LATE QUATERNARY PALEOENVIRONMENTS AND THE EXTINCTION OF THE AUSTRALIAN MEGAFAUNA. B. J. Johnson[1], G. H. Miller[2], M. L. Fogel[3], and J. W. Magee[4], [1]School of Oceanography, University Washington, Seattle WA 98195-7940, USA bjohnson@ocean.washington.edu, [2]INSTAAR, University of Colorado, Boulder CO 80309-0450, USA, [3]GL/CIW, 5251 Broad Branch Road NW, Washington DC 20015-1305, USA, [4]Department of Geology, Australian National University, Canberra ACT 0200, Australia.

Approximately 85% of Australia's large land animals went extinct in the late Quaternary [1]. *Genyornis newtoni*, a large flightless bird and element of the Australian megafauna disappeared from the Australian interior approximately 50 ka ago, during a period of moderate climate change [2] and roughly coincident with the arrival of the first human immigrants approximately 60 ka ago [3].

We use stable carbon isotopes ($\delta^{13}C$) in fossil eggshell carbonate laid by the extinct *Genyornis newtoni* and the extant *Dromaius novaehollandiae* (emu) from Lake Eyre, South Australia, to better understand the paleoecology and dietary preferences of both birds. Between 50 and 65 ka, *Genyornis* was primarily a C_3 feeder, and relied heavily on the presence of C_3 trees and shrubs, whereas *Dromaius* had a much broader dietary range including a significant component of C_4 grasses. We speculate that after 60 ka, a decrease in shrub and tree cover resulted from an increase in fire frequency brought about by the arrival of the first human immigrants, and contributed to the ultimate demise of *Genyornis* [3].

The $\delta^{13}C$ of *Dromaius* eggshell provides the first continuous paleovegetation record from the Australian interior which extends through the last 65 ka [4]. Because the Australian monsoon controls summer precipitation over Lake Eyre, changes in the relative abundance of C_4 grasses serves as an indirect proxy for the effectiveness of the Australian monsoon. The monsoon was most effective when C_4 grass abundance was highest (between 45 and 65 ka), and least effective when C_4 grass abundance was lowest (between 15 and 28 ka). The Holocene had intermediate levels of C_4 grasses, and a moderately effective summer monsoon.

Our isotopic results are consistent with a human overprint on natural climate change. The effectiveness of the summer monsoon at Lake Eyre decreased significantly at approximately the same time as the megafauna extinction and never fully recovered despite an invigorated planetary monsoon during the early Holocene [5]. Furthermore, a change in vegetation-type across northern Australia may have reduced the southward penetration of the Australian monsoon by decreasing the amount of moisture transfer to the atmosphere. Continued investigations of vegetation and fire histories are currently underway.

Reference List

[1] T. Flannery, The Future Eaters (Reed Books, Melbourne, 1994). [2] G. H. Miller et al., Science 283, 205 (1999). [3] R. G. Roberts et al., Quat. Geochronol. 13, 575 (1994). [4] B. J. Johnson et al., Science, in press (1999). [5] J. L. Xiao et al., Quat. Sci. Rev. 18, 147 (1999).