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Diffusion Processes on Power-Law Small-World Networks[1] BALAZS KOZMA, RPI, MATTHEW B. HASTINGS, LANL, G. KORNISS, RPI — We consider diffusion driven processes on power-law small-world networks: a random walk process related to folded polymers and surface growth related to synchronization problems. The random links introduced in small-world networks often lead to mean-field coupling (as if the random links were annealed) but in some systems mean-field predictions break down, like diffusion in one dimension. This break-down can be understood treating the random links perturbatively where the mean field prediction appears as the lowest order term of a naive perturbation expansion. Our results were obtained using self-consistent perturbation theory [2] and can also be understood in terms of a scaling theory. We find a rich phase diagram, with different transient and recurrent phases, including a critical line with continuously varying exponents.

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[2]B. Kozma, M. B. Hastings, and G. Korniss, Phys. Rev. Lett. **92**, 108701 (2004).

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