

Parasites and Pattern Formation

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Biological information is coded in replicating molecules. To maintain a given amount of information a cooperative interaction between these molecules is essential. The main problem for the stability of a system of prebiotic replicators are emerging parasites. Stabilization against such parasites is possible if space is introduced in the model. Complex patterns like spiral waves and self-replicating spot patterns have been shown to stabilize such systems. Stability of replicating systems, however, occurs only in parameter regions where such complex patterns occur. We show that parasites are able to push such systems into a parameter region where life is possible. To demonstrate this influence of parasites on such systems, we introduce a parasitic species in the Gray-Scott model. The growing concentration of parasites will kill the system, and the cooperative Gray-Scott system will be diluted out in a well mixed flow reactor. While considering space, in the model stabilizing pattern formation in a narrow parameter region is possible. We demonstrate that the concentration of the parasitic species is able to push the system into a region where stabilizing patterns emerge.

Key words: Pattern Formation; Reaction-Diffusion; Molecular Evolution; Parasites; Coevolution; Cooperation.

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