REPLY TO SAHLE AND GOSSA:

Technology and geochronology at the earliest known Oldowan site at Ledi-Geraru, Ethiopia

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Sahle and Gossa (1) identify 2 components of our paper with which they disagree. Their concerns are based on misunderstandings of our paleomagnetic data and the published details of the Bokol Dora 1 (BD 1) artifact assemblage.

The normal paleomagnetic sequence at BD 1 cannot represent the Reunion subchron [2.128 to 2.148 Ma (2)]. This would require one or more of the following scenarios: 1) The age of the Ali Toyta Tuff (ATT) is ∼0.5 My too old. There is no evidence to support this in the $^{40}Ar/^{39}Ar$ data; the 95% confidence interval places a minimum age of 2.55 Ma on the juvenile feldspar population. 2) The ATT feldspars were reworked from older eruptions and are unassociated with the vitric component. Geochemical analyses of ∼150 glass shards demonstrate that the ATT has a single, homogenous population (3) indicating no incorporation of additional tephra. 3) The normal paleomagnetic interval represents both the Gauss (at/around the ATT) and the Reunion (at/around BD 1), separated by an ∼0.5-My unconformity. There is no evidence for an unconformity between these levels in the sedimentological analysis of multiple sections. Any unconformity would have had to remove the reverse polarity sediments of the Matuyama chron while preserving on the brief (20 ky) Reunion subchron. Nearby sedimentation rates range from ∼30 cm/ky (4) to ∼90 cm/ky (5). Thus, the ∼9 m of sediment between the ATT and BD 1 may represent ∼10 to 30 ky. Considering the uncertainty on the ATT age extends to 2.618 Ma, this thickness can be accommodated within the Gauss chron but cannot extend to the Reunion subchron.

Sahle and Gossa's second major concern relates to technological analysis of the BD 1 assemblage. They draw on frequencies of flakes and percussors of the LOM3 assemblage to contend that our analysis "endorses disputed characterization of the Lomekwi assemblage emphasizing percussive activities" (1). However, we show that the proportion of percussive tools at LOM3 is significantly greater than any documented Oldowan assemblage (ref. 3, figure S18). This is emphasized by Harmand et al.'s (6) inference that many of the cores were also used for battering. Sahle and Gossa suggest that the frequency of flakes and fragments at LOM3 indicates a mastery of flake production. However, Harmand et al. (6) documented frequent mistakes in flake production. This questions Sahle and Gossa's inclusion of fragments into their flake frequency estimates at LOM3 and their suggestion that the "inexplicable exclusion of Lomekwi's flake components" (1) led to erroneous interpretations. This is a misrepresentation of our study, as measurements and comparisons of LOM3 flakes appear in 9 of our figures. Sahle and Gossa state that aspects of raw material variability can drive assemblage differences. We agree. We provide detailed comparative information on the raw material context of numerous

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Oldowan assemblages (ref. 3, figure S12). Sahle and Gossa contend that we drew associations between environmental changes, the appearance of early *Homo,* and systematic flake production. We did not. The connection between the appearance of *Homo* and environmental parameters is well documented (7). Previous studies document that systematic flake production increases resource return rates for subsistence opportunities that occur in more open habitats (8, 9).

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