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Percolation Threshold of Kinetoplast DNA Networks[1] JOSH RAGOTSKIE, NATHANIEL MORRISON, RYAN BLAIR, ALEXANDER KLOTZ, California State University, Long Beach — The structure, topology, and physical behavior of kinetoplasts, two-dimensional chain-mail like structures of linked DNA rings, are of great interest to the parasitology and materials physics communities. We are interested in how their connected topology affects their physical properties. Kinetoplasts have excess DNA linkages forming a loop around their edges, but previous estimates of their topology did not take the outer boundary rings into account. We intend to measure the topology of these structures by measuring their percolation threshold: a critical point at which a sufficient number of links are removed from the structure and it is destroyed. We performed numerical simulations that indicate that the presence of an edge loop leads to two percolation thresholds. We experimentally probed the percolation threshold of Crithidia fasciculata kinetoplasts by staining them with YOYO-1 dye and examining their disintegration under blue light exposure due to photo-induced double-strand breakage. We observed fragments of the outer loops surviving after the breakages in the interior of each kinetoplast had reached percolation. These findings support our simulation predictions and we plan on further quantitative measurements of the percolation threshold using restriction enzymes.

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