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Active matter clusters at interfaces. KATHERINE COPENHAGEN, Univ of California - Merced, AJAY GOPINATHAN, University of California - Merced — Collective and directed motility or swarming is an emergent phenomenon displayed by many self-organized assemblies of active biological matter such as clusters of embryonic cells during tissue development and flocks of birds. Such clusters typically encounter very heterogeneous environments. What happens when a cluster encounters an interface between two different environments has implications for its function and fate. Here we study this problem by using a mathematical model of a cluster that treats it as a single cohesive unit whose movement depends on the nature of the local environment. We find that low speed clusters which exert forces but no active torques, encountering an interface with a moderate difference in properties can lead to refraction or even total internal reflection of the cluster. For large speeds and clusters with active torques, they show more complex behaviors crossing the interface multiple times, becoming trapped at the interface and deviating from the predictable refraction and reflection of the low velocity clusters. Our results show a wide range of behaviors that occur when collectively moving active biological matter moves across interfaces and these insights can be used to control motion by patterning environments.

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