Meeting: 1003, Atlanta, Georgia, SS 18A, AMS-SIAM Special Session on Recent Advances in Mathematical Ecology, I

1003-92-1378 **Jaap A. Kaandorp*** (jaapk@science.uva.nl), Kruislaan 403, 1098 SJ Amsterdam, Netherlands. *Modelling morphogenesis of a branching coral.*

Understanding morphogenesis of scleractinian corals is crucial to study their role in the marine ecosystem and to obtain insight into into their susceptibility to changes in the external physical environment. In the simulation experiments we studied the flow pattern and the advection-diffusion of nutrient in three-dimensional images of the scleractinian *Madracis mirabilis* and in simulated morphogenetic models of a branching coral. The three-dimensional images were obtained using X-ray (Computed Tomography) scanning techniques. The three-dimensional morphogenetic model of *Madracis mirabilis* is based on an accretive growth model of a coral, in which the growth process is simulated by a surface normal deposition process and where the thickness of new growth layers is determined by the local availability of a (simulated) nutrient. For modelling the advection-diffusion of nutrients, a particle-based technique (the lattice Boltzmann method) was used. In the simulation experiments we found evidence that in branching scleractinian corals, relatively large boundary layers and stagnant zones are formed between the branches. The formation of regions around the coral, where mass-transfer is diffusion-limited, plays a fundamental role in the morphogenesis of the coral. (Received October 05, 2004)