Figure 1 A cavity within a cavity. Trigo et al.[1] arranged layers of semiconducting material to make Bragg mirrors (which reflect certain frequencies but transmit others) for photons and phonons, creating an acoustic cavity inside an optical cavity. When a light beam of an appropriate wavelength enters the structure, it sets up a standing wave in the cavity. The light–sound interaction allows a photon of the incident beam to split into two parts: a phonon resonant in its cavity and a photon resonant, and trapped, in its cavity. But as the mirrors are not perfectly reflective, both light and sound can escape the cavity.

photon frequencies, in much the same way that crystal planes reflect X-rays and that electronic forbidden-energy bands occur in crystals. In such a one-dimensional optical Bragg structure, introducing an additional phase-shifting layer that is different from the others can create an optical bound state whose distinct resonant frequency lies within the range that is reflected at the Bragg mirror. The structure then provides an efficient transmission channel: light of an appropriate frequency passes through the Bragg lattice, then is phase-shifted and resonantly enhanced within what is, in essence, a 'microcavity' in the additional layer; gradually the light escapes the microcavity through tunnelling and passes out of the Bragg lattice at its original frequency.

Various authors[2,3] (in fact, combinations and subsets of the present authors) have made good use of such microcavities in a range of experiments, using optical resonances to enhance processes such as inelastic or Raman scattering. The new twist in this

experiment by Trigo et al.[1] is the insertion of a second microcavity within the optical one.

The second cavity is conceived in direct analogy to the first, and is constructed as a resonator for acoustic phonons. Here, the Bragg mirrors have periods of about 10 nm, the central cavity is only 5 nm thick, and the whole structure fits snugly inside the central layer of the optical cavity (Fig. 1). The photons, with wavelengths of hundreds of nanometres, are unaffected by the thin acoustic layers (they simply take the appropriate average refractive index). The resonant frequency of the acoustic phonons in this structure is about 5×10^{11} Hz, well beyond the range of frequencies studied by either microwave or normal Brillouin scattering techniques.

In Trigo and colleagues' experiment, an incident photon is 'scattered' into the resonant, localized state in the optical microcavity, and at the same time a phonon is generated in the resonant, localized state in the acoustic cavity. The incident or absorbed photon must carry energy equal to the sum of the energies of these states and, to achieve resonance and the highest possible efficiency, the photon must be incident at a small angle to the structure (not quite 'head-on'). To resume its journey, and be observed, the 'scattered' photon must escape from the cavity by tunnelling through the Bragg mirror. As the resonant states inside the cavity are standing waves, there is no distinction between forward and backward scattering, and the scattered photon tunnels out simultaneously in both directions. The spectrum of scattered light measured by Trigo et al. clearly shows the peak expected for such a device.

Returning to the resonant, or localized, phonon that is produced alongside the scattered photon, it also tunnels out through the Bragg mirrors that form the acoustic cavity. This raises the prospect of realizing a coherent monochromatic source of very-high-frequency acoustic phonons. Trigo et al. have not observed these phonons directly, and their intensity outside the microcavity must be very small. But it is not difficult to imagine the steps towards enhancing the phonon intensity — by raising the intensity of the incident light, and also by seeding the optical cavity with photons to stimulate the scattering process.

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NATURE

The fact that the message from the King to President Roosevelt, in reply to the latter's wireless telegram greeting, had to be sent to America by cable occasioned at the time much comment and correspondence in the daily papers on the attitude of the Post Office towards Mr. Marconi… Mr. Marconi made the following statements:— "We asked the Post Office authorities whether they would allow us to connect our station at Poldhu by wire with Mullion — at our own expense, mind you — but they refused absolutely and entirely. The message (that from the King) was not received at our offices until after Mullion Post Office had closed for the night, and one cannot very well keep a King's message lying about for twelve hours. I think it would have been much more discourteous to the King to have kept his message waiting for a day than it was to send it by cable."… In these circumstances, it is not surprising that Mr. Marconi's feelings towards the Post Office are rather bitter… He now proposes to go to Italy and build a huge station there, partly, no doubt, because, as he says, "Abroad I can get everything I want. Here in England I can get nothing." This is a little sweeping, for all England has not been so backward in supporting Mr. Marconi's enterprise as the officials of the Post Office.
From *Nature* 19 February 1903.

We have formulated a structure for the nucleic acids which is compatible with the main features of the X-ray diagram and with the general principles of molecular structure, and which accounts satisfactorily for some of the chemical properties of the substances. The structure involves three intertwined helical polynucleotide chains. Each chain, which is formed by phosphate di-ester groups and linking β-D-ribofuranose or β-D-deoxyribofuranose residues with 3′, 5′ linkages, has approximately twenty-four nucleotide residues in seven turns of the helix. The helices have the sense of a right-handed screw. The phosphate groups are closely packed about the axis of the molecule, with the pentose residues surrounding them, and the purine and pyrimidine groups projecting radially, their planes being approximately perpendicular to the molecular axis. The operation that converts one residue to the next residue in the polynucleotide chain is rotation by about 105° and translation by 3.4 A. **Linus Pauling, Robert B. Corey**
From *Nature* 21 February 1953.