team considers *H. naledi* 'primitive' in morphology compared to *Homo erectus*, maintaining that "the *H. naledi*

lineage must have existed earlier than the first occurrence of *H. erectus* around 1.8 Ma."<sup>10</sup> To evolutionists the bones "could be more than four million years old or less than 100,000 years old."<sup>11</sup> A phylogenetic study by Dembo *et al.* claims the most likely age for *H. naledi* is 912 ka,<sup>12</sup> but the study depended on unfounded assumptions, including assuming evolutionary relationships between fossil species and accepting dates associated with fossil specimens as valid, as well as biasing the characters used to one anatomical region, the skull (including teeth), making the findings unreliable on this measure alone.<sup>13</sup> An earlier similar type of study estimated *H. naledi* to be about 2 Ma old.<sup>14</sup> That some of the *H. naledi* bones were described, by the recreational cavers who made the discovery, as "just lying about on the surface, as if someone had tossed them in,"<sup>15</sup> may indicate the bones are quite young. Hence, one wonders about the extent of fossilization of the bones, that is, to what extent have organic substances in the bone been replaced with mineral substance. Radiocarbon dating of a small sample of the bones would be very interesting. Of interest also is whether they will be able to extract and sequence DNA from the bones.

The Berger *et al.* analysis is based on multiple individuals, and on the assumption that the fossil "material represents a single species, and not a commingled assemblage."<sup>16</sup> No other large animal remains have been found in the chamber, and apparently the bones indicate no damage caused by scavengers or predators, although suggestions that "post-depositional cortical bone removal by invertebrates may have obliterated evidence for surface modification of bone by carnivores" has had to be defended.<sup>17</sup> Presently the single species assumption is plausible, but it cannot be ruled out that future excavations inside the Dinaledi Chamber will indicate multiple species were present. Apparently the bones recovered so far represent only a small portion of what is in the chamber, so there may be further surprises in store.

In analyzing the *H. naledi* skeleton (figure 1) here the focus will be on features that the Berger team indicate are

outside the range of humans, whether modern or ‘robust’ (such as *H. erectus*, *Homo heidelbergensis* and Neandertals), in order to determine whether *H. naledi* represent human individuals, australopithecine apes, or perhaps humans with pathology.

### Rib cage and vertebrae

The description of the vertebrae is consistent with *H. naledi* being human.<sup>18</sup> The rib cage of *H. naledi* is described as “wide distally” like *Australopithecus afarensis*, and elsewhere in the paper the thorax is suggested as being “pyramidal in shape”.<sup>19</sup> The *H. erectus* Nariokotome boy (KNM-WT 15000) is described as having a barrel-shaped thorax, like us.<sup>20</sup> Interestingly, the Neandertal rib cage is not barrel-shaped, like in modern humans and *H. erectus*, but an assembled entire Neandertal skeleton (consisting of fossil elements from several different sites) “boasted a conical thorax that tapered upward from the broad pelvis to a narrow top, giving it an incredibly distinctive look.”<sup>21</sup> Before 2001, however, the Neandertal rib cage had been illustrated in textbooks to look like a “barrel-shaped human model”.<sup>22</sup> The reconstructed rib cage of *Australopithecus afarensis*

(represented by the famous specimen Lucy AL 288-1) is described as being “shaped like a funnel, with the narrow part at the top and a wide lower region.”<sup>20</sup>

Hence, a wide distal (lower region) rib cage can, apart from being interpreted to be like *Australopithecus afarensis*, also be interpreted as being similar to that of the Neandertals. As I (and most creationists) regard Neandertals (and *H. erectus*) as fully human, the rib cage does not preclude *H. naledi* from also being human, even if its lower rib cage is broad, as suggested by the authors, as it would fall within human variation. However, a reconstruction “suggesting that the thorax was pyramidal in shape” sounds unconvincing.<sup>18</sup> Presently the shape of *H. naledi*’s rib cage is probably best described as indeterminate.

### Shoulder

The shoulder of *H. naledi* is stated as being “configured with the scapula situated high and lateral on the thorax, short clavicles, and little or no torsion of the humerus.”<sup>18</sup> Humeral torsion is an angle that “refers to the orientation of the humeral head relative to the distal end of the humerus.”<sup>23</sup> Low humeral torsion is also present in the *H. erectus* Nariokotome boy<sup>24</sup> and the *H. erectus* Dmanisi humeri.<sup>25</sup> Hence, a low humeral torsion does not preclude *H. naledi* from being human. At the 2016 meeting of the American Association of Physical Anthropologists (AAPA) it was reported that the humeral torsion of *H. naledi* was well below the range of both fossil and extant taxa.<sup>26</sup> If true, this is more akin to the low initial estimate of humeral torsion (110°) in the *Homo floresiensis* LB1 specimen (figure 2), possibly indicating pathological developmental influences on torsion, but it could also be inconsequential as the revised LB1 torsion (115° or 120°), although still very low, is reportedly within the range of “extant small-bodied humans”.<sup>27</sup>

Concerning the short clavicle of *H. naledi*, a relatively short clavicle has also been reported for the *H. erectus* Nariokotome boy,<sup>28</sup> and so a short clavicle is not inconsistent with *H. naledi* being human. As for the suggestion that the scapula is situated high on the thorax in *H. naledi*, this is also a possible interpretation of the Nariokotome boy specimen,<sup>29</sup> and therefore does not rule out *H. naledi* being human.

Scapulae from australopithecines such as *Australopithecus afarensis* specimen AL 288-1 and *Australopithecus africanus* specimen Sts 7, as well as the great apes, differ from that of



**Figure 1.** *Homo naledi* skeletal material, including composite skeleton in the centre representing multiple individuals (cc Lee Roger Berger research team).

modern human scapulae in having a more cranially oriented glenoid fossa (cavity), indicating habitual use of the arm in an elevated position “that would be common during climbing behavior”,<sup>30</sup> such as suspensory arm-swinging.<sup>31</sup> Studies of the more complete right scapula of the Nariokotome boy indicate that the glenoid fossa in *H. erectus* was not cranially oriented; although a Dmanisi *H. erectus* scapular fragment was more cranially oriented than that of the Nariokotome boy, it was still within the human range.<sup>32</sup>

The orientation of the glenoid fossa in *H. naledi* is stated to be “markedly cranially-oriented”.<sup>33</sup> John Hawks, a senior researcher in the Berger group, comments that the “*H. naledi* scapula has a superiorly oriented glenoid, very different from the Dmanisi scapula specimen or the Nariokotome

*H. erectus* skeleton.”<sup>34</sup> At the AAPA 2016 meeting it was reported that the glenoid fossa of *H. naledi* was as cranially oriented as gibbons (hylobates).<sup>26</sup> The orientation of the glenoid fossa is more cranial in gibbons than in the great apes (chimpanzees, orangutans, and gorillas), modern humans (*Homo sapiens*),<sup>35</sup> and australopithecines such as *Australopithecus afarensis* specimen AL 288-1 and *Australopithecus africanus* specimen Sts 7.<sup>36</sup> Hence, how could *H. naledi* be a transitional form between the australopithecines and a later species of *Homo* if its shoulder (in regards to glenoid fossa orientation) is even more ape-like than its hypothetical australopithecine ancestor.

### Hand

In the initial paper by Berger *et al.* it is stated that the hand of *H. naledi* “shares many derived features of modern humans and Neandertals in the thumb, wrist, and palm, but has relatively long and markedly curved fingers.”<sup>18</sup> A later publication on the hand of *H. naledi* by Kivell *et al.* essentially told the same story as the initial paper, stating:

“... the wrist and palm are generally most similar to those of Neandertals and modern humans, while the fingers are more curved than some australopiths. This distinctive mosaic of morphology has yet to be observed in any other hominin taxon and suggests the use of the hand for arboreal locomotion in combination with forceful precision manipulation typically used during tool-related behaviours.”<sup>37</sup>

There appears to be something very strange about the curvature of *H. naledi*'s fingers, and that is the high degree of curvature of not just the proximal phalanges (PPs), but also the intermediate phalanges (IPs). At face value the fingers of *H. naledi* appear better suited to climbing than chimpanzees, as the PPs are about the same curvature, but *H. naledi*'s IPs are considerably more curved than chimpanzees and australopithecines, the median value even higher than orangutans.<sup>38</sup> According to the authors “extant apes and most fossil hominins,



**Figure 2.** A replica skeleton of the *Homo floresiensis* LB1 specimen displayed at the Smithsonian National Museum of Natural History, Washington, DC

such as *A. afarensis* and OH7, generally have more strongly curved PPs and comparatively straight IPs.<sup>39</sup> Yet, other aspects of *H. naledi*'s hand, such as the "thumb, wrist, and palm bones all look remarkably modern."<sup>40</sup> Hence, most of the of *H. naledi* hand is human-like, except for the markedly curved fingers, stated as "a clear functional indication that its fingers experienced high loads during grasping required for climbing or suspensory locomotion."<sup>39</sup>

It should be noted that "degree of longitudinal curvature is strongly correlated with the degree of arboreal locomotion across primates, with climbing and, especially, suspensory taxa showing much stronger curvature than terrestrial quadrupedal or bipedal taxa."<sup>41</sup> Also, changes in phalangeal curvature appears to be associated with functionality (i.e. locomotion) during ontogeny, "such that more arboreal juveniles have more strongly curved phalanges than their more terrestrial adult counterparts."<sup>41</sup> A study on the biomechanics of phalangeal curvature concluded that "the strain differences between curved and straight phalanges illustrated here support the common assertion that phalangeal shaft curvature is related to the strains associated with arboreal and especially suspensory activity."<sup>42</sup>

*H. naledi*'s hand does not make sense in an evolutionary scenario because, if *H. naledi* is transitional between the australopithecines and a later species of *Homo*, then functionally (as indicated by finger curvature) it appears that *H. naledi* was even better suited to an arboreal lifestyle than its hypothetical australopithecine ancestor, when it should be less so. As with glenoid fossa orientation of the shoulder, it is very unlikely that the high degree of phalangeal curvature exhibited by *H. naledi* can be explained by normal human variation, if indeed the hand is from a human.

It is interesting that in regards to *H. floresiensis* "the proximal phalanges are curved to a similar degree as in *Au. afarensis*."<sup>41</sup> The proximal phalanx referred to belongs to the LB6 *H. floresiensis* individual. The authors of the publication that performed the study commented that "LB6/8 falls at the extreme upper end of the human range and overlaps with gorillas. It is similar in this respect to A.L. 333w-4, an *Australopithecus afarensis* specimen."<sup>43</sup> The proximal manual phalanges of the *H. floresiensis* LB1 individual were not complete enough to make conclusive judgment on curvature.<sup>44</sup> No information appears to be given on the curvature of the intermediate manual phalanges of the LB1 and LB6 *H. floresiensis* individuals.<sup>45</sup>

The species designation of *H. floresiensis* has been controversial, as it has been argued by some evolutionists that it instead consists of individuals, such as LB1 and LB6, that "are, most likely, endemic cretins from a population of unaffected *H. sapiens*."<sup>46</sup> Hence, did the *H. naledi* individuals suffer from cretinism, in a similar way that individuals from the *H. floresiensis* species possibly did, with the curved fingers related to cretinism or associated conditions?

## Pelvis

According to the Berger group the pelvis of *H. naledi* "appears to be flared markedly like that of *Au. afarensis*."<sup>47</sup> There are pelvic bones attributed to *H. erectus* that are described as having "broad, laterally flaring ilia", including the Gona specimen (BSN49/P27), OH 28 and KNM-ER 3228.<sup>48</sup> According to Gruss the "pelvis of *H. erectus*, while broad compared with modern humans, was narrower relative to body height than in the australopithecines."<sup>49</sup> As opposed to being markedly laterally flared, in modern humans the iliac blades curve or wrap around the sides of the body considerably more. The australopithecine ilium has been described as "excessively broad", such that the "breadth of the human iliac blade is actually intermediate between those of the chimp and of *Australopithecus*."<sup>50</sup> A later presentation of the pelvic features reported that the angle of lateral iliac flare on the best preserved pelvic fossil (U.W. 101-1100) in the *H. naledi* sample was:

"... identical to that seen in *Australopithecus* fossils like Lucy and Sts 14. It is such a wide angle that there is no way to reconstruct the *Homo naledi* hip to make it look not-flared. This extreme amount of flare is a primitive hominin feature that is not found in other *Homo* pelvic remains, even though fossil *Homo* pelvises have been described as being more flared than modern humans."<sup>51</sup>

The authors note that it is possible the Gona pelvis also has similar extreme amount of flare, as that of the *H. naledi* pelvis, but that it may not matter as there is debate about whether the pelvis is a species of *Australopithecus* rather than *H. erectus*.<sup>51</sup> Hawks states that "the pelvis of *H. naledi* exhibits a short, flared ilium unlike those known for *H. erectus*, including the Gona pelvic specimen."<sup>52</sup> Hence, it appears the extreme lateral iliac flaring observed in the *H. naledi* pelvis is outside the range of *H. erectus*.

Similar to the description of the *H. naledi* pelvis, it has been stated in regards to the pelvis of the *H. floresiensis* type specimen (LB1) that its "marked degree of lateral iliac flaring recalls that seen in australopithecines such as 'Lucy' (AL 288-1)."<sup>53</sup> As already mentioned, some evolutionists believe individuals from *H. floresiensis* were actually pathological humans, with cretinism a plausible explanation.<sup>46</sup> Interestingly, one of the features noted in cretinism is lateral flaring of the ilium of the pelvis.<sup>54</sup>

## Foot

Assessing *H. naledi* the Berger group state that "the foot and ankle are particularly human in their configuration."<sup>47</sup> Essentially the only traits of its foot regarded as "primitive" are evidence "suggestive of a lower arched foot"<sup>18</sup> and "slightly more curved toe bones."<sup>55</sup> Paleontologist Will Harcourt-Smith, lead author on a subsequent publication

on the *H. naledi* foot,<sup>56</sup> that essentially told the same story as the initial paper, states it “is essentially the foot of a modern human, but subtly different.”<sup>55</sup> Paleoanthropologist Dan Lieberman is quoted as saying: “The foot is indeed strikingly modern ... and suggests it walked and *possibly* ran much like modern humans.”<sup>57</sup>

According to evolutionary experts: “All primates possess a transverse arch, but only humans have a longitudinal arch making non-human primates anatomically and functionally flat-footed.”<sup>58</sup> The longitudinal arch is a structure involved in storing elastic energy and it “maintains the structural rigor of the foot during the push-off stage of bipedal locomotion.”<sup>58</sup> As for the lower arched foot, the Berger group state in their separate Fact Sheet that *H. naledi* “likely had minimally developed longitudinal foot arches (i.e. flatter feet), which is uncommon (but not unknown) in living people.”<sup>59</sup> Flatfoot is a frequently encountered pathology in both pediatric<sup>60</sup> and adult<sup>61</sup> human populations, and is not regarded as a ‘primitive’ condition of modern humans, and neither should it be in the foot of *H. naledi*, particularly as the “relatively low medial longitudinal arch” interpretation appears to be based on one foot (Foot 1).<sup>62</sup> It is interesting to note that, according to Jungers *et al.*, in *H. floresiensis* the big toe (hallux) was fully adducted (in line with the rest of the foot), but a medial longitudinal arch was suspected to be absent.<sup>53</sup> Hence, *H. floresiensis* probably had flatter feet than *H. naledi*.

The Fact Sheet mentions human-like features of *H. naledi*, for example, that their “big toes were in-line with the rest of the foot, unlike the grasping, opposable big toe in chimps”, but also mentions that their “toes were also slightly curved—not as much as a chimp’s toes—but more than in humans.”<sup>59</sup> The range of curvature in the pedal proximal phalanges of *H. naledi* appear to overlap considerably with *H. sapiens*, so this finding is probably not that significant,<sup>63</sup> although it is a little bit odd in that it does not appear to reflect any functionality. To be used effectively for climbing in trees the feet of *H. naledi* would need to have a grasping, opposable big toe as chimpanzees do, but *H. naledi*’s big toe was in line with the rest of the foot, like in humans. It is interesting that the toe bones of *H. floresiensis* are also said to be slightly curved (i.e. the proximal pedal phalanges).<sup>53</sup> As already mentioned, *H. floresiensis* is possibly associated with cretinism.

### Other postcranial skeletal parts

Based on a tibia (U.W. 101-484), the stature of one *H. naledi* individual was estimated to be just under 1.5 m, whereas body mass was estimated, from eight femur specimens, to vary from about 40 kg to 56 kg; with estimates of both stature and body mass “similar to small-bodied modern human populations”.<sup>64</sup> It is stated that locomotor

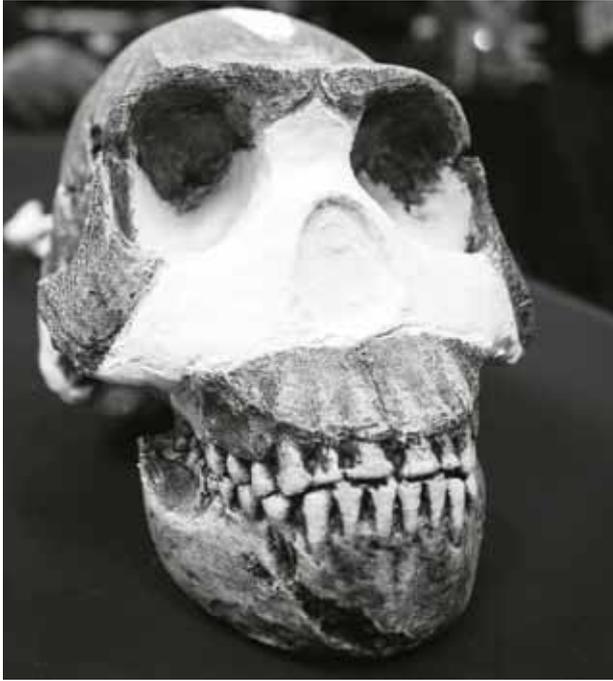
“traits shared with Homo include the absolutely long lower limb”,<sup>65</sup> which is consistent with *H. naledi* being human-like. *H. naledi* is said to possess a valgus knee<sup>66</sup> (angling inward of the femur making the knees closer together), a characteristic of humans that allows efficient bipedalism.

Much fuss has been made about *H. naledi*’s femoral neck being relatively long and anteroposteriorly compressed,<sup>67</sup> a feature allegedly making it look different from African and Dmanisi femora attributed to *H. erectus*.<sup>52</sup> It is generally considered an “archaic morphology”<sup>68</sup> (i.e. femoral necks that are narrow anteroposteriorly relative to superoinferiorly), as it is considered typical of the australopithecines, but not in modern humans or femora attributed to *H. erectus*.<sup>69</sup> Whilst as a group the femoral neck of australopithecines are statistically anteroposteriorly compressed compared to modern humans, data from Ruff and Higgins indicated that individually quite a few of the femora from the modern human sample were similarly anteroposteriorly compressed.<sup>70</sup> Hence, as this feature is not unique to the australopithecines, but also present in modern humans, albeit less frequently, it is not an “archaic morphology” that supports assignment of *H. naledi* to a new species of ‘ape-man’. Ruff and Higgins had two femora (KNM-ER 1472 and KNM-ER 1481) attributed to *H. erectus* as part of their analysis.<sup>71</sup> These were not anteroposteriorly compressed, and even if the Dmanisi femur is not either, then this only leaves a sample size of three—hardly enough to establish the range of intra-species variation.

### Skull

According to the authors the “morphology of the cranium, mandible, and dentition is mostly consistent with the genus *Homo*, but the brain size of *H. naledi* is within the range of *Australopithecus*.”<sup>47</sup> The authors compared the *H. naledi* skull (figure 3) with those of other fossil species and found none that *H. naledi* could be incorporated into. When the *H. erectus* Dmanisi Skull 5 was revealed in 2013,<sup>72</sup> one of the big surprises was the implication of this find on the variability of *H. erectus*, at least of the skull, with the morphological variation considerable indeed.<sup>73</sup> Given the enormous variation in the skulls of specimens labelled *H. erectus*, is the skull of *H. naledi* really that different? According to Tim White the *H. naledi* fossils “are a small, primitive *H. erectus*”.<sup>74</sup> John Hawks responded to White’s assessment by saying “*H. naledi* does not have the elongated, low cranium of *H. erectus*”.<sup>34</sup>

In Chris Stringer’s accompanying *eLife* article *H. naledi* is labelled as having a “relatively high and thin skull” and small teeth, whereas *H. erectus* is labelled as having a “relatively low and thick skull” and large teeth, with both having a flexed occipital and transverse torus.<sup>75</sup> The Berger paper states that “compared to samples of *H. habilis*,



**Figure 3.** Replica of the composite *Homo naledi* skull. The white areas represent missing bone (cc Wits University).

*H. rudolfensis*, and *H. erectus*, the teeth of *H. naledi* are comparatively quite small, similar in dimensions to much later samples of Homo.<sup>76</sup> Having small teeth is a feature of modern humans, as is having a high and thin skull. Also, the cranial vault of *H. naledi* is described as having only slight post-orbital constriction, the mandibular dental arcade as parabolic in shape, and the mandibular corpus (body) as being relatively gracile.<sup>77</sup> These features of the skull do not align it with the australopithecines, but rather with humans, although the skull of *H. naledi* is not that of an anatomically modern human. In *National Geographic* the general shape of the composite male *H. naledi* skull is said to be “advanced”, as well as labelled a “Humanesque skull”.<sup>78</sup>

There is indisputable evidence that the morphology of skulls classified by evolutionists as *H. erectus* vary considerably, a point illustrated by Schwartz *et al.*<sup>79</sup> Regardless of whether it is classified as *H. erectus* or not, the form of the *H. naledi* skull appears to be within human variation (here human variation encompasses the combined range of both modern and robust humans).

### Cranial capacity

Perhaps the most astonishing aspect about *H. naledi* is its small cranial capacity.<sup>80</sup> *H. naledi* is said to be “characterized by body mass and stature similar to small-bodied human populations but a small endocranial volume similar to

australopitths.”<sup>81</sup> Details of the virtual reconstruction of the composite crania is given in the Berger group paper,<sup>82</sup> and apart from merging crania from different specimens, a problem with the cranial capacity values of *H. naledi* appears to be the amount of guesswork involved, evident by reference to the number of holes (large and small) filled by various software functions. Large parts of both composite skulls are missing including, for example, most of the cranial base in the smaller DH3/DH4 composite cranium (465 cc), and most of the frontal region in the larger DH1/DH2 composite cranium (560 cc). Whilst the cranial capacity of *H. naledi* is undoubtedly small, there could large errors in estimation.

Before *H. naledi*, the smallest estimate of cranial capacity of a *H. erectus* skull from Africa, at 691 cc, was KNM-ER 42700, believed to be of “a young adult or a late subadult”.<sup>83</sup> Outside Africa, smaller *H. erectus* cranial capacities have been estimated from Dmanisi, Georgia. The cranial capacity of 546 cc for the adult Dmanisi Skull 5 (D4500/D2600) is the smallest of the Dmanisi sample, with cranial capacities of the other four skulls reported to be between 601 cc to 730 cc.<sup>84</sup> Of other interest is the LB1 *H. floresiensis* cranium, most recently estimated to be 426 cc.<sup>85</sup> The mean cranial capacity for modern humans is about 1345 cc, but the range of modern humans able to function normally is difficult to specify, although approximately 700 cc to 2,200 cc is given by expert Stephen Molnar, who comments that “there are many persons with 700 to 800 cubic centimeters”.<sup>86</sup> One of the smallest brain sizes documented of a modern human with normal intelligence was from Daniel Lyon, a man of small stature (height of 1.55 m), with a brain volume of about 624 cc,<sup>87</sup> and hence an estimated cranial capacity of 660 cc.<sup>88</sup>

### Discussion and conclusion

Can *H. naledi* be human? Most of the features that are said to be ‘primitive’ in *H. naledi* are still within human variation, whether it be modern humans or robust humans. One explanation why robust humans, such as *H. erectus*, *H. heidelbergensis* and Neandertals, were more robust (heavily built) and/or different in morphology to modern humans is that it could reflect differences in development of these pre-Flood and early post-Flood humans, linked to longevity.<sup>89</sup>

From a creationist point of view, if *H. naledi* is human the features most difficult to explain are those that appear outside normal human variation, whether modern or robust humans, in particular the small cranial capacity, the extreme lateral iliac flaring observed in the pelvis, the strongly curved fingers of the hand, and a glenoid fossa said to be markedly cranially oriented, like a gibbon. Such extreme skeletal features make it hard to argue *H. naledi* individuals were normal (non-pathological) humans, although some

suggest just that,<sup>90–92</sup> with Kurt Wise stating the “mosaic nature of characters exhibited by the *naledi* are consistent with fossil human morphologies being non-adaptive morphologies expressed from latent genetic material and fixed by genetic drift in small populations dispersing from Babel.”<sup>93</sup> This model proposes there was a period of rapid human diversification beginning during the construction of Babel, resulting in extreme morphological variability in post-Babel humans repopulating the earth.<sup>94</sup> Other explanations are that *H. naledi* were strange extinct apes,<sup>95</sup> a mixture of both human and extinct ape bones,<sup>96</sup> or robust humans with pathology,<sup>3</sup> the case for the latter restated in this paper.

In paleoanthropologist Tim White’s eye, “Berger’s findings are probably South African representatives of *H. erectus*. The *H. naledi* cranium is similar in conformation and size to the earliest and most primitive *H. erectus* representatives.”<sup>97</sup> Hence, as discussed earlier, and also in the opinion of other evolutionary experts, the cranium of *H. naledi* is likely within the *H. erectus* range of variability. An unusual aspect of the cranium, however, is its diminutive cranial capacity, which is small even for *H. erectus*. Although there are doubts about the accuracy of the estimated cranial capacity values of the *H. naledi* composite skulls (465 cc and 560 cc), they are undoubtedly very small, and outside the range of what could be considered normal for modern humans.

If *H. naledi* are just small-brained *H. erectus* specimens, are they part of the normal variation of these robust humans? Given the number of *H. erectus* specimens with small cranial capacities, it is hard to escape the conclusion that the range of what could be considered normal brain size was lower in *H. erectus* compared to modern humans. Even so, the only skulls comparable to *H. naledi* in terms of cranial capacity are 546 cc for the Skull 5 Dmanisi *H. erectus* cranium and 426 cc for the LB1 *H. floresiensis* cranium, I consider both to be robust humans that had suffered from some sort of developmental disorder, possibly cretinism.<sup>73</sup>

In regards to *H. floresiensis*, some evolutionists have argued that it shows similarities to hypothyroid endemic cretins “from a population of unaffected *Homo sapiens*”.<sup>46</sup> Cretinism brought about by environmental iodine deficiency (cretins being the offspring of mothers with severe iodine deficiency) is not a genetic disorder,<sup>98</sup> and can occur anywhere in the world there is iodine deficiency in the food chain. As such it can affect entire populations in an environment where iodine deficiency is endemic, and people in different parts of the world, although “morphological traits vary substantially”.<sup>99</sup> Cretinism (congenital hypothyroidism) “can reduce brain size by approximately 50%”.<sup>100</sup> Hence, whilst cretins from modern human populations of large brain size may not give rise to cretins with small enough brains to

explain *H. naledi* or *H. floresiensis*, parent populations with smaller brains, such as *H. erectus* humans, could do so. Most likely so would also the small-brained *H. sapiens* population from Palau, Micronesia,<sup>101</sup> but if individuals assigned to *H. naledi* and *H. floresiensis* are cretins then it makes more sense that they come from robust human populations, such as *H. erectus*, because of their similarity in skeletal features to the latter. In regards to *H. floresiensis*, in the original publication announcing the find it was suggested that it was the result of “endemic dwarfing, of an ancestral *H. erectus* population”.<sup>102</sup>

Apart from small brain size and stature, some of the alleged ‘primitive’ skeletal features reported in *H. naledi*, that have been discussed earlier, which are also noted in *H. floresiensis*, are: lateral flaring of the ilium of the pelvis,<sup>53</sup> relatively short clavicle,<sup>103</sup> low humeral torsion,<sup>103</sup> reduced medial longitudinal arch (i.e. flatter feet; actually arch suspected to be absent in *H. floresiensis*),<sup>53</sup> curved finger bones,<sup>43</sup> and slightly curved toe bones.<sup>53</sup> Some of these features have also been documented in modern humans with cretinism, including lateral flaring of the ilium of the pelvis,<sup>54</sup> relatively short clavicle,<sup>104</sup> and low humeral torsion,<sup>105</sup> whereas the presence of other features is unclear.

If individuals of *H. floresiensis* and *H. naledi* suffered from cretinism one would not expect them to show exactly the same features, particularly ones living as far apart as Africa and Indonesia. This is because “cretins are enormously more variable than unaffected humans in many features (as would be expected in a pathology with different degrees of affect [sic], and conflation with associated conditions)”.<sup>106</sup> According to Charles Oxnard “all cretins are not identical. The effects of the deficiency vary to greater or lesser degree. Their genetic heritages can also be expected to influence the picture.”<sup>107</sup> Evolutionist Oxnard makes the following revealing statement:

“It is remarkable that so many features similar to those normally present in great apes, in *Australopithecus* and *Paranthropus*, and in early *Homo* (e.g. *H. erectus* and even to some degree, *H. neanderthalensis*) but not in modern *H. sapiens* are generated in humans by growth deficits due to the absence of thyroid hormone. In other words, many of the pathological features of cretinism mimic the primitive characters of evolution making it easy to mistake pathological features for primitive characters.”<sup>108</sup>

If a modern human with cretinism can have many pathological features that mimic the so-called ‘primitive’ features of evolution, it is highly likely that robust humans, such as *H. erectus*, with cretinism will have as many, if not even more such features, yielding individuals that look like members of *H. floresiensis* and *H. naledi*.

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