

E1-29: An analysis of complex patterns

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There is a striking similarity in a vast array of patterns in nature, ranging from cloud formation and patterns in sand dunes, to animal coats, fish scales and beehives. The patterns are regular on a small scale (typically consisting of stripes or hexagons) but form highly complex structures on a large scale. The similarity of patterns generated in quite disparate systems demands a study transcending the microscopic details of the physical system. The first aim of a theoretical analysis of labyrinthine patterns should be the identification of suitable characterizations; in particular patterns generated under identical control parameters (and visually similar) should be assigned the same set of measures. The characterizations should also be capable of contrasting visually different patterns. Such an identification would be analogous to the determination of 'ensemble independent' variables (e.g., pressure, entropy) in statistical mechanics, or the deduction of dynamic invariants (e.g. fractal dimension, Lyapunov exponent) in chaotic systems. A characterization for the analysis of labyrinthine patterns, referred to as the "disorder function" has been introduced. We will present results from the analysis on numerical experiments that provide several useful features of the characterizations.