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Three Forms of Chaos and Their Associated Attractors[1]

What should one mean by the statement that a function f is *chaotic*? To some it might mean that the iterates of f admit *strange attractors*. When dealing with self–maps of an interval I, however, the notion of chaos usually carries the sense that the iterates of f separate or spread out the trajectories of certain sets of points.

Two such notions appear frequently in the literature: the existence of scrambled sets (chaos in the sense of Li and Yorke), and positive topological entropy. The latter form of chaos implies the former, but the converse is not true. A new notion involves the map ω_f which maps each $x \in I$ into its ω–limit set, (i.e. attractor), $\omega(x, f)$. When the space of all ω–limit sets is furnished with the Hausdorff metric, the map is always in Baire class 2. When it is not in Baire class 1 we have a certain form of chaos intermediate to the other two.

We illustrate these three forms of chaos with a particular function, and discuss how, in general, the form of chaos is intimately connected to the types of ω–limit sets that the function possesses.

[1] A more complete summary of this talk can be found in the Inroads section of this issue.