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News and Views
Materials witness: In praise of wood
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In his classic book *The New Science of Strong Materials*, soon to be reissued by Princeton University Press, Jim Gordon tells how, during his wartime work on aircraft materials, he would be regularly reminded by Charles Gurney, a specialist on fracture mechanics, that "Plastics are made by fools like me, but only God can make a tree."

"I found it depressing", Gordon wrote, "because wood was in fact a better material for making aeroplanes than the plastics which we could then produce."

I suspect that Gordon was also secretly a little pleased by that too. Trained as a naval architect and all his life an avid sailor, he clearly loved wood and found it a bountiful source of inspiration for his pioneering work on composites. He drew attention to the ingenious cross-winding of cellulose fibres in successive layers of the cell walls of wood, and was clearly delighted by the way it absorbed the energy of a propagating crack through a combination of buckling and fibre elongation — a process that Gordon's colleague George Jeronimidis at the University of Reading showed could account for wood's remarkably high work of fracture.

Weak interfaces, fibre orientation, laminar and hierarchical structure: these are all tricks now well recognized in the field of biomimetic materials engineering, which Gordon foresaw long before its time. Add to that its biodegradability (although this is of course sometimes a drawback), light weight, low cost, mouldability and beautiful appearance, and it is hard to find a more versatile structural material than wood, which is why it is still used today in applications ranging from musical instruments to construction scaffolding.

It is all the more striking, then, that convention tends to confine discussions of biopolymers to proteins and nucleic acids, ignoring carbohydrates. This is largely because the former two polymers are where biological information — crudely, the software of the cell — primarily resides, making them of greatest relevance to biological function and biomedical intervention. But it by no means follows that carbohydrates are uninteresting or simple — indeed, it is probably fair to say that their relative neglect comes about because they are so hard both to understand and to synthesize. Many of the microstructural and molecular details of crystalline, amorphous and liquid-crystalline cellulose remain to be uncovered. Glycopeptides are evidently crucial players in the specificity of biochemical reactions (and thus of great interest for drug development), but the chemistry of their synthesis has only recently become a hot topic.

For the materials scientist, the potential of cellulose is tremendous, as a new review illustrates (D. Klemm *et al. Angew. Chem. Int. Edn* **44**, 3358; 2005). Plasticized cellulose nitrate (celluloid) was of course one of the first industrial (semi-)synthetic polymers, and cellulose derivatives are used in coatings, laminates, pharmaceuticals, foods and textiles. Cellulose is a versatile framework for supramolecular chemistry, and it is now produced by bacterial fermentation as a fabric for tissue engineering and a tough, ‘green’ form of paper. There is plenty still to discover and celebrate in cellulose.