THE ROLE OF NOISE IN "SELF-ORGANIZING SYSTEMS"

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This paper deals with information transfer from environment and "self"-organization in open, nonlinear systems far from thermodynamic equilibrium in the presence of either non-stationary phase jitter noise, or amplitude stationary noise. By "self"-organization we mean here the progres-

sive formulation within the system sequential ordered (cocherent) relationships between appropriate dynamical variables-like for example, the phase differences between the oscillating components of the system. We take up (in section (II) the classical Laser as a specific example and examine in detail the influence of phase jitter noise in the mode (phase) locking process. We find-as expected — that phase fluctuations in the cavity cause degradation of the coheren behaviour (i.e. increase the entropy) of the system, which, however, levels off, or saturates with time.

Further (in section III) we examine systems, where the number of self-sustained oscillating components may vary with time in such a way that the maximum entropy of the system increases faster than the overall instantaneous entropy. We put forth the hypothesis that in such cases — because of the increase of the redundancy — the system gets organized not just in spite of, but merely because of the presence of Noise. Possible applications in biological systems (especially concerning a model of cerebral organization) are briefly discussed.

It is understood here that the system has to display some preliminary dynamic structure *before* the organizing procedure takes over; What happens *afterwards* is the subject of this paper.