Forestry in 100 years

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Cheese will please, but why the cows? Wood is good, but why the trees?

While it is technically possible to make milk directly from grass in large stainless- steel vats, via a process that mimics the natural bovine rumen, the product might be a nightmare to sell. Although it may taste and look identical to cows' milk, and may perhaps be cheaper and more environmentally friendly, people are very fernickety about what they eat. The furore over GE-food is but one example of this. The antiquity of drinking milk from cows is evidenced by the fact that, unlike all other adult mammals, one-third of the human race (those with a tradition of pastoral agriculture) has a genetic mutation to allow lactose tolerance. A marketer that tried to sell artificial milk or cheese would confront conservatism developed over many tens of thousands of years.

Wood is quite different. Consumers do not usually want the product, or its derivatives, in its relatively natural form; they want consumer items that happen to be manufactured from wood. In many cases, the composition of those articles is irrelevant, as long as it meets certain specifications. When your forebear walked into a hardware store and asked for a ladder, a bucket and a wheelbarrow, the only choices would have been wooden ones. When these were eventually superseded by metal or plastic, I am not aware of any public outcry. No doubt, however, the quality of the new materials was critically appraised ("lighter, stronger and generally better") and the price compared ("cheaper").

The list of new wood-substitutes could be extended indefinitely: grape-growers are ripping out treated pine posts ("CCA leaks into the soil") to replace with imported steel; builders are thinking twice about conventional wooden studs ("too variable – takes too much labour"); paper supermarket bags are now plastic ("water-resistant, less bulky"); and so on. Will there be any residual demand for wood in a hundred years?

As has often been mentioned, wood has many desirable environmental qualities, not least being the low fossil-fuel energy required to make it. Wood is a way of obtaining free and infinitely renewable solar power. Some of wood's virtues (ease of machining, earthquake resistance, disposability) are acknowledged, but eventually can be designed into substitutes. Some of wood's vices (variability, non-durability, reaction to changing humidity) are inherent and more difficult to solve.

One problem is that, from the vantage point of 2006, environmental virtues carry no reward – or at least a reward somewhat less that the attractions of the synthetic, polluting alternative. For example, the embedded sunlight in wood will become appreciated relative to high-energy aluminium only if electricity becomes highly priced, and therefore highly valued.

Without wishing to bore the reader, my often-expressed opinion is that if the ten billion humans in 2106 wish to emulate current living standards, they could not do so by continuing to burn fossil fuels. Cheap energy from this source will not be available. There will still be sufficient geological reserves in the form of coal, but if we swallow that bait the Greenhouse Effect will bake, or drown, or desiccate parts of our civilisation. Extrapolation of current trends leads us down this gloomy path.

So, we could have a future based on expensive energy; where we scrabble for coal in a heated and polluted world, but where wood is valued for the energy it contains and for its gentle environmental footprint. A pessimist would conclude that the world is going to the dogs although there will continue to be a demand for wood as an affordable, albeit lower quality, material.

But there are other possibilities: we could imagine a world of cheap energy. It was once claimed that nuclear fusion could supply power "too cheap to meter". There is no scientific, or technical reason, why this proud boast was not merely premature. It could still happen.

And there are many other, more proven, technologies. The daily input of the sun can be harnessed directly, or indirectly via hydroelectric dams, biomass, wind-turbines or wave machines. The tides are driven by the gravitation of the moon; geothermal fields by the movement of tectonic plates; there are still some reserves of nuclear fissile material; and there are imbalances in pressure, temperature or chemical composition that originate from Earth's formation and which have yet to be exploited.

An optimist could visualise a much more ordered society, where we have got our collective act together and have learned how to harness the energy all around us, so that fuel costs are very low. The intermediate position – where energy in 100 years is the equivalent of today in terms of cost and value – is not believable. It is like a tightrope walker in a strong wind.

An optimist would envisage a future where there is a carbohydrate polymer that has all the advantages of wood but none of its problems. It would be made in factories from a combination of air and water, using cheap (fusion?) power. The polymer would be custom-designed for human purpose, rather than primarily for supporting the branches and crown of a tree, as evolved over millions of years. It would be assembled step-by-step using the best principles of chemical engineering, and no allowance will need to be made for cells that conduct fluids, excrete wastes, or bear the historical marks of season, water levels or disease.

Perhaps I should expand on this idea. What are the advantages of this synthetic wood, and how would it be made?

The synthetic wood would be very cheap, comprising mainly carbon, hydrogen and oxygen, mixed with inexpensive energy. Parts of it might contain carbon atoms alone, for special uses (more of that in a moment). The polymer would be strong but light, as in natural wood from the best forests; it would be just as renewable as the original source of the energy; after use, it would be degrade

back to its former ingredients – water and air; it would be manufactured in combination with other materials to impart surface-hardness, fire-resistance and durability. It would come in infinitely long lengths, in blocks, or in sheets. It could be stiff, flexible, insulated, or as transparent as glass (think of polycarbonate skylights).

Special carbon fibres extruded throughout the polymer could confer remarkable tensile strength and electrical conductivity. Surrounding this scaffold, a matrix of carbohydrates would fill the gaps and provide electrical/heat resistance. For cutting edges, carbon would be sprayed on as diamond – the hardest substance known. Or for sliding edges, carbon could be manufactured as graphite. What does all this mean in terms of actual products?

Whole sides of buildings could be extruded in one continuous process, with windows seamlessly integrated. Car, aeroplane and ship bodies could adopt the same approach and the same materials. The interwoven carbon fibres have a wealth of potential uses: they could conduct electricity to power points, wheels or propellers; they could help turn all walls and roofs into solar panels; they could be attached to a network of LEDs to provide ever-changing colour and appearance. Imagine a house where all or most of the wall-area is translucent – a huge window where the transparency is alterable by a rheostat switch. Or a house where the inside resembles the rippling waves of a coral beach, and the outside walls appear to be a dappled forest, leaves trembling in the wind.

In other words, we could end up living INSIDE a computer screen saver! Most things we would see and touch would be artificial – a construct or a mirage. Does this prospect delight or revolt the reader?

Even in the early years of the twenty first century, I see the signs of a back-to-nature backlash in public attitudes. Many people who have spent their whole lives in a conurbation yearn for the simplicity, the complexity, the cleanliness, the *rationality* of a "natural" environment. Their affection for "untouched" areas of land would have been peculiar – even unthinkable – only 100 years ago, but is now starting to grow into a deeper, almost religious veneration. The painful discovery that humans can survive on this planet only by courtesy of Nature's goodwill, will induce an even greater reverence for the tree-clad hillsides that surround us.

Thus it would be premature to conclude that foresters will become redundant as a profession. There will continue to be a need for someone to protect and care for those forests. But wood production may not be part of the job description....