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<h3>Henry Cohn - February 14, 2011</h3>

One of the most striking phenomena in science is the occurrence of unexpectedly regular patterns, such as the growth of crystals. These cases can be viewed as solutions of constrained optimization problems, and the surprising aspect is how much symmetry occurs in the solutions. The constraints are typically highly symmetrical, but symmetrical problems needn't have equally symmetrical solutions (Instead, the symmetry is generally broken, with the complete set of solutions being symmetrical but with each individual solution lacking symmetry.) In this expository talk, I'll discuss several areas in mathematics and physics that are on the boundary between order and disorder. In particular, I'll try to sketch what we know, what we may never know, and what we ought to know but for some reason haven't yet figured out. Specific topics will include packings, coverings, foams, minimal surfaces, and energy minimization In general.

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