A Homegrown Renaissance

The resurgence of timber building over the last twenty years has been called a renaissance, and that may not be too bold a word. But this renaissance could not have happened without a simultaneous revival in essential skills and crafts: designing and constructing timber buildings goes hand in hand with making the wooden fixtures, fittings and furniture to put inside them. Creative arts and age-old crafts combine with architecture to explore and exploit the look, feel and simple good sense of working with wood. They all depend on a plentiful supply of timber from well-managed woodlands.

There is nothing new about building with timber; people have built their houses of wood for millennia. Trees continue to provide the inner strength of our homes: around 80% of all new domestic buildings are constructed on timber frames. But the timber is generally hidden from view, carefully concealed inside and out beneath plaster, concrete, stone or brick. And most of the timber is imported. But now there is an emerging trend to use home-grown hardwoods and softwoods with great imagination and skill, not just to construct the internal frame, but also to provide the external cladding and inner linings, floorings and stairways. Much of this timber is sourced and supplied from woodlands within a few miles (sometimes metres) of the building site.

More revolutionary ideas come from studying contemporary buildings in Norway, Germany and Austria, where trees cover more ground and government subsidies encourage the development of innovative technologies. Now our most visionary designers and builders are also experimenting with the potential of 'massive timber' – using a large volume of relatively low-grade softwoods to construct buildings that are so energy-efficient that most of the heating comes from the warmth of human bodies, and the boiler is just a backup. For once, more is less – the more timber used to construct, insulate and fit homes, the less carbon is released in the process of building and living in them. If the timber is from local woodlands, that further reduces transport pollution, and planting new trees for future building locks up more carbon while creating a more richly diverse natural environment, adding to the cycle of growth, harvest and renewal.

A home-grown timber industry fits well with targets to increase the forest estate and balance the carbon budget. For example, the Scottish government has pledged to increase woodland cover from 17% to 25%

A replica of an early British dwelling (opposite, and see page 313). The sustainably constructed café at Glencoe Visitor Centre (bottom), and working at the Woodland Enterprise Centre (below, and see pages 50–52).

by 2050 (the European average is 36%) and to reduce carbon emissions 40% by 2020. Local authorities across the country are exploring the potential of timber building in schools, workplaces and social housing. But there are obstacles in planning and building regulations. And the pioneers of what may be our greenest industry say that even 25% forest cover will not produce enough timber for the industry to fulfil its true potential. They ask for more planting and more diverse species: more Douglas fir, more larch, more Scots pine, more hardwoods.

In this dynamic environment, idealists are also entrepreneurs. Old skills meet new ideas and traditions of the past add strength to visions of the future. Both new and old techniques bring new opportunities for training as new buildings bring jobs and renewed purpose to rural communities.

Exploring this renaissance takes you on a kind of adventure trail that is both exhilarating and inspiring, not least because it leads to some of the most beautiful places in the country. This path also leads to a place where modern technology meets traditional skills, in the Internet community which links woodland managers and sawmills with architects, artists, builders, carpenters, designers, engineers and community organisations. Highly individual yet part of a collaborative network, they all share a passionate belief that the future lies in building imaginative, energy-efficient homes with timber, providing comfort and warmth without damaging the natural world.

Ancient Skills Revived

The inhabitants of Britain have been building with wood for thousands of years. Research into surviving buildings reveals information about the way people lived in previous ages and demonstrates their close connection with surrounding woodland.

The revival of timber building forges a new link with skills that can be traced back at least 5,000 years. Post-and-beam frames have been used since the Iron Age, when the building of roundhouses required skill with tools as well as oak for frames and hazel or willow for wattles. The traditions continued through Roman, Saxon and Viking invasions and settlements. In the Middle Ages, cruck frames (a cruck is a pair of curved timbers that provides a solid triangular frame at either end of the building) were commonly used, a technique that has recently been revived in greenwood building.

In parts of England, many venerable pubs and inns, farmhouses and barns survive five centuries and more after they were built. It might have taken 250 trees from local coppiced woodland to build a half-timbered Tudor house that is still lived in today. Builders from the sixteenth century would be amazed by today's heavy machinery, but quite at home with many of the construction techniques that are used to build our newest timber buildings.

In Scotland and Ireland during the Iron Age people built a version of the roundhouse called a crannog, examples of which have emerged from underwater archaeology. The crannog was a circular structure supported by stilts driven deep into the bed of a body of water, like the one illustrated below, on Loch Tay. For more than five millennia people built defensive homes on natural or man-made islands in lakes, as protection from other people or animals. But crannogs can also be used as farm buildings or fishing stations, for hunting and, of course, for holidays!

Using Locally Sourced Materials

From a distance, Glencoe Visitor Centre looks like a traditional Highland village: it consists of a somewhat higgledy-piggledy line of cottages sitting low among birch woodland. In reality it is a single twenty-first-century timber building designed to cope with thousands of visitors annually, while sitting as lightly as possible in a spectacular but sensitive natural setting.

Perhaps no single building endeavour exemplifies collaborative working as well as Glencoe Visitor Centre, which was designed for the National Trust for Scotland by Gaia Architects. Constructed entirely from home-grown timber, the award-winning project draws on a network of skills and supplies drawn from across Scotland. The result is the biggest public building made solely from Scottish wood, proving that it is not necessary to import timber for large-scale construction projects.

Most of the timber came from within a 70-mile radius (Glencoe itself is within two hours travel of both Glasgow and Edinburgh), and the building exploits the different qualities of a variety of native trees: larch, oak, Scots pine, Douglas fir, spruce, birch, ash and alder. All the timber, including external cladding, has been left untreated to avoid introducing toxic chemicals into the environment.

Chapter 2
Timber Buildings

Bernard Planterose of North Woods Construction is tremendously excited by the new popularity of timber, and the juxtaposition of old and new traditions. 'At the moment I'm working on a building design with massive timber from Austria, using timber for the structure and straw bales for insulation in the roof. One moment a modern crane is used to position the huge panels, which are incredibly high-tech; the next, a tractor from five miles down the road brings in the straw insulation.' This variety of techniques, from around the world and throughout history, is fundamental to those who are seeking to create buildings that are appropriate to their locations and have little or no environmental impact. In Britain there are craftsmen who use traditional hand-tooled joints with green oak or Douglas fir, while others like Planterose use modern self-drilling carbon-steel dowels with steel flitch plated joints. They all belong to the same ongoing tradition.

There is an infectious enthusiasm in the language of architects and builders as they explore old and new ways of working with wood.

The Woodland Enterprise Centre at Flimwell, East Sussex, is an award-winning building designed by Feilden Clegg Bradley using a structural gridshell of small pieces of local sweet chestnut (below, and see pages 50–51). The sweet chestnut coppice from which this wood was sourced is shown opposite.

Whether they are using prefabricated softwood panels or post-and-beam oak frames, there is a wholehearted belief that building with wood is good for the economy, the environment and communities. Combined with this belief is a pioneering spirit that encourages invention along with rediscovery. Award-winning homes and workplaces set new standards for energy efficiency, sustainability and design. Not surprisingly, these buildings look completely at home in the landscape. As Neil Sutherland points out (see pages 34–37), the building materials have often come from the nearest woodland.

In pictures of buildings designed by Robin Baker, Gaia Architects, Feilden Clegg Bradley, Bernard Planterose and Neil Sutherland, close-up details can be seen that celebrate the strength and character of different timbers: Douglas fir for structure, larch for external cladding, oak for solid timber framing. Often the maligned intruder, Sitka spruce gains new importance as a suitable material for massive timber construction, while the Scots pine, much-neglected

Finger-jointed beams (above) made by Inwood Developments in Sussex.

Interior details of the stunning, light-filled John Hope Gateway at Royal Botanic Garden Edinburgh, built with laminated softwood timber construction (overleaf). On the opposite page, Ullswater, Cumbria.

until recently, is used in new framing techniques. Unfortunately, massive timber is not yet manufactured in Britain, so it has to be imported from Europe. However, the success of buildings like Acharacle Primary School, Argyll (see pages 46–49) is stimulating interest in massive timber in Britain. Designed by Gaia Architects, the school is constructed of massive timber imported from Austria; using the Brettstapel technique (see page 52), the building is so well insulated that there is no need to use the boiler. Buildings such as this demonstrate the value of home production of massive timber which could bring benefits for education, employment and forestry.

Specialist skills are in great demand in a closely connected network (spot how often the same names often crop up in different projects across the country). The revival of traditional crafts like oak timber framing encourages the growth of small companies and that is also good for employment and the environment. Richard Wilkinson, of Heartwood Timber Frames, encourages his clients to plant trees to replace what they have used in the frame of their house. Like others in his industry he believes timber building protects woodland: 'Woods have to be managed and local landowners have got to have some incentive to maintain the woodland. If you use local timber then hopefully local landowners will look after it better and it will be there for hundreds of years.'

Architecture

Architect Neil Sutherland uses local timber for his building designs, motivated by the belief that timber building benefits both the environment and the economy.

It was exactly twenty years ago that I decided I wanted to focus on building in rural Scotland in order to give something back to the place I loved. But I could not work out why none of the materials derived in the region were used in its buildings. Timber seems like an obvious 'missing element'. At that time the industry imported 90% of the timber used in construction. Why were we importing wood from Brazil and south-east Asia when we could be using our own materials?

In 1991 I set up a design business and moved to Glenelg, on the west coast of Scotland. We led an environmental restoration project to establish native trees on previously overgrazed hill ground. Shortly after arriving in Glenelg, I was asked to design a building for a small business called Glenelg Candles; however, when there was no one to build the design, I decided to resource the project myself. I set up a joinery company, bought some trees, sawed them and constructed the building, which was very successful. Our company has been working in a similar way ever since.

In 1999 we got a big commission to design an office for the Natural Power Company, which is owned by Fred Olsen, the Norwegian shipping businessman. His father had bought the estate in Galloway and planted the land with a mixture of productive timber species. The original forester had been involved in planting this forest as a young man, and I met him when he had retired and was in his early seventies. He and I went round the forest and selected the trees for the building, primarily Douglas fir, Norway spruce and larch. We processed the materials on site and put the large building together. It was extended a few years after that.The building was entirely resourced from the materials on the estate, and it won a national award for sustainability.

Torbreck (above) benefits from a green roof, like many of Neil Sutherland's designs. The house is built into a north-facing slope, with the living area on the upper level to maximise the light. Small and medium-sized milling equipment (opposite) helps to utilise locally-sourced timber, including Douglas fir.

In 2003 we moved to new premises just outside Inverness, where there is space for a construction yard and for my wife's organic vegetable gardens. At the time we moved there was just myself and an assistant, but now there are eighteen of us, between the design and construction businesses. The Highlands have a wonderful resource of timber, such as Douglas fir and larch, which are particularly useful for the design and construction techniques we use. Douglas fir is good as a large-section, stable material, and larch has natural durability for external finishes. We purchase between 300 and 400 hundred tonnes a year, mainly for our own

buildings, but some is sold on to others. All this timber is from Scotland, normally grown within 50 miles of Inverness. By using regional timber, we can ensure that most of the economic benefit goes back into the region, helping to develop the prospects of the Highlands and Islands.

Our main focus is on house building and on how to build a new standard – the next generation in appropriate housing, matching the long-term aspirations of clients with the comfort and technical levels of a well-considered architectural product. We design buildings that are carefully detailed technically, and in doing so can avoid timber treatments, chemicals and poisons endemic in the construction sector. Our buildings are healthy for people to build and healthy for people to live in. We've developed a range of houses for rural living – adaptable houses that will compete more favourably with other options available on the market, but which also have the quality and performance we place at the heart of our buildings.

It is important to us that we are not exclusive: we don't want to build only for rich clients. Our clients are mainly people who have been convinced by what we are doing environmentally and who are prepared to put perhaps an extra 10 to 15% into a good quality home.

Because our methods are different, it has taken us a lot of time and effort to work out how to do what we do in an economical way. We make the house in a workshop and then put it up on site quickly,

Many Neil Sutherland designs have a Scandinavian feel, although they are 'home grown' (opposite and above). Massive timber beams don't have to be of oak: softwoods may be more appropriate in some cases (opposite, far left).

taking the building to a wind- and watertight stage. Roughly 50 to 60% of the financial commitment has been realised at that stage, and the remaining work can be managed by the owner or by another contractor, thus potentially reducing the overall cost for the client.

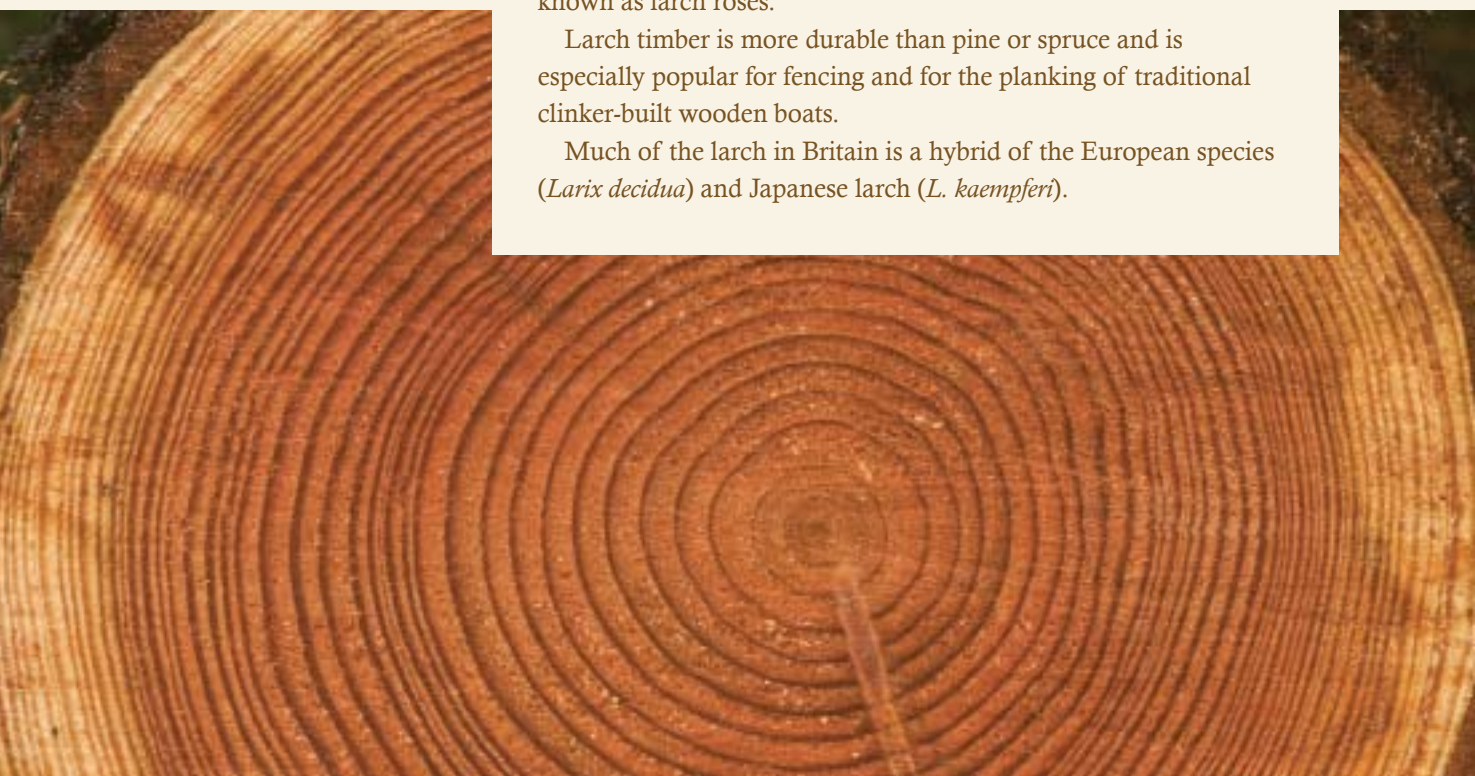
We call this method 'assisted built' – it is not a full self-build. Most of the decisions about the eventual quality of a house and its performance are made early on, and if it is all professionally undertaken, the client's participation makes finishing and living in the house much more enjoyable!

Larch • *Larix decidua*

Larch is the only common British conifer to lose its needles in winter. The new lime-green leaves appear in late spring, along with small, green male flowers and bright red female flowers, which are known as larch roses.

Larch timber is more durable than pine or spruce and is especially popular for fencing and for the planking of traditional clinker-built wooden boats.

Much of the larch in Britain is a hybrid of the European species (*Larix decidua*) and Japanese larch (*L. kaempferi*).



Design and Build

Bernard Planterose wants Britain to build on recent advances in timber design and construction from Europe, and to realise the full potential of timber buildings.

I was a tree-planting contractor in the 1980s and '90s when I first got interested in building. In the late 1980s I met Neil Sutherland (see pages 34–37), who was then a post-graduate architecture student at Robert Gordon University in Aberdeen. Neil was already interested in ecological approaches to architecture, and he invited me to speak at the university. I was speaking about the ecology of building with timber – in other words, the connection between our native woodlands and the use of timber in architecture – but at that time I had little more experience of construction than building sheds. As a result of that meeting, Neil showed me how to build in post and beam, and my business took off from there.

It was while I was building some of those sheds that someone asked, 'Do you do houses?' My first home-grown timber house was built in 1999, working with Sven Skatun from NorBuild. But it is important to remember that timber construction is nothing new in Britain. Even then the domestic construction industry was already based on timber, with approximately 80% of new buildings having a timber framed construction. What we're doing is changing the use of timber in other aspects of building, particularly in cladding.

Along with a few others I am engaged in a parallel promotion of what architects call an expressed timber frame. Most houses use a timber frame, but that frame is invisible in the finished building. Although called a timber kit, the wood is unseen and, to my eyes at least, the result not very interesting, even artless. By using an expressed timber frame, we are moving into a different world of serious timber design – one that had been largely lost until recently.

Our great hope now is to use home-grown timber more and more in the interiors of buildings, for linings and flooring, instead of using imported timbers. At our present scale of operation, we can still find local sawmills and processors to supply the timber

A mixed conifer forest in autumn in the Lake District (page 38). The deciduous larches stand out among the evergreen conifers. Larch timber and cones (page 39).

Two contrasting examples of Bernard Planterose's timber buildings: a wildlife observation hide (opposite, top) and a studio and house (below).

we need, but the country lacks the timber resources for the scale to grow significantly. Currently the wood simply isn't there – neither the diversity of species nor the quantity.

Since doing some massive timber building with Gaia Architects, I have to admit that I've become a bit obsessed with it. Having seen the materials used in Europe and visited a number of factories, I am determined to incorporate it into my own projects, as well as in collaboration with others, such as Chris Morgan of Locate Architects. Essentially, the massive timber technique involves laminating many pieces of solid timber together either with glue – cross-laminated timber (CLT) – or with hardwood dowels, known as Brettstapel (see page 52). The net result of both is similar, but the processes are quite different. Different forms of massive timber have been around in central Europe for about thirty years. And the question we're all asking ourselves is, why can't we make it here?

In central Europe massive timber is made out of the mixture of firs available in the principal manufacturing countries of Austria, Switzerland and

Germany; in Norway, the preference is for Norway spruce and Scots pine. In all cases, locally available timber is used, not an overseas import. If this industry is transplanted here, we would likely use Sitka spruce and Scots pine, the most economical and abundant materials. Although I would like to use larch and Douglas fir, from the ecological and economic viewpoint there simply is not a sufficient supply of either to support a major manufacturing industry at this time. This lack of diversity in species available in commercial quantities is regrettably likely to act as a brake on the development of the timber building industry.

Leaving aside for the moment what it is made of, from the construction point of view the massive timber has tremendous potential because construction is rapid and easily made airtight – a major advantage in our damp climate. But of course, the most exciting factor is that a massive timber house can use a huge amount of timber: we have looked at houses in Norway that comprise up to 100 tonnes of timber. The ability of timber buildings to fix carbon is incredible, and therefore the ability to promote forestry is huge. It all ties in with our carbon dioxide sequestration targets.

The conventional way to get people in the UK to plant more trees is through incentivising them with subsidies, but this tends to encourage quantity rather than quality, simplicity rather than diversity. We learned an amazing lesson in the '90s when the Woodland Grant Scheme added a tiny extra grant for the planting of broadleaves and native Scots pine. The scheme had a dramatic effect, demonstrating how effectively subsidy can influence species choice – increasing quality as well as quantity. There is an exact equivalent to this in building. Why are Austria, Germany and Switzerland leading the way in green building and technologies? Because they are subsidised: the greener the build, the more money they get. It is that simple.

Raising a frame (top); Inchdryne Lodge (above); an open-plan living space (opposite, top) and an isolated study retreat (opposite, bottom).

Sustainable Building

A primary school designed by Gaia Architects, working with local children, teachers and parents, has set a new British standard for sustainable building with timber, as Sam Foster explains.

Residents of the village of Acharacle, 40 miles west of Fort William in the Highlands, had been campaigning for a new primary school for more than twenty years. The Victorian stone schoolhouse looked lovely, but was wet, cold, draughty, and featured a series of Portakabins: not a good learning environment at all.

In the same area there is a programme called Sunart Oakwoods Initiative, which campaigns for the use of home-grown timber. This is not just about the oakwoods, but about using timber in construction and furniture making, using the forest as a place for recreation and for food as well. There was a strong emphasis that any new school at Acharacle should be a timber building, which made absolute sense. So we designed the building with input from staff and children, and the community also had a hand in designing the school. This was really important to ensure that the locals would feel a sense of ownership and pride in the finished building.

We were not asking the students to design the building, but for ideas, for what they would like to do and see in the building. It is our job as designers to take those ideas, the key themes, and transfer them into a design. It was just brilliant fun working with the children, and reasonably easy to manage. The children came up with ideas that I would never have even considered. Working with fifty or sixty children, several recurring themes emerge, and those are the things that are most important to the design.

The first design was for a standard, highly insulated timber-frame building, using Scottish timber. Unfortunately the estimates were very expensive, mainly because of what was called the 'Acharacle factor': the fact that it's a remote

A new timber-built, energy-efficient school for the twenty-first century (above), and one of its light-filled classrooms (below).

If these kids look happy about their new school building (above), they are! See their verdict – in their own words – on page 49.

Previous pages: an isolated alder.

location, with big costs associated with transport and accommodation.

However, Howard Liddell of Gaia Architects had been working with Bernard Planterose and Brian Burns on the 'Econo' (Eco House North) project, a collaboration looking at developing standard timber house construction types that would be suitable for the Northern European climate. After considering different European techniques and receiving quotes for Acharacle, it became apparent that Brettstapel (see page 52) might be very appropriate for Scotland because of the type of forest resources available. We suggested to Highland Council that a Brettstapel kit could significantly reduce costs. Unfortunately, the Brettstapel kit was not available in the UK, but after consulting a few firms we had worked with on the Econo project, it appeared that the Acharacle project costs could be cut by buying a prefabricated timber kit from Austria. Highland Council was convinced; they understood that there would be carbon benefits, health benefits, and time benefits from using a prefabricated structure. So we invited a tender from a company in Austria – and suddenly we were going ahead with Britain's first Brettstapel building, which was exciting.

The Austrian company Sohm guaranteed Passivhaus standard for the building fabric. (Passivhaus,

German for ‘passive house’, is a standard for energy efficiency in buildings rating the amount of energy that is required for heating or cooling, most often used in Germany and Scandinavia.) This meant they were guaranteeing airtightness, eliminating draughts that cause discomfort and account for about half of the heat loss in a building, and allowing for a smaller boiler.

The running costs for such buildings are significantly lower than for a conventional design. The engineers for the Acharacle project did a calculation that suggested the running costs would be about 86% lower than those of a standard building of comparable size. Unfortunately the construction savings were wiped out by currency fluctuations between the planning and construction dates; however, there are ongoing benefits in the low running costs, and the building itself acts like a sponge for carbon – by using such high volumes of solid timber, the building has sequestered around twenty times more carbon dioxide than was emitted during the transport of the timber from Austria to Scotland.

Throughout the school, timber is used for everything: it’s used for the structure, insulation and cladding. The health benefits are brilliant. We refused to apply any toxic treatments to the timber, and there are great health benefits from that. It is not just about physical health, either. The sensory qualities of timber are incredible.

Architects get very close to a project, but Acharacle is special for us. It’s difficult to put into words, but you just get a nice feeling simply walking through the building; it is an intangible quality that has to do with the acoustics, the light, the atmosphere…the whole thing.

The school’s exterior design includes decking, which is put to good use in fine weather (above).

‘Our New School Is Wooden’

The children of Acharacle Primary School give their opinion of the new school:.

Sophie Harkins, year 7

‘Our new school is massive and we have a cloakroom so we don’t need to hang our bags in the toilets.’

Kayleigh-Anne Woods, year 7

‘It is amazing how warm it is because it has no radiators and I never get cold.’

Abigail Woods, year 7

‘There is some cool technology that we did not have in the old school, like the blinds that go up and down by themselves.’

Caleb Lock, year 7

‘The new school is amazingly eco-friendly. Rain water is used to flush the toilets, the windows open when it gets too hot and it has wall heating.’

Kate Bradley, year 5

‘It has absolutely no glue in the wood. It’s kind of like a big jigsaw!’

Daibhidh Duncan, year 4

‘Our school has things that tell you the humidity, carbon dioxide, sun, light and temperature.’

Modern Construction Methods

Wood is one of the oldest building materials, but modern manufacturing and construction methods are extending its uses in ways limited only by the imagination.

Throughout the UK architects, builders and developers are demonstrating new uses of sustainable materials, often using species, sizes or quality of wood that would previously have been discarded. University departments are researching new techniques, and there is a new willingness to learn from other countries – particularly from Scandinavia and Germany.

The progress in wood construction has gone hand in hand with new ways of joining or fastening pieces of it together, or combining it with other materials. Key to many recent advances has been the development of environmentally friendly high-performance adhesives.

Finger jointing, which connects two pieces of wood along the grain like interlocking fingers, is not new, but new glues and industrial processes have given this method new life. Inwood Developments, a pioneering company based in Lewes, East Sussex, used finger-jointed sweet chestnut to make the handrails for the treetop walkway at the Royal Botanic Gardens Kew. Short pieces of wood were joined to make straight sections up to 60 metres long, as well as curved segments that match the turns in the path.

The same company worked with architects Feilden Clegg Bradley and structural engineers Atelier One on the gridshell roof of the Woodland Enterprise Centre, Flimwell, Sussex, which uses small-section timbers rather than heavy beams to support the structure (see page 31).

Built from both softwood and hardwood timber harvested from sustainably managed estates in

The gridshell structure is exposed in the lofty, light interior of the innovative Woodland Enterprise Centre, Flimwell, East Sussex (above).

Glulam beams supporting the roof of the debating chamber in the Scottish Parliament building (above).

south-eastern England, the building demonstrates how timber of relatively small dimensions can be used to create elegant, low-impact developments that contribute to the local economy. They have also stimulated new markets for traditional woodland crafts, such as coppicing. The gridshell was constructed from 20-year-old coppiced sweet chestnut, while other buildings at the centre use local Douglas fir. The building features Warmcell insulation, an automated wood-fired heating system, and has been designed for low-energy consumption and to be recyclable at the end of its life.

Another technique increasingly being employed is glue lamination ('glulam'), which means that massive timbers to support large structures or stresses can be produced by sticking together relatively small pieces of softwood of a lower grade than would be required for a similar beam cut from a single piece of wood. Examples of its use range from the Merry Hill shopping complex in the West Midlands, where columns and arches for two

new covered walkways were made from glue-laminated thinnings of Welsh oak, to the Ecotech Centre in Swaffham, Norfolk, which contains the largest volume of timber in any structure in the region. Glulam was chosen as the only truly renewable building material, using timber from forests with a clear sustainable management policy.

Glulam's good tensile characteristics make it especially suitable for long-span load-bearing widths like bridges. The Centre for Timber Engineering at Edinburgh Napier University estimates that more than forty glulam bridges have been built in the UK since the first in 2002, but they are mostly footbridges. Britain has a long way to go to match Denmark, which has built a motorway bridge using Danish spruce from sustainable sources for the glulam deck and piers. It has two roadway decks in four sections, each 55 metres long, 3.5 metres wide, 2 metres high and weighing approximately 50 tonnes. The bridge is a vision of lightness and elegance, with special features including a wildlife passage and a path to the adjoining golf course.

Brettstapel, another new process that has been imported into the UK from Germany, is by contrast a glueless form of massive timber construction (*Brettstapel* is German for 'stacked board'). Relatively low-grade softwood posts are connected with hardwood dowels instead of glue, helping to ensure good indoor air quality. Careful sealing eliminates draughts, and wood-fibre insulation cuts heating costs.

Very new in the UK (see pages 46 to 49, Acharacle Primary School), this process has been in use in Germany for nearly forty years. Precision wall panels (with pre-formed openings for windows and doors) are made in sections in the factory under controlled conditions, meaning that on-site construction time – which requires suitable weather conditions – can be cut dramatically. Brettstapel buildings claim to have healthier living environments and be better insulated and cheaper than other construction methods. The all-wood construction also locks up more carbon, helping to combat climate change.

Above and below, the Robin Baker designed David Douglas Pavilion, Pitlochry

Working at a sweet chestnut coppice (opposite top). The Woodland Enterprise Centre in Flimwell, Sussex, runs an extensive programme of woodland and timber-related training courses from their base in a gridshell building (opposite).

Innovative Designs

Robin Baker, who has designed some of the most innovative new buildings in the timber industry, enjoys the versatility of home-grown timber.

I grew up in rural Hertfordshire, and was impressed early on by the old timber-frame and half-timbered houses. Still, my first experience of building with local materials was not in England at all, but in Sudan, where I was promoting construction methods that used local materials. We not only made roof tiles and bricks, but also used local timber – they had teak poles, and we did one or two structures with scissor trusses using these poles.

After I came back to England and finished my architecture course, I worked in Yorkshire with a conservation architect, and later worked on the restoration of an eighteenth-century Methodist chapel in Halifax. It had magnificent roof trusses of Baltic pine spanning 18 metres, with all internal timbers in oak. Although there was talk of using steel to reinforce the roof trusses, which had distorted and were full of rot, we decided to do structural carpentry repairs. I really enjoyed the project,

and feel that avoiding introducing steel was the right thing to do.

In 2003 I won the brief to design the David Douglas Pavilion for the Explorers Garden at Pitlochry Festival Theatre, Perthshire. Appropriately, we selected Douglas fir (which is named in honour of naturalist David Douglas) as the principal structural timber; it was an ideal opportunity to demonstrate the versatility of home-grown timber. I was able to source some pretty big sections of Douglas fir, but the main ridge beam, which is cantilevered, had to be spliced because we were not able to get sections longer than 10 metres. I worked closely with Gordon Macdonald of Carpenter Oak and was deeply impressed with his skill in working with large sections of timber in such a precise manner. As you can imagine, such large sections are pretty heavy, and the geometry of the building is really quite complex.

Gordon Macdonald was one of many skilled craftsmen I've been fortunate to work with, not just from the United Kingdom. I have also worked with Sven Skatun and Betsy van der Lee of NorBuild on a couple of projects; it was Sven who collaborated on the Tree House project at Kinlochlaich House in Argyll. All the remarkable joinery and carpentry work at the Tree House was done by him and his team. The name of the project comes from the fact that it is propped up on piles, so it is a tree house in that sense; it also has a tree as its central post, but it is not a living tree rooted in the ground. The owners were looking for a special sort of holiday house. Going with such a novel design was a brave move for them, but it worked out very well, and everyone appears to like it.

Robin Baker's forest look-out shelter in Perthshire, above and opposite.

Robin Baker's Argyll Tree House (left) is let as a holiday home and is the perfect location for a romantic honeymoon.

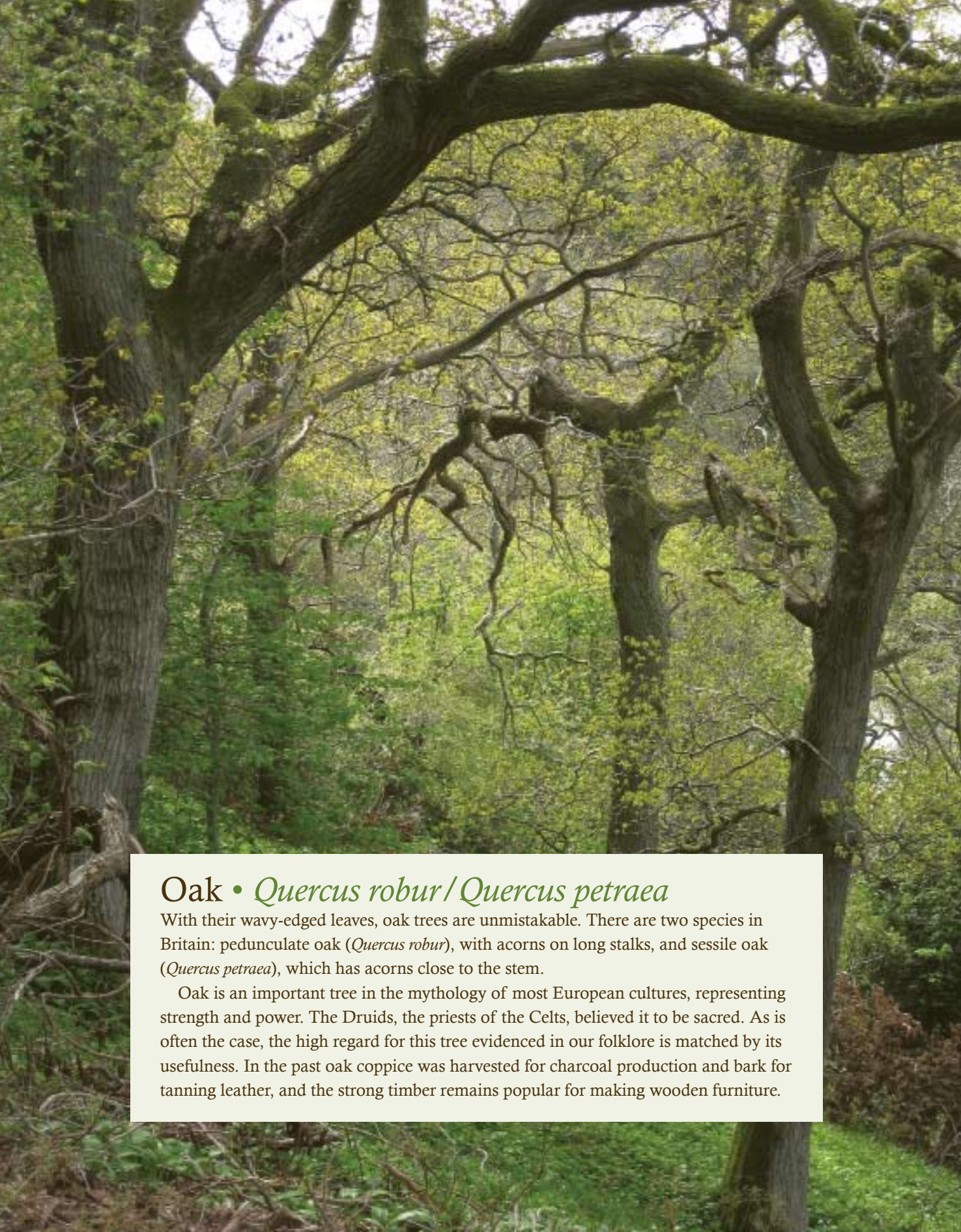
The tree that acts as the house's central post (below).

Another major design project for us was the viewing tower at Flanders Moss National Nature Reserve near Stirling. Flanders Moss is the largest raised bog area in Britain. The Nature Reserve had already constructed a 900-metre boardwalk so that people can see the moss close up, but they wanted an elevated viewing position from which people would be able to appreciate the scale and the context of the entire site. My first design was tendered but it came in over budget. This original design was partly a timber structure, partly steel, requiring considerable co-ordination between the two materials. The Nature Reserve asked for a simplified redesign, and this time I came up with a square tower with a jettied viewing deck at the top. The entire structure above ground is built of green oak; other than fixings (piles and a platform) there is very little steel.

For me, one of the practical attractions of using timber is that it is a cost-effective material. The vast majority of new houses are timber frame: even if they have a separate skin of block or brick, the timber provides the structure. To put a masonry structure outside the frame requires putting in wider foundations, whereas hanging cladding off the timber frame can be more economical in terms of space and money.

Using British Oak

Robin Baker loves oak for practical and personal reasons. Oak has excellent sustainability credentials, he says, because of its property of locking up carbon dioxide. But oak comes from a living tree, and is a wonderfully sensual, tactile material as well, with every piece unique. ‘When I worked in York, there was a severe fire in the South Transept of York Minster. For days I saw workmen carry out enormous pieces of charred timber; when they rebuilt the roof they did not use steel – they used oak again.’ Strange though it may seem at first, in a fire oak timber can be much safer than steel. When steel reaches a certain temperature, it will fail and the structure will collapse, whereas oak simply chars. Since the charring process is relatively slow, it is more likely that the flames can be extinguished before the structure collapses.



Oak • *Quercus robur / Quercus petraea*

With their wavy-edged leaves, oak trees are unmistakable. There are two species in Britain: pedunculate oak (*Quercus robur*), with acorns on long stalks, and sessile oak (*Quercus petraea*), which has acorns close to the stem.

Oak is an important tree in the mythology of most European cultures, representing strength and power. The Druids, the priests of the Celts, believed it to be sacred. As is often the case, the high regard for this tree evidenced in our folklore is matched by its usefulness. In the past oak coppice was harvested for charcoal production and bark for tanning leather, and the strong timber remains popular for making wooden furniture.

Oak Timber Frames

Oak timber framing is becoming a more popular form of building, and an industry is springing up to serve it. Richard Wilkinson explains why he has chosen to work with this ancient hardwood.

Oak framers work the timber while it is still green (unseasoned) but make allowance for subsequent shrinkage and movement as it dries.

Timber framing has been slowly gaining in popularity for the past thirty years, but it is really since the restoration of the Great Hall at Stirling Castle that timber framing has captured the imagination and inspired homeowners. The publicity generated by the Great Hall restoration was a tremendous boost to the industry, and suddenly local joiners began to find that customers came in requesting timber framing.

Timber frames use predominantly heartwood, for its strength and durability. It was these qualities that drew me to timber framing. I wanted to build buildings that would last, that would have a soul. Traditionally an oak frame building used timber that had a degree of sapwood. The sapwood is slightly more prone to insect attack; although the sapwood may get damaged, the heartwood remains strong. In many older frames what began as a rectangular piece of timber is slightly rounded off. But the heart of the building is still strong.

I also want the buildings to embody the spirit of the place in which they are built. I use the most locally sourced timber possible. Although I have worked for companies that have sourced their timber from France, I want to avoid importing timber, because to me, transporting it that far just does not make sense. I think it's important to give value to local timber. Building requirements and available resources permitting, I will use local timber to give back locally: to give employment and to give value to the timber that is already there.

Like everyone who is working with local woodlands, I hope that seeing the beauty of local timber will encourage people to look at the trees around them in new ways. Woodlands and trees are beautiful things, but they have to be maintained for a variety of uses. Woods have to be managed and local landowners need to have some incentive to maintain the woodland. I encourage my clients to plant replacement trees – for every tree that is used within the frame, try to plant a couple on your land and

An oak frame barn being constructed as part of a training course in Derbyshire (above). It shows some of the traditional features that provide strength and a special aesthetic quality.

restore what you have taken. If local timber is used, then hopefully local landowners will become good stewards, and the woodlands will be there for hundreds of years to come.

Each of my projects is a labour of love, because I try to build houses that will last a lifetime. Extraordinary care is taken at every stage to ensure the quality of the timber used in the frame. Once the design has been finalised and approved by an engineer, the sawmill, working to an agreed timber specification, provides the sawn timber. Depending on what the client wants, the timber usually has a simple band-sawn finish: this is clean with only the occasional tannin mark. If the client wants a planed frame that is oiled afterwards, the majority of the planing is done to begin with, before it is all scribed together. All the individual pieces are then scribed to one another with traditional joinery; the pieces are then taken apart and given a slight sand to remove any carpenter marks or pencil lines. Afterwards the timber is oiled, and then stacked carefully. As an added protection the timber is sometimes wrapped as well.

Sometimes clients choose a light sand-blasting, rather than piece-by-piece sanding. The frame retains its slight band-sawn finish, and when the building is weather-tight a crew of sand-blasters go in and take off any marking. Although not as protected as an oiled frame, this option gives the timber real character and a good finish. I also try to use only very basic finishes with a minimal environmental impact.