



new forms of architecture: utilising bio-based materials

**Peter Wilson, Director
Timber Design Initiatives Ltd**

reflections on wood use



rethinking traditional models



untreated oak cladding & shingles



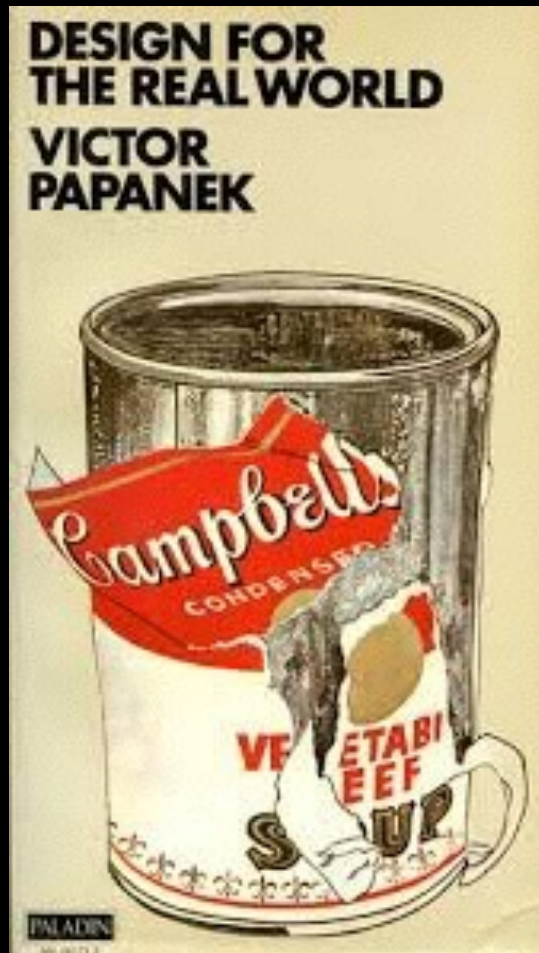
*community of built forms
using natural materials*



*combined with
contemporary structural solutions*

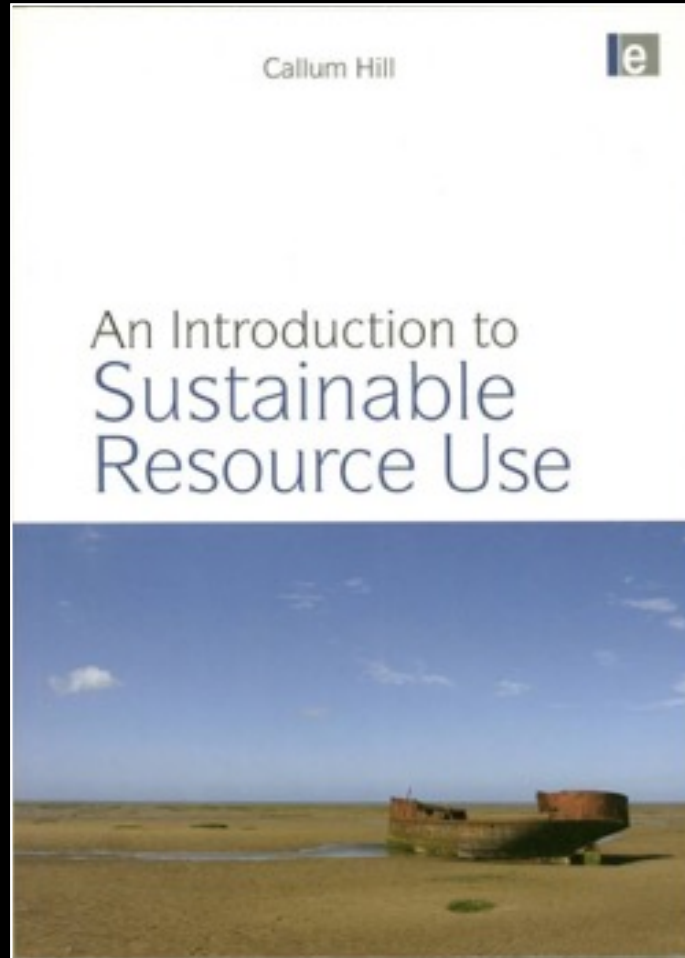


sustainability - but not as we know it



Victor Papanek, 1971

sustainability can mean many things



why wood, why now?



80% of the world's population of eight billion will live in urban situations by 2050

in the next decade 75 million multiple family housing units will be required in China alone to accommodate the approximately 300 million people expected to migrate to major urban & adjacent suburban areas

international concerns over rapidly accelerating climate change & the scale & nature of extraction processes demands a paradigm shift in the way we conceive buildings & cities

working with with the properties of wood



large spans from small sections



*post-tensioned laminated timber
5 metre span*



locally grown, rough sawn



increasingly large spans - 50 metres



local sourcing of materials



*exterior oak from within
windsor great park*



*internal larch lattice ceiling
from within 600 metres*



the model D - zero carbon house



uk grown timber throughout



contemporary uses of green timber



prefabricated oak structure



supporting cross laminated timber roof



simple timber frame and cladding



all from siberia



economic use of material



oriented strand board used as internal finish



very low budget projects



osb feature walls of self-build house



simple industrial timber panels & sections



oak laminate facing to plywood panels



precision joinery



*homogeneous, warmth of wood
throughout*



offsite manufacture



modern methods of construction (mmc)



prefabrication doesn't mean repetition



panelised solutions



standard timber frame technology



combined with parametric modelling



producing non-standard solutions



clt using uk grown timber



research, development & manufacture



structural testing



six species



initial application



shear walls in visitor centre



clt exposed to view



commonwealth games athletes' village 2014



dowel-lam (brettstapel)



dowel-lam at coed-y-brenin



nail-lam (nailed stacked planks)



nail-lam manufacture



completed nail-lam panels



nail-lam exposed in home extension



nail-lam used in e-core service cores



first floor unit

1. Roof vent cap
2. Whole house mechanical ventilation with heat recovery system
3. Service distribution duct
4. Whole house ventilation duct work
5. Bathroom fittings in compliance with Housing for Young People
6. Integrated heating installation

e.CORE

an off-site fabricated, fully serviced structural core built from Scottish timber

e.CORE incorporates

- mass renewables structure and contents
- whole house mechanical ventilation and heat recovery
- all heating requirements and controls
- all hot and cold water requirements and controls
- all drainage including shower waste water heat recovery
- all electrical systems including distribution board, smart meter and voltage optimisation

e.CORE complies with:

- Scottish Building Standards contributing to Minimum compliance with Part 7
- English Building Standards Part 1, 19H and 19K
- Code for Sustainable Homes Level 6

Housing for Young People - services can be supplied for other, private, student and workplace users

e.CORE benefits

- Carbon Capture
Each core sequesters 600kg of carbon. A 2-storey house captures 1.2 tons of carbon
- Thermal Mass
Each core contains 1 ton of timber which forms a heat sink at the heart of the house, assisting out the heating and cooling cycle allowing the heating system to perform more efficiently
- Structural Optimisation - Cross
provides racking resistance for whole house allowing reduction in section size and quantity of timber in structural frame
- Improved Indoor Air Quality
The massive timber structure of the core acts as a water vapour buffer for the living spaces of the house ensuring indoor air quality and mitigating mould conditions for the optimum house-wide

© CH2M HILL 2013



K2 insulated wall panels



e-core & K2 - ongoing testing

Future Affordable, Fife Housing and Innovation Showcase



modcell - glulam frames & straw



offsite frame assembly



packing the frames



the complete modcell panel



constructed into modular house



the bale house



the bale - or modcell - school



construction exposed



community projects
knowle west media centre



sponsor a modcell panel scheme



modcell schools



exposed modular design



lime render exterior



lilac housing

(low impact living affordable community)



sustainable communities



the mill house



the interior is all about natural wood



wood flooring forms the space



*contemporary thatch at
lake tåkern bird sanctuary*



nature explicit - light, air & wood



sculpted wood interior



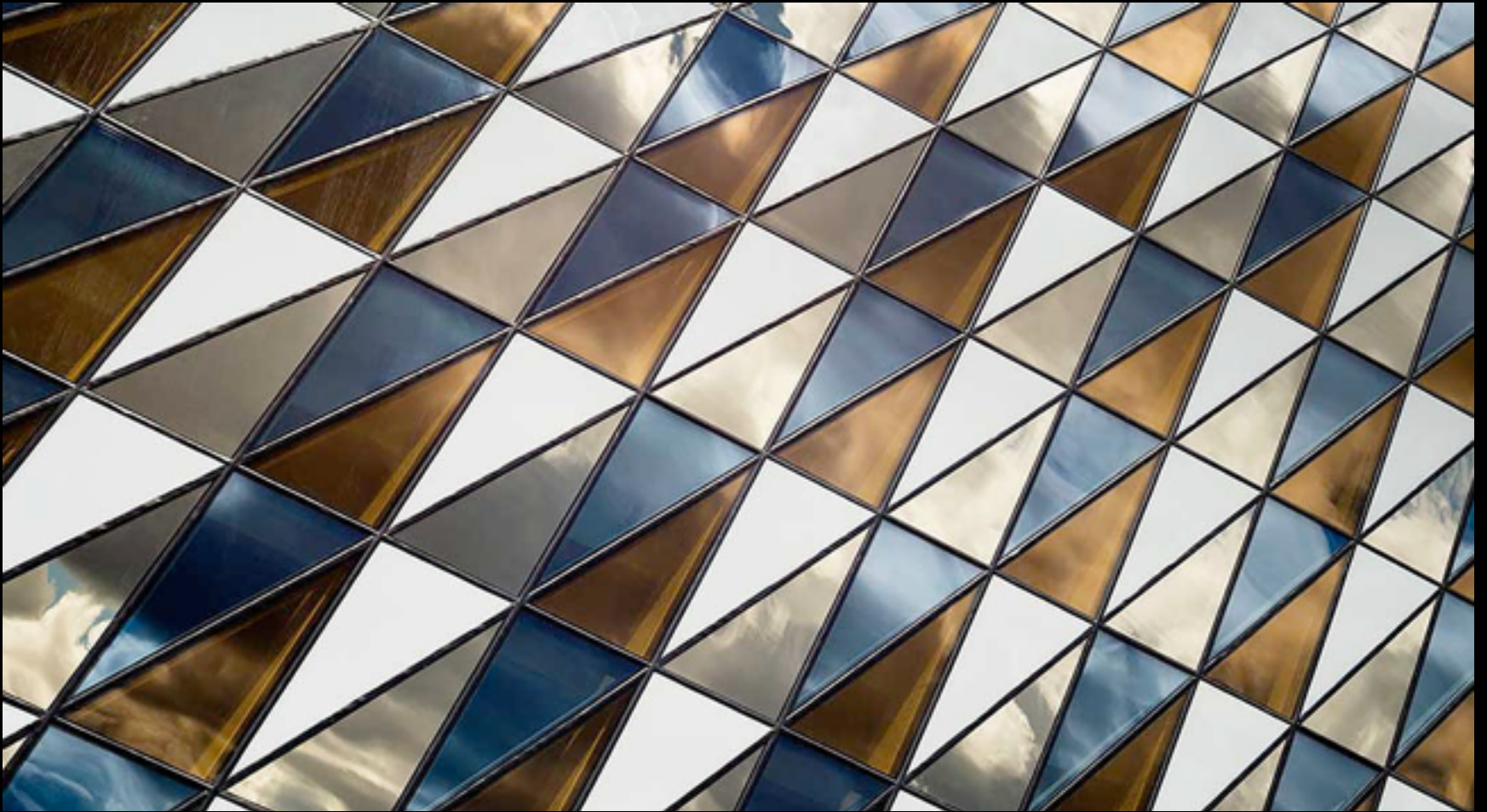
wood - par excellence



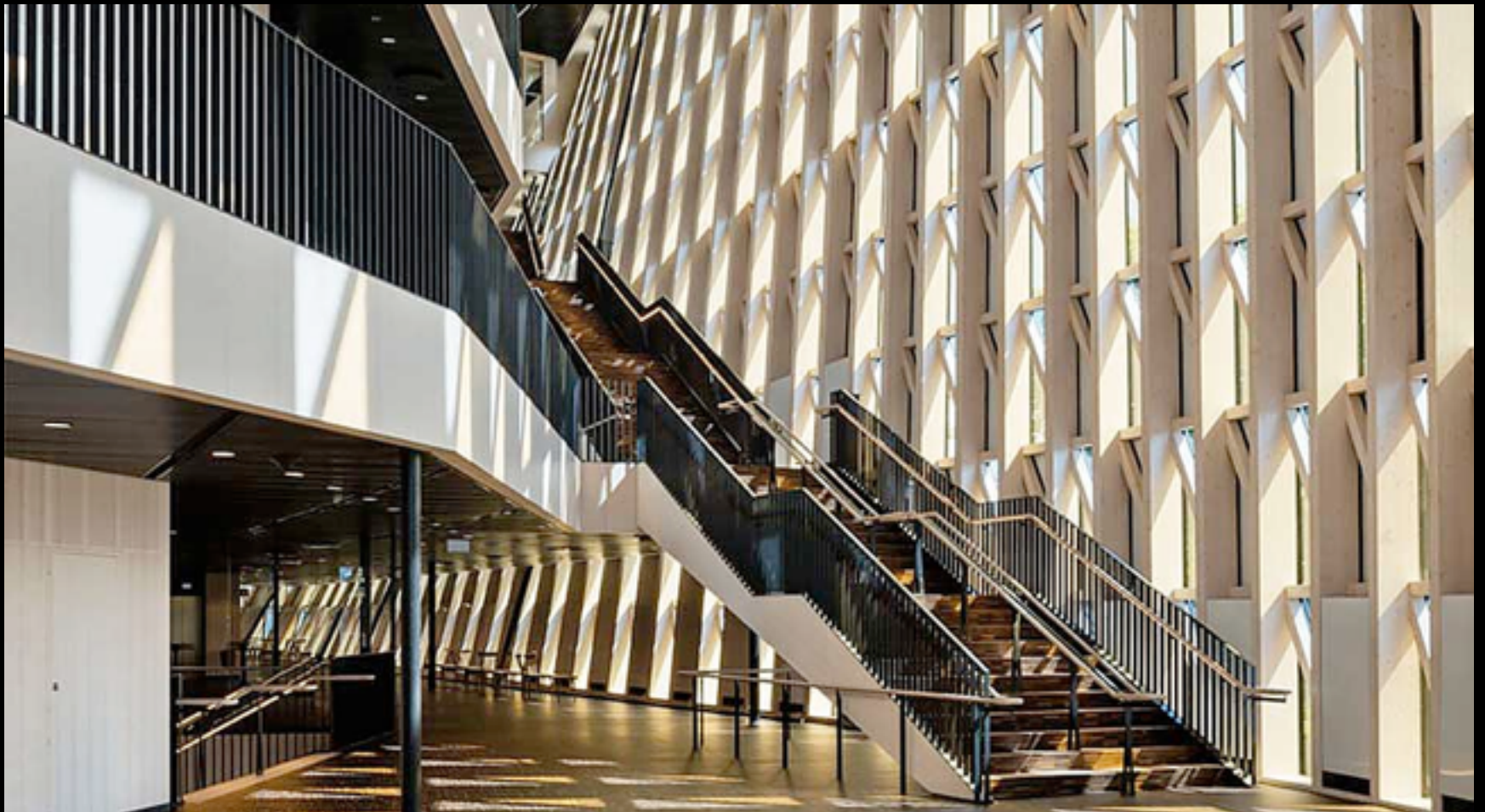
aula medica, solna



six types of glass



karolinska institutet



*nobel prize laureates in medicine or
physiology*



1000 seat auditorium



spira, jönköping



arts centre



the interior is all about wood



new buildings forms



repeat elements



glulam is a major product



finding new structural & spatial solutions



*hardwoods used to complement
historic structure*



commercial use of sustainable timber technology



BSkyB Believe in Better Building (BiBB)



glulam, clt & timber cassettes



delivering a healthy working environment



40 metre clt tower, portland, oregon



Lever Architecture

12 storey framework of clt & glulam



Lever Architecture

35 storey 'baobab' tower, paris



*Michael Green
Architecture*

solid timber



excels in difficult conditions



cross laminated timber is increasingly common



*now used in schools, housing,
supermarkets*



exhibitions offer opportunities for innovation



french pavilion, milan expo 2015



double curving, interlocking glulam



parametric modelling



prefabrication of many unique elements



precision + rapid erection & dismantling



An Ceann Mor



tourist routes



scenic locations



testing ideas and materials



scottish wood, scottish landscape



balquhiddy - student project



sitooterie



centre culturel et touristique du vin, bordeaux



auditorium - light, volume & acoustic design



the timber interior given cultural expression



autarkic (energy self sufficient) buildings



based on solid timber technology



modified wood offers new possibilities



*exposure to elements -
traditionally hardwoods*



acetlyated glulam



used in netherlands to line canals



or to create sunken bridges



© RO & AD Architects

or even floating ones



*fabricated in elegant shapes
that provide structural stiffness*



*new frontiers of design -
& maybe for health and safety too?*



impregnation is not modification



nanotechnology applied to wood



cnc machining to create new forms



*double curved cladding
using sapele faced plywood*



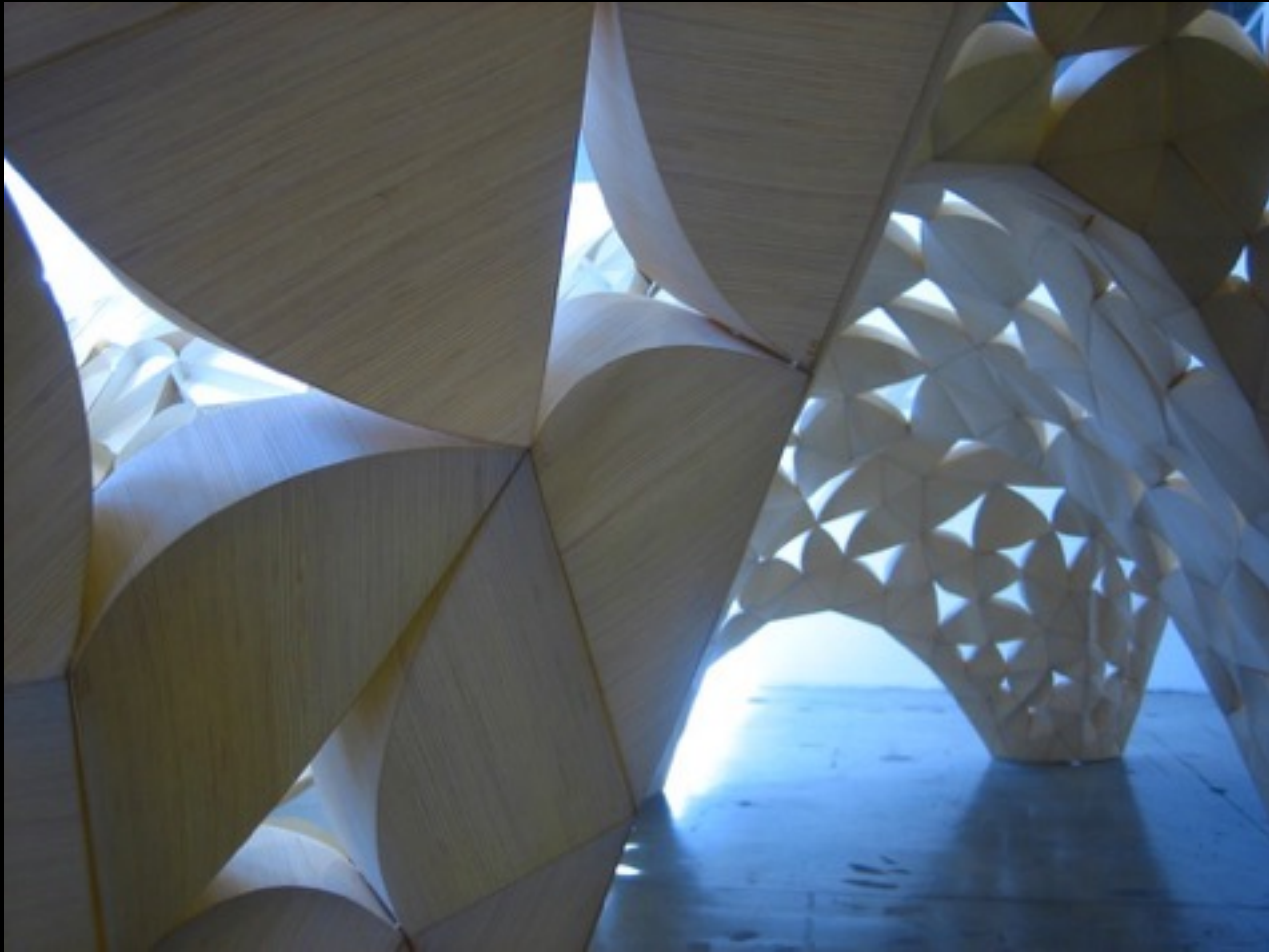
*standard ply sheets
reconfigured by computer*



ultra thin ply



formed into ultra strong structures



the future?



so much research, so much testing still to do

- *academia should be leading on innovation - who else will do it?*
 - *too much research operates in a vacuum - research without dissemination is arcane*
 - *we need to bring different disciplines together in joint research -*
 - *fire engineering, energy, acoustics/sound, harmonised design procedures, strength classes, moisture, etc*
 - *we need to rethink r&d alliances to make most effective use of available funds*
 - *we know what the research challenges are - let's stop redesigning the wheel and get on with answering the big questions*

***muchas gracias!
thank you***

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