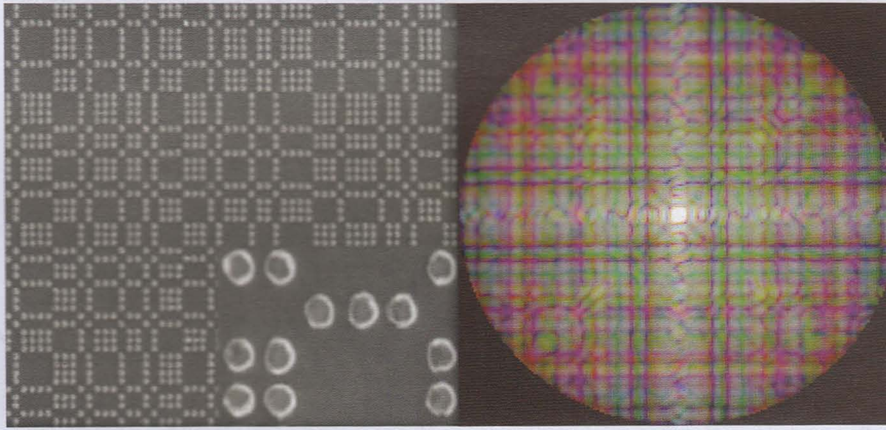
Aperiodic arrays

Two-dimensional arrays of gold nanoparticles that are arranged according to aperiodic mathematical sequences, such as those defined by Fibonacci, Thue–Morse and Rudin–Shapiro rules, can give rise to broad plasmonic resonances that span the entire visible spectrum. That is the recent finding of researchers from Boston University in the USA (*Nano Lett.* doi: 10.1021/nl8013692; 2008). Ashwin Gopinath and colleagues fabricated their nanoparticle arrays on quartz substrates by using electron-beam lithography. The resulting nanoparticles had a diameter of 200 nm, a height of 30 nm and a minimum separation that spanned from 50 nm to 500 nm. Dark-field scattering spectroscopy of the samples revealed that for small particle separations (around 200 nm or less) the aperiodic gold nanopatterns have photonic-plasmonic resonances that are significantly broader than a periodic sample, with scattering spectra that extend from approximately



400 nm to 1,000 nm. Electrodynamic calculations based on Mie theory show good agreement with the experimental results. The team is of the opinion that far-field diffractive coupling is responsible for the generation of the characteristic scattering modes. Gopinath *et al.* say that the structures could prove useful for creating a range of broadband plasmonic devices in the future, including improved substrates for surface-enhanced Raman scattering (SERS), biosensors or structures for enhancing the light extraction from LEDs.

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