# Radiocarbon dating of North American terrestrial gastropods

JEFFREY S. PIGATI U.S. Geological Survey, 520 N. Park Avenue, Tucson AZ 85719
JASON RECH Department of Geology, Miami University, 114 Shideler Hall, Oxford, OH 45056
JEFFREY A. NEKOLA Department of Biology, University of New Mexico, 167 Castetter Hall, University of New Mexico, Albuquerque, NM 87131

Radiocarbon dating of plant macrofossils and charcoal has provided the chronological foundation for numerous late Quaternary records in paleoclimatology, geomorphology, and neotectonics. These materials are ideal for $^{14}C$ dating because they meet two criteria: (1) prior to death, their $^{14}C$ activity is in equilibrium with atmospheric carbon, and (2) after death, they remain a closed system with respect to carbon. When these materials are unavailable, researchers generally use less reliable materials for $^{14}C$ dating, such as bulk organic sediments, or other dating techniques, such as luminescence, which are not as precise as $^{14}C$ dating. Terrestrial gastropod shells provide another alternative, but early studies indicated shell ages were often anomalously old because of "old carbon" effects. Based on our recent work in the American Southwest, however, it appears that fossil shells of some small (<10 mm) terrestrial gastropods yield $^{14}C$ ages that are as reliable as those obtained from plant macrofossils and charcoal. These small gastropods differ from other gastropod taxa in that they do not incorporate old carbon from limestone in their shells even when it is readily available. Limited evidence also suggests that their shells remain closed systems with respect to carbon over geologic timescales in arid environments. In this study, we present the results of a systematic evaluation of the $^{14}C$ activity of small, live-collected terrestrial gastropod shells from 44 different taxa that are commonly preserved in the fossil record. Our initial results suggest that shell carbonate of many common taxa, including *Succineidae* and *Discidae*, will yield reliable $^{14}C$ ages regardless of local geologic or environmental conditions. Other common taxa, including *Pupillidae* and *Valloniidae*, obtain up to ~15% of their shell carbon from limestone, correlative to $^{14}C$ ages that are ~1,500 years too old. Ongoing evaluations will determine if shells from *Succineidae*, *Discidae*, and related taxa also remain closed systems with respect to carbon over geologic timescales.