A unified picture of laser physics

Science: Laser technology is present in our daily lives through literally thousands of applications, including surgical instruments, CD and DVD players, optical fiber communications, and even supermarket barcode readers. Despite the fast pace of laser research, the design of most laser devices relies on assumptions in the underlying theory that have barely changed since the early days of laser theory (1). However, this situation is problematic for two reasons. First, the rapid advance of nanofabrication techniques has led to the development of completely new lasing systems whose description falls outside the scope of conventional laser theory. Of these, random lasers (2) are perhaps the most challenging example. Second, more general models could enable the design of substantially different classes of lasers. With their contribution in this week's Science magazine, Türeci, Rotter and Stone have substantially changed this picture. By developing a new theory in which the main properties of a laser can be physically understood as the result of strong nonlinear interactions between lasing modes, they have provided a substantially broader perspective of laser physics that unifies the physical description of many possible laser structures.

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Strong Interactions in Multimode Random Lasers
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