PREBIOTIC PCR TEMPERATURE PROFILES ON THE EARLY EARTH. Z. R. Adam[1], [1]Earth and Planetary Sciences Department, Harvard University, Cambridge, MA, USA (correspondence: zach@bmsis.org).

Introduction: Energy dissipation in abiotic systems is typically unidirectional, ranging from the gentle rain of sunshine to the steady flow of a hydrothermal vent to the explosive release of an impactor. Though these and other processes have served as invaluable organic synthesis testbeds, the thermodynamics of such systems are inherently problematic for origins of life studies. Mass transport, thermal and chemical gradients converge and interact on short systemic scales to freeze reactants into organic matter, but work and information flow rarely result in stable circulatory patterns that create significantly higher ordered states of matter. This is because most dissipative processes in origins studies lack feedback mechanisms that link chemical outcomes to energy inputs. Here we will introduce a geologic and engineering model of natural nuclear reactor formation on the early Earth to demonstrate how the feedback parameters of reactor operation would have simultaneously created organic polymers near reactor core centers and temperature oscillations comparable to polymerase chain reaction (PCR) thermal profiles along reactor margins. Natural nuclear reactors may thus serve as an instructive scenario into how abiotic energy feedback mechanisms can serve as a thermodynamic template for the production and self-organization of organic matter. A search for thermodynamic feedback in naturally-occurring organic synthesis systems and geologic settings, and the incorporation of feedback analogs into laboratory experiments, may prove an insightful avenue for future origins of life studies.