

LANDSCAPE ISSUES

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ISSN 0265-9786

EDITORIAL

Too hot, too dry, too sunny.
Using microclimate to temper
the extremes

Date: Thursday 11th August 2022. Late morning. The day is heating up. Yesterday it reached 36°C in my garden (Gloucester city). News headlines scream a probable drought crisis looming. No rain forecast for the UK south; just “sunny, dry, hot”. Released Met Office satellite images contrast green Britain weeks ago with brown Britain now. The driest summer for 50 years. You get the picture. Still remember it? The doom scenario also embraced the announcement of wildfires and restriction on portable barbecues. South west France and the American west reported fires out of control. High temperatures and dry vegetation the culprits. It’s a European, a global catastrophe. Warnings and conspiracy theories abound: what to do, why bother, whose fault?

Baroness Young on the radio blamed the ill-preparedness of governments not doing anything with issues until they became crises: “Never try to do anything between the flash and the bang” she warned. Sufficiently advanced planning is what is needed. We have got to take the long view. Not just building more reservoirs – that should be the last resort. Tony Juniper of Natural England asserts that our environment is degraded, desiccated, quoting the loss of 90% of our wetlands over 100 years. We need to rewet the floodplain, revive peatlands, fenlands and coastal marshes. There are triumphs in the cities: formerly buried rivers have been ‘exposed’ – taken out of culverts – and bringing multiple benefits climatically and socially to the citizens. In Seoul the restored Cheonggyecheon river is cited as a landscape success. Can London’s Fleet or even Cheltenham’s river Chelt be similarly transformed?

But returning to the summer of ’22 heat-wave, what can be done to cool the climate? Reducing CO₂ emissions is fundamental. But at a local level, following the Notre Dame fire in Paris, landscape architect Bas Smets was appointed to turn the Ile de la Cité into a “verdant paradise” and thwart the heat island effect by drawing on microclimatic expertise. While global heating is global, he contends working at a smaller scale can make a big difference. You have to understand a site intimately in order to improve its resilience to extreme climate events by “using shade, humidity, wind and water to lower the temperature in the heart of Paris”. The *parvis* in front of the cathedral is to be covered daily in a film of water which evaporates so cooling the air, just one feature unarguably drawing on Islamic tradition. Modern air-conditioning technology must be avoided. Such systems only generate more heat in other locations.

We need to learn from vernacular techniques that have been tried and tested for centuries. We need to understand the science of microclimatology. How to optimise the climatic potential of a site, modifying temperatures with attention to thermal properties of buildings, landscape materials and their surface reflectivities. Knowledge and consideration of the sun’s seasonal and daily trajectory. (Tree) species selection that moderates high temperatures and humidity equably by transpiration. Reducing or promoting air movement (wind) for shelter or cooling. Learning about air quality and pollution. Yet more prerequisites for landscape architects. Get toolled up for the new normal.

[*Robert Moore*]

WHY CHOOSE LANDSCAPE?

Final year Cheltenham students present their unique answers

The following collection of edited student papers is taken from the honours degree year submissions for the Philosophy and Creativity module (AD6603), in January 2022, in which they present their personal perspectives on 'What shapes a designer?' and a summary of what their individual design ambitions might be.

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Getting a work experience placement

I have always been interested in the built environment, and the construction industry, mainly thanks to my grandfather, who brought me to jobs he was working on for as long as I can remember. Art and design are also engrained in me. It was always my favourite subject in school, and I spent lots of my free time painting, drawing and designing. When I was growing up, I wanted to follow my grandad's steps and get an apprenticeship in bricklaying, but as time progressed, and I got closer to choosing a career, it became clear that if I decided to become a bricklayer, I wouldn't be utilising my creative abilities fully.

With an interest in construction and art, career tests all suggested architecture as the profession for me. So that is what I decided to aim for, tailoring my A-level subjects to the requirements of undergraduate architecture courses and getting a work experience placement at a significant local housing development. It was during this placement that we had a talk with a landscape architect. During this session, he introduced us to the sustainable urban drainage scheme they had implemented on the site, explained the rationale behind the planting and showed

us videos of existing trees on site being extracted and replanted. This was all fascinating to me and by the end of that day I knew that landscape architecture was the subject I wanted to choose at university.

When designing in the future I want to focus on making projects as sustainable, ecological, and biodiverse as they can be, and feel it is my responsibility as a landscape architect to do so. With projects I work on, I want to maximise productive green spaces that sequester carbon dioxide, create safe habitats for local wildlife, retain, clean and store rainwater with sustainable drainage systems, improve green active transport links and help to educate people and motivate them to do what we can to fight against the climate crisis. I would like my designs to be innovative, contemporary, unique, and eventually follow a style recognisable as my own. The remediation and rejuvenation of brownfield sites using adaptive reuse is something that really interests me, and it is a specialism I would like to pursue in my career.

My main goal as a landscape architect is to have a significant impact on climate change and create spaces that improve people's lives. I firmly believe we should be doing everything we can to drastically increase the amount of green space in urban (and suburban/rural) areas, create havens for pollinators and local wildlife, reduce single occupancy car use and encourage green active or public transport. I aim to try and convince clients of mine or of any practice I work for, that the sustainable and eco-friendly option is the best option for their space. [AY]

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Longing to be outside

Before studying landscape architecture and my access course, I was working within the NHS operating theatre; as much as I loved my job I couldn't help feeling squashed by the rooms with no windows, the whirring of the high-tech air conditioning and the bleakness of the thick, white walls, an environment making me long to be outside. But often, after a long 12 hour shift for the fifth day in a row, when I got outside I was greeted with a flooded car park, tall buildings that stole my chances of viewing any openness and the city skyline. I was, however, given a few yew hedges to guide me out on to the chewing gum stained pavement. This could be better, right?

As a child I loved to be outside, adventuring under the oak tree canopies, exploring the mysterious animal burrows in the woodlands and standing on top of the world along Wiltshire's ridgeway.

Now, as a mother, I take my son to the same places and enjoy watching him play in the freedom of nature. We cross shallow rivers while he's on my back, we bike ride over the fallen leaves and the untraveller woodland routes (calling it off-roading) and take a moment to let our eyes fall upon the city lights below as we walk the dog in the winter evenings. While enjoying these moments, between the birches and the willows, there's a sadness that the development of our urban places is being left to the engineers and architects. While their skills amaze me, what about the balance of nature and man? Could there be places that give the same opportunity that my son and I get within the urban landscape? Can't everyone enjoy timeless moments?

I want to become a landscape architect to create functional and community driven places for all users to engage and explore in. I want to create a balance of design, green infrastructure and use the natural capabilities that nature has provided as well as employ new technical advances to sustain damages that are beyond repair. I want to design urban realms that increase health and wellbeing, reduce climate change and return the community atmosphere for our future children and generations to come.

As a designer I am influenced by connec-

tivity, place making and new approaches with modern technology. I favour pioneering vegetation species that absorb excess flood waters, reduce climate change and have high carbon sequestration qualities. I believe that being a landscape architect provides an opportunity to engage people with their surroundings as well as contribute in solving alarming climate issues. I consider the use of sustainable materials a priority and would like to lead in demonstrating radical changes and adopt healthier choices for our landscapes that exhibit positive change and lasting results.[VW]

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Painting & drawing the landscape

Landscape is a piece that is emotional and psychological [Jim Hodges, 2000]

I think Hodges quite accurately describes the way I view landscape. Although he was primarily referring to landscape from an art perspective, I think that landscape architecture itself can be considered an art too, and one that conjures up a whole host of emotions. Similarly, my interest in landscape architecture began in the art of landscape illustration. Inspired by the landscapes I grew up in and the countless trips to National Trust properties in the north of England and the Scottish borders, I found great joy in painting and drawing the landscape. After discovering what landscape architecture actually was, I realised just how important these experiences had been to me. As a profession I was intrigued as to how much scope it had for making real change to what I could see around me and to what would be sustainable for the future as well as the wealth of theory that underpins it. Being born in the most critical time for action against climate change means that providing these sustainable spaces is key and is something I think is imperative to be a part of. The implementation of green-space can have so much impact not only for placemaking but for tackling social issues, bridging communities and mitigating climate effects.

Going forward, I feel I am driven in many aspects towards the various foci of my future career. For instance, I, like the millions of other disabled people, at times feel let down by design that does

not always offer appropriate accessibility measures or accessible landscape features. Inclusion in this way is so important and achievable, and being intimately aware of this, accessibility is something I feel I will always want to focus on. I'd like to work to go beyond basic inclusion to creating accessibility that instead inspires a real sense of belonging. Furthermore, I am also driven by the idea of social inclusion. The UK's green space gap – wherein people are unfairly disadvantaged in their access to greenspace (De Zylva, Friends of the Earth) – is one I feel is of incredible importance to tackle in that everyone is deserving of, and should have access to, the simple amenity of green space.

Being able to bring green spaces to those deprived of it is where I feel landscape architecture can have such a meaningful impact in the improvement of mental and physical wellbeing. I also place great importance in the value of the female leader. I think having strong female leaders and role models in general in this profession is crucial and my experience with the Women in Property Association this year has been an eye opener into the future of female leadership for our built environment.

In the near future I intend to take a year in practice with a firm whose values align with mine and that I respect, before returning to complete my masters and begin on the path to chartership. [LR]

Putting ecology first

Growing up in Bristol I have always had a passion for the great outdoors and at any chance I could get, I would be outside rain or sunshine! I have always had a nurturing side and would help my grandad and mum in the garden, whether that was helping him grow vegetables or planting with my mum and having a lovely cup of tea and cake! Art has also been a passion of mine; I love to draw and took A-level art.

This nurturing side of me took me initially down a nursing route. Unsure of what I wanted to do when I left sixth form, I decided to go into dental nursing. After working my way up to assistant practice manager and I also became an implant specialist nurse. However, my

love of the great outdoors was always near with walking or hiking up mountains at weekends. After ten years, I decided to drop a day from my full-time job and get a qualification in garden design.

I developed my understanding of local fauna and flora through my many National Trust visits to historic gardens which helped guide me to this route. I loved the course so much I left my dental nursing days behind me and decided to join the WRAC's scheme to become a gardener. I was lucky enough to work in a Victorian garden which hit my nurturing button, but I still wanted to learn more. This is where I found landscape architecture. My love of art, the outdoors and fauna and flora led me to this career: if only I had found it sooner!

For me, the work of Ian McHarg and his philosophy of design with nature has been a key influence in the development of my own practice. Putting ecology first, one of the first landscape architects to do so. He influenced the environmental impact assessment which is used today. Arne Maynard has a very natural style with order in the gardens he designs. The structure of the garden holds hands with the environment and respecting nature. Respecting nature is important to me. His gardens also have interesting form especially in winter months. Grant Associates who designed the famous Gardens by the Bay in Singapore have a philosophy that I feel is equal to my own: they believe in reconnecting people with nature in insightful, delightful and distinctive ways whilst addressing the global challenges of urbanisation, the climate crisis and biodiversity extinction. It's a practice I admire because of their forward thinking. Another landscape architect practice I admire is James Corner Field Operations. James Corner tells a story through his designs and sometimes they can be theatrical. For example, the design of the now famous New York High Line. He used the old railway line as a stage for the pleasures, joys, dramas of public life while also borrowing the landscape of the skyline of Manhattan. These works and philosophies are something I aspire to embrace. Finally, the biggest influencer of them all Sir David Attenborough for always fighting for the environment.

As a qualified landscape architect, I believe everyone should be allowed equal access to green spaces for mental and physical wellbeing. Inspiration is around us everywhere and the unique *genius loci* of a place should always be taken into consideration within the design process. Narrative is an important part of design which is why I am interested in the stories behind ideas. I also enjoy colour theory: I find it interesting that one can change how people see things just by using colour. A note for me to remember is less is more. A design does not need to be overly complicated for it to work and look beautiful. Less is more. Listen carefully to the landscape and the people around you. Education about how to look after nature I feel is important. Whether this is in art, workshops, or lectures. We need to look after this planet, there is no 'planet B'. Designers need to try and use sustainable materials where possible, with a low carbon footprint. Don't be afraid of white space! [GD]

No time to waste, everything to gain

I studied graphic design for two years at Eastbourne Art College; this was the first time I was taught a design process. We learned to sketch fast and I was forever collecting magazines for ideas in a scrapbook. Years later I'm still collecting ideas in a very different media-orientated world. I understand that creative people have a thirst for knowledge, the passion to drive themselves further than most, and that it could be mistaken for rudeness or selfishness, but it's a desire to truly understand, to equip oneself for the myriad of choices that first bombard you when starting a new creative project.

Certain designers have taken my interest, although I must admit I find them all fascinating. The first would be Zaha Hadid as I find the twists and curves of her designs amazing just like a sheet of fabric. I instinctively move directly to MAD architect Ma Jansong and of course Frank Gehry. Piet Oudolf will always be one of my heroes for planting and what especially I like about his work is the off seasons where he leaves the dead and decaying stalks in situ which suddenly

creates a different picture in the autumn, full of spider webs and the winter as frost glistens. I will never be rushed to prune back things after reading about his philosophy. Then there is James Corner and his fantastic High Line project and his views on public spaces to improve the surroundings and spirit of the cities we live in.

Being a mature student I feel I have no time to waste, but also everything to gain. With my experience as a landscape gardener, advertising and graphics, my heart tells me to aim high, in the respect of being part of a creative team in some of the large projects that are going on around the world. That being said I need to believe in the purpose of the projects and what difference that makes to the people and the environment as a whole. Turning cities green, rewilding of urban spaces, rewilding within green spaces are some things pulling me at present.

Where do I see myself in five years? I see myself working as a landscape designer in some sense; designing is the most interesting aspect for me, the problem solving to reach a conclusive finish to the design is extremely gratifying and also the most exhausting, but I see it as a process and, with practice, I'm pretty sure I will become good if I keep on track. After I finish university I wish to travel for a time to go and see these places and get the full effect of the projects that are going on, big and small, spend the time truly evaluating sites. [MF]

Surrounding breathtaking landscape

Ever since I can remember, the natural world has been a significant influence in my life. I was brought up in south-western Poland just a 40-minute drive from the Sudeten Mountains where natural landscapes dominated in any direction you travelled. Due to our culture and my family's upbringing, spending time in the countryside was pretty much a weekly tradition in my first years of life. The beauty, diversity and vastness of our landscapes made each of those trips unforgettable. I look back at those days with incredible nostalgia as I remember the tips of towering spruce trees touching

the ground under the immense weight of snow, the cloud-like cushions of moss sinking beneath my feet in pine understorey and drinking water from crystal clear mountain streams. At around the age of five, I was already foraging mushrooms, reaching the tops of mountains and learning how to grow flowers and vegetables in my grandparent's allotment. These were highly sensual and valuable experiences which allowed me to develop an eye for detail and a lifetime fascination in plants which seems to continue growing stronger with age. Above all, the endless hours spent in nature stimulated me to express my experiences through drawing and photography, which swiftly became my new passions through which I still explore and document the natural world today.

When reaching my teenage years, my love for the outdoors only continued to develop new interests and hobbies such as cross-country mountain biking. Over time I found myself going on exponentially longer rides and realised that it wasn't only the adrenaline rush that made me enjoy the experience but the connection with the surrounding breathtaking landscape. This is when I began understanding the importance of natural landscapes on our wellbeing and how many components make up our successful living environments. It became clear that a landscape is only enjoyable when most of its components are beneficial for its users and when human influence is harmonious with the natural surroundings. Since then, I began looking at our urban spaces with a critical eye and realised how many don't have this green-grey balance responsible for our wellbeing. Consequently, I knew that I wanted to do something to improve our living environments and discovered landscape architecture.

When investigating the effects of accelerating climate change, I came across the concept of 'garden cities'. Writing an essay on this subject led me to the discovery of fascinating environmental and landscape approaches, such as green infrastructure, agro-forestry and rewilding which can all be applied in biomorphic urbanism. I became incredibly passionate about these landscape methods as they shared my views on introducing biodiverse green spaces into urban environments in or-

der to make them more sustainable and resilient in the future. As a designer I highly support the biomorphic urbanism approach as it advocates the use of green infrastructure systems in our living spaces which provide countless ecosystem services to us whilst creating healthy biodiversity rich ecosystems for wildlife. It's a harmonious approach which helps us fight climate change whilst combining benefits of both urban and rural life.

My ceaseless interest in plants has led me to being highly passionate in planting design. I am especially captivated by naturalistic planting, shade gardens, roof gardens, green walls, soil health and the plant typologies of various habitats. The work of Patrick Blanc, Dan Pearson, Beth Chatto and Piet Oudolf have greatly inspired my approach to design and I believe plant knowledge is key in order to design biodiverse climate sustainable planting, which has significant potential in adapting our spaces to climate change.

My next step forward would be to work for a landscape practice providing me with first-hand experience in biophilic design. I am determined to advance my knowledge and confidence in this field in order to design balanced and thriving landscapes incorporating green infrastructure and tackling current climatic and urban sprawl issues in the future. I'm aiming to apply my plant knowledge and empathetic approach to craft biophilic landscapes, hugely beneficial and fascinating for their users, whilst being self-sustainable and resilient to shifting climatic conditions. [FT]

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Gardening with a passion

My early childhood was divided between east Africa and the rolling hills of rural west Gloucestershire. I spent these formative years immersed in the contrasting lush landscapes of coffee and sugar plantations, red dirt roads and jacaranda trees and plum orchards, wild daffodils under broadleaf woodland and cow parsley-fringed hedgerows. I discovered very early in life a fascination with plants. Aged around ten, I saw one day a van with the words 'Landscape Gardeners' painted on the side. I was transfixed, imagining

beautiful spaces filled with trees, flowers, ponds and pathways. How amazing it would be to create such spaces.

In my twenties I began gardening with a passion. This led me to study at evening classes and gain a distinction in the RHS general certificate in horticulture. In 2001 I started studying for an HNC in garden design at Sparsholt College, Hampshire. One year into the course I relocated back to Gloucestershire and recommenced the course at Pershore College, Worcestershire, where I gained my qualification in 2004. Since then I have worked as a freelance garden designer and horticulturalist. I designed and helped build a show garden at the RHS Malvern Show in 2007 which was featured on BBC Gardeners' World and awarded a silver medal. I have designed and worked on a wide variety of projects.

My starting point for design is often drawn from the *genius loci* of the site. My approach is to interpret the brief in a way that takes the best elements of the setting and the site itself and use these as the basis for creating designs which respect the context and preserve the best of the past, whilst avoiding pastiche, to bring something new and fresh. I aim to create places which embrace nature and biodiversity and enhance the lives of the people who will use them. I believe that the experience for the end users is paramount.

I feel I design intuitively and am able to pick up on what is valuable and worth preserving even in the most unprepossessing of circumstances. My preference is for sites which are in need of total redesign, renovation or re-imagining but which retain essential elements of beauty, no matter how faded. The Japanese aesthetic concept of *wabi-sabi* appeals to me. Everything, even a few broken bricks or almost-dead trees, can be inspiring and worthy of preserving. My approach is often 'light touch' design.

The contemporary naturalistic planting movement greatly interests me and I am inspired by the work of designers such as Noel Kingsbury, Dan Pearson and Piet Oudolf. My personal preference is for planting which combines the pleasing aesthetics of balanced colour and form with a naturalistic ambience. I am an admirer

of the ethos and work of landscape architects Kathryn Gustafson and Jan Gehl, the garden designers Arne Maynard and Jo Thomsson, the plantsman Jimi Blake and the architect Zaha Hadid. [JB]

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Gardens changing people's mood

Gardens and nature have always been an important aspect of my life since a young age. It was always fascinating to me how gardens can change people's mood and their approaches to life. Growing up in an area near the Gobi Desert where public facilities such as hospitals and schools were scarce and life was tough in many aspects. Green space as a whole was precious and public gardens were not easily accessible for many. I believe the youthhood I experienced has influenced my decision of becoming someone who can change the life of those who live in less advantaged communities and lead to a better overall life for the residents. The idea of working for the local government has always been in my mind throughout my school days as I believed it to be the most direct way of achieving such goal.

The later decision of becoming a landscape designer as a specific occupation was originated during my foundation year where I encountered some well-designed public gardens and observed how they had changed the area entirely which later inspired me to take on landscape architecture as my university course choice.

Looking towards the future, I have always been fond of the idea of working for the government to improve people's general life and provide positive impacts in the society as I always hoped for. I have my ambition in becoming a town planner working within the local government with an aim to promote healthy living and provide better public spaces. As it is noticed that many communities in Britain lack available accessible public parks to be enjoyed by everyone while many valuable plots have been abandoned or underdeveloped. Considering the rising depression rate and teenage obesity, it is also imperative for the councils to develop suitable public facilities targeting groups with specific needs (physical exercise spaces, gardens for meditation). The style

of gardens and landscapes I have designed tend to have a great focus on such versatility and allows different types of activities to be present on site which can be particularly helpful when designing community based public spaces. [TF]

Cycling over Shropshire's rolling hills

I was born in Shrewsbury, Shropshire, a town in which I have resided for most of my life. Shrewsbury can be considered a rural settlement, with a quaint medieval town centre. Shropshire itself is a very rural county, with easy access to luscious countryside and famous for its picturesque southern Shropshire Hills (an AONB). I consider myself lucky to have led an active childhood from an early age having been introduced to the sport of mountain biking by my dad. It's from early memories of cycling over the rolling hills of Shropshire that my love for the natural world and the outdoors was developed. From the adrenaline rush of racing down steep rocky terrain to the tranquillity and serenity of hilltop sunsets and wind glistening against trees, I love spending time in nature and it is something that very much embodies me as a person.

Prior to starting university, I embarked on a two-month interrail adventure around Europe, taking in countries such as France, Germany, Austria, Poland and Hungary, to name a few. This was done mostly solo, with a rucksack and a tent. Among other experiences during this trip, I spent a lot of time outside railway stations and walking around cities. Despite being British, and technically a European, I observed a different kind of culture: a culture where spaces in cities are used vibrantly and valued more. I noticed how public spaces had more function and were more interdisciplinary. For example, a park I visited in Königstein, Germany had integrated a skatepark, parcour course, nature trails and a children's playpark all into the scheme. It is clear that in some regions of Europe, outdoor recreation and public space is treated with a high importance for the wellbeing of citizens and this has inspired me to think from a multi-scalar mindset.

Projects within the public realm, such

as parks, plazas, waterfronts and brown-field restoration sites excite me the most. I am also particularly interested in the planning of green infrastructure and the improvement of transport links for cyclists and pedestrians in urban environments; however as a young designer I remain impartial to the type of work I get involved in. [JE]

Beautifully composed masterplans

What drove me into landscape architecture at first sight, were the beautifully composed masterplan panels. Having just graduated from secondary school I was fully attracted to the exquisite design, the entangled curves between the building blocks, the professional diagrams explaining the design methodology and the reason behind the design choice. All of these stirred me greatly, made me write landscape architecture into the choices of my university subject and finally to enter into the broad field of landscape architecture.

In my first year of study, when I was overwhelmed by the painful learning process, I once wondered whether it was only the beautiful typography on the display boards that attracted me back then. Facing those hard to eat words and mathematics, I once regretted choosing this subject, but after the first master plan was composed, I soon threw this emotion out of my mind. And I realised the true points that attracted me to this subject are the overlapping between nature and artificial material, the exquisite and clear landscape designs and the distinct visualisation of ideas.

The attractive visual presentation does not mean I prefer the concept and design more than its function. Another item that drives my ambition into the landscape design field is the insertion of small bits of greenery into the busy urban area. As a person who was born and raised in a busy urban area, the wide and fresh nature didn't catch my attention, but the small flower growing in the crack of concrete paving attracted me. Rather than build new artificial structures into the natural environment and say that's nature preservation, I prefer more to bring nature into the busy cities. So the idea of biophilic de-

sign and the urban pocket park is where my interest lies. They are both trying to make a balance between greenery and overwhelming cities, which is also the solution I want to find through landscape architecture. [KK]

A system of relationships

I believe that landscape is a system of relationships and that the designer's role is to improve or preserve those relationships depending on their priorities. Any impact in the landscape will often affect other systems, whether directly related or not. Hence, observational and analytical skills help us identify the issues that we are responsible for.

The most important relationship is that between the site and humans. At its core, landscape architecture exists for human interaction and appreciation. The first tenet is shown in that built landscape is designed for human use, while the second tenet is demonstrated in the example of aesthetics by fulfilling a human need for beauty. In addition, contemporary ideas of landscape architecture add that human design be sustainable, creating a third direction between human needs and the ability of the landscape to provide for such needs.

My inspiration for this worldview comes from my previous experience in Hong Kong. In a densely populated city, and in small urban parks, any relationship between the landscape, the environment and human use can be easily shown and mapped.

However, I also learned about projects and design philosophies from other parts of the world. In particular, Richard Haag and Ian McHarg were two landscape architects that stuck out the most. Having researched Bloedel Reserve and Gas Works Park by Haag, I was inspired by the use of existing sites and the restoration of a polluted area, both of which are applicable to Hong Kong. By contrast, *Design with Nature* by McHarg was more of a long-term study, but definitely useful and innovative for my own design directions as well as an educational guide.

Working in urban design became my dream due to the factors that led me to

landscape architecture. I admired the built environment as a way of expression and design on a practical scale, and urban design seemed the most efficient way of reaching both qualities. In addition, urban scale was something that I was comfortable with and later focused on in my designs, as I could determine precisely the details of my project as opposed to using approximations or repeating patterns. Finally, urban landscapes share much in common with architectural designs, and although I have chosen landscape architecture as my career, architectural notions still interest me and I would like to work with them given a chance. [MK]

Immersed in the natural world

Having grown up in the peaceful, green Devonshire countryside, my earliest memories are filled with scampering up trees, swinging from rope swings and jumping into rivers. My father kept goats and cows, and in the warmer months we would take them for walks along the green country lanes so they could browse the rich flora from the hedgerows.

Their favourite snacks were young bramble shoots and I can remember being captivated, watching their nimble lips hastily and delicately plucking each one from the thorny stems. Thinking back, I'm grateful to have been so immersed in the natural world at such a young age as it's given me a deep appreciation for our planet and its beauty.

Since then I've travelled to new places around the globe and have witnessed many new cultures and environments. The beauty of the world has never ceased to amaze me, but it's also become ever more apparent that the way we live our lives here on earth comes at a cost. From flying over the vast plantations of oil palm and seeing high levels plastic pollution in south east Asia to working on environmentally destructive farms in New Zealand and Australia, these experiences have allowed me to witness in person just how critical our current situation is.

The connection between people and their environment is at an all-time low due to the fact that we are restricted to seeing our world through a narrow lens

of pure scientific logic and economic value, with little regard for the infinite and miraculous complexity of the natural world. The result has been devastating, as we continue to use up finite resources and destroy our own environment at an alarming rate.

Since beginning my studies in landscape architecture, I have come to realise just how much potential there is to catalyse a large-scale shift in thinking by demonstrating how we can live in symbiosis with the natural world instead of abusing and destroying it. As we work at the nexus between the built environment and nature, we have the opportunity to replenish and revitalise the beneficial exchanges between the two, through a holistic approach to design. The potential benefits through living sustainably are endless and can offer solutions to many of the social, environmental and economic issues we face today.

The completely efficient cycling of nutrients and energy in nature is a fascinating process and by taking inspiration from it we are developing ways to live in a more sustainable way. De Ceuvel in Amsterdam is a project which I found inspiring to say the least. Through innovative thinking and creative design, a team of landscape architects have managed to convert a small disused boatyard into a self-contained circular community, showcasing ingenious sustainable living and recycling methods. The positive impact this has had, not only by testing and proving these techniques but also by changing in the public the perception of what is waste and what is valuable, has been immense. I believe that small scale projects like these have huge potential and should not be underestimated. [SB]

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Impact on emotional wellbeing

One of my earliest childhood memories vividly reimagines a warm soft path of yellow and orange leaves leading to the highest viewpoint located in the castle of the town. Infinite, undulating layers of blue and dark green mountains shelter it. I am now 21 and the memory of autumn in the Italian alps feels distant but profoundly nostalgic.

The pleasure of experiencing the alpine landscape was often taken for granted and incredibly missed when we moved to the West Midlands during my adolescence. The contrasting difference had a noticeable impact on our emotional wellbeing. We went from waking up to blue skies and forest vistas to a monotonous grey and brick red colour palette with little green; the sky looked hopelessly infinite. This drastic change of scenery, though challenging and contrastive, allowed me to reflect and appreciate the beauty of our natural world. Nature was a source of escape and shelter, we no longer had forests to get lost in, so we decided to hunt for parks and woodlands.

What we discovered however was disappointing; there was a lack of green space in the area we lived in. So, I started to contemplate how this is tolerated by long-term inhabitants and why there is no initiative to introduce green spaces as they did for my town in Italy, concluding that they simply did not invest in them, it was not a priority. But for me, it was, with my research ultimately leading me towards the possibility of drastically changing our concrete jungles to more sustainable, human-friendly habitats by harnessing the potential of landscape architecture.

My next step meant immersing myself into this whole new world of possibilities that were unknown to me but being passionate and excited about learning overall contributed to a pleasurable university experience. From the start our duties and responsibility to tackle climate change are undeniably significant, emphasising the implementation of climate responsive solutions. At this point, I realise that this field I am specialising in, holds an even greater importance than my original understanding of it.

What particularly mesmerises me about this subject is that one method can solve numerous issues; it centralises the entire natural system from biodiversity to humans, a holistic approach that benefits, improves and strengthens a network that actively works together and has an impact on each other in the first place. As someone who is fascinated by art, nature, design, and human psychology I see landscape architecture as the ideal tool to rediscover these topics further with biophilia and

sustainability being the main theme for my designs.

Leaning towards biophilic design probably stems from my conscious awareness of joy and comfort because of exposure to nature. As someone who comes from a Bengali background, was raised in Italy, studies in the UK but is based in Germany, I am aware that culture plays a vital role in our understanding of the environment. Learning how the concepts of biophilia and sustainability are approached in different geographical and demographic contexts would allow me to further analyse and understand alternative meanings of this diverse discipline. For me, a sustainable approach is harnessing the power of nature, therefore I am keen to adopt nature-based solutions both in the rural and urban context, looking forward already to being astonished at the positive outcomes. [NM]

The above selection is taken from the following students' submissions:

- Janette Barker,**
- Seb Beamish,**
- Georgina Davolls,**
- James Ellmore,**
- Tsz Fan,**
- Mike Furse,**
- Matthew Kan,**
- Ka Hei Heidi Kong,**
- Nabila Mollah,**
- Lizzie Rimmer,**
- Filip Tomaszewski,**
- Victoria Walker and**
- Archie Yorke.**



May Hill, Gloucestershire © Janette Barker

HOW IS THE LACK OF DIVERSITY IN VISUALISATIONS CREATING A BARRIER FOR APPLICANTS FROM ETHNIC MINORITIES TO THE FIELD OF LANDSCAPE ARCHITECTURE?

Shereen Din

The current Landscape Institute president recognises we need to create “inclusive and accessible environments that celebrate the culture, diversity and creativity of our communities” (Findlay, 2022). I feel this is a basic value that is publicly acknowledged but is implicitly disregarded. Society required a global campaign *Black Lives Matter* for humankind to learn to respect one another’s differences; however, in some cases this is still a problem. Beginning my career in landscape architecture I felt inspired by the subject. I thought I would find a community who wants to better the earth together but once I noticed the under-representation of ethnic minorities in visualisations it appalled me. Landscape architecture as a discipline prides itself on being empathetic. However, as an ethnic minority myself, I have felt no empathy regarding this issue. For this reason, I want to make a change within the discipline starting with this paper. I will discuss the origin of the issue, some recent changes in the contemporary world and statistics that present the extensivity of the issue at hand. I will conclude with how it could affect the future of landscape architecture and will present solutions that I believe should be implemented.

In 1943 Le Corbusier founded *Le Modulor*, a man with his arm raised in the air, designed to be “a universal system of proportions” (ICON, 2009). He aimed for it to be used as an exemplary comparison to everyday features in architecture such as doorways, despite that it “represented a very small percentage of the world population” (Arellano, 2018). The average height of a man in 1943 was 5ft 7in

(1.7m) but figure 1 shows the scale used is a 6ft white man. We can refer to him as white because Le Corbusier stated “the good-looking men, such as policemen, are always 6ft tall!” (Le Corbusier, 1954), whereby he is referring to the policemen in the English crime novels he used to read – during the early 20th century the protagonists were always white in this genre of literature. This controversial proportion is still used today and it is time “to redefine Modulor Man for a new era of inclusivity” (Slessor, 2014). Slessor posted the article eight years ago, which shows the ongoing, significant concern for the lack of development within the design world using proportion. Thus, the question

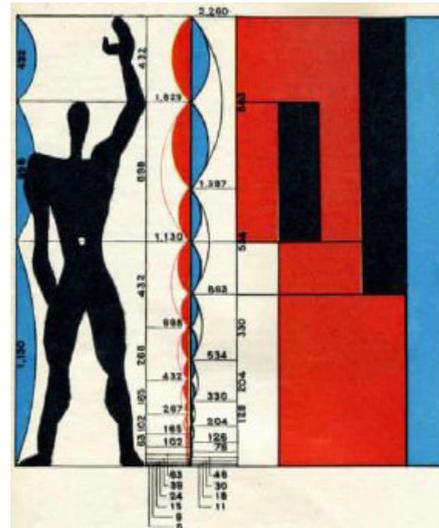


Figure 1 Corbusier's Modulor Man (Arellano, 2018)

remains – why are we using an outdated proportion of a 6ft white man in landscape architecture? This relates directly to the lack of diversity in visualisations as the designs within the visualisations are biased in themselves.

It is arguable that the bias is for economic benefit, where some critics have referred to it as a connection to how “architecture was consumed with its relationship with show business” at the time (Arellano, op cit). From this I believe the design world is heavily influenced by social and cultural trends such as the media. Unfortunately, the social trends of our contemporary world have not yet blossomed with visualisations for landscape architecture. Since 2010 a design movement has existed throughout social media; “it’s no secret that body diversity and inclusivity have become an important conversation” (TLFB, 2020). Body acceptance, regardless of the size, ethnicity or physical ability is being voiced through social media and is now a new social norm. For instance, traditional global fashion brands like Gucci have made their fashionwear limitless; figure 2 shows two models “who made history as the first curve models to have ever walked a Gucci runway” (Rodgers, 2021). This movement has drastically shifted the social paradigm of the last 100 years which should be considered within the design world. Modular Man’s universal system (ICON, op cit) of a 6ft white man is now broken. A new one is required, to be implemented within designs and visualisations. The measure needs to look at society for whom it includes and not whom we think it should include.

Related disciplines such as urban planners have indicated a commitment to changing the lack of diversity represented in their profession and keeping up with this social change. They “have been working on revising and updating urban data visualization style guide” (DATAVIZ, 2020) which includes altering the representation of written data. For instance, rephrasing “people with disabilities” rather than “disabled people” and referring to users as people rather than their pigmentation: “Black people” not “Blacks” (ibid). This shows substantial promise for the future of urban planning.

They recognise that “more people are thinking and writing about these issues” (ibid) but “there hasn’t been much agreement around best practices for taking an equity lens to data visualization” (ibid) due to it requiring a set standard for the companies. Nonetheless, their dedication to ethnic diversity and inclusivity in their data visualisations has proved successful as the discipline has had an increase in the employment of ethnic minorities as shown in figure 3. Urban planning is a role model to landscape architecture to attract a higher diversity of ethnic minorities into the profession.

The lack of diversity in architecture is formally acknowledged through the regulations and laws of EDI (Ethnic Diversity and Inclusion). This strategy was approved in 2019 and subsequently local authorities have attempted to include designers who reflect the users of those landscapes. However, I think for the most part this enactment is to present practices and authorities as abiding by the legislation but in reality there is a severe lack of genuine concern. The most evident way to support diversity and inclusivity would be to begin by visually representing these ethnic minorities within society. My opinion concurs with others who believe it is a “hollow gesture” (Waite, 2021) used as



Figure 2 Plus-sized models walking the Gucci parade (Rodgers, 2021)

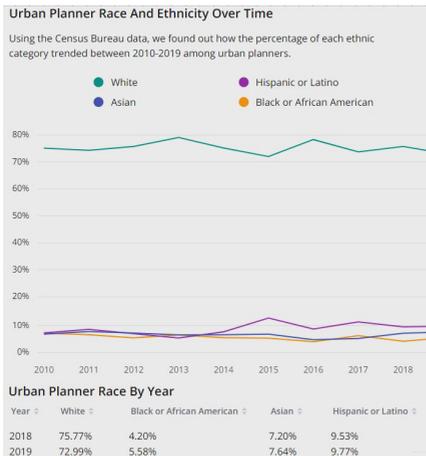


Figure 3 To show race & ethnicity rise within urban planning 2018-9 (Zippia, 2021)

“box-ticking” for ethnic minorities. This is also known as “BAMEwashing” (ibid).

An example of my criticism can be demonstrated in the Charlton Riverside housing scheme. The Simpson Haugh’s visualisations “showed 36 people and only one was a person of colour. This was for a scheme in a London borough that is 48 per cent non-white” (Ravenscroft, 2018). That is 2.8% of the visualisation represented as an ethnic minority when the real representation should have been 48% which is 18 people in comparison to the singular ethnic minority shown (figure 4). I believe this is unacceptable, especially with the ongoing *Black Lives Matter* movement, there are historical and political tensions between ethnic minorities and Caucasian people. This could be seen as designing ethnic minorities out of the city. Interestingly, the scheme was initially rejected because “the proposals did not adhere to the spirit or letter of the Charlton Masterplan” (Pitcher, 2018). In the context of ethnic minorities, it most certainly does not fit “the spirit” of the local area since it does not even care to depict the local demographics.

To further substantiate the lack of representation of ethnic minorities in visualisations an analysis has been conducted. Figures 5, 6, 7 and 8 show the selected images which have been analysed.

These images have come from landscape architecture practices from across the



Figure 4 Charlton Riverside housing with one person of colour (Pitcher, 2018)

country. Overall, the results in figure 9 exhibit a severe lack of ethnic minority representation. As a whole, out of all four images only 7.3% of the visualisations are of ethnic minorities. In the UK, “ethnic minorities account for around 14 percent of the UK population” (Allas et al, 2020) which makes the ethnic representation in these visualisations just over half of what it should be. This is inexcusable and beyond doubt, and shows that the lack of visual representation for minorities is creating a significant barrier in the professional practice of landscape architecture. “Diversity is making an outsized contribution to British culture” (Khan, 2019) but from my research I think the discipline is disregarding the change in British culture and not paying enough attention to the society who we design for. From an outsider’s perspective, it could be said that landscape architecture is designing for a society that no longer exists. Further research indicates a “survey of 2,000 UK adults suggests nearly seven in 10 of us agree that diversity has improved our culture” (ibid). A majority of the public acknowledges the presence of ethnic minorities so why don’t professional practices in landscape architecture?

This disappointing encounter led me to further research; how many landscape architecture practices do represent ethnic minorities? I conducted a primary research piece, looking at 10 office practices



Figure 5 (Cutieru, 2020)



Figure 6 (Bruck, 2015)



Figure 7 (Cosgrove, 2019)



Figure 8 (Hogrefe, 2017)

	Figure 5	Figure 6	Figure 7	Figure 8
White	33	24	28	43
Black				3
Asian			1	
Mixed ethnic		2		2
Other	1			
Disabled			1	
Pregnant				
TOTAL	34	26	30	48

Figure 9 The tally count of diverse ethnic minorities and less able people represented in the visualisations from figures 6-9

across England including cities such as Birmingham, London and Manchester. From this, the average computed for employed ethnic minorities was 20%. I contrasted this with the representation of ethnic minorities in the practices’ visualisations which averaged 5%. Additionally, I found that practices with no ethnic minorities employed had no representation of ethnic minorities in their visualisations at all. These findings led me to accept the contention that “visualisations are based on people’s perception of themselves and

their own cultural context” (Burford, 2022). Thus, this primary research confirms my opinion that landscape architecture appears to not have enough empathy towards ethnic minorities in society.

Once I had noticed the lack of ethnic representations in visualisations, I made a conscious effort to include a diversity of people in my own university work, but upon this engagement I discovered an additional obstacle. There is a barrier to diversifying visualisations with AutoCAD blocks (software-derived object symbols:

trees, north point, people, etc). From personal experience, I have come across an extreme bias whereby CAD blocks of western people are freely distributed and common to encounter with a variety of angles and groupings of men and women (figure 10). Unfortunately, this is not the case with the search for blocks of ethnic minorities. For instance, figure 11 illustrates a payment requirement to obtain blocks of Arab individuals whereas having western representation is completely free and accessible.

To further emphasise this problem figure 12 shows the commonality of this issue. CAD blocks of Arabic people were required to represent the Muslim population (with appropriate dresswear) for a scheme in Birmingham for which “there were 301,000 Muslims in Birmingham in 2018, making up 27% of the local population” (Miller et al, 2019). This growing number means a large portion of the population is being under-represented and denied a graphic presence in the design world. I believe the lack of accessibility to ethnically diverse CAD blocks is catastrophic and one of the root causes to the lack of diversity in employment for landscape architecture’s professional practice.

To resolve the issue at hand we need to re-orientate our vision as a discipline. This can be done through various solutions, such as boycotting visualisations that do not truthfully represent the population for schemes. Possibly, making it a requirement for practices to conduct a

demographic count as part of their site analysis and submit justifications to the Landscape Institute if their visual ethnic representations differ from those of the existing population. Alternatively, practices could have to set standard minority representations across organisations whereby a certain percentage that reflects the UK’s ethnic population is shown in visualisations.

As an additional solution, I have constructed a series of drawings to present a range of ethnic minorities and abled people (figure 13) as a guidance. This reflects my interpretation of how diversity should be represented. (It is acknowledged that these drawings are not to a professional standard; however, I think that the ethicality behind this issue prioritises the representation over professionalism.) I am confident others would agree with this concept. Figure 14 simplifies the representation with basic shapes to illustrate both techniques being as equally effective.

Ultimately, figures 13 and 14 convey that the lack of accessibility to renders of ethnic minorities should not be a barrier to their depiction in professional practice. They show that representation is attainable regardless of the situation.

Another solution is shown in figure 15, which contains visualisations of people who are blanked out with white. I believe this is equally as effective and shows great representation of society as a whole. This is because it does not explicitly depict any ethnicity but instead creates a

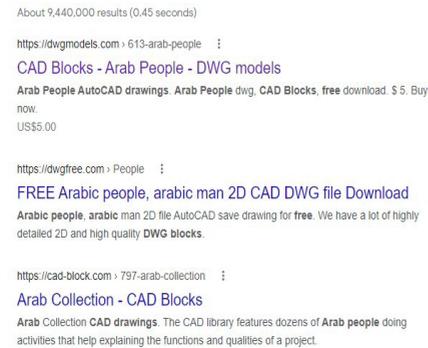


Figure 12 Google search for free Arab people CAD blocks

universal anonymity. This can be seen as cohesive and equal which is exemplary for visualisations in landscape architecture’s professional practice. As an economical advantage it saves time to render and colour the people too. Alternatively, it is important to acknowledge the reverse of this solution. The use of colour psychology “I don’t see color”, an ethnic minority will internalise that as meaning “You don’t see me.” (Louie, 2016). This could be a serious issue as individuals may see the blank visualisations as a deliberate disregard and rejection of ethnicities as a whole. This arguably can be seen as ignorant of societal demographics. Nonetheless, it is still a possible solution to represent the whole of society as an equal despite how unrealistic it is.

Moreover, an additional issue is the stigma of the landscape architecture profession being less welcoming due to “the lack of visible role models” (Cook et al, 2020) in the south Asian community, where I speak from a personal level. This barrier to employment can be a two-way issue, whereby the removal of any stigma may be helped through the education of cultural communities to assist in reshaping their perception. This can be done through the representation of ethnic minorities within the profession via visualisations, billboards and advertisements for the profession. This would help to build a new reputable portrayal for landscape architecture as a widespread community embracing people from different backgrounds and cultures.

Henceforth, the lack of diversity in visualisations will be detrimental for the future employment of ethnic minorities in the landscape profession. This paper has endeavoured to reveal the true nature of landscape architecture and related disciplines such as architecture and urban planning and their lack of regard to diversity in visualisations. This has a direct relationship with the disciplines’ employment rates vis-à-vis ethnic minorities. For instance in the Landscape Institute, 95% of LI members ... identify as white (Cook et al, op cit). To put this figure into perspective, the total membership in 2019 was 5,613 (Landscape Institute, 2019) which means approximately 280



Figure 10 (left) CAD block accessibility (CAD-blocks.net); Figure 11 (above) Arab CAD block payment requests (DWG Models, 2021)

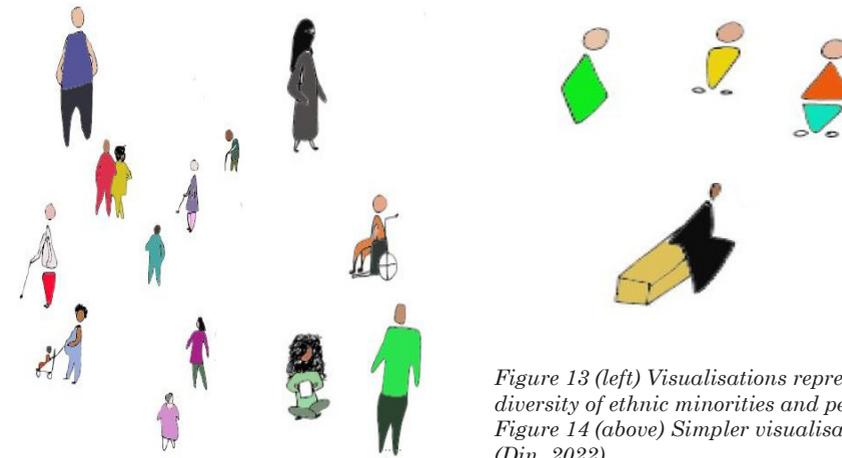


Figure 13 (left) Visualisations representing diversity of ethnic minorities and people; Figure 14 (above) Simpler visualisations (Din, 2022)



Figure 15 No colour representation (Shelley, 2020)

members in the Landscape Institute are from ethnic minority backgrounds in the UK. Thus, the lack of ethnic minorities within the profession itself partly reflects why there are barriers for employing ethnic minorities.

The lack of visual representation of ethnic minorities further discourages potential applicants to the profession; instead it creates “unrealistic expectations” (He, date unknown) for an outsider looking into the profession. As a result, this forms a portrayal of landscape architecture as biased towards the majority (white Caucasians) before people have had an opportunity to explore the profession themselves. Thus, it is a barrier to employment. Further to this, the profession is not widely known; only 12 out of 164 universities in the UK offer an undergraduate degree in landscape architecture. Therefore, the lack of awareness of the profession combined with the negative portrayal means that the attraction of employment towards ethnic minorities is extremely limited.

Subsequently, it creates a hostile environment for employed ethnic minorities in the industry; “for a Black or Asian person to choose work in the environmental sector takes great courage and inner strength” (Khatwa, 2020). It is important to consider the perspective of those minorities who work in the profession. Their experience would be crucial to representing landscape architecture as an empathetic discipline.

To conclude, the extreme lack of diversity in visualisations is creating a barrier for applicants from ethnic minority backgrounds in the landscape profession. Nonetheless, there is hope. Designers like Eric Combes are “fighting for more diversity” (Combes, 2017) in visualisations. The “unconscious bias means that a predominantly white institution will ... overlook the views, experiences and needs of non-white communities” (Cook et al, op cit). Thus, my personal view is that it is our duty as students, practitioners and members of the Landscape Institute to fuel this movement at this current moment. Times have changed since Le Corbusier, and I believe landscape architecture needs to be at the forefront to show adaptability and genuine concern to accurately reflect the needs of our society. To represent landscape architecture as a discipline that is empathetic, inclusive and, most importantly, proud of our diversity through showcasing it in visualisations. And in this way, I think we will fulfil our pledge to the code of practice and attract more ethnic minorities to deliver our “quest for equality” in the profession of landscape architecture (ibid).

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Biographical Notes

Shereen Din has completed the second year of the BA (Hons) landscape architecture course at Cheltenham this year, submitting this essay for the module AD5606 Cultural Context in January. She is very passionate about the issue – it is hoped the content will promote further discussion both within the department and the wider profession.

NATURALISTIC PLANTING: A CASE STUDY OF OUDOLF FIELD, SOMERSET, UK

Janette Barker

What follows is one of two case studies used to illustrate a dissertation on naturalistic planting in urban areas (Barker, 2022).

A site visit was made to Oudolf Field at Hauser & Wirth, Durstlade Farm in Somerset on 26th April 2022. The primary purpose of the visit was to review the aesthetic qualities of the planting in mid-spring and make a comparison with the visual impact of the same site in mid-summer, as observed on a previous visit, on 18th July 2020.

Although the location of the garden in rural Somerset may not seem to bear much relevance to the study of naturalistic planting in the urban public realm this site was chosen because it was designed by the eminent Dutch plantsman and designer Piet Oudolf who has been a leading light in the New Perennial Movement since its inception in the 1980s. It is one of the best and largest examples of his work in the UK. Its status as a free-to-enter public garden results in many thousands of visitors each year, approximately 100,000 on average, and the garden is open to the public all year round. In addition to Oudolf Field, the 0.6 hectare perennial “meadow”, for which the site is best known, are other, smaller areas of planting scattered through the development.

The largest of these is the Cloister Garden, an enclosed courtyard garden which serves an important purpose as a link between the renovated former farm buildings and new gallery space which make up the Hauser & Wirth art gallery complex. All of the planting throughout the site

was designed by Piet Oudolf. Oudolf Field opened in September 2014.

Since Hauser & Wirth is an art gallery, Oudolf Field is used to showcase sculpture as well as being a work of art in its own right. On the day of the site visit, two large Henry Moore pieces were in the process of installation in the garden, resulting in its temporary closure. However, the Cloister Garden was accessible. Its enclosed location between the old and new buildings of the Hauser & Wirth gallery lent a warm sheltered atmosphere which was comfortable for both human visitor and, seemingly, the planting within the courtyard, which was flourishing. Set out as a gravel garden, the planting is mainly concentrated into two freeform island beds, one approximately double the size of the other. The shape of these beds is defined by narrow metal edging, flush with the surrounding gravel. Permanent structure is given to the planting by four multi-stemmed *Broussonetia papyrifera* (paper mulberry) trees, three in the larger planting area and one in the smaller. The understorey planting is allowed to drift out of the beds into the surrounding gravel area and is scattered throughout the whole courtyard, fading out towards the perimeter. Other than the gravel/hoggin, the hard landscaping is limited to straight-edged pale stone paths immediately adjacent to the buildings and under the loggia of the new building. Unfixed seating is provided in the form of several individual bronze coloured metal chairs. The planting beneath the trees is set into a matrix of grasses, the larger growing *Molinia caerulea* subsp. *caerulea* ‘Moor-hexe’ closest to the trees with smaller



Figure 1 Cloister Garden, Hauser & Wirth 26th April 2022

Sesleria autumnalis drifting through and around the edges. The grass *Deschampsia cespitosa* ‘Goldtau’ creates visual accents together with a variety of bulbs and perennials and an unusual sub-shrub, *Clematis heracleifolia* ‘China Purple’ providing seasonality. At the time of the site visit, in late April, the grasses remained predominantly green with clear colour contrast provided by the orange bracts of perennial *Euphorbia griffithii* ‘Dixter’. Tall spires of robust *Nectaroscordum (Allium) tripedale*, which adds a long season of interest, were on the verge of opening and the magenta cyclamen-like *Dodecatheon meadia* added ephemeral colour at the border edges. The overall effect was subtle but impactful, restrained and attractive.

Private Tour of Oudolf Field with the Head Gardener, Mark Dumbelton

Oudolf Field was temporarily closed to the public on the day of the site visit but Mark Dumbelton, the Head Gardener at Hauser and Wirth, very generously conducted a private tour of the garden over a period of approximately two and a half hours. The following paragraphs are a summary of the conversation which took place during that tour.

Oudolf Field was created on existing farmland, on a site which is quite open and exposed. It is a rectangular space of approximately one and a half acres (0.6 ha) adjacent to the cluster of buildings which make up the art gallery complex and is overlooked by the main gallery at its lowest point. The ground rises to the north-east where a white sculptural building, the Radic Pavilion, dominates the far end. The site is enclosed by hedges which are kept low to borrow views of the surrounding countryside but which fulfill the designer’s intention to create a *hortus conclusus*. The garden is set out as a series of 17 organically-shaped beds of perennial plantings, edged with narrow metal strips. These beds contain over 26,000 herbaceous perennials (Oudolf, 2014). The planted areas are set into turf walkways, with a wide, central, sinuous hoggin path leading from a large wildlife pond in front of the gallery to the Radic Pavilion at the far end. Set into this path, at the widest point, are a series of ten elliptical low turf mounds edged with the same metal strip, offering a quiet counterpoint to the ebullience of the planted beds. Immediately in front of the gallery building is a paved terrace under

a loggia with individual unfixed bronze-coloured metal seating. At either end of this two sets of glazed double doors give access to the garden. Seven specimen trees, *Gymnocladus dioica* (Kentucky coffee tree), are set out in two groups flanking these doors. In late April the bare branches presented a striking, stark outline.

Mark Dumbelton has been employed as Head Gardener at Hauser and Wirth since 2014, taking on the role just before the initial planting was completed and as the opening deadline was rapidly approaching. His brief is to keep the garden looking as good possible, for as long as possible. During the private tour, he shared much of his experience and some of his extraordinary depth of knowledge about the garden and the plants it contains. His insight and unique perspective on the creation, construction, upkeep and maintenance of the Oudolf-designed perennial meadow was most illuminating.

On the day of the tour, in late April, the

dominant sight across the whole of the garden was the blue of *Camassia leichtlinii* 'Caerulea'. Bulbs are used in the garden to extend the season of interest and *Narcissus* spp. and *Fritillaria meleagris* had just finished flowering. In three of the central borders, large numbers of *Allium cristophii* were yet to open. Other than the *camassia*, the garden was visually fairly subdued, predominantly green but with a variety of foliage textures and shades from the emergent perennials and grasses. The advantage of this was that it was possible to compare how different groups of the same plant were performing in different areas of the garden and to examine the growing medium used to support them.

Mark Dumbelton explained what preparation had taken place prior to planting the perennial meadow. Even though the pre-existing site was ancient, productive farmland, before planting the turf had been removed and approximately 1500 tonnes of engineered topsoil imported on to the site. This substrate was then spread directly over the existing topsoil and the

perennials and grasses were planted into it. Mark reported that this importation of topsoil was due to a perception among the construction team that for the creation of the "meadow" to be a success, it was necessary to provide a poor quality growing medium low in nutrients and humus, as when creating a wildflower meadow. However, the types of plants favoured by Piet Oudolf in his designs tend to be strong-growing wild and cultivated herbaceous perennials and grasses chosen to provide maximum impact and a long season of visual interest. The imported topsoil at Oudolf Field is not suitable for these plants and this creates enormous difficulties in keeping the plants healthy and thriving. In addition, the imported topsoil contains *Equisetum arvense* a fast-growing pernicious weed with deep-rooted creeping rhizomes (Royal Horticultural Society, 2022). The imported soil holds very little moisture and has little or no crumb structure. The addition of organic matter as a mulch has been less than successful because the soil lacks invertebrates to carry this down into it.

The perennial meadow planting designed by Piet Oudolf calls for the top growth and seed heads of the perennials and

grasses to be left standing over winter to maintain visual structure and benefit wildlife. An exception is the *Allium* seedheads which are removed after flowering to prevent an unwelcome abundance of monocotyledon seedlings which would give the appearance of an invasion of lawn grasses into the borders. All other top growth is cut down in early spring once it has begun to disintegrate, just as the plants begin to put on new growth, and they are then fed. Due to the nature of the soil and the cost of fertiliser, Mark delays the feeding of the emergent plants until after the spring rains, since in dry soil the nutrients are unlikely to be accessible to the plants. In the current dry spring this means the plants can become short of nutrients as they attempt to put on early growth. At this stage in the year, it is clearly evident that different areas of the garden have widely varying soil fertility and moisture retentiveness, visible in the health and vigour of groups of the same plant, sometimes in the same border. This was demonstrated by three groups of *Hylotelephium* (*Sedum*) 'Matrona', which varied greatly in their development across three differing, but close, locations. Another advantage of the time of year was that it was possible to see the distribution of the plants in groups and drifts of varying sizes within the matrix of grasses with occasional individual accent plants interspersed among them.

The new perennial style in which Oudolf Field is planted tends to be at its zenith in mid to late summer and into early autumn, when the bulk of the plants used reach their flowering peak. On a previous visit, on 18th July 2020, the Oudolf Field was performing spectacularly. At that stage in the growing season the perennials and grasses have reached their full height and most are in, or about to be in, full flower. Whilst the groups and drifts are still clearly visible they link into one another, enhancing and supporting each other to give a beautiful tapestry effect. At that point in the season, the choices and positioning of plants to create complex aesthetic effects becomes apparent. Notable juxtapositions were *Thalictrum delavayi* threaded through with *Veronicastrum virginicum* 'Erica', and *Sanguisorba* 'Blackthorn' with *Veronicastrum*



Figure 2 Oudolf Field, April 2022, with *camassia* and Henry Moore sculpture



Figure 3 Soil conditions



Figure 4 Plant combinations, July 2020

virginicum 'Diane' against a backdrop of *Filipendula rubra* 'Magnifica'. In July, Oudolf Field was clearly a magnet for pollinators, with several species of butterfly observed and some plants, such as *Eryngium alpinum*, covered with bees.

Running throughout the planting the clumps and drifts of grasses such as *Deschampsia cespitosa* 'Goldtau', *Molinia caerulea* subsp. *caerulea* 'Moorhexe', *Stipa tenuissima* and the Oudolf Field signature matrix plant, *Sporobolus heterolepis* (prairie dropseed), enhance and frame the colour and structure of the flowering perennials. Many of the chosen grasses are American native prairie species or selections of them, often cultivated by Piet and his wife Anja at their nursery in Holland. Mark mentioned that one of the grasses originally planted in Oudolf Field, *Briza media* 'Limouzi' has subsequently been removed because of its tendency to self-seed too readily.

This complex and high impact patchwork effect, together with the fact that all the planting is visible from every angle, can be problematic. Mark Dumbelton remarked:

There is nowhere to hide if anything goes wrong – all the planting is on display. If one of the perennials fails or is attacked by pest or disease, in most gardens it would be cut back to regenerate. Here, that creates a hole that spoils the tapestry effect.

Oudolf Field continues to flourish well into late summer and autumn, with, *Achillea*, *Eupatorium* and *Selinum wallichianum*, more Piet Oudolf favourites, flowering into September and beyond. All of the plants used in the garden are individually selected by Piet Oudolf at the time of designing primarily for their visual effects and longevity of interest. It is interesting to note that this does not necessarily mean that they are selected on a "right plant, right place" basis. There are some surprising choices, such as *Gentiana asclepiadea*, a woodland specialist, or *Geum rivale*, a recent new addition, normally seen in damp soils. Mark takes great pride in his skill to cultivate these plants in less than ideal conditions. In order to improve the imported topsoil, in some areas he is excavating the lower layer of the pre-existing topsoil, bringing it to the surface and incorporating it into the engineered soil. This has resulted in a far better growing medium in these areas with a visible improvement in the crumb structure and consequential benefit to plant growth.

Keeping the planting healthy and refreshed requires an on-going propagation and replacement programme. Mark takes cuttings and seeds from Oudolf Field and propagates these at his own home since there is no provision for this at Durslade Farm. He finds bulk sourcing replacement plants from UK nurseries to be difficult since leaving the European Union. Some perennials in particular, notably *Achillea* spp, commonly used by Piet Oudolf, are not often readily available in quantity from nurseries within the UK. The budget for maintaining the garden is very tight and apart from Mark himself, there is only one other full-time member of staff. There are no part-timers or volunteers.

Virtually all maintenance within the garden is carried out by hand or by using

light machinery because there is no suitable access for larger equipment such as a ride-on lawnmower.

Piet Oudolf visits Durslade Farm annually to observe and review the garden and discuss its successes and challenges with the Head Gardener. There is no doubt that the on-going beauty and success of the planting he designed for Hauser and Wirth, and Oudolf Field in particular, depends very heavily on the skill and knowledge of those who maintain it.

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Figure 5 Oudolf Field, Google Earth (2020)

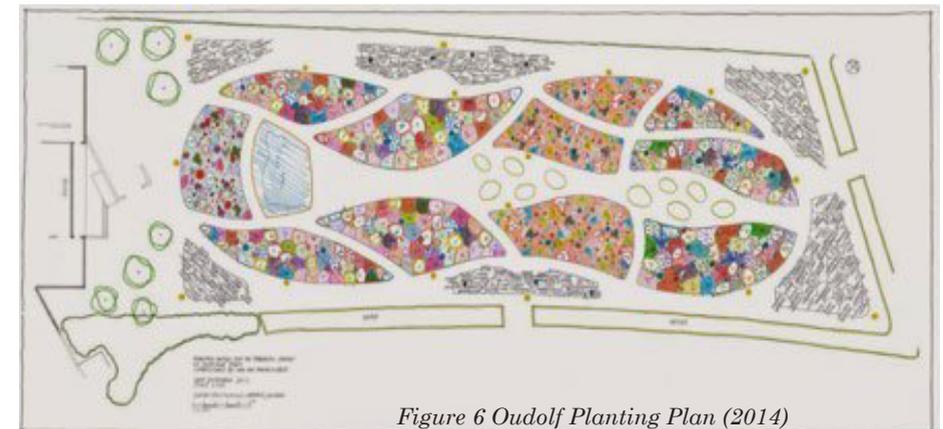


Figure 6 Oudolf Planting Plan (2014)

Biographical notes

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CAN THE *CHINAMPA* BE ESTABLISHED AS A VIABLE MODERN SOLUTION FOR CLIMATE RESILIENT URBAN AGRICULTURE IN THE UK?

Lizzie Rimmer

Globally, urban areas account for 80% of all food consumption (FAO, 2019) despite only 14% of food being produced there (IPCC, 2016). With urbanisation set to grow exponentially as 68% of the world's population is projected to live in urban areas by 2050 (United Nations, 2018) there is therefore increasing strain on the agricultural sector and substantial growth of its carbon footprint. This negative impact on the climate is of increasing concern as "34% of current crop land could be unsuitable for food production by 2100" (Freiberg, 2022) hence there is scope for new, climate resilient, urban agricultural solutions that reduce the global 'foodprint' and associated greenhouse gas (GHG) emissions. As cropland becomes more unsuitable it may be valuable to explore hydrological techniques instead, such as the implementation of the *chinampa*, an Aztec 'floating garden' technique, which is a form of field agriculture using nutrient-rich soil staked by willows that creates raised beds for crop production (Robles et al, 2018). These beds are productive "year-round" and work to "control flooding" encouraging "climate control" (ibid). Their ability to sequester carbon and contribute to the reduction of emissions (Renard et al, 2012) promotes the *chinampa* as a climate-resilient solution to agricultural problems. In the UK, agricultural land has decreased by around 26,000 hectares per year over the last two decades (Norton, 2019) as an increase in urban developments restricts the amount of land accessible for farming; hence, in the UK, land available for urban agriculture is at a premium. This paper therefore takes an interest in the application of *chinampas* in

the context of the UK and their scope for inclusion in landscape design projects. It recognises the potential large-scale impact made by advances in urban agriculture in an increasingly urbanised and intolerant climate and seeks to find ways that *chinampas* could be implemented from a contemporary, climate-considerate perspective.

The *chinampa*

The term *chinampa* originates from *chinamiltl* meaning 'hedge close to the reed' (Ebel, 2019) and 'pan' meaning 'upon' (Werner, 1992) from the Uto-Aztec Nahuatl language. Although referred to more informally as a floating garden this 'floating' is merely a trick of the eye – the appearance of surrounding canals against the raised topsoil creating the illusion of islands (The Archaeologist,



Figure 1 *Chinampero* cultivating a *chinampa* plot



Figure 2 *Chinampas* in Mexico valley

2021). Instead, the *chinampa* is better described as a kind of man-made raised field agriculture (Morehart, 2012; Comptour et al, 2018; Ebel, op cit). Raised field agriculture in this context refers to the farming of "large elevated planting platforms which provided drainage, improved soil conditions, and improved temperatures for crops" (Erickson, 1988).

The construction of *chinampas* dates back to the 12th century in the postclassic kingdom of Xaltocan (Morehart, op cit) and are largely recognised as an Aztec invention. Originally community-based schemes, the Aztecs "expanded and intensified" *chinampas* thrusting them into immense popularity and spreading the technique across the region well into Lake Texcoco and beyond as shown in figure 2 (ibid). Furthermore, in the major states of Xochimilco, Xaltocan and Tenochtitlan (the former Aztec capital), the *chinampa* was pivotal in society. As productive wetlands they were essential to their communities and it has been noted that [they] supported up to one-half of the population (ibid) with food potentially being produced at a surplus, fuelling community events and even soldiers at war (ibid). In the nearby state of San Mateo Atenco, life was characterised by

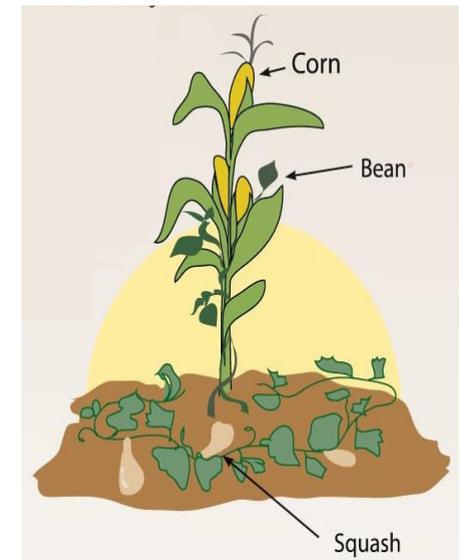


Figure 3 The Three Sisters plants

lake activities (Osornio, 1999) reinforcing the idea that these lakeside constructions were a crucial part of societal functioning well into the wider Aztec region.

Chinampas also grew the majority of staple crops. Corn, beans, squash and chili were considered to "[monopolise] peasant fare" (Dunmire, 2004) and the crops grew symbiotically. Indeed, the growing of corn, beans and squash was a productive system referred to as the *Three Sisters* in response to their harmonic growth qualities of shade, support and nitrogen replenishment (History on The Net, 2018).

Typical construction of the *chinampa* occurred at the lake edge in the heart of Aztec communities as both individual and community canal systems, and lengths varied from 8 to 100 m and widths from 2 to 25 m, mostly dependent on local context (Ebel, op cit). As a general rule, a wide field is particularly desirable for crop cultivation, but in times of incessant rainfall or drought, a narrower field is more suitable (Renard et al, 2012).

Basic *chinampa* construction techniques typically entail the channelisation of mud from the lake floor supported by willow fencing (Robles, op cit). However, there is some uncertainty

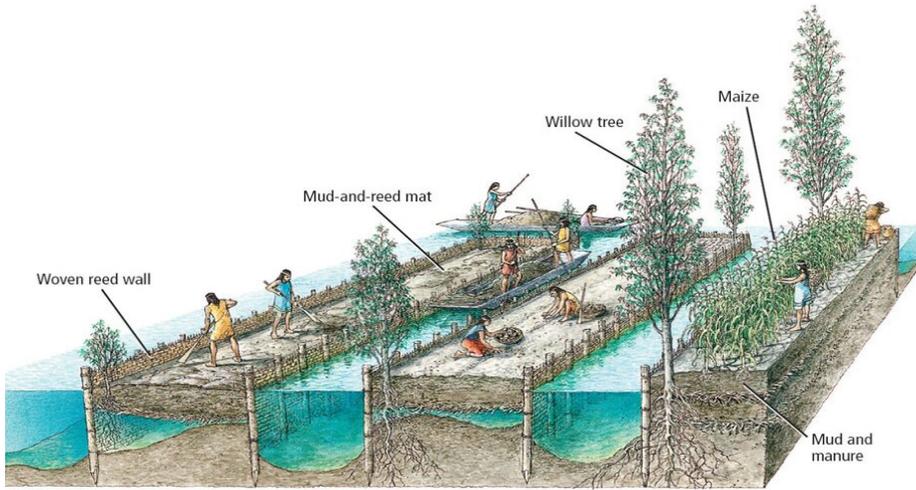


Figure 4 Chinampa cross section

around the organic matter in between as this inner construction tends to be unreported. Despite this, statements by 'local informants' presented by Osornio (op cit) expand on the typical chinampa arrangement and clearly define the layering system as mud from the lagoon, *tamborcillo* (a plant likened to the water lily) and plates of aquatic herbs including roots and grasses on top of a carefully shredded floor. During the rainy season, the layers were stacked so as to create enough height to be raised above surface level and secured by willow stakes sourced from existing chinampas.

One of the main aspects of successful chinampa management is the control of water to allow for effective sub-irrigation. Of vast importance are "consistent, well-regulated water levels" that are "essential to the success of chinampa cultivation" in that the surface level must meet "the correct height above the water" for best practice and without such would not produce bountiful yield year-round (Conway, 2018). This is made particularly complex as the region has rainy and dry seasons so hindering the control of water levels, but such cyclical nature of sub-irrigation enables a balance of nutrients and nitrogen-fixing bacteria to thrive which in itself is beneficial for plant growth (Ebel, op cit). Soils that "contain several

fungal species that limit proliferation of crop pathogens" are developed even without human intervention (Renard et al, op cit).

The chinampa is also a somewhat effective system for climate mitigation which it achieves through its ability to sequester (at least to some degree) GHG emissions in soil and its flood control (Ebel, op cit). However, it is worth noting that this has been partially refuted as large presence of bacteria in the soils can have the opposite effect. During the rainy season chinampas become "regulation vessels [for water] diverted from Mexico City" (Robles et al, op cit). Such water retention could theoretically be applied in other city contexts and as they sit above the surface level of the water can be seen as resilient to changes in water level.

Chinampa failure

There is a lack of successful chinampa presence globally which could perhaps be considered unusual. Preservation attempts of this efficacious sub-irrigation system have failed due to economic, sociological, environmental and political factors.

Tenochtitlan was occupied by the Spanish in the 1500s, who introduced increasingly sophisticated drainage systems to suit their own dry farming



Figure 5 Modern chinampa

techniques, draining existing chinampas (Jiménez et al, 2020). Indeed, "only one lake remains from the original five and its canals mostly dried up in the 1950s" (Pett and Ashtari, 2019).

Environmental factors also pose a risk to the chinampas, as they are not always immune to natural events. In 1985 a powerful earthquake in Mexico City led to the destruction of a large number of remaining plots and many *chinamperos* (farmers) fled to the city, abandoning their crops (Jiménez et al, op cit). Furthermore, water pollution from untreated sewage and toxic waste can also cause considerable crop damage. These hydrological issues will no doubt be intensified by the threat of climate change (Rahiz and New, 2012).

Sociologically, urban sprawl is a particular issue as "peri-urban agricultural land is a convenient space to meet housing demand" (Pérez-Belmont et al, 2021) and so with a dwindling chinampa area and lack of *chinamperos* there has been a considerable loss of livelihoods engaged in agriculture meaning that more people are moving away from traditional areas into cities for better prospects. Cities provide the money, housing and security that chinampa zones currently cannot provide.

Consequently, these issues need resolving to make the chinampa a viable

modern solution, although some may be less apparent in the UK context. Perhaps the most pressing threat is climate change as the occurrence of weather events and adverse environmental factors will only increase over time. Hence, to be a viable future technique the chinampa must be climate resilient.

Global climate projections

With the climate doomsday clock set at "100 seconds to midnight" (Mecklin, 2022) it is clear that the threat of climate change continues to pose the highest risk to human existence. Food production alone could contribute 34% of emissions (Crippa et al, 2021) however it is apparent that emissions by region are not proportionate. In 2017, Africa, China, the Middle East, south Asia and Oceania all saw the greatest increase in methane emissions compared to Europe which saw a decrease (Jackson et al, 2020). Whilst a lot of these emissions can be attributed to fossil fuel and industrial usage, those attributed to agriculture are also seeing a significant rise (Liu, Guo and Xiao, 2019).

The UK does not produce a lot of its own food and its dependence on imports is continually rising. Indeed, almost half of UK food is imported with 84% being fresh fruit (Garnett, Doherty and Heron, 2020). Having left the EU, the UK's

imports may become more strained and by choosing to import fruits and vegetables which are able to be grown on home soil there is greater risk to food security. In the UK, most farming occurs outside of the urban area so numerous parties handle the food before it reaches shops. Only 1% of urban greenspace is utilised for farming (Walsh et al, 2022) so the majority of UK farmed food is destined to be transported and handled regionally by road which, as Crippa et al (op cit) find, could be considered the costliest in terms of emission production. Therefore, urban agriculture may be preferable as it reduces these transportation rates.

One of the more damaging climate impacts is the implications on UK waterways. A particularly pressing issue is the predicted increase in flood events and it has been suggested that “global precipitation will increase with increased global temperature” which without increased mitigation puts Europe in particular danger of floods and drought (Watts et al, 2015). Furthermore, it is projected that by 2070 winters could be 25% wetter and summers 38% drier (DAERA, 2018) which further increases risks to agricultural land as these weather extremes will make cultivation and irrigation even more difficult. Agricultural land currently constitutes 72% of the UK total (Norton, op cit) of which almost 60% is less than 5m above sea level (Graves et al, 2016). Therefore, it may be necessary to explore agriculture that can be established in locations that are more resilient to these changes.

Urban agriculture

Urban agriculture is agriculture that happens inside the urban area (USDA, 2022). However, Mougeot (op cit) offers a further distinction in that it is its embedding and relationship within the urban environment as opposed to its location that separates it from its rural counterparts. Urban agriculture is preferable in that it significantly reduces distance between produce and the consumer and also helps to reduce the amount of packaging needed (such as single use plastics). However, repurposing UK greenspace would have major implications on the urban environment

through the loss of beneficial amenity land. Furthermore, access to greenspace is also disproportionate as it tends to be concentrated in more affluent areas (Friends of the Earth, 2020).

UK water potential

Although it is still beneficial to utilise greenspace for urban agriculture, the aforementioned disparities in access and amenity space may mean that other environments are more suitable. As 60% of cropland is at substantial risk of flooding (Graves et al, op cit) it may be beneficial for developers and landscape architects not to look to land at all, but rather to water. The UK has large amounts of freshwater with 4000 miles constituting inland waterways (Maritime and Coastguard Agency, 2022) many of which are currently unused and often largely polluted (Biomatrix Water, 2019c; Thames21, 2012).

Interim summary

The chinampa we have seen is largely a sustainable but underrepresented agricultural technique with the ability to sequester carbon and sustain changes in water level whilst being largely self-sufficient which is useful in response to a changing climate. Furthermore, it is clear that the current forecast for the climate in terms of changes in temperature and frequency of high impact weather events calls firstly for a reduction in emissions, and further asks for more sustainable solutions for future mitigation. The agricultural sector has been highlighted as an area of major growth in emissions globally. By utilising a structure such as the chinampa in landscape developments, the UK could make use of its largely underutilised urban waterways and bring production closer to the consumer. This also addresses the idea that urban sprawl will limit the amount of available urban greenspace for landscape design, and instead considers a potentially more accessible water resource. Despite this, the chinampa is not faultless in its response to the climate: its sequestering of atmospheric carbon is disputed and its flood resilience capabilities could be extremely strained under current climate projections. The chinampa would fundamentally require adaptation for



Figure 6 Traditional trajinera boat

future viability as the conditions they derived from were vastly different to today's climate.

However, there is little research as to how chinampas are applied outside of a Mexican context, therefore, analysing case studies of successful chinampa interpretations not only in Mexico, but in Europe, can be instructive. The following case studies consider two modern conceptions of chinampas and related constructions alongside their sociological, environmental and economic impacts. These implications provide insight into the benefits of the systems as well as areas which need improvement.

1 De la chinampa a tu mesa

Established in 2007, De la chinampa a tu mesa [From the chinampa to your table] (McCutcheon, 2015) is a project run by Ricardo Rodriguez and his wife in Xochimilco, Mexico, that revitalises traditional chinampas, restoring their profitability and productivity via means of community tours and an online market. Rodriguez does not explicitly create new chinampas but brings life to those that had been left unused. Xochimilco's chinampas were listed as a world heritage site in 1987 (Pskowski, 2018) but the site is decreasing in size, hence the main aim of the initiative is to bring awareness to the

traditions before they are lost.

The boat tours provide a substantial level of exposure to the chinampas. By booking an online tour, guests can take a tour on a *trajinera* (brightly coloured boat) and be shown around the Xochimilcan plots by a guide, before sampling locally farmed ingredients (Cookly, 2019). The celebration of the chinampa farmed ingredients also extends beyond the *trajinera*. The De-la-chinampa-a-tu-mesa (Facebook) website stocks everything from ice-cream to vegetable baskets at reasonable prices that support local chinamperos and livestock farmers. It is worth noting that the chinampas here are run in an organic way too.

Community is enhanced by bringing together different groups to make the project work. Rodriguez collaborates with “more than 18 prestigious restaurants [and] has strengthened more than 40 families of direct producers” (Rodriguez, 2016). Locals can rent the chinampa space allowing them to harvest crops assisted by chinamperos, encouraging sustainable food sourcing (De la chinampa, 2007) Rodriguez's initiative has led to the rescue of six unused chinampas (Rodriguez, op cit). By promoting sustainable urban agriculture, Xochimilco works towards a future of reduced GHG emissions. The promotion of urban agriculture reduces

potential food miles and packaging. Maintenance costs are low; however, tourism fluctuates throughout the year and, in off peak times, tourist revenue is lost, so is, as a result, mostly profitable seasonally.

2 Biomatrix Water

Biomatrix Water describes itself as a company that “brings water to life [and works towards] providing products and services to meet the growing demand for ecological water technology” (Biomatrix Water, 2019a). It provides a host of ecological services, mainly designed for wastewater management, including floating islands, ecosystems and farms and these products have been implemented internationally. In order to create these floating systems, Biomatrix Water has pioneered its modular island technology: layered planting on 2D, 3D and 4D modules designed to interlock to create a multitude of shapes whilst maximising biodiversity (Biomatrix Water, 2019b).

Of particular interest are the floating module projects in London canals, including the Kingsland Basin and Regent’s canal nature reserve, under the *Living Water Cities* initiative in London. By 2022 Biomatrix Water aims to have utilised 20% of London’s 600km of waterways in an attempt to establish green corridors (Biomatrix Water, 2019c) to create access for over 1.2 million Londoners (Canal & River Trust, 2019a). The Kingsland Basin and Regent’s Canal Nature Reserve in Hackney consists of 75m³ of Biomatrix modules secured to the walls of this stretch of canal utilising native aquatic plants including *Caltha palustris*, *Filipendula ulmaria* and *Irish pseudacorus* amongst others to provide habitats for urban wildlife both in the water and on land (Archer, 2020; Canal & River Trust, 2019b). The resultant green corridor received a Green Flag award in October 2020 and was recognised by Hackney’s Green Infrastructure Plan as a scheme as beneficial to London as the High Line on New York (Shaw, 2020). Although the basin mainly utilises inedible planting, there is easily scope for edible planting to be applied in the same way for urban agriculture.

The modules act as a solution for

cleaning polluted canal water in that the plant roots create homes for biofilm which are microorganisms that remove water contaminants (Biomatrix Water, 2014). This is particularly important as London’s waterways, particularly those to the east of the city, are polluted (Thames21, op cit). Habitats are created for a host of species such as kingfishers, wrens and fish (Canal & Rivers Trust, 2019). Edible planting can be established and the modules become floating farms to provide food to the neighbouring canal area. There are costs to be considered with implementation and maintenance, but these are relatively low.

Adaption to the current climate

The literature is clear in establishing that climate change will inevitably lead to an increase in extreme weather events. Therefore, to be accepted as a climate resilient solution, the chinampa must demonstrate effective adaption to these projections but this is contested in some literature. For example, the chinampa does not fare well in response to major events such as earthquakes (e.g. 1985 Mexico City) but conversely responds more positively to other events such as droughts and floods. (Osornio, op cit) The uprooting of chinampas reduces the potential for maintenance and crops may fail as a result; therefore perhaps the chinampa can only be seen as resilient as the location it is in. Regarding location, it may then be of interest to consider how the chinampa fits into the resilient strategy of the sponge city ‘integrated urban water systems’ (Nguyen et al, 2020).

The literature suggests that the chinampa should be considered a product of its time; one adapted to the conditions of an ancient climate. To establish chinampas in the UK, changes could be made that would improve productivity and respond to related contextual problems, such as water pollution. Currently the chinampas are susceptible to polluted water and applying them in the UK could be difficult in areas where contamination is an issue. It may be of interest to further explore phytoremediation by utilising plants that contribute to the purifying of water over time.

Another area in which chinampas could be improved is flood resilience.

Despite faring better than other forms of agriculture they are still exposed to the extremes of projected climate changes and it may be worth looking towards floating modules like that of Biomatrix Water. Conversely, it may be of benefit to build chinampa islands higher above water surface levels keeping up-to-date with flooding forecasts and projections so as to raise them to appropriate levels but not so much as to hinder productivity.

When considering whether introducing the chinampa is a viable strategy for the UK it is first important to consider whether the UK provides suitable environments for their implementation. The literature has highlighted a few essential conditions for successful chinampas, those being an area of ideally wide freshwater which is limited in pollution and is suitable for dredging to create the island forms. With over 4000 miles of inland fresh waterways there is plenty of scope for implementation throughout the UK as a whole. The main issues lie in assessing which of these waterways are at an acceptable level of pollution and have the right soil qualities.

The average Briton eats around 94kg of fruit and vegetables a year (BBC News, 2012) and the scope for increasing production is something the chinampa would wholly address nationally. A change in public mindset around seasonality of fresh produce may be beneficial as a lower demand for out-of-season produce would allow chinampas to excel. Therefore, whilst the chinampas cannot entirely address issues regarding agriculture in the UK, they could tentatively be considered a viable solution for the problem of fresh produce importation, particularly in areas with a lack of access to nearby rural productive land.

Chinampa viability should also be assessed in relation to its climate resilience and how it compares to other urban agriculture methods. The research here clearly highlights two things: the reduction in ability to use current cropland and the increase in drier summers and wetter winters. These are of particular importance as they have strong implications on which systems are viable and which are not. Firstly, urban agriculture that exists on land is limited by flooding in a way that the chinampa is

not, thanks to the latter’s aquatic nature and its response to flooding. Secondly, the reduced amount of water needed for irrigation by the chinampa makes it a favourable alternative to traditional cultivation.

Conclusion

Two main conclusions can be drawn. Firstly, that the chinampa is a sustainable raised field agriculture technique found in Mexico using natural irrigation techniques. Secondly, that the projections for climate change on both a global and (UK) national scale are substantial, have been significantly spurred on by food production and transportation, and will have devastating impacts on the planet without the mitigation and reduction of GHG emissions.

The main conclusion drawn is that the chinampa has the potential to be a viable urban solution in the landscape for the problem of fresh produce importation, and may be more viable than other land-based urban agricultural systems. However, to be truly feasible, it would need to be adapted in response to climate changes. The chinampa was established as somewhat climate resilient but may benefit from enhancements or in relation to other sustainable landscape solutions such as sponge cities.

The overarching research aim to analyse the ancient chinampa technique and explore its current and potential applications in agriculture has been achieved. It can be concluded that the chinampa is a previously influential and pioneering form of sustainable agriculture that, if utilised in landscape architecture in the UK, has the potential to reduce GHG emissions and provide high volumes of fresh produce directly to the consumer in response to the changing climate reducing current agricultural issues. However, it is difficult to predict viability as projections for the future climate fluctuate and the implementation of UK chinampa projects would be necessary to truly assess their impacts and resilience. Regardless, it is clear that under any climate scenario, implemented chinampas would benefit from adaptations that improve their resilience regarding the frequency of intense weather events.

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Biographical details

Lizzie Rimmer has recently completed her undergraduate degree and submitted her BA (Hons) dissertation in June of this year from which the above article is extracted. The research considers the future of urban farming, something she is particularly interested in.

THE LANDSCAPE ARCHITECT ABROAD: AN AMERICAN INTERLUDE

Bodfan Gruffydd

Bodfan Gruffydd, founder of the Cheltenham course, intended publishing this travelogue as a chapter in his auto-biography and also as a complementary piece to his critique of the American landscape schools he visited en route. Sadly no typescript of this remains in his archive. Comparable with his European grand tour (see Landscape Issues, vol 20, 2021, p.72), this American sojourn was as he admits responsible for shaping his understanding of the genesis and manifestation of

We are all aware of our ambience but for those living in small countries like Britain surrounded by sea or in mountainous Switzerland the ambience tends to take in the whole country. It is not a question of language – in Britain, English and Welsh with some Gaelic, in Switzerland four active tongues. It is, I suppose, in landscape terms, a combination of location, climate, and the history, customs, culture and politics of the place. These factors place their stamp on the behaviour and interests of the people and combine to produce a broad national culture. Then there are the divisions into districts or localities where local loyalties flourish, where local raw materials have dictated a unique vernacular in built artefacts, where the very voices of the people have underlying intonation if not dialect. With topographical form and plant cover, not forgetting fauna, all the human factors mentioned contribute to the *genius loci* – the spirit of the place.

Understanding and recognition of what goes to make up the *genius loci* underlies the basic art of designing landscape, the key to which is familiarity – close observation and analysis of all the factors, their synthesis and, finally, design. It is

landscape. He declares it was the most formative experience of his life and a powerful contribution to his competence as a landscape architect. One has to smile when one imagines his 'tiny' Daimler Dart managing to notch up a magnificent c17000 miles in total, and apart from dust in the air filter we hear of no other motoring difficulties. The photos accompanying this article are taken from his archive, all assiduously referenced by the author and here scanned for publication.

for these reasons that it is necessary for landscape architects to travel widely in order to acquire a reasonable understanding of the breadth of possibilities and suggestions of any trends in morphological change (man being part of the ecology) in order to equip themselves to deal satisfactorily with the problems of design and change in the landscape.

It was therefore extremely fortunate for me when, out of the blue in February 1961, a letter arrived from the Trustees for Harvard University inviting J. St Bodfan Gruffydd for a fellowship “to visit the Schools of Landscape Design in the United States and to stimulate an exchange of ideas”. To one who had not benefited from formal training, it was dumbfounding. I consulted my brother-in-law who knew about such things for he had been awarded fellowships at St. John’s Cambridge as well as St. John’s Oxford and at Yale. He said, “Drop everything and go”. It was the best advice I could have had for it led to the most formative experience of my life and a powerful contribution to my competence as a landscape architect.

The letter of invitation inquired of my interests in America and I replied that I



Figure 1 The main tours undertaken: 1 West Coast and Great Basin
2 Appalachians and Florida 3 Niagara and Michigan 4 New England

would wish to study urban and rural conservation methods for which the country was already famous and also the equally successful National Parks achievement.

The schools of landscape architecture are widely spread across the country, which offered the opportunity to drive along the small grey roads on the map and really see the wonders of this fabulous part of the world. So I took my little sports car on a Cunard liner to Montreal and set off from there. But first the headlamps had to be changed for they are strict about motoring laws over there.

I had resolved to keep to modest country roads so as to see unadorned country life and crossed a quiet little border post into Vermont, thence down the Adirondacks and Appalachians to Washington DC in a haze of incredible autumn colour. I was a little unsure of things and thought I ought to let my immediate hosts in Washington know of my arrival in the country. I lifted the telephone receiver in a call box and explained my difficulty in not knowing the number. The telephone operator asked who I wished to speak to and I said, “Mr Thatcher at Dumbarton Oaks in Washington” and she said, “Oh! yes, of course, sir, please wait a moment” and I was connected! I was very impressed with the United States’ telephone service.

Then I noticed the most incredible road

signs indicating a speed of 35 miles per hour – in open country. By this time I was in New York State and followed by a police car so I kept the speedometer at 35mph, just in case. After a long, long time the policemen passed me scratching their heads. I think it was the foreign number plate BOD 999 that took their fancy. Later, of course, I discovered that a speed limit was universal, though the actual speeds varied from state to state, with average 55mph by day and 50mph at night.

I discovered this to be of the greatest importance from an environmental and traffic point of view. In most states the sensible speed limits are reduced for night time driving; road and street lighting has been kept down to a minimum – just sufficient to find one’s way about, you could see the stars – so that strict headlamp adjustment allows safer driving for motorists on dipped head-lamps, with less spillage of road lighting onto adjoining properties and into the night sky. The regulations were advertised on boards at state borders, the only sensible one being for Oregon, where it stipulated “The speed limit is that at which it is safe to drive”.

Dumbarton Oaks, Washington DC, was to be my headquarters for the next two years. Dumbarton Oaks was set up and endowed by Mr & Mrs Woods Bliss as a Byzantine centre, with a fine collection

of Byzantine art and probably the most comprehensive Byzantine library in the world. It was donated to Harvard University at the beginning of World War Two. The gift was later augmented by Mr Woods Bliss' magnificent collection of pre-Columbian art. Mrs Bliss continued to develop the beauties of the garden co-incidentally with her rare book collection on garden design and ornament, so that the institution now provides for Byzantine studies as well those of garden history and pre-Columbian art. She was also keen on the Rococo period of garden design and has left the most amazing and beautiful reappraisals of this period by which to be remembered. Those lucky enough to remember Dumbarton Oaks during her lifetime, when she kept up her active interest in the place and the standards of her youth, will be undyingly grateful for the glimpse of those gracious pre-war days of American living.

On arrival, the first thing to do was to arrange visits to the schools of landscape architecture and design, some twenty-odd accredited by the American Society of Landscape Architects, within various universities. Assuming that speaking of one's interests and work would "stimulate an exchange of ideas" I had brought with me about half a dozen collections of slides to which I could talk on 'English garden design', 'The landscape development of an English new town', 'The influence of behaviour on landscape design', the 'Fountains of Rome' etc. Imagine my consternation when virtually every school opted for 'The landscape development of an English new town'. I was very worried until a Cambridge don with experience told me, "You must not worry old chap, it is perfectly possible to go all round America on one lecture and you give it better every time." And so, apparently, it turned out.

So I set off across the Appalachians for Columbus, Ohio, in driving rain. I was running late and went on what we call a motorway for the first and only time in North America. The huge trucks, driving at or above the speed limit, threw up solid curtains of water which blinded me, submerged in my tiny sports car. I vowed I would never go on a throughway again. When I came out of the hotel next morning, a great big American standing by his



Figure 2 Dart on the highway

great big motor car said, "Gee! I'm glad to see you, I was frightened of reversing right over the top of that cute little car of yours."

It was then I realised what had been puzzling me because I knew American cars were enormous; but they did not look big because the roads were big and the roads did not look big because the landscape was vast and open; the whole scale was different from England and most of Europe.

The buildings of Ohio State University are arranged quite formally round a roughly rectangular campus, which is called 'The Oval', fairly formally planted too, with specimen trees. The fascinating thing about this generally level campus was the cats-cradle of criss-crossing footpaths. Apparently, when it was first laid out, it was seeded only to wait and see how the origin and destination (O & D) of student movement would work out. (O & D of human or traffic movement can be fairly accurately worked out on the drawing board and normally forms one of the bases influencing the final design.) The tracks they made were hard-surfaced accordingly and so empirically the design was determined. I had never actually come across an example of this before and I gazed fascinated at the lines of human figures crisscrossing the campus as in a Lowry drawing, during class changes.

The next port of call was East Lansing, Michigan, stopping to see the truly amazing collection of ancient glass at the Art Gallery, Toledo, and to visit the Ford Museum at Dearborn, where the first street lighting installation by Thomas A Edison with carbon filament lamps had been lovingly re-installed, together with many T Model Fords and much of automobile interest.

Detroit is on the north-western shore of the Detroit River, connecting Lake St Clair with Lake Erie. Like most American cities it has a fine art gallery, in this case notable for enormous murals by Diego Rivera and a remarkable metal sculpture of Icarus suspended at the entrance.

Detroit is remarkable for its 'Green Belt', in that it is owned by a charitable trust. Earlier this century, when Detroit was growing with great rapidity, the wise old city fathers realised that citizens would shortly be without recreational space within reasonable distance of their homes; so while land on the outskirts was still cheap, they joined to purchase a great swathe round the landward side of Detroit, over which the developing city would have to jump, and (to avoid land tax) vested it in a charity for public enjoyment. First, they laid out a golf course, because golf courses are money spinners. Then, when the highway authority needed land for a new ring road, it could easily be spared for the wise old men had allowed for such contingencies in their original purchase. So they said "Yes, and it will cost you so much". (Very much more than they paid for it.) Gravel was needed for the road works so the Trustees said, "Yes, we can sell you gravel, but you must take it from here and here," where they wanted lakes for swimming and sailing. In these ways the Trust was paid for the land and also for the gravel coincidentally gained and won excellent recreational facilities, including large lakes, all for free. The charity now thrives under the name of the Huron-Clinton Metropolitan Park Authority. It has many very popular parks. In one there is a long sandy shore backed by a board walk (a wooden promenade on stilts) with varied amusements beyond, including archery to practise for shooting deer, for which guns may not be used during the early part of the season.

(I remember stopping at a lay-by [a pull-off] not so far away in Virginia. There was a large shooting-brake type of car there with two huntsmen wearing red caps – compulsory to warn the public of the danger. A police car drove up and the policemen started talking to the hunters. They said, "What you got there?" Reply: "Oh! we just shot a deer". Question: "What with?" They produced their bows and ar-

rows. The police seemed entertained and went sniffing round the shooting-brake. They opened the back hatch and there was a smelly old billy-goat! "You call that a deer?" they said, and drove off.)

In East Lansing was the first of the original Land Grant Colleges set up (in this case in 1855) by the Federal Government with the grant of land by way of endowment. Most states had one in addition to a university. The universities are, I suppose, somewhat more academic; the state colleges – many are now universities, as is Michigan State University – are still preserving the image of attachment to the land and its needs. At all events, East Lansing has a very good School of Landscape Architecture (while the dairy section made delicious ice-creams). Nearby Cranbrook School has particularly fine architecture, water gardens, and a great number of sculptures by Carl Milles.

The University of Michigan at Ann Arbor also has a landscape school, where I was particularly interested to notice that the landscape students passed through the painting and sculpture studios of the Fine Art Department to reach their quarters. I thought this is just what it should be (and as I hoped it would be at Cheltenham), for the art aspects of the training to rub off on the landscape students; but I was told they hardly spoke to one another.

I then moved on to Chicago, which I approached at night over miles of elevated roadways (viaducts), sparkling with lights in the frosty air. Part of the lake shore at Chicago, at the south western end of Lake Michigan, was developed for the great World Columbian Exposition by Frederick Law Olmsted in the 1890s. The quaysides remain with their lion mask rights to which office workers still tie up their boats and sail during the lunch hour. The Art Gallery has one of the finest collections of Impressionist paintings in the world with whole galleries full of Van Gogh, Cézanne, Gauguin, et al, collected by Mary Cassatt for her friend Fanny Potter Palmer, a beef baron's wife, who bequeathed them to the city.

During this first tour, I stayed in motels on the outskirts of towns; it was only later that I chose the graciously run-down, downtown (centre of town) hotels to observe the local life. Motels are very dull.



Figure 3 Arrival at the Rockies

One just backs up the motor car to the bedroom door and goes in to sleep, leaving early next morning for breakfast on the road. There is no sociability at all; but in the old-fashioned hotels of the town, locals come in the hotel for a drink and a chat and sit around the large lobby. I found they were cheaper too. Leaving Chicago I was really quite ill. The Doctor was called and pronounced "Foot and Mouth Disease: we get a lot of that round here." Nasty little white ulcers inside the mouth and between the toes. "Antibiotics will soon deal with that." He came back and gave me a supply to carry on with. The motel proprietors were very kind and fed and looked after me.

It was fascinating driving west across the states of Illinois and Iowa to see by the names on the barns where farmers from different parts of Europe had settled; there would be clusters of Welsh names, then clusters of German names and so on, and the different languages could be heard in the local drug stores. It made one feel quite at home.

Heading for the Landscape School at Ames, Iowa, I stopped for the night at Amana, which had been settled by Jewish farmers from eastern Europe, very much as the Amish settled in Lancaster County, Pennsylvania. It was novel and interesting to stay in a kibbutz in the United

States. One was given a guest room and joined the families for dinner and breakfast. Each family occupied its own house; its members would leave in the morning to breakfast in the common dining room. Then everyone went off to their respective jobs, leaving the infants in the crèche and the older children at school. In the evening the family reunited for evening meal before going to their respective homes for the night. In this way family life remained centred round the home. I was told that Ben-Gurion, while working for the creation of the State of Israel, realised that the organisation of families in kibbutzim was the most likely to succeed in a frontier state, went to Amana to "see how it had been done". Thus this communal organisation, born in eastern Europe, went (back) to Israel via the USA. Latterly, Amana industries, functioning on a co-operative basis, have diversified to make, among other things, the best refrigerators in America.

At Des Moines, the architect Saarinen had built a very lovely Art School, tailored to a low hill very much as Frank Lloyd Wright moulded his buildings to the land form. It was built of buff-coloured sandstone, laid in horizontal courses, yet broken in a way to suggest its appearance on the quarry face, with slight horizontal undulations which gave it an almost woven,

tapestry effect, prompting the thought "I bet it came out of the quarry just like that" – and there, further along the road, was the quarry face to prove it! Lutyens with all his vernacular brilliance never got quite that far – coarse work reminiscent of Butterfield's Keble College, Oxford.

By this time, driving west through Nebraska and Kansas, I felt I must be well out on the prairies of the Mid West. The road stretched on as straight as an arrow, across fawn coloured stubble to the far horizon, punctuated only by gleaming white corn silos, marking rail heads, as church spires might rise in the flatter parts of Europe. These great food stores with occasional farmsteads composed a repetitive rhythm across the featureless landscape, becoming progressively more bare. The land curving away to the distant horizon gave the impression of approaching the sea; but, instead of the roar of waves, the Rocky Mountains appeared in the distance. I had not realised there were still more than a thousand miles to go before reaching the Coastal Rockies and the Pacific Ocean. I arrived in Lincoln, Nebraska, on Thanksgiving Day and stopped at the post office to send off some postcards. I had a penny (a cent) to put in the parking meter because a banker, way back in Ohio, told me always to have a penny in my pocket for parking meters out West. As I turned to cross the road to the post office an elderly gentleman said, "Thanks very much." I looked blankly at him until he explained that I had fed his side of the double-headed meter. I went to put a penny in my own, right, side but he had already done it. I think it was all a ruse to satisfy his curiosity. He insisted on taking me out to Thanksgiving Dinner, when we had peanut-fed ham cooked in red wine with black cherries, served with ambrosia salad. I later discovered the recipe for the Georgian peanut-fed ham dish:

10-12lb ham at room temperature; 3lb black cherries; ½lb light brown sugar. Squash cherries as much as possible and mix with sugar; let this set for 30 minutes; place ham in cooking container; pour cherry and sugar mixture over ham; add water if more juice is desired; place in refrigerator overnight; cook until pin bone slips free (3-4 hours). For the sour cream sauce: last

30 minutes of cooking ham, add 1 pint of dark wine; remove from oven and let cool (do not let ham become cold); add 1 quart of sour cream and 12 ginger snap cookies; heat (do not boil); remove ham from container; strain sauce left in container; reduce if necessary; serve with ambrosia salad: equal quantities of shredded coconut, pineapple – small cubes, mandarin oranges – sections, marshmallow – small lumps, sour cream.

He was a charming old gentleman. He turned out to be the most prosperous business man in Lincoln, but he had never been east of Chicago or west of Denver. He was quite sure I could never reach the Pacific Coast "in that little motor car" and later I had to send him a postcard to prove it. He said, with all seriousness, during the course of dinner, that it was a great mistake for America ever to have entered the war, it should have had nothing whatever to do with it. Here was an example of the isolationism of the Mid West. And yet, whenever I stopped on the road and said, "This must be the Mid West?" I was invariably answered, "Oh! no, you must travel further to find the Mid West." In fact, I reached the Pacific before finding it

Presently the Sawatch mountain range came into view, the beginning of the long ascent to the Continental Divide, deep snow on the mountains with a sprinkling below. (The Continental Divide is the watershed separating rivers flowing west to the Pacific from the east-flowing to the Atlantic.) In the side valleys white trunks and golden twigs of balsam poplars marked the water courses, proving a sparkling contrast to the sombre background of Douglas firs, climbing the hillsides.

I crossed the Divide at Monarch Pass, elevation 1,312 feet. Up here, on the slopes of Mount Ouray, the pines grow progressively smaller until they are little larger than bushes. West of the Rockies the land levels out once more. All the flat areas are covered with snow, but gay with winter colours of vegetation; the yellow twigs of poplar, red stems of dogwood and occasional dark green of pine or juniper, against a background of protruding grass, and rushes.

Between the Rocky Mountains and the Pacific Coast Range a thousand miles fur-

ther west, lies the Great Basin Desert of sharply eroded buttes, plateaux and canyons, sparsely colonised with sage bush and less successful desert competitors. The minor hills look like great tip heaps, neatly graded to angle of repose. Nothing grows on them and, when wet, they glisten like liquid mud. One has the impression of having only just missed witnessing the creation of the earth. But this arid landscape has taken millions of years to evolve, as I realised when driving along the road which skirts the rim of the canyons of the Colorado River and its tributaries, which have now worn through successive layers of sedimentary rocks to the underlying pre-Cambrian granite.

At Arches National Monument on the west side of the Colorado River in Utah, the desert contains a remarkable collection of weird and wonderful rock forms of red sandstone. Fantastic rock arches and strange monoliths eroded by wind, frost and water, buttressed by the products of their own decay, supported, as are the swamp cypresses of the South East, by their knees, as if the surf of the desert had been washed up and petrified about them. But here the wind, which determined the angle of the eroding rain, seemed to have been blown by an abstract sculpture-god to create specially desirable and delicate forms in monochromatic harmony. I was filled with wonder, drugged with the other-worldliness of this fabulous landscape; but the time came to drive on over the red-brown desert, comforted by the now familiar forms of snow-clad mountains in the distance.

To drive into Utah is to enter another country. All the states of America have unique characteristics, recognisably different from their neighbours; but Utah has distinctive orderliness and cleanliness and a harmonious way of life. It also has the Great Salt Lake and Great Salt Lake Desert, 90 miles across. Much of the land bordering the Great Salt Lake is treacherous saline marsh and there are notices warning travellers not to stray from the road. I thought of the intrepid Mormon settlers coming out all this way in covered wagons from the Atlantic, a distance which can take 16 days to drive in a motorcar, along minor roads.

Further on, I crossed Bonneville salt

flats on a causeway. Here water meets sky in limpid opalescence, making a fantasy of solid earth form, while a snow fence reflected in the mirror of the cloudy sky, completes abstracted nature. One seemed suspended between earth and sky, drifting on lacteal brine, wondering if one would ever reach the familiar world again.

By this time I realised I had taken a wrong turning out of Salt Lake City; but decided to push on across Nevada into Oregon, the road stretching on and on through the sage bush, a vastness defined only by surrounding mountain ranges which seemed to move forward, along with the traveller, never changing form. One seemed to be trapped in space, a space which was endless. I was grateful for the advice tendered back East always to travel with a full fuel tank and so be able to do another one hundred and fifty miles to the nearest hamburger. Presently, a haystack promised human habitation, which took the form of a small shack, and two petrol pumps. Filling up, I said I was hungry and the man said, "Oh! you can have a hamburger." So, into his little shop I went and he apologised for his wife's absence. She had gone shopping with a neighbour to Eugene some 300 miles away (I suppose the neighbour lived 40 miles away). I complimented him on his hamburger and he said, "Oh!, I am very well known for my hamburgers, people come from all round to eat them."

The following day brought the Cascades, glistening under a fresh fall of snow, into view and the rest of the drive was through storms of rain and sleet to the University of Oregon at Eugene. But first I fortified myself with that T-bone steak for lunch. I had fortunately remembered what Dame Margaret Lloyd George had said to my mother at tea one day. She was accompanying her husband on his triumphant tour of North America after World War I. When they reached Chicago, Lloyd George was ill. His wife called the doctor who said, after examining him, "Mrs Lloyd George, give your husband a beef steak for breakfast every morning, the poor man's exhausted". So I remembered always to follow that good advice; but then I must stop at a drug store for the tablespoon of olive oil. Never was I more grateful for that bit of advice of the

Lord Mayor of Bristol who, on seeing off a group of his councillors on a goodwill mission to Stalingrad (Bristol's twin city) at the end of the war, said, "Now I want you to remember that you are going to a country renowned for its hospitality. I would not like any of my councillors to disgrace themselves and I want you all to promise to take a tablespoon of this olive oil before every party," and he handed each a small bottle of olive oil (it floats on top of the stomach contents and prevents the alcoholic fumes entering the blood stream – it certainly inhibits any feeling of intoxication, in favour of slight stimulation – effective but dull). For when I reached the university there, sitting in a circle were the whole faculty, as if waiting for Godot (me) to drink bourbon (pronounced burbon) with them, before giving my lecture to the students; to be followed by a reception where more bourbon flowed and then dinner before I got to bed. The custom of powerful aperitifs, it seemed, is a hang-over of prohibition, when raw liquor was readily available from the bootleggers but tasted so awful that one called at a drugstore for suitable flavourings to mix an acceptable cocktail. The drill was then to drink up quickly, there was no further alcohol during or following a meal, so as to appear sober when driving home.

The drive over the Cascade Range to Eugene in the valley of the Willamette River, and later over the Coastal Range graphically illustrates the topographical effect of climate on vegetation; the high rainfall on the western slopes encouraging the growth of magnificent forest of Douglas fir and sugar pine (*Pinus lambertiana*) of enormous size, whereas the drier eastern slopes of the inland range are comparatively bare. I finally reached the Pacific Ocean at Port Orford. The coast is spectacular, peaks of the coast range, rising 4,000 feet sheer from the sea, running southwards to protect the fertile valleys of California from Pacific gales. Placid sandy bays lie between dramatic headlands, but the surface of the ocean is pierced by jagged rocks like shark fins, projecting outliners of the mountains running out into the sea, perilous to shipping. It is a geological pattern which may be seen, inland, in the deserts of Arizona and further east, where rippling sand substitutes for water.



Figure 4 Forests of redwood

Now the road turns south; one of the most beautiful roads in the world. Certainly it is the finest I have ever driven; Highway 101 to Leggett, California, and Highway 1 south from there to Santa Barbara. It follows the coast, now and then turning inland to provide scenes of infinite variety and startling beauty. One moment high up the mountainside and the next at sea level. Sitka spruce trees hug the seaward slopes. I had only seen these grey-blue spruces blanketing hillsides in Wales, blotting out topographical character; but here, in their native habitat, the foliage is less dense than it is in Britain, displaying the graceful form of the trunk and branches with glimpses of silvery bark.

The coastal highway crosses broad rivers which flow down through valleys densely clothed with forests of redwood trees, fringed with poplars. Many of the finest stands of coast redwoods, *Sequoia sempervirens*, have been given privately to the nation as memorials to relatives and friends. The trees are much more important than the Redwood Highway, which threads its way between them and one must be careful whilst driving not to run into an old veteran, which seems to grow out of the middle of the road. And so the road threads its way through broken,

barren hills to the Golden Gate. This is where the rivers draining the huge Sacramento and San Joaquin valleys break through to the sea. The famous bridge is not gilded at all but bright red. Apparently the artistic San Franciscans were so taken with the colour of the undercoat, they kept it that way.

San Francisco is an amazing city: a grid-iron of streets superimposed on a topography of ridges separating steep-sided valleys. The switchback roads are so steep that cables had to be employed to draw the street cars (trams) up and down along them. Much beloved of San Franciscans, who insist on keeping their cable-cars, they form a whimsical, delightful and improbable juxtaposition with modern traffic. There is a large Chinese district where the telephone kiosks are miniature pagodas with bells hanging from eave corners. The local children, on their way home from American school, call in at their own Chinese school to learn Chinese language and customs. But the Chinese, like all the other distinctive ethnic groups of the country are 'all-Americans first'. Groups of people from all the countries on earth have come to live in the United States, bringing with them their language and customs, which they have sensibly kept. But they arrived as foreigners in a country already speaking English, so they had, perforce, to adapt and to integrate, to fit in with what they found and, to survive, it was necessary to become 'American first'. Involvement, however reluctant, in two World Wars has taught its lesson however and that is why the 'Stars and Stripes'

were flown at every schoolhouse door and why the first lesson of the day was to recite the Oath of Allegiance to the American flag. Incidentally, it also explains why the federal form of government, as evolved in the United States, would not necessarily work in the same form in Europe. United States citizens are really very lucky for they have found in their form of English one language which is relatively easy to pick up, adopt and use, and this is a major step towards integration.

San Francisco is an artistic city. Here the cultures of the West meet the cultures of the East, facing each other across the Pacific Ocean. The women are marvellously dressed, modelled on fashions perhaps from Paris, of rich fabrics from the Orient and everything carried out with great éclat. To commemorate a historic event its citizens will quite happily pave a whole street with silver blocks "just for the hell of it" or gaily pull down a bridge they do not like the look of and replace it with something better. But they have to put up with a climatic quirk, for the cold Pacific sea meeting the hot dry land causes San Francisco fog, giving the area warmer winter than summer temperatures – a quirk unique in the world which may give its citizens some of the British phlegm. They are certainly keen business people.

The Golden Gate is a comparatively narrow channel, subject to tides, through which the waters of San Francisco Bay flow into the Pacific. The Sacramento River flows into San Francisco Bay from the north and the San Joaquin from the south. These fertile valleys enjoy the shelter of

the Sierra Nevada to the east and the Coastal Ranges to the west and – with irrigation – produce the abundance of fruit, wine and vegetables for which California is famous. In fact it is said that nearly every lettuce eaten in the United States is grown in one of these two valleys.

An old friend was teaching at Berkeley when I visited the school there. He picked me up in San Francisco and drove me over the Bay Bridge, which is several miles long, to Oakland. I complained that I could not see the view over the high bridge parapets when lo! the whole car rose up. I thought, "This is another American wonder" but it proved to be a French Citroën motor car.

At that time, the students were rather blasé and I started my lecture to an almost bare house with an audience of perhaps half a dozen. During the course of speaking, I sensed things warming up. To my surprise I found students sitting on the window sills when the lights went up. A faculty member came up afterwards to say he happened to hear laughter while walking along the corridor and came in to investigate. He said, "You knew it was funny but with all that laughter I kind of learnt something". That was one of the best compliments I had, though the ridiculous part of it is that if ever I try to make a joke it usually falls flat.

I also visited Stanford University, south of San Francisco, where I had an introduction to the Professor of Oriental Art. The Stanford Estate is large, of lovely rolling parkland, furnished with Californian live oaks, the university occupying only a small part of it. The campus was laid out by Frederick Law Olmsted, the father of landscape architecture in the United States, and the main buildings are modelled on Byzantine forms. The university is well endowed with valuable land. When a professor was appointed he was allocated a piece of land and the money to build a house on it, to his own specification, choosing his own architect. That house then remains for his (or his widow's) exclusive life use, before reverting to the university. My host could pick fresh fruit in his garden every day of the year and his house was one of the few I have visited where the beautiful Turkish carpets hung on the walls (as they should). As winter was now

advancing I drove up the San Joaquin valley to the high sierras hoping to be lucky enough to get into Yosemite National Park before snow closed its doors for the winter. As it was, snow lay thick on the passes and I wondered if I should make it, when the magnificence of the canyon burst into view. This was the view that greeted the men of the Mariposa Battalion when they first came to survey and later to guard the beauty of Yosemite, more than a century ago. It is one of the three most spectacular canyons in America, 4,000 feet deep, carved by glaciers from the solid granite of the sierras. Though the canyon's floor is 4,000 feet above sea level, the Yosemite valley escapes the worst of winter storms and has gentle showers almost every day during the hotter part of the year, so it is always cool and green. I was delighted to see for the first time in my life, mistletoe growing on oak trees.

Snow clouds hung low over the valley the day I visited it but El Capitán stood clear above the valley floor, its full 3,600 feet of granite cliff face, dwarfing the giant redwood trees at its base. A shaft of sunshine pierced the clouds to illuminate the famous Yosemite Falls. In two drops of 1,430 feet and 320 feet, this superb waterfall descends with intermediate cascades a total of 2,425 feet to the valley floor. It is an exquisite sight, as if of heaven itself, when rainbows play on the clouds of spray above water falling over glistening black rocks to the verdure of the valley.

The survival of the big trees or Wellingtonias (*Sequoiadendron giganteum*) is surely one of the freak anomalies of conservation, for when it was discovered that redwood timber made the best roofing shingles on earth, the lumbermen moved in. But the big trees were so huge that, in felling, nine out of ten shattered into a thousand pieces on impact with the ground, becoming much waste, so far as splitting into shingles went. They were disappearing quite rapidly that the Sierra Club of California petitioned the Federal Government to send troops to protect them. Troops were stationed in the high sierras for forty years to ensure the survival of the Big Trees from the hazards of lumbermen and fire. But here develops the anomaly. The sequoias were said to have had only one enemy, lightning, be-



Figure 5 San Francisco's Golden Gate

fore the coming of exploiting man. Lightning took the tops and started fires in the undergrowth in a fairly regular cycle, as in rotation, a sort of natural swaling. Fire burnt the undercover of chiefly sugar pines (*Pinus lambertiana*) before they grew large enough to generate sufficient heat to penetrate the thick bark of the sequoias, which was of course the reason for their survival. The Sierra Club members, the conservationists at that time, however did not understand this ecological balance which was ensured by periodical fires; they were so keen to secure the survival of the big trees that they insisted that all fires should be suppressed. The result was that the sugar pines grew so big that an uncontrollable fire could well threaten the survival of the Big Trees themselves.

I just escaped from Yosemite before the snow came down again in earnest and set off westwards to the coast. The way lies across newly irrigated upper reaches of the San Joaquin valley, before rising through foothills to cross the Call Mountains at Poncho Pass – broken rolling country of golden grass and orange foliage of winter weeds. Where springs come to the surface homesteads are established, marked by the presence of willow and poplar trees. Nearer the coast, the landscape becomes bare and broad, undulating in soft folds reminiscent of the English downs, now ploughed for spring seeding. I spent the night in the charming little town of Carmel. This deceptively

simple, if select, community expressed, at that time, an aspect of American life it is difficult to describe. Dollars were just taken for granted, as though snatchable from a layer hovering just above one's head, for the emphasis was not on the value of the dollar but on what could be done with it by way of making life charming and pleasurable, though at the same time embracing the extreme fatuity of over self-indulgence.

There was a very nicely designed shopping centre, on two levels with a car park depressed one storey down. At this level was a small courtyard with a fire burning in the middle, just a natural gas flame playing on asbestos logs to look cheerful. Round the sides were craftsmen's workshops and above these, at street level, the shops. The craftsmen included a wood turner and a potter, a weaver, a picture framer and cabinet maker and there was a gold and silver smith. He displayed beautiful designs, which I admired. He asked me where I came from and, knowing he might not have heard of Wales, I said: "New York, but I was disappointed because during all that long journey I had not seen an Indian." He said "Oh! I'm an Indian, my mother was a Zuni Indian and my father was Italian".

And there in Carmel the arts of the two worlds meet. He was rather depressed and poured out his woes. He emptied a small wash leather bag onto his bench and out dropped seven large diamonds.

He said, "These belong to one of my oldest customers. She has had seven husbands and these are the diamonds they gave her and I am to mount them all in one memorial ring." Poor craftsman, for a real artist to be faced with such vulgarity.

Below Carmel and near Monterey lies Point Lobos, a rocky headland dominating a wild stretch of coast. Here the Monterey pine (*Pinus radiata*) and the Monterey cypress (*Cupressus macrocarpa*) harbour great swags of Emperor moths, hanging from the foliage like swarms of bees, the trees competing with Pacific rollers for a foothold on the rocks. Magnificent cypress trees display an elegance of form and grace of foliage barely ever seen in Britain where higher rainfall encourages the growth of heavy foliage to obscure the attractive branch patterns and where the foliage is scorched by frost and salt. It is a great tragedy that *Cupressus macrocarpa* was ever brought to England. It is one of those trees which grow to an immense age in the wild and whose wood is virtually imperishable, so that gnarled, bleached old skeletons ossify through the effects of weathering to become earth-antlers, truly stag-headed, of sculptural form.

On down Highway 1 the road follows the curves of bays and headlands. From high up, there are views down into the blue-green sea, as enigmatic in colour as the Côte d'Azur. Sea lions are swimming about and sunning themselves on the rocks, their coats drying golden brown in the sun, gossiping loudly and reeking to high heaven.

The coastal ranges of California are bare and arid, but the gentler slopes of the foothills grow sparse grass. The shallow ravines, called 'draws' locally, collect sufficient moisture for the native Californian live oak (*Quercus agrifolia*) to flourish, offering its welcome shade to grazing animals.

Southwards through Big Sur, San Simeon, San Luis Obispo, Santa Maria – names marking the advance of early Spanish missions in California, to Lompoc, site of the 11th Franciscan mission dedicated in 1787. This was called La Concepción Purísima de María Santísima and was destroyed in the earthquake of 1812, known in California as El año de los temblores.

La Purísima was rebuilt about four

miles north-east of the original site, near some fine springs known as the Canyon of the Watercress. The Residents Building is an outstanding example of Mission Architecture, with strongly buttressed gables and adobe walls four and half feet thick, built to stand up to possible future earthquakes. Following the secularisation of the Mexican missions in 1834, La Purísima fell into decay. It was restored under the Government Emergency Conservation Programme with the help of President Roosevelt's Civilian Conservation Corps (CCC). The restoration followed the methods adopted so successfully at Colonial Williamsburg and included a remarkably ingenious irrigation system in which the same water is used over and over again for different complementary purposes.

I arrived in Santa Barbara in time for Christmas cookies and sat enthralled to gaze at the many humming birds. I shall never forget the wonder of seeing these exquisite brilliantly coloured minute things advancing and retreating, rising and falling without apparent means of locomotion, round hanging jars of raspberry-red syrup thoughtfully put out to attract them.

I had to tear myself away from la dolce vita California all too soon and left that fair state by crossing the Colorado River at Blythe. Here is a great broad river, filling its channel from bank to bank, running through arid country of scrub and small trees, the beginning of the Great Sonoran Desert which stretches from California across southern Arizona into Mexico, heralded by the great cactus trees and prickly ocotillo (*Fouquieria splendens*). The road onwards to Prescott winds its way up into the high plateau which composes much of Arizona and New Mexico. This area has a lovely climate of warm days and cool nights. Viewed from high up near Whipple the arid desert stretches away towards Mexico, a series of jagged hill ranges rising from a sea of sand, repeating the configuration of the Pacific coast, further north.

It was dark when I reached Grand Canyon and next morning I woke to find it full of cotton wool. This was very puzzling and not a little worrying. No one had seen it so filled with cloud before and I began to wonder whether it would clear in time for



Figure 6 Spanish mission



Figure 7 Giant cacti

me to view the Great Wonder. However, I set off eastwards along the southern rim in hopes. Slowly the cloud dissipated and I could see the Colorado River winding through the canyon a mile below. The elevation is just under 7,500 feet. The opposite, northern rim, being higher is closed by snow in winter. Here the colours change with the passing of each cloud and hour of daylight. A marvellous clarity accompanies the approach of evening, bringing out the colours of the various layers of rock through which the river has gouged its billion year way. It is hard to believe that it is 18 miles across to the other side. (But it is.)

Christmas Day and early in the morning I set off on my faithful mule to face the hazards of the descent down Bright Angel Trail. We soon left the snow above, but it was perishingly cold. About halfway down the party stopped for lunch at Indian Gardens. Here, long ago, native Americans cultivated their corn and vegetables beside a strong spring, now providing water for the hotel. I had heard of the terrors of this trip and as I looked down I wondered how on earth it was going to be possible to descend to the canyon floor; but we snaked our way down to the depths. The track doubles back and back upon itself. There were moments as the mule turned at hair-pin bends when her forefeet were on land

at one side and her hind feet on land on the other and I was suspended over space in the middle. We had a wonderful cowboy as our guide who kept up morale by telling us of the party of nurses he brought down the previous summer and how seven passed out at one of the worst corners.

Finally we came to the Colorado River. I thought, "Landfall at last", but when I looked round, I could see no sign of Phantom Ranch, where we were to spend the night. There was nothing but the river with precipitous rock cliffs on either side. I could not understand where we could possibly go, then winding far up the sheer cliff I espied the trail, cut out of solid rock, disappearing from view above us. I thought, "No. It's not possible." But it was and up the trail my surefooted Helen went. I reasoned with myself, "Now, don't be a fool. Relax ..." and I relaxed so much I nearly fell off. There was nothing for it but to abandon oneself to one's mule and I have certainly never abandoned myself to anyone as I abandoned myself to Helen then.

Ultimately, with what pain and soreness, we came to a tunnel. The cowboy said, "Now we have to go through a tunnel. The mules do not like the dark so whip them up and keep them going." So we all whipped up our mules. But I did not have to because Helen was so good she did everything in the proper order. The dust rose and we trotted through the tunnel in fine style – only to emerge on to a bridge a yard wide suspended at a dizzy height above the Colorado River. And then the bridge began to sway ...

The river here runs smooth and deep. Benign and mysterious, it was difficult to believe that such a river could be capable of so much erosion. For although it did not look particularly big, such is the vast scale of the bottom gorge, through which it flows. It was not until one realised the siltiness of the water that its corrosive properties became understandable. Brown, smooth and thick it slithers its oily way on down the canyon.

We had descended 5,000 feet from the snowy heights. Down at the bottom of the canyon it was still autumn with the poplar leaves only beginning to lose their summer green. A group of cabins clustered round a ranch house, with toilet facilities

and a swimming pool, compose Phantom Ranch. It is equipped with electricity and air conditioning (the temperature reaches 120°F down here in summer). The equipment was all brought down by pack mule. We had a Christmas tree and plum pudding and a very gay time singing cowboy songs round the fire. But we were very tired, sore and glad to retire early.

At the crack of dawn we set off on the return journey. Back over the suspension bridge and up the Kaibab Trail. Going up hill was very much easier; one sat back comfortably in the saddle instead of feeling that one might at any moment shoot forward over the mule's head. But Helen would still lean over the precipice to secure some tasty morsel of herbage, whenever we stopped for a rest. There is one point on the Kaibab Trail when the track rounds a sheer bluff of cliff, high above the river. The cowboy said, "We are coming to quite a nasty corner and I advise you not to look down. If you feel you want to look at something, concentrate on the flank of the mule in front." Well, of course, we all took deep breaths and I dutifully riveted my gaze on the handsome flanks in front. But, like Lot's wife, I could not resist a side-long backward glance. My head reeled for there was nothing but a diminutive group of buildings forming Phantom Ranch and the Colorado River 3,000 feet below. Slowly those sure-footed mules wound their way upwards, stopping 27 times to rest, steep ascents alternating with flat plateaux as we climbed from terrace to terrace of the former river's course. The light changed at every turn of the track and the vegetation changed from sub-tropical to alpine. We rounded the last butte and returned to a land of gaily coloured rocks and snow.

From Grand Canyon I drove southwards across the Painted Desert invisible beneath a blanket of snow, past ruined pueblos of the 12th century, some rising to three storeys and containing a hundred rooms, through the lovely walking country of Oak Creek Canyon where, at a lower altitude the green juniper and Piñon pine contrasted with bright red rock forms to provide the ideal cowboy film country, to the ghost town of Jerome. It was an eerie experience to drive into a town without seeing a soul. The buildings looked quite

whole; there was glass in the windows and it was difficult to believe that it had been completely abandoned a few years previously when the local copper mine became exhausted.

Here was the advancing frontier in operation. When livelihood failed, people did not wait for Uncle Sam to come and dole out relief. They went to the nearest garage and hired a U-Haul. This was a trailer, usually covered, like a little van; the garage which hired out U-Hauls fixed a proper draw bar to the back of your car; you loaded your goods and chattels and set off, preferably west, in search of pastures new. When you came to the place of your dreams, after unloading, you turned in the U-Haul to the nearest agent and there it was, ready for someone else to hire. Simple, and saves a lot on furniture removers. U-Haul rents everything from open and covered trailers to giant lorries nowadays; but they don't use the slogan 'Adventure in moving' in their adverts for naught!

I penetrated to the centre of the ghost town and there, sitting on his heels was a solitary cowboy. He welcomed me as if I was the first person he had seen for years. He wanted to know where I had come from in that tiny car, etc etc. By this time, I knew that it was no use saying Washington or London, because those places were too far away to mean anything. So I said that I had just come from the Grand Canyon. "Oh!" the cowboy said, "I used to work as a guide in the Grand Canyon. I was summoned for assault." I thought, "Blimey ... and here I am alone with him in this ghost town". "Yes" he went on, "I used to take tourists down the Grand Canyon and one day one of the ladies took fright, and when we got to the bottom declared, I'm not going back. Well, lady, if you stay down here you will starve to death." "Alright I'll starve." "After thinking about it for a little while I spoke to her again, Lady, it's my duty to take you out of here; I cannot leave you here to starve. Still she insisted, Well I'm not going. So the only thing I could do was to take hold of her and put her on the mule and tie her legs underneath and drive her out." Do you know that when he had brought that tourist safely to the top the woman had the sauce to sue the cowboy for assault?

“Well” the cowboy continued, “I could see the Sheriff going round with a piece of paper in his pocket. When he had been carrying it for about two months I asked him one day, Sheriff, when are you going to take that piece of paper out of your pocket? and he said It’s a summons isn’t it? Oh, all right. Are you coming quietly, or must I shoot you? So I went along quietly, and went before the judge who asked, Guilty or not guilty? Guilty, your Honour. Yes, and quite right, too. You come back and tell me when you have committed the same offence again, and I will give you the same punishment. Case dismissed.”

From Jerome, the road winds over Minus Mountains, at elevation 7,600 feet; thence, across the irrigated plains round Phoenix, where every garden is a citrus grove; down the Gila River; and across the western spurs of the Saucedo Mountains. It descends again to the deserts of Sonora, arid igneous rock in sharp and jagged peaks rising from a cinder floor, radiating the heat of the sun, ringing hollowly under one’s feet, so porous that one wonders how the tree cactus Palo verde can survive. On it runs to Ajo, a town of dazzling white Spanish architecture and extensive copper mines, begun by the Spaniards two centuries ago. This surely is not the United States, with everyone speaking Spanish, it seems another world.

On I drove, further south towards the Ajo Mountains, across volcanic valleys to Organ Pipe Cactus National Monument, the only locale of this strange plant in the United States. The organ pipe cactus (*Pachycereus marginatus*) grows in groups on the high elevations of this (Saguara) section of the Sonoran Desert on the Mexican border. Its stems spring directly from the ground and when they do branch, they do so in a manner characteristic of the Lombardy poplar; the national monument is designated to preserve it among many other interesting plants.

From here all the way to Tucson one drives through desert astonishingly packed with life and seasonally gay colour. Prickly pear (*Opuntia*), teddy bear cholla (*Bigelovia*), agave (*A. palmeri*) occur in groups, the ironwood tree (*Olneya tesota*) so hard that it turns the blade of an axe, and the ubiquitous ocotillo (*Fouquieria splendens*), producing its leaves

and tassles of scarlet flowers within hours of showers, among others are noticeable.

The desert faunal life is mostly nocturnal. All day long the desert is quiet, so quiet that the only sound comes from the cracking of the rocks as they expand under the heat of the sun. Then, as evening approaches, there is an indefinable whispering and murmuring of movement as all the animals and reptiles and birds come out from their burrows and from under rocks where they have been sheltering from the blistering heat. Night comes quickly. Very soon one thinks one could reach out and pluck a star from the velvety-blue blackness of the sky while all round one is aware of intense nocturnal activity.

The life of the desert is dramatically portrayed in the Arizona Sonora Desert Museum near Tucson, where a section of the desert is developed to display all the desert’s flora and fauna. On a lovely site sloping west is a little zoo containing every animal, bird, reptile, insect and fish which inhabits the desert, including an underground exhibit which was used to show the desert rats in the Walt Disney film *The Vanishing Prairie*.

On the western outskirts of Tucson is Mission Saint Xavier del Bac, the ‘White Dove of the Desert’. This is the last to survive of the teaching missions founded by Father Kino in the 17th century. Adjoining is one of the Tohono O’odham (formerly Papago) villages the mission is built to serve. The more sophisticated of the buildings are constructed of ocotillo wattle and daub. The mission church is probably the most beautiful surviving example of Spanish mission architecture in America, with an elaborately carved west front of painted sandstone and a charming cloister garden ecologically furnished with plants from the surrounding desert.

The finest Saguaro cactus trees (*Cereus giganteus*) are found east of Tucson where they are preserved at Saguaro National Monument. These extraordinary trees grow to be 200 years old and 50 feet high. They grow in groups, one feels, for company. Elongated concertinas, securely anchored by enormous tap roots, they inflate with each rare rain, collected by a ramified system of surface roots, sometimes they burst.

Eastwards from Tucson the road traverses Apache Pass, only a century ago the scene of battles but now colonised with nothing more formidable than agave plants. Here the Chiricahua Mountains rise 10,000 feet from the arid plain, an oasis of green plane (sycamore in United States) trees with Pinyon pine and juniper higher up the slopes, a striking demonstration of the effect of altitude on vegetation. These mountains were laid down by successive volcanic eruptions depositing layers of lava in differing thickness and densities. Subsequent weathering has eroded the various strata at unequal rates to produce igneous geological forms, characteristic of sedimentary rocks, repeating patterns seen in Colorado and Utah. Another national monument is established here to protect the unique geology and flora.

I stopped for a long look across into Mexico and then continued eastwards along the road which runs parallel with the border, to the red sands of the Tularosa Basin, where the first atom bomb was exploded. Vast deposits of gypsum underlie this huge basin and the strata of the surrounding mountains, from which it sank. Leached out by rain and ground water, which drains to the ephemeral Lake Lucero, granular gypsum evaporates out under the hot New Mexican sun and is deposited by the prevailing south-west winds in great dunes up to 50 feet high.

White Sands National Monument has been created to preserve this unusual and interesting phenomenon. There is an information centre built in the local manner of adobe (dried mud) blocks, with a roof of pine trunks, overlaid by juniper brush and daub. Here the geological history and evolution of the White Sand Dunes is explained and the fascinating plant and animal life, adapted to this strange environment is described. It is an extraordinary experience to wander over these dazzlingly white dunes, moulded into strange forms and sculptured by the wind rippling their surfaces, especially in their folds and hollows, isolated from any view of ‘land’ and transformed to an eerie waste by moonlight. Under pressure of the prevailing winds, the dunes are constantly on the move across the desert and the National Parks Service must frequently move the

roads and the picnic shelters built on runners, to suit, for the natural phenomenon must not be constrained.

Travelling over the high plateau of New Mexico where native Americans herd their sheep across the vast, sparse grazing lands dotted with pinyon and juniper trees, I drove to Pueblo de Taos; multi-storey buildings of adobe blocks are grouped round an informal plaza with a sparkling river running through the middle. This shows the continuing pattern of Pueblo life since before the first Spanish conquest.

From Taos I drove west in search of even earlier allied cliff dwellings. The way led back over the Continental Divide and by the Zuñi Mountains, an impressive landscape of massive cliffs of red sandstone rising above pinyon and juniper grazings to the vast Navajo Nation Reserve, where I came to Canyon de Chelly National Monument; a complex of canyons carved out of the red sandstone of the Rio de Chelly and its tributaries, which run only for part of the year. At its river exit the canyon is perhaps 30 feet deep but only a few miles up it reaches 1,000 feet and the twin needles of Spider Rock rise 800 feet sheer from the canyon floor. Down in the bottom of the canyon the first soft green of spring suffuses the red earth round the hogans (dwellings) and the inhabitants prepare to sow their corn, beans, tobacco and squash, the traditional crops which feature in so much of the pictorial art of the Navajo people. Across the quicksands of the Rio de Chelly, White House Ruin nestles in a recess of the sheer rock face. This is one of the 400 cliff dwellings built progressively in these canyons since 300 AD, when the basket-makers first excavated their pit houses.

I drove on westwards to run into a desert sandstorm, which blew to 75 miles per hour gusts, obliterating vision. Fortunately I was only a short distance from Oraibi Pueblo, where I had an introduction to the chief, White Bear, who gave me a little adobe guest room, heated by a jet of natural gas which came up out of a hole in the floor in the corner. His wife was an excellent cook and they looked after me as a stranded traveller. I was very lucky because the Hopi do not like white strangers visiting their pueblo.

The pueblo was like a medieval fortress of two and three storey dwellings all built of adobe roofed with pine beams and juniper rafters under more insulating adobe. No windows looking outwards to the desert; a large square in the centre with baking ovens and a small stream of water, cooking hearths, etc. to meet the needs of the inhabitants. The surrounding dwellings were high enough to prevent sand blowing into the pueblo, so that within it was sunny and snug. The Hopis spent much of the days dancing, while the storm raged across the desert. They dressed up in their regalia. The men had bells round one of their legs, below the knee like English morris dancers and a turtle shell containing pebbles attached to the calf of the other leg. They would dance a kind of shuffle snake dance, in single file, two shaking shell movements to one jangle of the bells ... shuffle, shuffle, jangle, shuffle, shuffle, jangle, repeated Then the medicine men would come out, made up to look either terrifying or benign. The terrifying ones did ogreish capers while the real medicine man scattered corn meal on the ground. Those dancers then retired to rest and out came others aping the medicine men, doing amusing and macabre capers. After a while, it all started again. Towards sundown, the whole cast appeared with huge baskets loaded with gaily wrapped sweets for the children. They threw me some too, because I was a stranger. I was told the Hopis dance in this way because they believe it helps to propitiate the gods (to end the storm), because they are bored, but chiefly, I suspect, because they enjoy dancing. The Hopi and Navajo peoples are skilled silversmiths; White Bear carved delightful kachinas (dolls) dressed and painted for the dance. They are also very good weavers and have wonderful heads for heights. Many young men go to New York to make their fortune building up the scaffolding for skyscrapers before returning enriched to settle down in their native villages.

When the storm died down, I found my little car half buried in a sand dune and the engine had a mini dune on top of it, under the bonnet. Fortunately I had spare air filters and after a general brush off the engine started beautifully.

After leaving my kind hosts, I stopped

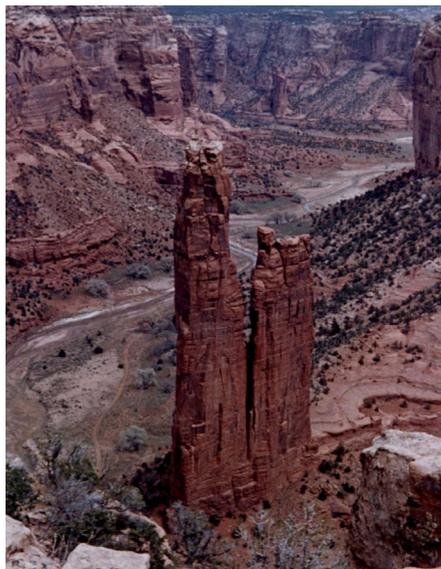


Figure 8 Canyon de Chelly monument

at a wayside cafe for refreshment. There was a group of native Americans there and I suddenly heard them speaking Welsh! I listened carefully, only a few words were recognisably Welsh, but still I thought it was very odd. Later I heard that the early American explorers penetrating the West always took a Welshman with them because they believed there might be truth in the legend that Madoc sailed from Wales across the Atlantic centuries before Columbus, trekked across North America to the west coast and thence southwards almost to central America, leaving progeny. It was a strange experience, almost inexplicable. Clear of blown sand once more and as though searching an epitome, the scene which unfolded might have been entitled 'The Gateway to the Deserts of the South West'; for here in all the splendour and all the characteristic aloofness of the great empty spaces of the deserts, with their impelling call to investigate their secrets, lay in view. So close to the Four Corners, where the States of Arizona, Colorado, New Mexico and Utah meet, is surely the landing and jumping off point for investigating the remarkable landscape wonders of this part of America. I know that if anyone asked me how to see the spectacular scenery and

archaeology of North America I would say "Fly to the Four Corners and motor round from there": Grand Canyon a little to the southwest, Zion and Bryce to the north and marvels of nature and man all round.

The approach to Zion National Park is through a wonderland of eroded and fissured limestone, rising above coniferous forests, in some ways the most breath-taking of all the canyons. The road descends down a tortuous pass engineered with great ingenuity along the side of a canyon after passing through a long tunnel with pull-offs (laybys) from which openings in the rock side give fantastic glimpses of the bare rock faces of the mountain on the opposite side. Zion is all rock, sculptured and eroded into voluptuous as well as austere lines and curves. If you lie on your back on the canyon floor, you see nothing but the bare rocky walls and blue sky above. The surrounding cliffs are solidified sand dunes a mile high; but what is so remarkable is the deposition of lime on top of the sand so that each peak is capped with a snowy whiteness shading to marvellous reds and purples as it blends with the sandstone below. The average depth of the canyon is 4,000 feet, at its head, several people can span its width with outstretched arms while some of its pinnacles rise to almost a mile of sheer rock cliff. The motor road reaches only part way up the canyon, thereafter is a further forty miles of wilderness to explore on foot. Then back up the winding road and through the tunnel, past the scored white rocks, between the pine trees to the snow once more and northwards to Bryce National Park.

Bryce is not a canyon in the same sense as Yosemite, Zion and Grand Canyon, but rather a great crescent of fantastically eroded cliffs on the edge of space The desert beyond, appearing limitless for all its colours, forms and features might well be the eternal ocean. The elevation is 9,000 feet. White poplar bark sparkles in the coniferous forest above; below the weird colourful forms have weathered from sand the limestone deposited 2,000 feet thick on top of the earlier formations of Zion and Grand Canyon. The erosion is much sharper here, the red sandstone less blue in colour and the ramification of pinnacles truly extraordinary. Contrasting coloured horizontal bands of talus

rock contrapose vertical weathering of rock pinnacles, which seem to compete with the coniferous trees for a place in the sun. A compulsive and compelling rhythm is set up which pulsates outwards into space – an earth-space affinity. The weathered forms of time look on space and reflect the process of their ageing, here portraying the splendid inevitability, the satisfying completeness of the evolutionary process; while beyond the crescent of the cliffs of Bryce is the wilderness of America. It could be the end of the journey, the fulfilment of all man's endeavours, if he could but succeed in the battle for its preservation.

Northwards flows the Sevier River, through lovely sage-bush country. Beneath snowy peaks all is sparkling silver, accentuated by dark green juniper and the occasional red-brown of rocky outcrops. Gradually mountains appear out of the distant haze, made purple by all the colour absorbed from the reflection of so much red rock. Juniper and scrubby pine grow as thickly as they can on this dry red desert and tumbleweeds wait only for a gale to blow them on their bouncing, seed distributing way across the arid waste.

As a prelude to Capitol Reef, New Mexico, for hours on end I drove through sublime landscape, as fabulous as the imagined landscape of the moon and almost as barren. Unreality was accentuated by the impression of looking at the evolutionary process through a looking glass backwards, in negative form, for these talus slopes are not scree but themselves the product of primary weathering, through which the harder rock forms appear to thrust themselves upwards. The alternating colours of the strata give an extra dimension to the weathering process and the resultant forms are sublimated. The very core of the earth is laid bare to the eroding processes of time, unprotected by any green mantle. Where the scree of eroding sandstone spills down the talus, the rock itself seems to bleed. Beneath cliffs, improbably, runs a tributary of the Colorado River, through deep and spectacular gorges displayed and protected at Capitol Reef National Monument. Beyond is a landscape of arid forms and sombre hues – barren earth and rocks suffused

with grey sterility, emphasised by the miserable growth of tussocks struggling over the surface of the desert. A new road is being constructed in this strange landscape of weird slopes and forms. To drive it is worth a pilgrimage.

Suddenly lush green appears on the flat river plain – irrigated crops, stacks of hay and browsing animals. The activities of intrepid man seems to complete the fantasy of this fabulous landscape ... for beyond is the aridity of the upper Colorado River, epitomised at Dead Horse Point.

Driving eastwards through stunted pine and juniper the road leads to Mesa Verde, 2,000 feet above the plain, the site of many cliff dwellings; green with coniferous scrub and scintillating with the silverpurple bark of deciduous trees and bushes, it has the attributes of a natural fortress. In the early days of National Parks, when the Federal Government took insufficient interest in the conservation of natural beauty or geological phenomena, John D Rockefeller Jr saw the need for action and pointed the way by initiating and financing pilot projects – Yellowstone, Grand Canyon, Colonial Williamsburg for example. He was perhaps the greatest benefactor of landscape the world has ever known. Mesa Verde was one of the first. A long winding road takes one to the plateau, to look down and across gorges at surprisingly well-preserved ruins of whole towns built under the overhanging rock.



Figure 9 Dead Horse point

Evidence of development dates to about 1AD when these caves were occupied by basketmakers who built their dwellings partly below ground. Building of the pueblos proper began late in the eighth century and reached its zenith of structural achievement in the 12th century when the pueblos were dramatically abandoned because of prolonged drought.

East of the Continental Divide, descending the Rockies, the land levels and broadens to the Great Central Plains of the Mississippi Basin. Across Texas corn (maize) dominates much of the landscape with bullnose pumps sucking oil from beneath the fertile crops covering the land, hence the wealth of Texas. Seven hundred miles of driving, however, to cross a state the size of France, less peopled and rather flat, is somewhat of an anti-climax after the other-worldliness and excitement of the western deserts. It could hardly be more of a contrast, though the spice of Mexican cooking is a reminder of those arid places – chillis beware! for they are so chokingly strong in all the stews.

Approaching the Mississippi delta I was suddenly awakened from a long and rather boring drive by the approach of an erratically-driven motor car. The road was just an ordinary country one, not wide, with deep drainage channels on either side. The driver of the car was obviously drunk, weaving an erratic course from side to side of the road. There was no pos-

sibility to pull on to the side of the road and, in a flash-back of remembrance of youthful encounters with livestock on the road, I thought, “If it is a hen it is sure to go in the opposite direction to that in which it is moving; but if it is a pig it is sure to do what you do not expect; therefore I will dodge it and if the drunken driver looks as though he will move in one direction I will go in the other” ... and so we passed. (My mother, I remember, just hooted and drove straight on.)

So I came to Lafayette, among the bayous, where I was assured I would be fed gulf prawns prepared in the genuine creole way, and they were delicious (simple cookery warmed in oil and finished in white wine). The landscape school in Louisiana is at Baton Rouge, an industrial city up river from New Orleans. By this time the weather was getting unusually cold. There was actually frost, an extremely rare occurrence ... a kind student took me home to New Orleans. It was a tragic introduction to this famous city for all the (tropical) plants in the patios were killed by frost and it was so cold the jazz cellars could not be heated to the statutory minimum temperatures for performances; but we did find a defiant one where we could hear the real thing – until the police arrived; but I did savour oyster Rockefeller for which the deep shells are lined with spinach, oyster on top, coated with mornay sauce, sprinkled with parsley and browned in the oven. One of the fascinations of New Orleans is that during its best architectural period, it was occupied by Spain which accounts for the Spanish facades, with elegant ironwork, in this predominantly French creole community. It is also interesting to see the raised burials in the cemeteries with grand tombs well above the permanently waterlogged ground.

I was invited to share a creole meal with my friend’s family. His aunt said, “It would not be a typical creole meal indoors so we will eat out on the patio”. I prepared to shiver, but to my astonishment all the windows were thrown open on to the patio, the air conditioning heat pump turned on full blast and we enjoyed our dinner with warm breezes at our backs on the icy terraces. The main dish was prepared with black-eyed beans and we had pompa-

no (east coast rather flat, but plump fish), liberally buttered and stuffed with crab meat en papillote. It was a delicious meal.

Driving north across Alabama, crossing the Chattahoochee River into Georgia the weather slowly warmed up – flat, swampy country forested with swamp cypress (*Taxodium distichum*) festooned with Spanish moss (*Tillandsia usneoides*) sheltering plantation homes in the drier parts, another complete contrast to the Texan plains – I headed to the school at Athens, Georgia.

I found Atlanta, Georgia quite remarkable in a peculiar way. I had, of course, heard of the isolationism of the Mid West but did not understand exactly what it meant until I reached Nebraska. It was only later that I realised one of the causes. Travelling across the United States, I bought the local newspapers, usually the newspaper of that state was the only one available anyway. There was virtually no international news in any of these papers. Discounting the federal capital, at that time I only found three cities whose newspapers covered foreign news: New York, San Francisco and Atlanta, Georgia, was the third.

There is a very good school in the more traditional mould at Athens where crinkle-crinkle walls are used to screen the car park, economically allowing car doors to open into the concave crinkles and thus save space. Athens is also most unusual in having a street tree with a legal existence, bequeathed to the community with suitable endowment for its upkeep. This tree is almost unique, there is another in the City of Landon (Mississippi).

North lies Tennessee, the Tennessee River and the famous TVA – the Tennessee Valley Authority, one of President Roosevelt’s most celebrated achievements in his Five Year Plan. Constructed during the years of deep depression in the United States to rehabilitate a whole region which had been eroded by over-exploitation of natural resources, industrial and agricultural, exhausting the fertility of the land, resulting in widespread flooding. This great work of conservation, paralleled in that of the Ruhr River Authority in Germany, was achieved before World War Two, half a century before we in the United Kingdom started to think serious-

ly along these lines. The stated aim was to control flooding and produce hydro-electric energy; a complementary aim was later to provide for recreation coincidentally. (This could not be mentioned at the time, there being a terrific fight to get even the economic aims through Congress.) The whole enterprise was carried out by the CCC – the Civilian Conservation Corps – set up by President Roosevelt to counter unemployment. The CCC, using voluntary recruitment, employed the whole staff needed for the project: surveyors, architects, engineers, landscape architects, quantity surveyors, draftsmen, managers, foremen and construction workers. Camps were set up to accommodate them and they achieved mighty wonders in road building, national parks and conservation works generally.

Going and coming to school, children were encouraged to drop twigs and grasses into wayside streams to hold up the flow of water, dams were constructed across the rivers and electricity was generated by the water passing down the river. Gauges were set up along the rivers to record water flows; the engineers had done everything to control floods in the Tennessee valley; but the day I reached headquarters there was consternation in the camp. Automatic sensors had recently been installed for computer control of water flows. The scheme had been automated. Early that morning the man in control of the bottom dam, where the Tennessee joins the Ohio River, reported that the automatic control had completely closed the dam so that no water was leaving the Tennessee River. Such a thing had never been seen or thought of and there was near panic. Then it was discovered that there had been heavy rain in the upper catchment of the Ohio River the previous night and that the clever computer programmer had fed weather forecasts in addition to river flows into the computer system, thus reducing possible flooding lower down the Mississippi River. Recreational enjoyment now accompanies economic and conservation success and for landscape the design is brilliant.

And so I completed the circuit. It was delightful to be in Washington in spring when the famous cherries froth into bloom. They were a gift from the people of

Japan and are planted round the tidal basin, framing the memorial to Thomas Jefferson. Oriental magnolias follow closely, dispersed in groups in the magnificent formal space contained by the Capitol and Lincoln Memorial, the White House and the Jefferson Memorial, in formal relationship round the Washington Monument. It is surely one of the finest civic spaces in the world.

At this time of year, the Dumbarton Oaks gardens are breathtakingly beautiful. From the terraces around the house one looks across tiers of cherry and magnolia blossom. There is a valley entirely filled with *forsythia*, a truly incredible sight. The dogwoods (*Cornus florida*) unfold their firm white flowers against blue skies, accompanied by the red bud (*Cercis canadensis* and *Cercis reniformis*) and the very beautiful Pennsylvanian cherry (*Prunus pennsylvanica*) of semi-weeping habit and intensely delicate growth. These are the first indicators of the conspicuously interesting flora of the eastern states of America. As I travelled during spring and summer the variety, beauty and abundance of it was a constant revelation.

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In May I set off for Florida, down Skyline Drive then Shenandoah National Park and along Blue Ridge Parkway, following the ridge of the Appalachians from northern Virginia right down to southern Tennessee, some 600 miles, providing a scenic drive from the popular north east to the Great Smoky Mountains National Park. The Parkway also has the status of a National Park and was set up to protect the topography, flora and fauna of southern Appalachia; farmsteads, rural industries (including stills for making bourbon) en route, have been restored. There are so many, protected, black bears that they compete with tourists for the use (or misuse) of the litter bins. At elevation 3-4,000 feet, the mountain laurel (*Kalmia latifolia*) is in bloom, forming a fairly dense evergreen undercover in the climax forest of the mountain chain.

Skyline Drive and Blue Ridge Parkway form part of the linear core of Shenandoah and Great Smoky Mountains National Parks, a single two-lane carriageway,

beautifully fitted to the curves of the mountain ridges. The indigenous rhododendrons (*Rhododendron maximum*, *carolinianum* and *catawbiense*, chiefly) come into bloom, in much the same relationship as does the purple *Rhododendron ponticum* in Britain. The American cousin has richer, rose pink flowers, very handsome against the greyish-green foliage. Turning the southern boundary of the Smoky Mountains National Park, following tributaries of the Tennessee River, the vegetation assumes a tropical luxuriance. One feels one is entering the Deep South. River banks are covered with the beautiful daylily (*Hemerocallis fulva*) and the native vines try to smother everything within reach.

Entry into Florida can be heralded by tropical downpour. Summer is the season of violent thunderstorms and torrential rain; without warning the sky darkens, the heavens open and before there is time to put up the car top, one is drenched to the skin and must open the doors to let the water out of the cockpit. Florida is a flat country of lakes, swamps and water courses with considerable pine flatwood, having an undergrowth of cabbage palm. The pine trees are tapped for their sap and wild pigs forage along the roadsides. The swamps have been drained. Overlying oolitic limestone is minced up with giant excavator mincing-machines, suitably fertilised, sown with tropically-bred grasses and irrigated with water pumped up from only a few feet below the surface. Brahman cattle from India are crossed with Hereford bulls from England to produce more beef steaks than the state of Texas. The humped animals with white faces looked decidedly odd.

Driving southward through the centre of the state, I came to Punta Gorda and Fort Myers whence by car ferry to Sanibel Island. These islands in the Gulf of Mexico are little more than sand bars covered with palm trees, the Australian pine (*Casuarina*) and cabbage palm (*Sabal palmetto*), so called because of the usefulness of its heart for cooking as a vegetable. The islands are so low that one would not be surprised to see them submerged by high spring tides. Shore vegetation alternates with long beaches of beautiful white sand. Here one roams, searching for the gaily

coloured shells washed up from the tropical sea. It was raining hard most of the time I was on Sanibel Island and when I felt cold it was only necessary to go for a swim in the Gulf, which was 84° Fahrenheit, and when I was hungry I was fed fresh guavas stuffed with Philadelphia cream cheese.

Further east, the Everglades National Park protects the remaining wilderness of Florida. The Everglades is a shallow swamp, part-time river, roughly 120 miles long and 74 miles wide, having its source in Lake Okeechobee to the north. During the summer rains Lake Okeechobee overflows, flooding a vast area of the Everglades. In winter, on the other hand, it almost dries up, allowing the Everglades to be subjected to raging fires. The bed of this extraordinary river is oolitic limestone two miles thick, weathered in places into huge holes, forming ponds. The pervious sedimentary rock has become caulked with marl, washed down by flood waters, over which deposits of peat have collected from the sawgrass (*Cladium*) growing on it. The area is almost flat, the highest elevation in the park being 10 feet, and merges imperceptibly with the bed of the Gulf of Mexico.

Fresh water from Lake Okeechobee flows out over the salt water of the Gulf. In the rainy summer period, the layer of fresh water is sufficient to sustain fresh water life, but in the dry winter period the level of the salt water rises as the overlying fresh water evaporates. The alligators, however, like fresh water and, with flying tails they keep open nice little fresh water ponds for themselves. Into these retreat representatives of all the fresh water animals and fishes, which would otherwise be killed by the rising salt water, later to emerge, like animals from the Ark, when the summer rains again make more general conditions for living possible. It is this pulsating cycle of death and renewal which makes one so conscious of the fecundity of the Tropics. The water seems to be a seething mass of life. One only has to attach a piece of chicken liver to a piece of string, chuck it out to sea, wait a few minutes and then haul in enough crabs for dinner.

To obtain a view of the Everglades, one mounts a platform and there, stretching

away to the horizon, is sawgrass interspersed with glistening pools and stunted swamp cypresses. With the critical levels of alternating fresh and salt water and the general flatness, it will be appreciated that vegetation changes abruptly with altitude differences of only a few inches. Hammocks (elevated habitats) form, with taller trees growing in the centre, to give a rounded outline, further colonised by migrants from the Antilles and West Indian islands. This is where the vegetation of North America meets that of the Tropics. Deer have invaded from the north and succeeded in coming to terms with the razor-edged sawgrass. Boardwalks connect and penetrate the more interesting hammocks to the park roadway, allowing people to have a closer look at the wilderness without destroying it. On a few of the hammocks, some of the remaining mahogany trees in the everglades may be seen, much damaged by hurricanes. Also strangler figs, which germinate in the forks of trees and, sending roots downwards to the ground, ultimately strangle the host trees to death.

A great feature of Florida is the mangrove, for there is something romantic about a tree that has literally made so much of the land. This tree, the red mangrove (*Rhizophora mangle*), which thrives in salt water, throws out roots like flying buttresses which develop into forests and slowly march across the shallow waters of the Gulf. Mangrove seeds develop roots before they fall from the parent plant. These little plantlets drift across the shallow water until a root catches bottom. There a mangrove tree grows up to start a new colony and, with the ultimate accumulation of litter, a new cay is born. Impatient man, however, is not prepared to wait on nature. With excavators he cuts channels through the mangroves and using their roots and shoulders as revetment material piles on the excavated material from the channels to form dry land, thus short-cutting the natural process.

Speculators even sell house plots before the dry land has been created, to the mortification of northern citizens going down south to view their purchase for a retirement home. At sunset the migrations of roosting birds – herons, egrets, bald eagles, winging their way over the flats is a

truly magnificent sight.

Travelling up the Atlantic coast, the roads cross canals of vivid turquoise-blue water, cut through the white oolitic limestone. These are irrigation or drainage channels for the production of two corn (maize) crops per year, in the humid warmth of the near tropical climate. A string of peninsulas and islands protects the mainland from Atlantic gales. Where necessary the peninsulas have been severed from the main land to form the Inter-Coastal Waterway, along which ships can sail from New York to the Gulf, for the most part protected from the open ocean. Most of the islands are interconnected by road with the mainland. Some of the finest beaches of the American Atlantic coast are to be found on the open ocean side, north and south of Palm Beach, Florida; but there were jellyfish. While bathing I stepped on a broken bottle. It made a big wound and there was the jellyfish clinging to my toe. I went to hospital and there the kind doctor stitched it up. I asked how much I owed, but he shook his head, "Oh! that's all right, when we go to England we are not asked to pay".

North through Georgia the roads are lined with evergreen live oak, thickly hung with Spanish moss, which lives on air; even telegraph wires support it. Further north lies Savannah, laid out in the 18th century, its houses having cast iron pillars and balconies, brought in sailing ships from England, and a copy of St Martin-in-the-Fields for its parish church. Thence to Charleston, South Carolina, with its famous back-to-back houses with three-tier verandahs, supported on classical columns and balustraded widow's walks on the roof tops, from which to watch for their sailor-husband's return. Nearby swamp forests of bald cypress (*Taxodium distichum*) grow to magnificent maturity. These amazing trees will grow and thrive in water or on dry land equally happily, even if these conditions are alternated during the life of the tree. Finally northwards through the pine forests of North Carolina and past fields of tobacco to come to rest on the hot white beaches of Delaware, where Atlantic rollers come booming in, their spume a mist in the blue sky.

.....

In July it is time to set off on the last lap of the tour round the United States. The farmland north of Washington lies gentle and serene under a summer sky, before crossing the Appalachians and the Potomac and Monongahela Rivers to drive through Pennsylvania and Ohio.

On the richer farmland corn (maize) is at full growth, higher than man, lush and green, symbolising the abundance of America; but elsewhere are abandoned fields full of colourful weeds which are the corollary of this abundance, no doubt part of the land bank of the United States, financed by the Federal Government, to reduce agricultural surpluses, while providing for a rainy day. A very sound idea, for the land is rested and ready to produce bumper crops again when needed. Alas, this practice has been all but abandoned with the use of petrochemical fertilisers.

Scattered all over the north-eastern states small farms have been abandoned in favour of the rich, flat, more easily worked lands, further west or south, in Florida. These abandoned lands are reverting to forest, dissected by stone walls which are a memorial to those industrious pioneers who piled stone on stone as they cleared the land before the coming of the railways opened up the mid-west. With this depopulation goes a whole way of life from the American countryside, a difficult thing for a European to understand. For although there has been rural depopulation in the highlands of Scotland and the uplands of Wales, it has not occurred on quite this scale, from land by no means unworkable, where one perceives whole countrysides, the size of England reverting to indigenous forest.

Further west in the shallow undulating landscape of Michigan with a lake in almost every hollow, the smart farmsteads and the crisp trim of road details are characteristic on approaching the Great Lakes. The St Clair River flows down from Lake Huron to Lake Erie, which separates Ontario from Michigan. Ferries ply its milky-blue waters and big steamers come and go from the Atlantic to Chicago.

The Cape of Ontario is almost surrounded by water, which presumably tempers its climate for here the finest tobacco in North America is grown (the best Virginia, perversely, grows in Connecticut). A

great feature of the district are the groups of tobacco drying sheds. These are painted in bold colours with, usually, white trim. They form one of the strongest and most interesting architectural folk art vernaculars I found in North America.

One then comes to the Niagara Falls, shared between Canada and the United States, where the combined waters of all the Great Lakes plunge into the great gorge, of their own making. Originally, it must have been as dramatic as the present approach to the Grand Canyon and as unexpected; but now, somewhat marred by unsuitable development. On the Canadian side the landscape has been successfully designed to accommodate vast numbers of visitors without harm. All is gracious and pleasant; there are delightful lawns, shaded by trees where one can recline and watch the clouds of vapour ascending from the booming cauldron. There is a nice promenade with look-outs along the rim and fine restaurants with views of the falls. What a wonder it is. The great broad river suddenly plunging over the giant horse-shoe rim, lost in its own spray of triple rainbows and the brave little Maid of the Mist tourist boat bobbing below.

Moving on into Vermont, one is very conscious of a change in scale in the landscape, more closely related to man. It is not so much that the farms and fields look smaller, probably it is because one comes into more settled country, lived in and farmed over a longer period. The verges are full of chicory (*Cichorium intybus*), and other wild flowers common across the Atlantic. The Connecticut River valley also has the feeling of being long settled. There are broad fields grazed by cattle on the valley bottom, rising up through forests to the beautiful mountains of Vermont. The woods are full of the lovely summer lily of Canada (*Lilium canadense*).

New Hampshire lies east of the Connecticut River. Herds of Friesian cows graze the high pastures, the churches and houses cluster round very New English village greens with characteristically shaped American elms (*Ulmus americana*) to remind one of old England. (Unfortunately a blight about 15-20 years ago has all but wiped out the American elm – especially as a street tree.) The White



Figure 10 Niagara Falls

Mountains of New Hampshire beckon and the placid lakes invite rest.

It is a great discovery to find out how Americans relax. They retreat with at least a week's supply of provisions to a log cabin, buried in the trees at the edge of a lake fringed with silver maple and white willow and forget to wind the clock. When hungry they eat and when sleepy they go to bed and drink lots of bourbon in between. And so I returned to the Atlantic coast of Maine, the most northerly of the eastern states, to swim in the cold clear sea from a rocky, oak-fringed coast, watched over by the Sentinel Islands of the archipelago.

On the way I drove through villages of Queen Anne houses, with others of later Georgian influence but with cornice eaves instead of parapets, which did not apparently cross the Atlantic, shaded by enormous still surviving elm trees until I reached the smooth granite dome of Acadia National Park, to stand on top of Mount Cadillac and gaze in wonder at the fabulous archipelago, where one could visit a different island every day of the year. This northern wilderness, the only one on the east coast, matching with Everglades in the extreme south, is another of John D Rockefeller Jr's conservation successes. It takes in the rugged coast and hinterland. The magnificent coast is lashed or caressed by a lobster-filled sea, where the exquisite white spruce (*Picea alba*) competes with the gales for a foothold on

the rocks and the gleaming red berries of *Cornus canadensis* stud the carpet of their foliage in the sheltered hollows.

Finally it is time to head for home. With many lingering backward glances, I drove towards the White Mountains of New Hampshire, through the famous Dixville Notch and arrived at what seemed more of a frontier town than anything I had seen out west, with its old railway yard crossed by a viaduct, built entirely of great big beams, a reminder of the abundance of timber before the indigenous forests were felled. Thence into quiet Vermont, with its alpine pastures and clear distant views, its homely groups of farm buildings nestling among the rocks, sheltered by groups of conifers.

The road stretched on into the distance, past placid lakes and gentle hills and I had to drive out of this wonderful country so full of big-hearted people. But later in the year I was lucky enough to come back.

For the second year of my fellowship, I sailed from Liverpool on a cargo boat carrying a few passengers and calling at Newfoundland and Nova Scotia en route to Boston. On the way over we heard of John Kennedy's election to the presidency.

When the ship reached Boston there was no activity whatsoever at the docks. The only people I could see were a group of dockers leaning on a truck on the quayside. I asked them where my car was and was answered, "Your car, boss?" "Yes, I have a car on board and want to get



Figure 11 Acadia National Park

away". "Oh, we are not unloading anything. We are on strike" with an Irish lilt. So I said, "Oh, that's alright, I'll go to Harvard and read in the library. I will be quite happy." "You are going to Harvard?" "Yes." The docker asked, "You're not English are you?" "Dear me, no, I'm Welsh, I'm a Celt." "Oh, you come here tomorrow at this time. We'll have your car out for you, our President was at Harvard, we are very proud of him."

So off I went to settle in at the Faculty Club. The next morning I went back to the docks and there, in solitary state on the quayside, was my little Daimler Dart, watched over by the same group of dockers. God knows how much cargo had to be moved to get it out. The spokesman said, "We've filled your tank with gas, boss" and I drove off. I then felt I began to understand how the United States ticks. By and large it gets its laws and customs from

England, its technical efficiency from Germany and flamboyance Scandinavia, its gaiety from west Africa, its flamboyance from Italy; but without the nonchalance of the Irish it would be utterly intolerable.

The next day, I was entertained to lunch by the landscape faculty. I was asked what I would eat and I said the speciality of the house. I could see some wry smiles being exchanged, not realising what the speciality of the Faculty Club kitchen was. It was unmistakably horse. I manfully ate my way through it and was asked how I liked the speciality of the club. I said I thought it was rather sweet and they all roared with laughter. Apparently they had heard how we had horse flesh to eat during the war and decided they would put it on their menu out of sympathy. They kind of liked it and kept it there. Bostonian humour certainly has an edge on that of the old country.

VERTICAL LANDSCAPING

Angus Ferguson

Angus Ferguson graduated in 1988 and received his Diploma in Landscape Architecture the following year from the School of Landscape Architecture in the Gloucestershire College of Arts and Technology, precursor institution to the University of Gloucestershire. This paper is an edited version of his BA dissertation. It was first published in this journal in 1989 (volume 6, pp7-23).

INTRODUCTION

The city is an ecosystem in which “its functions become horizontally and vertically integrated to form one overall system, a New Babylon” (Friedberg, 1984).

A study of facade planting consists not only of the possibilities of vegetation being grown against walls but also the even more unusual notion of planting becoming free-standing walls. Clearly it is necessary to explore the realms of bio-engineering in order to propose a domain constructed and sustained by living vegetation. This technique owes much to applications derived from natural examples, such as vegetation clinging to vertical rock faces, and this article will argue the benefits of adapting natural plant forms and processes to the urban environment. The study will focus on the urban environment since it is here that space is at a premium: a planted wall may result in an enormous area of functioning foliage at a time when the equivalent area on the ground is not available or is usually occupied by buildings.

HISTORICAL CONTEXT

In Assyria and Babylon, terraced gardens on substructures, known as ‘hanging gardens’, were common in the 6th and

7th centuries BC. Later, in Rome and Pompeii, elaborate roof gardens were constructed for both villas and tenements, and in a military context the earth-stabilising properties of plants were often applied to fortress walls.

In the colder climate of northern Europe, dwellings were insulated with a protective layer of grass on roofs. In Iceland, for example, whole areas of housing were thus treated resulting in a sympathetic blending into the landscape. In Norway nomadic tribes habitually erected wooden shelters enveloped in layers of turf and grass for winter quarters and even today farmhouses can be found with meadow-like coatings on their roofs.

In England, records show that in the late 16th century, *Hordeum murinum* (wall barley) “...groweth upon mud walls and stony places by the wayes sides” (Gerald, 1597), and William Curtis in his *Flora Londinensis* of 1777 described several plants growing on walls including several stone crops and *Cymbalaria muralis* (ivy-leaved toadflax).

In the first quarter of the 20th century many eminent architects, Wright, Gropius, le Corbusier, and Van de Rohe, were using vegetation in and on their architecture, albeit for aesthetic reasons only. Perri designed a skyscraper for Madison Square, New York, in the form of a stylized mountain landscape with vegetation and waterfalls. Ungers used vegetation as a living part of his buildings while Kroll allowed his Alma Metro Station design in Brussels to develop a rough landscape to “disguise the hand of the architect”.

The more functional use of plants has

developed more recently as in the 1979 design by the architect Glensmall and the landscape architect Hamilton for a building claiming to be based on ecological principles. It made extensive use of plants to improve the local environment and as biological solutions to domestic problems.

ADVANTAGES

The benefits derived from giving buildings a green cladding can be discussed under several main categories: environmental, energy conserving, structural, psychological, aesthetic and educational.

A major environmental problem of cities is the lack of oxygen and the over-production of carbon dioxide. Rudolph Doernach, in his article on the use of ‘biotectural’ systems (1979) claims that Stuttgart has an oxygen deficiency of up to 50%, Paris of up to 85% and New York 90%. Carbonic acid, formed by the solution of carbon dioxide in rainwater, is responsible for the chemical weathering of much ancient stone work on buildings, and a range of other atmospheric pollutants, both gases and dust, often make life unbearable for the city dwellers.

The presence of vegetation in such environments can play an important role. Firstly it produces the greatest proportion of atmospheric oxygen as a result of photosynthesis, and simultaneously it absorbs carbon dioxide through the stomata in the leaves. Vegetation can also filter pollutants from air which passes across it, those with coarse or hairy foliage being able to trap most dust particles. Some gases, however, which are intercepted such as sulphur dioxide cause great damage to the plant in the process, and clearly deciduous species are at a distinct advantage since pollution-laden leaves are shed annually.

Another environmental characteristic of cities is the low humidity level compared with rural areas. This is because concrete and glass surfaces are designed to carry all precipitation into the nearest drainage network as quickly as possible. Reduced humidity can also be a consequence of the higher temperatures experienced in builtup areas: the so-called ‘heat island’ effect. If cities were greener, then precipitation would be intercepted reducing runoff and the

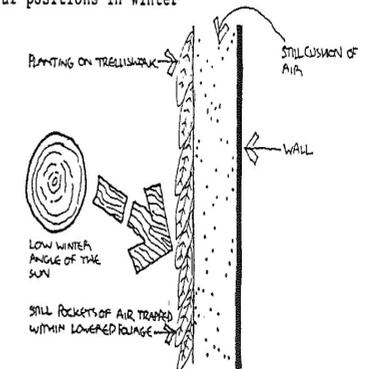
increased transpiration from plants would raise humidity levels. The comparatively dark colour of foliage absorbs more solar radiation than the lighter shades of concrete and mirrored glass; hence heat is stored rather than reflected and the ambient temperature is lower.

Large urban areas tend to experience stronger localised winds than rural areas. Here, wind velocity is often dissipated by vegetation while buildings, because of their relatively smooth exteriors, do not substantially reduce wind speed. Some early research in Vienna revealed that when deciduous trees were in leaf, urban wind speeds dropped by twenty to thirty per cent.

Vegetation also has an influence on energy conservation. During cold winter months, wall plants can offer useful thermal protection. In the first instance, this is done by the presence of near stationary pockets of air between the planting and the wall and within the planting itself. One could compare these insulating properties to the wearing of a string vest.

In winter the leaves of evergreen climbers lower their inclination on account of the low hydrostatic pressure in addition to the lower angle of the sun (Fig 1). The plant is no longer transpiring so greatly in the low winter temperatures and therefore the turgidity of the foliage is reduced causing leaves to lie relatively flatly against each other, trapping air and providing an insulating layer. Overlapping foliage also prevents rainfall penetration to the wall thus avoiding further heat loss.

Fig. 1 Leaf positions in winter



(Source: Doernach, 1979)

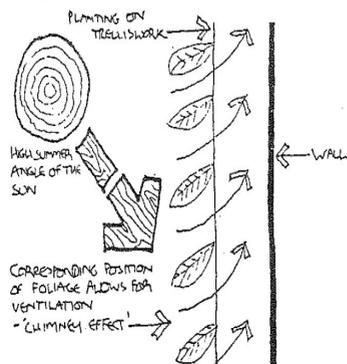
Computations undertaken by GlosCAT energy conservation officer John Willoughby reveal that significant energy savings could be made on poorly insulated walls by adding a veneer of planting. Little saving would be made on buildings already well insulated, for example with brick cavity walls.

As regards the value of vegetation in hot climates, buildings can benefit from the regulatory effect of deciduous species towards solar radiation. In summer they will tend to keep sunlight off for the most part, whilst in winter, after defoliation, they allow it to penetrate unhindered. Apart from keeping a building cooler, vegetation reduces the radiation strain on the building's external surfaces. More equable temperatures in the shaded part of a building can achieve a lessening of the external cooling load and therefore a reduction of thermic tensions within the structure. Because the leaf is a living solar collector, it naturally orientates itself to the diurnal and annual paths of the sun. Thus in summer the leaf is raised to correspond with the high angle of the sun (Fig 2).

Recent studies by Parker (1987) have established the cooling effects of shrubs planted immediately adjacent to walls. Results show that during periods for sunlight, the temperature of the shaded walls were between 5° and 14° C cooler than the uncovered equivalent (Fig 3).

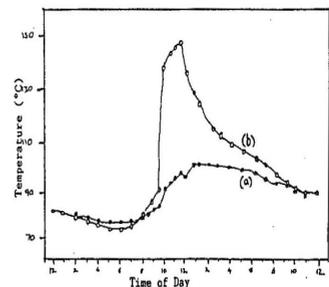
The structural benefits of vertical planting have already been mentioned earlier

Fig. 2 Leaf positions in summer



(Source: Doernach, 1979)

Fig. 3 Surface temperature of an east wall with (a) and without (b) shading from a single shrub.



(Source: Parker, 1987)

in the protection afforded against certain stone weathering gases. In addition, if water infiltrates building materials other processes can cause a gradual decay in the fabric. Freezing of water results in a 10% volume increase, and if this process occurs within stone, brick or mortar then cracking or exfoliation often follows. Vegetation appropriately planted, as we have seen, can limit this problem.

Climbing plants can, theoretically, offer structural support to the building. The network of clinging pads and shoots of plants such as *Hedera helix* (common ivy) has been suggested as being a valuable protection against traffic vibration and ground tremors. Unfortunately, there is insufficient research to substantiate this theory.

“Living plants refresh the spirit & generate joie de vivre ... the absence of green causes depression and results in stress and mental illness” (Doernach, 1979).

Clearly there are psychological benefits to be gained from improved aesthetics. Studies by Jurgen Bortz and other eminent psychologists have shown how important the decoration and intricacy of building facades are in determining how much people would like to live there.

‘Modern’ facades evoke feelings of severity, plainness, boredom, unfriendliness, inexpressiveness, dullness and sobriety. On the other hand, adjectives found to describe the older style of building facades would include: natural, meaningful, pleasant, artistic, playful, personal, friendly (Krampen, 1979).



Fig 4 Hanging baskets add a decorative element to an otherwise undistinctive pub

Aesthetically, otherwise drab concrete buildings have been greatly enhanced by the addition of planting, which can reduce austerity and punctuate a visual excitement to the overall structure (fig 4).

There are educational benefits as well. Vegetation within town & city boundaries provides a valuable teaching resource.

“We must recognise that 85% of our population are urban dwellers who usually have no direct contact and little opportunity for contact with either ‘raw nature’ which most of us consider so refreshing, or decent living conditions which most of us take for granted” (Spray, 1981).

It can be assumed that the process of adding vertical planting along with a general policy of ‘greening up’ our urban areas would provide the facility from which people be taught about such varied topics as plant reproduction, building insulation and air purification. Planting on walls is also a valuable habitat for certain forms of wildlife. No species is exclusive to walls but in this country there can be found molluscs, woodlice, spiders, bees, wasps, butterflies, swifts, stock doves, starlings, shrews and voles actually in, on or beneath a vegetable facade.

In addition, since agricultural & farming techniques have been becoming more intensive in character, the builtup areas will have a considerably more important

role to play in environmental protection, nature conservation and recreation provision (Spray, 1987).

DISADVANTAGES

The case against facade planting rests on potential damage to buildings, on problems of plant establishment and maintenance, on security factors, and on ethical restraints and public attitudes.

Building damage

The Ancient Monuments Society and the British and Scottish Building Research Advisory Services take a dim view of climbing plants, and ivy in particular. They recommend that ivy should not be allowed to grow on walls where root penetration can occur. They state that plant suckers and tendrils can contribute to the decay of mortar through the secretion of acid substances, but that the real threat is mechanical:

“Rapid growth with filaments intruding into joints and core work can convert substantial masonry into an unstable mass of loose stone and decomposed mortar” (DAMBH, 1977).

Damage to the wall can come not only from the plants but also from the fauna they support. This involves the burrowing of ants and solitary bees and the corrosive processes of animal excreta.

Establishment problems

The effects of the urban atmosphere on plant material were first observed last century when Nylander in 1866 noted the lack of lichens in the Luxembourg Gardens of Paris. Lichens and mosses are the most sensitive of wall plants to pollution but higher plant forms though varying in their tolerance can equally be affected by such atmospheric components as sulphur dioxide, fluorides, ozone and chlorine components. Clearly careful selection is needed when designing for certain city conditions, and where salt is used to clear roads of snow in colder climates halophytic species should be chosen.

Vertical walls store extremely small amounts of precipitation. For creepers and climbing plants the hazard is not crucial, but for species growing within or upon a substrate framework drought conditions can be experienced, particularly on south-facing orientations, or on high exposed locations. Xerophytic plants, eg *Sedum spp.*, are possibly best suited for these sites.

Some north-facing streets lined with tall buildings may experience little or no sunlight for the greater part of the year. Here shade-tolerant sciophytes such as *Hedera canariensis* (African ivy) and *Hedera colchica* (Persian ivy) could be used. Conversely, on south-facing areas of reflective steel or glass very high light levels can be experienced and sun-loving heliophytes such as *Wisteria sinensis* (Chinese wisteria) would be extremely well suited.

Maintenance presents a problem when the plants are established. On an annual basis this would constitute clipping, pruning and the addition of fertilisers and pesticides. On a less frequent basis supporting frameworks, where used, would need repair and replacement. In addition to implementation problems, particularly on high buildings where window cleaning platforms could be used, a high labour cost is incurred.

Security factors

Whilst the Fire Research Station in Hertfordshire does not have evidence to support wall plants being a fire risk (indeed, on the contrary, climbers can

offer evacuation routes), it is widely felt that such plants serve as an invitation to would-be burglars. Extra security, eg window locks, are not beyond consideration.

Ethical restraints

"Where there is beautiful, architectural proportion and enriched detail, it is obvious that it would be most unwise to let it be overrun with coarse or common creepers. In this case there should be just enough to clothe sufficiently, while none of the beauty of the building is unduly hidden" (Jekyll, 1901).

The question of the relationship of vegetation to architecture is quite complex and a design solution can be very personalised. Plant freedom or restraint depends often on an aesthetic opinion of the architect, or the landscape architect or the general public. Recent debate has tended to denigrate the featureless tower block architecture, and the architectural profession has become somewhat polarised in its view.

Each specific situation will require specific solutions. Careful analysis and evaluation are clearly necessary before decisions are taken. Public prejudices against climbing plants may have to be overcome.

An interesting test case of Kassel in West Germany is worth describing. In 1983 a campaign to promote the use of climbing plants particularly to cover the city's more 'ugly' buildings was undertaken. The scheme's administrators found that home owners initially resisted the initiative, fearing that these aggressive creepers would destroy walls and rendering, create dampness and provide cover for vermin and burglars. An 'untidy' appearance and exfoliation in autumn were also felt to be undesirable.

On average it took between 3 to 5 years before most prejudices were overcome. The best means of encouraging acceptability were, it was found, firstly, to show the public examples of good façade planting elsewhere in the vicinity; secondly to offer specialist advice; thirdly to combine the project with a more general programme of environmental landscaping and fourthly to urge the residents to help in the planting and maintenance. This

latter sense of cooperation and community interest succeeded in generating a sense of pride and responsibility in their own cityscape.

Clearly, these ideas and concepts can be adapted internationally. Success of this type of scheme can be measured not only by the amount of planting visible within a city, but also from people's growing appreciation of nature which results in the widespread care of urban 'naturalised' areas.

VERTICAL LANDSCAPING: TECHNICAL DETAILS

The following section is intended to offer specific information concerning the characteristics and uses of plants in vertical design applications. It deals with climbing, clinging, twining and rambling species, wall fruits and shrubs, climbing roses and mosses and ferns. In addition some bioengineering techniques relating to vertical and tilting walls and wall containers are discussed.

Climbing Plants

The large surface area of foliage presented by a mature climber allows it to function effectively as a 'green lung'. Deciduous climbers are more tolerant of pollution than evergreen, but it is important to remember that underlying architectural details may be revealed during the winter months.

Annual or herbaceous climbers are useful if that visual appeal is to be changed each year but they do not have the height advantage and require an annual stripping and replanting. Climbing plants in addition provide an excellent habitat for fauna.

Clinging Species

Species such as the commonly-used *Hedera helix* (common ivy) and *Parthenocissus tricuspidata* 'Veitchii' (Virginia creeper), for example, are able to cling on to walls with the help of adventitious roots or adhesive pads. Thus supporting structures may well be unnecessary. However the surface of the wall should be secure enough so as to prevent the roots and suckers penetrating the wall as some damage can be caused from this. Where the wall is too smooth

for the plants to cling by their own means, then wires can be attached to the wall as has been used on this species of vine.

Twining Species

Examples such as *Humulus lupulus* (common hop), *Lonicera periclymenum* and *Polygonum balschuanicum* support themselves by the whole shoot winding spirally upwards. Branching does not often occur and the species require thin steel wires, roughened plastic lines or timber battens to grow up. The hop fields of Kent illustrate the use of wire to support the planting.

Vitis & *Clematis* species climb with the help of modified leaves or shoots. They require a good network of wire for example to cling on to. A timber frame with cross-wires or steel mesh, as is shown (Fig 5) would be sufficient to allow the plants to spread and cover a wide area.

Rambling species

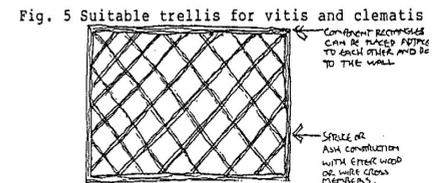
These are not strictly climbing plants. Their long shoots become entwined with each other or with those of other plants to form vertically orientated bushes. To achieve cover of a vertical facade, wide meshed grid structures are necessary. Species such as *Jasminum nudiflorum* (winter jasmine), varieties of climbing roses and brambles have to be tied up and trained. As such they can require considerable maintenance.

Wall Fruits

These are not as effective insulators as climbers but they do have other benefits such as the provision of food. They can, depending on how they are grown, have great visual interest forming strange shapes as can be seen in espalier forms. However, they do require support.

Climbing Roses

These do require a supportive network



(Source: Bartholomai, 1984)

and some varieties will require more maintenance than others. Plants of the 'rambler' variety require less than most and they can grow to an enormous size. When in flower, they can be extremely attractive and they may even have insulatory uses, eg *Rosa Albar* and *Rosa Albar*.

Wall Shrubs

Wall shrubs can provide very attractive flowering displays and can act as an effective insulator against heat. They are however not as effective as climbers in keeping a building warm. Some varieties such as *Magnolia grandiflora* will take up more space widthwise than its equivalent height in climbers. They provide excellent habitats for fauna eg *Ceanothus spp.*

Plants with their Roots in the Wall

Plants such as mosses, ferns and small angiosperms can, where there is a secure foothold for their roots, be grown directly onto the wall. As such they could provide little in the way of insulation but could contribute greatly to the aesthetic and environmental benefits.

These plants could be grown in a much denser and possibly more effective way on a vertical substrate layer supported by the wall. This combined with the density of cover and the thickness of the substrate would give a far greater insulating effect. It would also cover the building façade from view. Irrigation would be necessary for this type of planting.

Planting grown from a 90° 'artificial' substrate

Since the relatively recent idea of light-weight, low-cost roof planting has been explored, using growth, filter mats and substrates in the form of a sandwich, it has been conceived that the whole idea could be tilted through ninety degrees to cover the façades of buildings. The inventors call it 'green tile' and it is composed of a layered structure of waterproof membrane, a moisture capillary layer and vegetation (Fig 6).

It has been found that modified polypropylene is a suitable material for frameworking slabs, tiles or carpet-like elements; it is capable of absorbing temperature stresses. It is hoped that a

controlled water supply combined with the capillary characteristics of the matrix and further genetic alteration of plants will make the whole system much more viable. Until then, the only option for non-climbing species of wall plants is to plant them straight into the joints and crevices of walls.

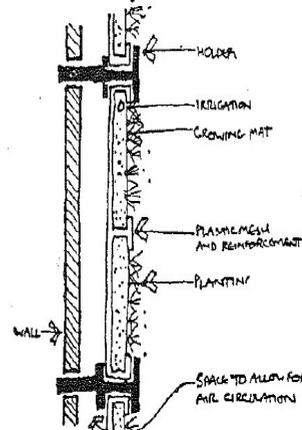
Planting Straight onto the Wall

Gertrude Jekyll recommends knocking holes in the of sturdy walls with a hammer and chisel and then a mixture of seed and loamy earth into the hole, sealing it with a stone or cement.

Sometimes plants will colonise a well-weathered wall themselves particularly where there has been a build-up of soil particles and where lime is used in the mortar. The wall is usually colonised by mosses which in turn are succeeded by ferns and then annuals. Plant colonisation is further accelerated by the fact that once plants are established on a wall, humus will start to build up and the developing foliage will help trap airborne soil particles. However, this form of planting can only be applied to walls with crevices, cracks and a certain degree of porosity. It is certainly not practical or desirable to go over a whole wall with a hammer, chisel and bag of seed.

One solution could be the adaptation of hydraulic seeding processes whereby a homogenous slurry of peat or wood pulp,

Fig. 6 Detail of 'green tile' structure



(Source: Sitta, 1983)

Fig. 7 Vertical wall formed from plant-filled containers



(Source: Ritter, 1980)

water, seed, fertiliser and thixotropic gel are sprayed onto disused quarry faces in order to establish a vegetative coating which would stabilise and camouflage the bare rock.

One other option to growing plants straight on to a façade comes from Paul Ritter (1980). He has devised what he calls a 'bio-wall' made from 'sculp-crete' as is shown in Fig 7.

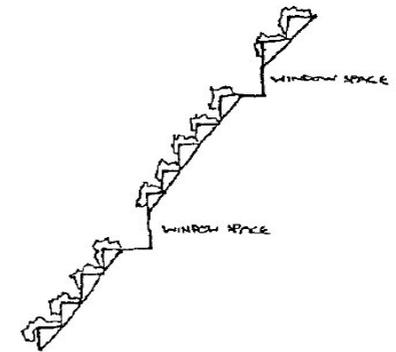
The Use of Containers in Wall Planting

Hanging baskets and window boxes can be an attractive attribute to any building. The use of hanging baskets on any large scale can, for the most part, be prohibitive simply from the fact that they are difficult and time consuming to maintain. However, why not take the window box idea a step or two further? (O'Kane, 1985).

The idea of walls acting as plant containers came about as a result for the need for effective noise barriers at the edges of roads. Concrete gave the structure its height, support and noise dissipation; planting made the wall visually appealing. This form of wall has been adapted into one of plant-filled containers sustained by an irrigation pipe running along the top (Fig 8).

Instead of building containers into architecture as has been accustomed, why not build the walls of a building as containers? This could be done on a stacked basis

Fig. 8 An inclined wall with plants



at forty five degrees, rather like a pyramid, or vertically as shown. Irrigation, if necessary, could be provided by means of a trickling pipe running along the rows of containers or compartments. The overall effect could be quite dramatic with even small trees being grown in the containers. The containers themselves could be manufactured from stone, concrete, fibreglass, plastic or terra cotta with holes to allow for drainage. The effect produced can be quite dramatic (Fig 9).

CONCLUSION

In an age of increasing environmental awareness and concern, brought about by the realisation that natural resources are not limitless and that a healthy environment results in a healthy population, the need to put back some of the areas of greenery, that have been taken away for housing and roads, becomes more of a necessity.

Using the technology that surrounds us today, it is possible to increase the relationship between the hard elements of a city and those of naturally 'healing' plant species such as creepers and climbers. Modern concrete, glass and steel walls depart from the basic visual and structural principles of brick equivalents which, on weathering, entice several plant species to naturally colonise them. New technology is required to help plants establish on other types of man-made cliffs.



Fig 9 Unterbilck, West Germany

More recent research has shown that façade planting does not live up to all the benefits that have been suggested. Planting cannot compete as successfully on insulation grounds with some of the man-made equivalents, for instance. It can also be expensive to implement. However, planting has some major advantages over its equivalent inanimate competitors. It can improve the environment around buildings, it can protect them from rain and thermal stress. It can improve the visual appeal of a building and 'soften' its often hard exterior qualities. It can provide, simultaneously, a source of play and learning and finally it can improve human health and wellbeing.

"The same influence of vegetation in softening the aspect of rugged architecture may be seen wherever there are old buildings; its presence investing the ancient structures with a whole new range of qualities that excite the keenness interest in cultivated minds. For who can see the splendid work of human design and skill shown in grand rough-hewn masonry, absolutely adapted to its own work, and yet, from its complete sympathy with surrounding nature, seeming to grow spontaneously out of the rocky gorge; who can see this, made all the more perfect by the lovely work of God in the dainty fern fronds of the Maidenhair, without a thrill of humble admiration and thankfulness?" (Jekyll 1901).

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CHELTENHAM COURSE NEWS

National design awards for Cheltenham students Imogen Reeves, Courtney Brodrick and Bevis Hughes

Imogen Reeves and Courtney Brodrick received £1000 bursary awards after submitting entries to the 2021 LDA Design Competition. The competition challenged designers to produce imaginative ways to respond to climate and nature crises by making places where people live more resilient and innovative. Their winning submissions are described below.

Bevis Hughes won a gold medal at his first RHS Chelsea Flower Show 2022. He was part of the Eden Project team who designed the exhibit, a restored Cumbrian bog showing the benefits of going peat free, both for private gardens and

for the protection and restoration of UK peatlands. Bevis said “We had a special licence from Natural England to ‘borrow’ 6.5 m³ of peat bog from Bolton Fell Moss National Nature Reserve to showcase this amazing habitat... It went down a storm with the public and the judges.” He went on to say that it was an incredible experience to help design a way to bring a living, breathing peatbog into the heart of London at the Chelsea Show. “The public really engaged with it, and being able to discuss with them the importance of these critical landscapes was an experience I will not forget.”

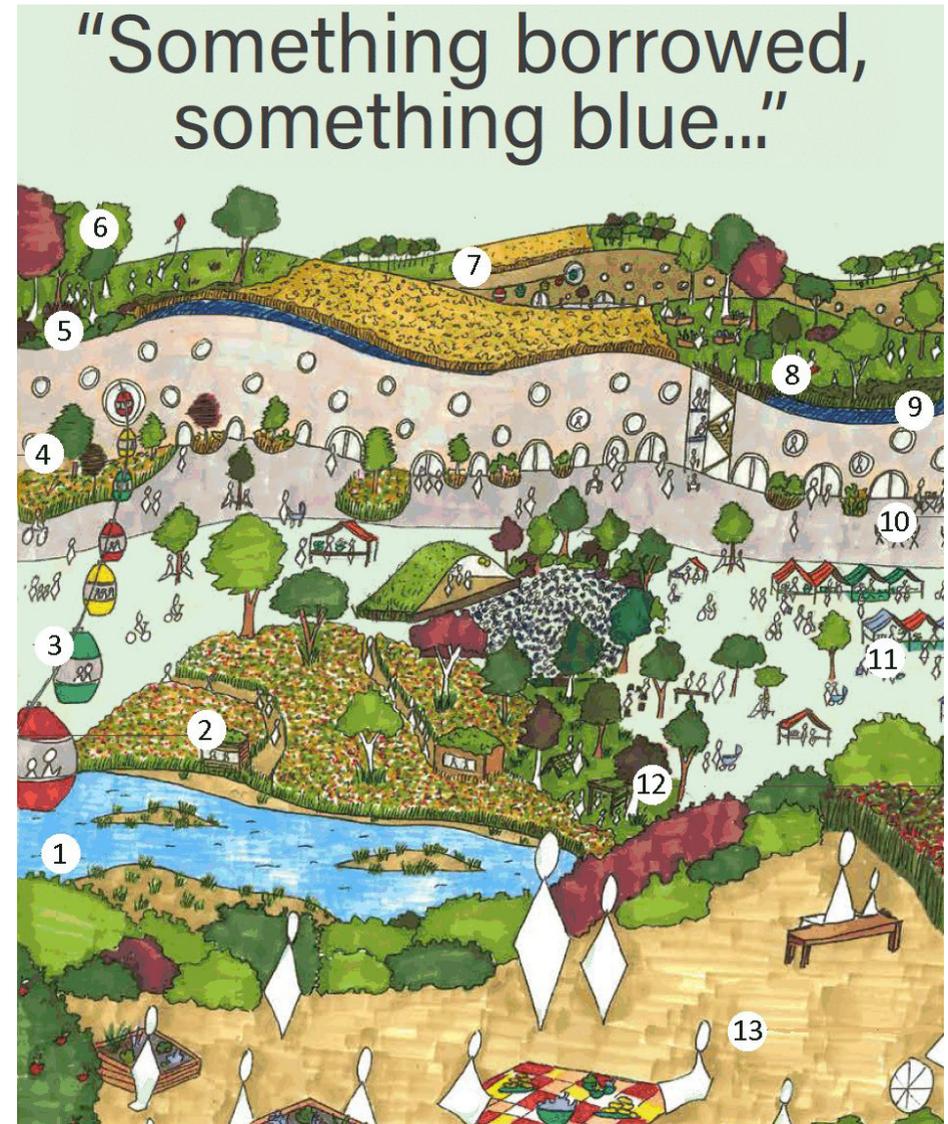
Something borrowed, something blue Imogen Reeves

The beauty and tranquillity of the pre-industrial rural idyll. The stimulation and life-giving buzz of the modern day city. The combined result? A dynamic, sustainable, people-focused, urban space that provides the missing opportunities of the countryside whilst bringing connection with nature and locally produced food to the city. This concept is inspired by historic rural villages, and other economic cultures globally, where markets drive trade and naturally generate a circular economy, and where access to natural resources is essential to sustain the community. At the confluence of ideas from the past and recently developed sustainable technologies, which respond effectively to the climate emergency, and specifically the use of wetlands to create ‘sponge cities’, is a new, utopian urban landscape. It is not necessary to continue innovating for the sake of design when many of the answers to a sustainable future, for people and planet, can be found in the past. As a result, this design also draws on the principles of the Garden

City Movement and Christaller’s Central Urban Place theory.

Crucial to this design concept is the densification of urban spaces, not to create a suffocating, skyscraper city, but in fact the opposite: to release space for living. This will be achieved by replacing extensive surface-based transport networks with a sustainably fuelled cable-car system. This would link different parts of the urban space aerially, as well as offering connections to other urban areas, encouraging healthy flows of people, ideas and money to stimulate the economy and prevent culture stagnating. The stunning views during the journey would also benefit users’ mental health by allowing time for reflection and appreciation of nature.

Because of the cable-car system, land use becomes more compact, with no distinction between residential areas and the central business district, as land use will be inter-spersed, improving safety and sense of community due to higher levels of activity.



- 1 Urban wetlands will create a 'sponge city' and make the space resilient to increased rainfall, in addition to providing connection to nature.
- 2 Birdhides allow connection to nature, and would be green-roofed, as would events stages, to limit visual impact.
- 3 Cable cars will provide the main transport infrastructure, allowing the city to be densified for pedestrians.
- 4 Pale-coloured materials for paving and walls will keep the urban interior cool by reducing the urban heat island effect.
- 5 Planting on the edge of the upper level provides a natural barrier, removing the need for harsh fencing.
- 6 Parkland and access to open air on the upper level improves mental and physical health.
- 7 Agroforestry and biofuel production will provide renewable fuel and material sources, as well as sequestering carbon.
- 8 Edible forest gardens will improve community relationships and provide sources of local, healthy food.
- 9 Solar panels on the upper level will provide renewable energy for built forms in combination with solar and kinetic energy stored in paving.
- 10 Wide, open spaces allow for alfresco dining as an adaptation to rising temperatures and creates a positive nighttime culture.
- 11 Extensive space for market stalls creates a strong community and supports local artisans, generating a circular economy.
- 12 Transitioning through meadow and forest to the built environment creates recreational opportunities, including free-form play equipment.
- 13 Open-air space endorses healthy community relationships and makes the city resilient in health crises. Also meets developmental needs in children for access to sunlight.

This will help to reduce loneliness and increase neighbourhood vigilance, in addition to improving quality of life for young children and their caregivers, as suggested by the new Institute for Transport and Development Policy recommendations. When homes, shops, nurseries, pharmacies and workplaces are closer together, the stress on caregivers of achieving daily activities is reduced, releasing their physical and emotional energy to invest in childcare, immensely benefiting future generations.

Moreover, densification of the city would create a safer nighttime culture because all circulation routes are pedestrian/cycle only, creating continuous circulation and improving neighbourhood vigilance. Furthermore, a pedestrianised landscape allows extensive space for restaurants to provide outdoor seating, creating an alfresco dining culture that will be a healthy adaptation to increasing temperatures, as well as endorsing a family-friendly, Mediterranean-style night time culture.

Although increased temperatures provides an opportunity here, the urban heat island effect must be mitigated to prevent unbearably high urban temperatures leading to civil unrest and public health crises. Natural cooling systems are therefore essential, which is why all built forms, including events stages and bird hides, will be topped with a planted landscape that is fully accessible to people as parkland, but most importantly will allow buildings to breathe and sequester carbon. This will also improve insulation, therefore increasing energy efficiency and reducing energy consumption; ubiquitous street trees will aid urban cooling too, as well as providing shade and increasing biodiversity and visual interest. Moreover, heat will be reflected through use of pale-coloured walls and paving materials, which, in combination with paving storing solar and kinetic energy and solar panels on the planted level of built forms, will provide renewable energy sources. Sustainable drainage systems for the top level will supply recycled water to homes and businesses through collection and biofiltration, making the city resilient to increased rainfall, reducing pollution and preserving water supplies.

Environmental, social & economic factors must be considered jointly, making market

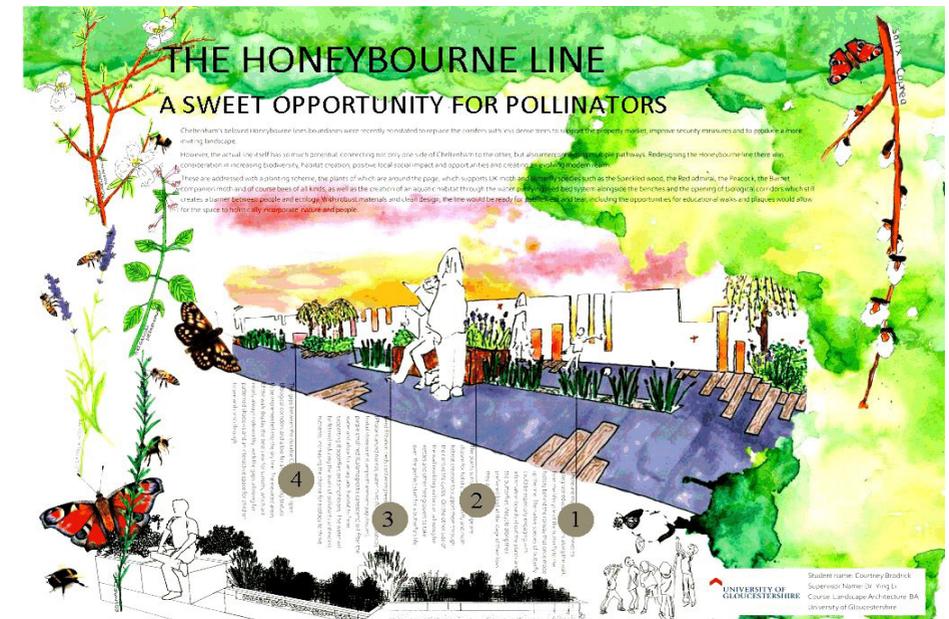
culture crucial to this design; by nurturing a healthy community of independent businesses and traditional craftspeople, a circular economy will be regenerated and a resilient economy established for the future. When people can buy better quality, buy less and buy locally, it becomes much easier to live a sustainable lifestyle whilst supporting local businesses and generating community. Skilled tradespeople will provide services in the market, consumers buying quality clothes will buy less, all providing continuous flows of finance by returning for alterations and mending. Similarly, metal welding, cobbling, joinery and so on can thus be sustained creating diverse employment opportunities and improving inter-generational relationships as young people learn traditional skills from older artisans, also reducing unemployment.

To supply the markets, builtform tops will release space for agriculture, agroforestry and community-led edible gardens. The benefits of people producing their own food in community are extensive and well understood, and by utilising vertical space food miles can be reduced and increasing demand met, whilst preserving space to accommodate growing urban populations and crucial land uses such as wetlands. The wetland in this design transitions into the built environment through wildflower meadows and forests, increasing biodiversity and interconnectivity between habitats, and providing diverse recreational opportunities in natural environments, such as the woodland gym trail. This avoids prescriptive play areas, thereby increasing children's resilience, imagination and appreciation for nature.

In conclusion, this vision for a new urban space aims to build upon elements of a past lifestyle when the issues of sustainability, community and resilient economies were not on any particular agenda, but were successfully encompassed in daily life. With consideration of people's social needs and culture today, these traditional practices can be intertwined with modern technology to create urban spaces that are adaptable and resilient to climate change. They will allow the environment and people to be restored to full health, reconnecting the two through people's greater awareness of their interdependence with nature.

A sweet opportunity for pollinators

Courtney Brodrick



- 1 The gaps between the durable corten steel wall open biological corridors and allow for an interesting texture to be implemented into the skyline. The elevated areas of the walk display the best view for sunsets which are nearly always noteworthy, with the gaps allowing for patterned shadows and an interactive space for children to see and climb through.
- 2 Reed filtration beds containing reed canary grass (*Phalaris arundinacea*), water mint (*Mentha aquatica*) and fox-tail stonewort (*Calamagrostis canescens*) will filter the water and allow for an aquatic habitat to form supporting dragonflies and amphibians. The water will be filtered reducing the levels of pollutants and excess nutrients increasing the chance for ecology to thrive.
- 3 The plants surrounding the page are chosen for holistic UK butterfly and moth habitat creation to support them through their entire life cycles. On the other side of the wall rewilding will occur allowing for nettles and other free growers to take over the perfect start for a butterfly's life.
- 4 There are multiple opportunities to integrate educational paths along the walk from the lifecycle of the butterfly to the history behind the railway that once made up the line. The native species of butterfly could be especially engaging with information boards above the plants and the butterflies' lifecycle along with their preferred food at the stage of the lives they are in.

Cheltenham's beloved Honeybourne line's boundaries were recently reinstated to replace the conifers with less dense trees to support the property market, improve secu-

rity measures and to produce a more inviting landscape.

However the actual line has so much potential, connecting not only one side of Cheltenham to the other, but also interconnecting multiple pathways. Redesigning the Honeybourne line, consideration was given to increasing biodiversity, habitat creation, positive local impact and opportunities, and creating an evolving modern realm.

These are addressed with a planting scheme, which supports UK moth and butterfly species such as the speckled wood, red admiral, peacock, burnet companion moth and of course bees of all kinds as well as the creation of an aquatic habitat through the water-purifying reedbed system alongside the benches and the opening of biological corridors which creates a barrier between people and ecology. With robust materials and clean design, the line would be ready for public wear and tear, including the opportunities for educational walks, and plaques would allow for the space to holistically incorporate nature and people.

Student botanical society wins annual award

Formed in 2021/22 the Botanical Society's aim was to provide students with more plant-learning opportunities and something fun and interesting to do. It met frequently during the year, mostly bi-weekly socials with different botanically-themed craft activities and regular plant ID sessions, as well as a number of field trips to local sites and one residential trip to Devon and Cornwall.

The Colesbourne visit in February comprised a guided tour of Sir Henry Elwes' estate and its huge display of snowdrops. He doesn't usually give the tours himself but decided to on hearing of our association with the university: he has recently stood down from serving ten years as its pro-chancellor. Everyone enjoyed the visit and appreciated his wide knowledge of the plants.

In June a weekend trip to Devon and Cornwall was organised. We visited the Wildside Garden and had a personal tour from Keith Wiley. It was amazing to see what he'd done with such a small site and hear him talk passionately about planting and his process of sculpting the landscape. See <https://wileyatwildside.com/>. Following an overnight stay in

Plymouth, the whole second day was spent at the Eden Project which was an incredible, inspiring place! See <https://www.edenproject.com/>.

The society also organised a number of one-off workshops: Christmas wreath making; houseplant propagation and exchange; mushroom growing; bonsai making. We had access to the glasshouse at the back of the campus too, which we used to propagate a number of plants from seed, including a bumper crop of marshmallows (*Althea officinalis*)! We planted some of them, as well as a few other perennials we'd seeded (*Malva moschata*, *Salvia pratensis*, *Silene vulgaris*, *Linaria purpurea*, *Lathyrus odoratus*) into the university's edible garden, where they are thriving so will hopefully remain for many years.

Our society won Best New Society of the Year at the Students' Union awards which represents some level of success! We hope to carry it on this academic year too. For more information, follow the Instagram page at @uog_botanical or <https://www.uogsu.com/organisation/botanicalsociety/>.

Nick Russell



Eden Project, St Austell, Cornwall



Obituary: Patrick Josselin (1970-2021)

It is with great sadness that we report the death late last year of Patrick Josselin, a former student who gained a first class honours degree in 2008 in Garden and Landscape Design.

Before university he had travelled very widely. According to those who knew him then, his wanderlust was insatiable and it was incredible how much he managed to cram into those early years: places, people and wildlife. He explored Africa, then south and central America and finally Asia. He had almost run out of new places to discover. His passion was always nature and taking stunning photos of creatures, large and small.

He found his calling on arrival at univ-

ersity in 2005. Although older than many of his fellow students, he found his tribe and loved everything about his studies. The record of his modules at university reveals a consistent commitment to high quality work. His superlative final degree was never in doubt, the overall average of his marks for the three years being 79.83%. He completed the diploma course the following year 2009 with a distinction.

Having excelled on the course Patrick duly returned to Jersey with unparalleled qualifications. When he set up his landscaping business, he poured his heart and soul into his work and loved the physical challenge of the work as well as the reward of a job well done at the end.

INFORMATION FOR CONTRIBUTORS

LANDSCAPE ISSUES publishes articles and reports on aspects of landscape architecture and landscape education. Typescripts in normal Word format (or simple text) should be emailed to the editor with the title of the paper together with the name(s) and any affiliation(s) of the author(s). A high scholarly standard is expected and normal conventions for references, illustrations etc should be followed. Illustrations should be emailed separately in *jpg* format. If the file sizes are too large to email, contact us to arrange an alternative method. We are particularly keen to promote student research. Reviews of books, conferences, exhibitions are also invited.

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Original cover artwork: Jill Steeves-Booker
All text Century Schoolbook

This issue is sponsored by the John Simpson Memorial fund. John Simpson, former long-serving staff member and professionally associated with Bodfan Gruffydd, founder of the Cheltenham course, established the annual student awards in his name in 2012. See also *Landscape Issues* vol 15, 2016, p 91.

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Printed by Frontier Print and Design, Cheltenham