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Length selective accumulation of oligonucleotides in thermal gradients MORITZ KREYSING, SIMON LANZMICH, DIETER BRAUN, Department of Physics, LMU Munich — Central to most Origin-of-Life scenarios is the possibility for pre-biotic organic molecules to interact in order to form increasingly complex, catalytic molecular machinery ultimately capable of autonomous replication. While strong evidence for the spontaneous synthesis of single nucleotides [1] recently arose, concentrations required to allow these building blocks to polymerize [2] and gain functionality, still seem improbable for early earth conditions. Here, we demonstrate experimentally that temperature gradients across pores, as found in rocks near hydrothermal vents [3], are sufficient to accumulate nucleotides efficiently from dilute solutions. In particular we show that depending on the pores' dimensions, it can act as a length-selective molecular filter. We suggest that equivalent systems could have served as meeting points for long and complex molecules, too rare to find each other in a dilute primordial ocean. Furthermore, we discuss under which conditions this selection could have triggered the evolutionary adaptation of molecular replicators, and how polymerase chain reaction assays could nowadays benefit from the presented concept. References: 1. M. Powner et al., Nature 459 (2009), 2. G. Costanzo et al., ChemBioChem 13 (2012), 3. P. Baaske et al., PNAS (2007)

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