MATERIAL WITNESS

Greatest hits

Everyone loves lists. Or rather, some love them and others love to hate them, condemning them as invidious, unduly competitive or plain meaningless. But it's hard to deny one thing in their favour: a list is guaranteed to excite debate about what is valued in the topic it tabulates. That, it seems, was what induced the magazine *Materials Today* (**11**, 40–45; 2008) to draw up the "top ten advances in materials science over the last 50 years".

Being informed by the magazine's editorial advisory panel and 'leaders in the field', the list doubtless has some formidable authority behind it. All the same, you might anticipate that I am going to pour scorn on it. Not at all — it's a very attractive selection, which runs (briefly) as follows: the International Technology Roadmap for Semiconductors, scanning probe microscopes, giant magnetoresistance, semiconductor light sources, the US National Nanotechnology Initiative, carbon-fibre-reinforced plastics, lithium ion batteries, carbon nanotubes, soft lithography and metamaterials. The magazine's editor Jonathan Wood admits that some might be dumbfounded by the omission of organic electronics (yes) or high-temperature superconductors (no), but the list gives a nice sense of the scope of contemporary materials science.

And yet (here it comes)… Well, for one thing, like all such lists this one is biased towards the present. It's hard to justify such emphasis on nanotechnology, still unproven as a truly disruptive technology, at the expense of advances in more mature areas such as biomedical materials. Many immensely important materials, such as Kevlar (which Wood also mentions), synthetic zeolites and vapour-deposited diamond, fall off the podium simply because they have become so pervasive or routine to produce.

But although a discussion of what's missing can be instructive, it's perhaps more revealing to consider the trends that the list brings to light. For example, with the possible exception of carbon nanotubes, carbon-fibre composites are the sole representative of structural materials (indeed, in this regard carbon nanotubes are only an elaboration of the same thing). Many of the innovations here are concerned with ways of storing, sending, reading and manipulating data. It seems that the past five decades have seen materials science transformed from being about 'holding things together' to managing information flows. I'm not convinced that three decades ago one could consider that transition to have been made, which is again why the list seems a little amnesiac.

Another characteristic is how extraordinarily high-value-added these innovations are. I don't think I'm quite ready to demand a place for self-compacting concrete on the list, but it seems unlikely that such things were ever given a moment's thought when pitched against the dazzle of, say, metamaterials. One might say the same of PZT and cubic boron nitride. Along with high-pressure synthetic diamond, they fall right on the edge of the chosen time frame, but that in itself reminds us both how fertile the 1950s were for new materials and how different the priorities were then for those who sought them.

Philip Ball

BIO-INSPIRED MATERIALS

Unnatural life

The biologically inspired toolbox is well and truly open. From three-dimensional DNA assemblies to active catalysts inside the confines of a virus — biomolecules are finding a second, unnatural life.

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At the turn of the nineteenth century, Pieter Harting and George Rainey laid the foundations of a science called "synthetic morphology"[1]. The inspiration for the name probably came from Wöhler's discovery of urea synthesis in 1828, a breakthrough commonly perceived to mark the beginning of synthetic organic chemistry. The primary goal of Harting and Rainey's synthetic morphology was to explain and artificially imitate the formation of inorganic structures associated with living matter, such as those found in diatoms, pearls or butterfly wings.

But, what has become of Harting and Riney's synthetic vision today? Indeed, the questions initially stirred by the aesthetics of shells, feathers and scales are far from being answered and have expanded in many directions that promise to affect how we harvest energy, carry out reactions and study biological function. Whereas emphasis has changed from the early days of playful explorations, the original awe inspired by biological organization was vividly present at the symposium on 'Biomolecular and Biologically Inspired Interfaces and Assemblies' at the 2007 Materials Research Society Fall Meeting in Boston.

DNA and proteins are known in traditional biochemistry as informational macromolecules because the order of their subunits (nucleotides in nucleic acids and amino acids in proteins) is