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Bifurcations and pattern formation in particle physics: a model study ERVIN GOLDFAIN, Welch Allyn Inc. — Quantum field theories, regardless of their formal content, lead to a large number of coupled nonlinear field equations. In general, solving these equations in closed form or through lattice-based computations has been accomplished with modest or limited success. Our study suggests that the theory of nonlinear dynamical systems offers a fresh approach to this challenge. Working from the universal route to chaos in coupled systems of differential equations, we find that: a) particles acquire mass as plane wave solutions of the complex Landau-Ginzburg equation (CLGE), without any reference to the hypothetical Higgs scalar; b) the $U(1) \times SU(2)$ and $SU(3)$ gauge groups, as well as leptons and quarks, become progressively generated through bifurcations of CLGE.

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