The tensile strength of the nanocomposites is 400 MPa, compared with 40 MPa for pure PVA. These are outstanding results.

The relatively simple layer-by-layer process reliably yields levels of packing and alignment similar to those of fibre-reinforced engineering composites. In this sense, the work is an impressive breakthrough. However, the packing perfection in biological composites such as nacre or bone is still higher, with platelets playing the role of bricks in tight pavement-like arrays with only small amounts of thin intercalated adhesive cement layers (Fig. 1c). Thus, even higher strength and stiffness are, in principle, achievable. A unique aspect of nanocomposites is their potential for both very high strength and toughness (the resistance to the propagation of a sharp crack), unlike the vast majority of traditional structural materials, which exhibit either one or the other of these properties, but never both simultaneously.

The high toughness of biological composites — such as nacre and bone — mainly results from the incorporation of structural 'tricks', such as soft interfaces at various scales (in bone) and the complex hierarchical architecture that incrementally develops at higher scales (in nacre and bone)[5,6]. The stress–strain curves presented by Kotov and co-workers show that the toughness of MTM/PVA nanocomposites is about an order of magnitude smaller than that of pure PVA, owing to the much smaller failure strain (by about two orders of magnitude) of the nanocomposite layers. It is likely, however, that the integration of such MTM/PVA unidirectional 'pavements' into larger-scale hierarchical structures will provide much improved toughness.

It should also be noted that the layer-by-layer process was previously used to successfully prepare CNT-based nanocomposites with impressive properties[7], and that CNT-based PVA fibrous nanocomposites with good mechanical properties have also been made by a continuous spinning technique from solution[8]. Nevertheless, this current study unquestionably demonstrates that the preparation of nanocomposites with high particle content and high performance is possible, but requires a deeper scientific understanding than that of more conventional fibre-based engineering composites. It remains to be seen if the layer-by-layer preparation technique can be scaled up in a reliable cost-effective way and if it can successfully be applied to practical thermoset resins such as epoxy. Only time will tell if new generations of large passenger airliners will take to the air on nanocomposite wings, or whether this is merely a flight of fancy.

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CARBON NANOTUBES

Turn the radio up (if you can find it)

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In 1901, the physicist Guglielmo Marconi sent the first transatlantic wireless signal carrying a message in Morse code. Fast-forward a century and experiments by two independent groups in California have put wireless technology back in the headlines again by making radios in which carbon nanotubes are central components, and in one lab, tuning the dial to Classic Rock.

Both designs rely on the inherently nonlinear electronic properties of carbon nanotubes. In a paper in *Nano Letters* with the title "Carbon nanotube radio" Chris Rutherglen and Peter Burke of the University of California, Irvine describe a radio receiver in which a semiconducting carbon nanotube acts mainly as the demodulator — the part of the radio that picks out the 'information' that is used to modulate the radio wave (*Nano Lett.* **7,** 3296–3299; 2007). In a separate paper, "Nanotube radio", Alex Zettl and colleagues at the University of California, Berkeley showed that the nanotube can function as all four major components of the receiver — an antenna to pick up the incoming radio signal, a tuner that picks out one frequency from this signal, an amplifier and the demodulator (*Nano Lett.* **7,** 3508–3511; 2007).

Both papers received widespread media attention, which raises the question: what is the role of packaging in modern science? For example, had the Berkeley paper been titled "Electrostatic deflections and electromechanical resonances of carbon nanotubes" — the title of a paper in the reference list that has been cited more than 500 times — and the nanotube radio played a series of dashes and dots rather than Eric Clapton, would the paper have generated so much media coverage? Time will tell whether the carbon nanotube radio truly has an impact on wireless communications. However, listening to an interview with Zettl on America's National Public Radio, it is not hard to imagine the excitement he and his students felt as the first sounds of a tinny version of *Layla* filled their lab.

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