Hidden Order in the Patterns of the Prime Numbers: Physics Meets Mathematics

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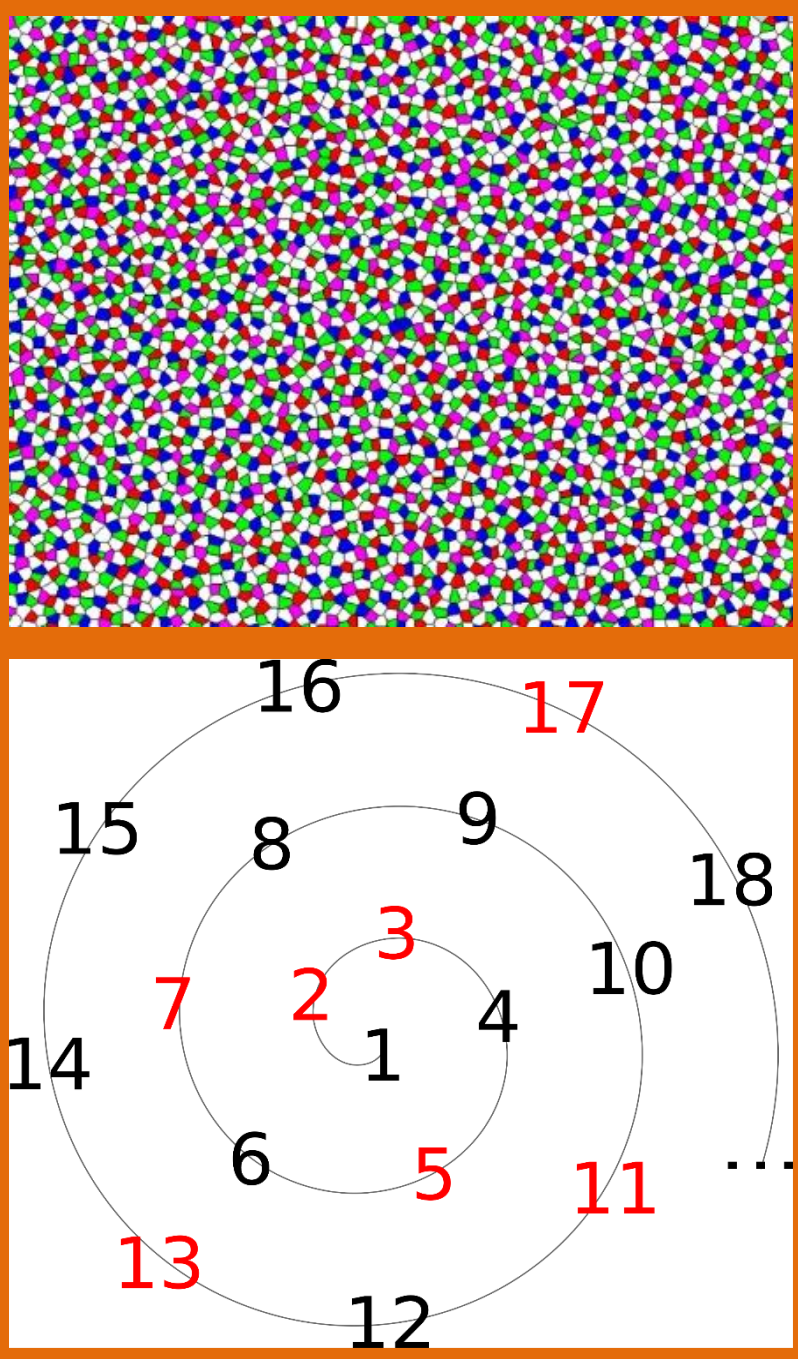
12:30-1:30 P.M.
Gitenstein Library Auditorium

Prime numbers, the basic building blocks of all natural numbers, have been a source of fascination for millennia and continue to surprise us. While prime numbers are deterministic, by some measures, they can be regarded as pseudo-random in nature. Indeed, patterns in the primes can be difficult to distinguish from random patterns at the same density. Combining ideas and techniques from physics and number theory, we have recently shown that the prime numbers in certain large intervals possess unanticipated order across length scales and represent the first example of a new class of many-particle systems with pure point diffraction patterns that we call "effectively limit-periodic". In this talk, I will describe the odyssey that led us to these remarkable results that began about two years ago. I will briefly review a number of beautiful concepts, including the Riemann hypothesis, scattering intensity from a many-particle system, and the nature of ``randomness" and "hyperuniformity." The latter concept has been receiving great attention in the physical, mathematical and biological sciences.



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