



Beyond the bucket: testing the effect of experimental design on rate and sequence of decay

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Experimental decay has revealed the potential for profound biases in our interpretations of exceptionally preserved fossils, with non-random sequences of character loss distorting the position of fossil taxa in phylogenetic trees. By characterising these sequences we can rewind this distortion and make better-informed interpretations of the affinity of enigmatic fossil taxa. Equally, rate of character loss is crucial for estimating the preservation potential of phylogenetically informative characters, and revealing the mechanisms of preservation themselves. However, experimental decay has been criticised for poorly modeling ‘real’ conditions, and dismissed as unsophisticated ‘bucket science’. Here we test the effect of a differing experimental parameters on the rate and sequence of decay. By doing so, we can test the assumption that the results of decay experiments are applicable to informing interpretations of exceptionally preserved fossils from diverse preservational settings. The results of our experiments demonstrate the validity of using the sequence of character loss as a phylogenetic tool, and sheds light on the extent to which environment must be considered before making decay-informed interpretations, or reconstructing taphonomic pathways. With careful consideration of experimental design, driven by testable hypotheses, decay experiments are robust and informative – experimental taphonomy needn’t kick the bucket just yet.