Title

Vertical Planting: Tectonics and Aesthetics

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VERTICAL PLANTING: TECTONICS AND AESTHETICS

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11.

Raderschallpartner, landscape architects; Burkhardt + Partner, architects.
MFO-Park.
Oerlikon, Zürich, Switzerland, 2002.
Interior space in summer.
[Marc Treib]

Vertical surfaces have been a component of garden-making since the first woven fences separated cultivated ground from wilderness. Vertical planting, however, represents a departure from the archetypal forms of the garden, as designing with plants in an upright orientation often requires structural support, artificial soils, and precise hydroponic systems to maintain them. Although vertical planting admittedly consumes intensive resources, it allows designers to achieve new effects with living plants, effectively integrating vegetation with architecture, and rapidly creating verdant and colorful urban spaces without the time required for achieving large trees and shrubs. Three unique design challenges and opportunities accompany vertical planting and raise some critical points of inquiry into its history, representation, and design. These include (1) the experiential and representational anomalies relative to the ground plane, and the issues raised by designing in elevation; (2) the theoretical origins of vertical planting in the modern era as viewed through the work of Stanley Hart White; and (3) the importance of depth and pattern when designing the planting medium (soil or composition substrate). Although these subjects are by no means exhaustive, their discussion will hopefully initiate discourse on an as yet poorly theorized form of garden-making.

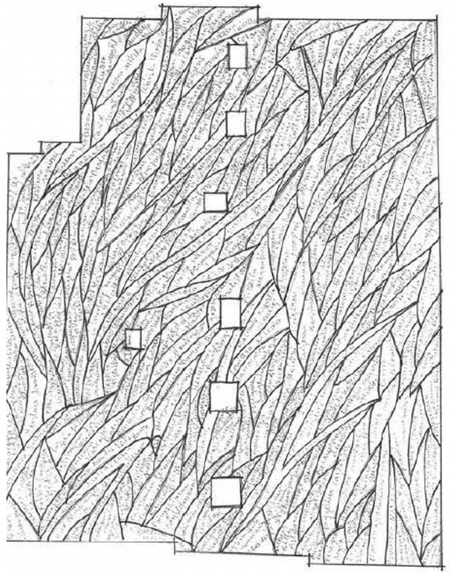
Plan, Elevation, and the Ground Plane

For centuries, the planting plan has been used to graphically depict the spatial organization of plants on a designed landscape, and like other plan drawings represents the ground orthographically, as viewed from above. Vertical planting therefore inverts, or more precisely rotates, the once stable relationship between ground and designed plantings. Rotating the axis of the planting plan perpendicular to the ground plane technically renders the vertical planting plan an elevation drawing, and alters the eye-level experience of the design. Although this may sound at first like a wonky distinction, the perpendicular shift of projection throws the widely accepted axioms common in planting design—mass, line, texture, and color—into disarray.[1] In many cases, this results in flattening the planting into a surface pattern, or more kindly, an expansion of the plants into new spatial dimensions.

Drawings and photographs of the 2013 Oasis of Aboukir in Paris by Patrick Blanc and a garden at Lindisfarne Castle designed in 1911 by Gertrude Jekyll in Northumberland, England, clearly illustrate the tension effected among plan, ground, elevation, and vertical planting. The notational styles of the plans for both gardens are similar, each utilizing drifts and masses of plants; yet certain peculiarities between the two nevertheless result. The voids/apertures in the planting plan of the Oasis of Aboukir (also known as Le Mirage Vert) are actually the windows of the adjoining apartment building; the openings/voids in the plan for Lindisfarne Castle are the paths that facilitate movement through the garden [11-1, 11-2]. In addition, the eye-level reading of the drifts of vertical planting appears as a graphic pattern on the building's façade; the drifts of the earth-bound Lindisfarne garden retreat in the distance as the varied heights and transparencies of the plants become layers that mask one another [11-3]. This resulting shift of orientation between viewer and designed planting creates both opportunities and challenges for spatial design and its representation. As suggested above, many vertical planting plans are in fact elevation drawings. Therefore, vertical plantings permit viewers at a distance to observe the expanse of the garden in a single glance and at full scale—a "bird's-eye view taken from the ground." In his essay "On Plans," Marc Treib notes that "a plan presents a view that never exists in reality" although it gives us a "coherent idea [of the order] at the expense of spatial experience."[2] Perhaps this is why many vertical gardens possess such a "thin" graphic quality—like a veneer, pattern, or camouflage—when compared to conventional gardens experienced from eye level.

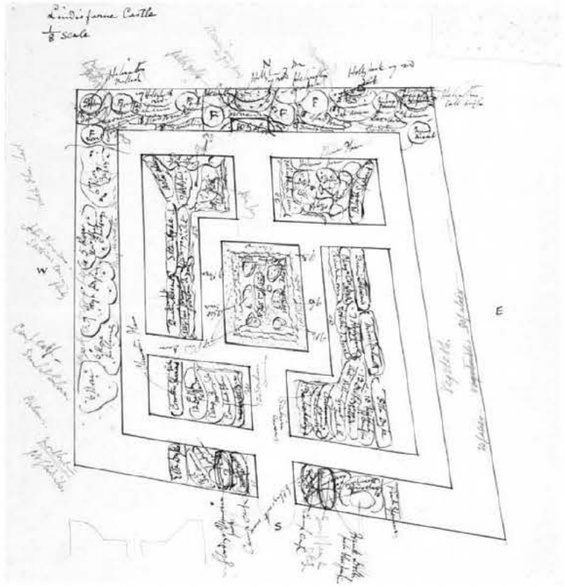
Designing vertical planting involves certain anomalies and unique representational and structural challenges—but also opportunities—that exert an impact on the spatial qualities of the planting and the experiential qualities that result. MFO-Park in Zürich, Switzerland, and the CaixaForum in Madrid, Spain, neatly illustrate the issues involved. MFO-Park utilizes a steel frame and extensive trellising to support the growth of a mixture of climbing plants [11-4]. Although the beds for these plantings occupy minimal square footage, today the vines completely inundate the structure with foliage and flowers. Alternately, at CaixaForum, the plants grow from a thin felt substrate supported vertically by a building façade and create a sheet or mat of vegetation that appears as a surface veneer. Both projects employ vertical planting, yet MFO-Park presents a series of intricate spatial volumes, while the CaixaForum laminates the planting to the building façade and reads only as surface, like a wall of greenery.

MFO-Park was designed by Raderschall landscape architects and architects Burkhardt + Partner around 2002 [11-5]. The vine-covered structure occupies a former industrial block of the Maschinenfabrik Oerlikon, a Swiss manufacturing company involved in various aspects of mechanical engineering, including the early production of electric trains. Given that the plan would have been ineffective in communicating the overall planting design, the landscape architects studied its



11-1

Patrick Blanc.
L'Oasis d'Aboukir.
Paris, France, 2013.
Planting plan/elevation showing the vertical distribution of plants on the wall surface.
[Redrawn by author]

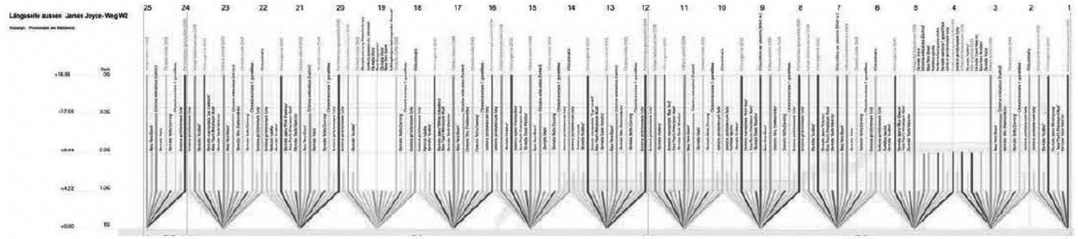


11-2

Gertrude Jekyll.
Lindisfarne Castle garden.
Holy Island, England, 1911.
The planting plan delineates the arrangement of plant species.
[College of Environmental Design Archives, University of California, Berkeley]

11-3

Gertrude Jekyll.
Lindisfarne Castle garden.
The spatial arrangement of plants seen from eye level.
[Marc Treib]

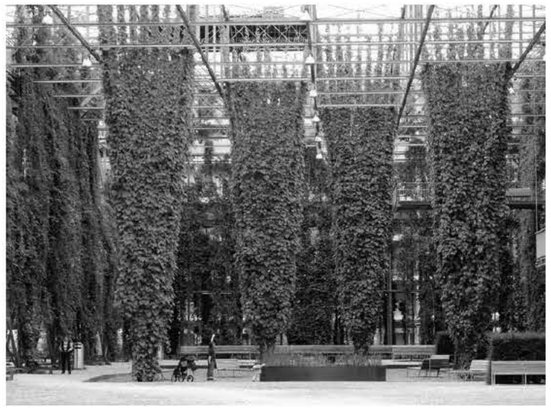


11-4

Raderschallpartner, landscape architects; Burkhardt + Partner, architects.
MFO-Park.
Oerlikon, Zürich, Switzerland, 2002.
Interior planting in autumn.
[Joachim Kohler Bremen, Wikicommons]

11-5

Raderschallpartner, landscape architects; Burkhardt + Partner, architects.
MFO-Park.
Interior space in summer.
[Marc Treib]



11-6

Raderschallpartner, landscape architects; Burkhardt + Partner, architects.
MFO-Park.
Elevation showing the distribution of plant species.
[Roland Raderschall]

design primarily in elevation diagrams [11-6]. Elevations of the project reveal the intimate relationship between plants and structure by articulating the anticipated vertical arrangement of plants as well as the structural framework. The architectonic system of cable trellising and steel frame supports the masses of varied clematis species, climbing roses (*Rosa 'Albertine'*), porcelain berry (*Ampelopsis brevipedunculata*), and other species that have today grown into a rectilinear volume of living plants. The elevation drawings reveal the hybrid of vegetation enfolding the elaborate trellis works; in many places, the vines prevail and are especially vivid at certain times of year, in autumn, for example. The planting is highly volumetric, ultimately mimicking or paralleling the structural form established by the architecture, yet on the ground the planting barely draws notice.

The vertical planting at CaixaForum, designed by Herzog & de Meuron in collaboration with the botanist and landscape designer Patrick Blanc in 2008, derives from a far different spatial and compositional idea [11-7]. The public space and adjoining plaza are bounded on two sides by historic structures: on one side stands the Corten steel façade of the former electrical substation designed by the architects; on the other, the green wall planted by Blanc. The plants used—including genera of *Carex sp.*, *Iris sp.*, *Sedum sp.*, and *Delosperma sp.*—sheath the adjacent wall and have adapted successfully to their vertical orientation and the thin planting medium [11-8]. The felt substrate that covers the apartment block façade reorients the plane of the "soil" and thus the plane of the planting. As a result, the planting and its substrate, almost invisible when viewed in plan, dominate the elevation and read as a component of the building façade.

At the CaixaForum, the planting becomes an ornamental skin for the apartment building and simultaneously a garden for the adjacent public space [11-9]. The collaboration between Blanc and Herzog & de Meuron is noteworthy in this regard, as it brings together similar garden and architectural languages premised on exquisitely detailed building envelopes and bold geometry. Jeffrey Kipnis summarizes the seductive power of this approach in his article "Cunning of Cosmetics."

> *Ornaments attach as discrete entities to the body, like jewelry, reinforcing the structure and integrity of the body as such. ... Cosmetics are erotic camouflage; they relate always and only to skin, to particular regions of skin. Thinness, adherence and diffuse extent are crucial to the cosmetic effect, which is more visceral than intellectual, more atmospheric than aesthetic.*[3]

11-7 *(opposite)*

Herzog & de Meuron, architects;
Patrick Blanc, planting design.
CaixaForum.
Madrid, Spain, 2008.
The Corte= steel façade and the green wall bracket the plaza.
[Edmund Gall, Creative Commons]

11-8

Patrick Blanc, planting design.
CaixaForum.
Tapestry of species.
[Marc Treib]

11-9

Herzog & de Meuron, architects;
Patrick Blanc, planting design.
CaixaForum.
A felt substrate supports the thin planting on the building façade.
[Marc Treib]

This reading of the Herzog & de Meuron architecture also provides a critical lens through which to regard vertical planting as façade and cosmetic blush for a generation of "green" buildings. At the CaixaForum, the technique is particularly salient, as the cosmetic treatment of the vertical planting screens the space in manner akin to Herzog & de Meuron's metal façade—yet it lacks the perspectival depth and spatial layering offered by earth-bound gardens of similar scale and dimension.

Tectonic and Theoretical Origins of Vertical Planting

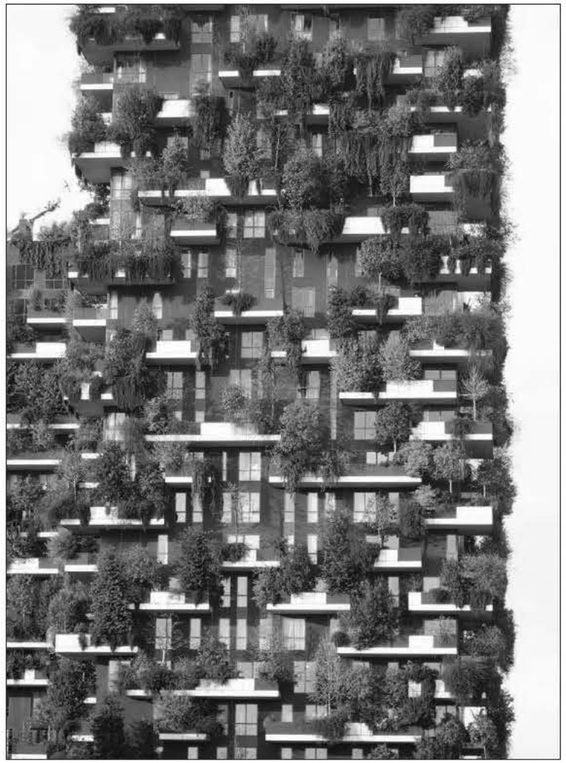
MFO-Park and Caixa Forum reveal the unique spatial and representational opportunities provided by vertical planting, its tectonic and structural hybridity—but also its limits. For example, gardens by Patrick Blanc, usually composed of veneers of felt and vegetation, also conceal involved technological devices for cultivating plants on vertical surfaces required for evoking awe and wonder from an impossibly thin green wall. Conversely, the open tensile structure of MFO-Park creates a volume that explores the tectonics of landscape architecture and the heliotropism of plants. Each approach has radically different implications for the ground plane, design in elevation, and space-making. This suggests that vertical planting should always be discussed in terms of the interrelation of building technology and living materials. History provides some examples and inspiration.

For at least four centuries, plants and structure have coevolved, many advances in architectural technology instigated by the pursuit of raising exotic plants. For example, the orangeries and winter houses built in Europe during the seventeenth through nineteenth centuries were necessary to create supportive climates for the cultivation of fruits and vegetables in northern latitudes.[4] These structures developed over time in a reciprocal relationship with plants that they housed, providing temporary shelter, or idealized artificial climates for the tender plants brought to Europe from distant colonies. These innovative structures represent an inextricable mutual relationship between plants and architecture that continues today in vertical plantings and their structural supports. No single point of origin for the coevolution of plants and structure can be determined with any degree of accuracy, of course. Yet within this vast field of inquiry we might include the ivy walls of storied universities, the sod roofs of Scandinavian folk architecture, the ornate and functional espaliers of France, agricultural glass-house technology, and the structural and botanical experiments of the Baubotanik ongoing at the University of Stuttgart in Germany. What unifies these precedents is the search to configure environments that foster an intentional symbiosis of plants and structure. Viewing vertical planting from the perspective of vegetal/structural coevolution leads to some uncanny interpretations of the "green" buildings that pepper contemporary cities. One Central Park, in Sydney, Australia, designed by Ateliers Jean Nouvel, has ostensibly more in common with nineteenth-century conservatories than with the urban ecology and sustainability often used to justify vertical vegetation in cities [11-10]. The treatment of the building's glass façade and arrangement of plants yields a curious hybrid in which indoor and outdoor spaces profit from structural innovation and adaptation of building systems that facilitate the survival of the plants. In a like manner, Stefano Boeri's Bosco Verticale in Milan sheaths a multistory structure with an unlikely coating of arboreal greenery [11-11]. This squarely situates the architectural design in the lineage of advanced glass-house technology that stems from Joseph Paxton's 1851 Crystal Palace, but have continued in modernist glass-wall construction that has allowed the creation of voluminous light-filled spaces.[5] Although conservatories are no longer at the peak of fashion, they provide fascinating precedents for the complex reformulation of architecture to accommodate vegetation as well as the domestic, social, and commercial lives of their patrons and visitors. Historically, the structural elements of many conservatories—such as support columns—were used to foster plant growth and create well-composed spaces for human enjoyment. This, I would argue, also represents the highest ambition of vertical planting—and not its function as a simulacrum of ecology.

Vertical planting in the urban landscape has tectonic origins and has been a part of the landscape architect's tool kit for more than a century. A "hedge-fence" designed by the landscape engineer John McLaren adorned the entrance to the 1915 Panama–Pacific International Exposition in San Francisco [11-12]. The fair, which among other things showcased a model of the Panama Canal, a transcontinental telephone, and other icons of western technological progress—included, apparently, vertical planting.[6] The hedge-fence surrounded the fair's exhibition spaces with a 36-foot-high green enclosure, a feat achievable in very few months and far from the centuries of care and growth needed to grow a yew hedge or ivy wall of similar dimension. The hedge-fence was a grand piece of civic architecture designed to provide a threshold for the fair, rapidly assembled on the exposition site. The support structure comprised shallow trays six feet long, two feet wide, and two-and-an-eighth inches deep, filled with soil and planted with ice plants (*Mesembryanthemum spectabilis*). Replacing the use of traditional hedges, these boxes provided an arched threshold for the fair; they were

11-10

Ateliers Jean Nouvel, architects; Patrick Blanc, planting design. One Central Park. Sydney, Australia, 2013. [Marc Treib]



11-11

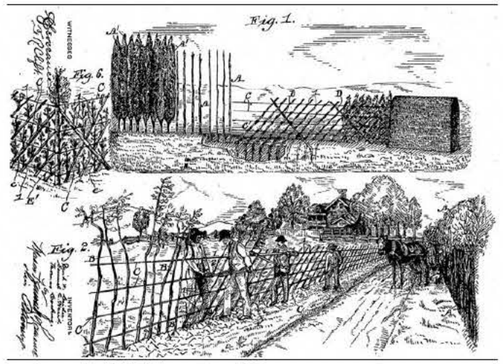
Stefano Boeri. Bosco Verticale. Milan, Italy, 2014. Each floor of the building supports large planters for trees, creating a vertical forest. [Marc Treib]

used in other configurations throughout the grounds. The expediency of this horticultural structure provided the perfect metaphor for the rapidly expanding and urbanizing West.

The hedge-fence at the Panama–Pacific International Exhibition made etymological reference to the miles of boundary fences that crisscrossed the American Midwest before the mass implementation of barbed wire in the late nineteenth century. Early American hedge-fences of the Middle West combined tensile steel wire and unique forms of joinery to weave living enclosures for the agricultural and ranch landscapes [11-13]. Although they varied radically in form and function from their urban counterpart at the San Francisco exhibition, these rural applications shared the common root of combining vegetation with inert structures, thus inventing a third condition in which tectonic elements augment the natural performance of living materials.

Other noteworthy vertical planting precedents include the walled enclosures used by Gertrude Jekyll, who planted the joints of stacked stone retaining walls to support her turning of plant growth from the ground plane to the vertical surface. Jekyll's wall gardens profited from the joinery of stone elements and exploited the cracks to cultivate rock-loving plants in a stereotomic configuration, through which mass and arrangement of the stone allows for growth of the plants in the open masonry joints on both vertical and horizontal surfaces [11-13]. These precedents, in combination with the historical forms such as espalier, arbors, and vine walls, provide the context in which to discuss today's vertical planting.

Permutations of vertical planting, from dry stacked wall to tensile systems to veneer, suggest that the structural origins of the type may also yield insights. The history of vertical planting and its aesthetics is primarily a trace of tectonic and technological innovation in relation to the selection and application of plants in tandem with the evolution of their substrates/soils. Or to put it more succinctly, in reference to vertical plantations: tectonics become aesthetics. For example, Jekyll's walls utilized plant species that were well adapted to rock outcrops and fissures. The midwestern hedge-fences interwove wire with vegetal species such as Osage orange (*Maclura pomifera*) and sea buckthorn (*Hippophae rhamnoides*), two plants that graft and fuse easily. Arbors and ivy walls exploit the capability of plants to attach to architectural construction. In contrast, the hedge-fence of the Panama–Pacific exhibition overlaid a skin of plants well adapted to shallow soils and drastic fluctuations in moisture. The structures that supported this green veneer allowed designers to surpass the limits characteristic of



11-12

John McLaren.
Hedge-fence.
Panama–Pacific International Exhibition.
San Francisco, California, 1915.
The foreground shows the hedge-fence and the hollow wall that supports the thin veneer of planting boxes.
[San Francisco Public Library]

11-13

David W. Crider and Samuel C. Heird.
"Combined Hedge and Wire Fence," U.S. Patent #588,400 (1897).
The fence integrates tensile steel cable and plant. Hedge-fences were common in this era before the invention of barbed wire.
[U.S. Patent and Trademark Office]

11-14

Gertude Jekyll.
Hestercombe.
Taunton, Somerset, England, 1904.
Garden planting and wall enclosure define the garden space.
[Marc Treib]

living plants and augment their growth rate. Increasing the possible heights achieved by these species fostered new compositional possibilities, an evolution that necessitated innovations in areas beyond structure. The advent of hydroponics, formulated by William F. Gericke at the University of California, Berkeley, in the 1920s, challenged preconceptions about the composition and need for natural soil, and liberated plants from their earthly bond. The artificial felt utilized by Patrick Blanc, as well as other lightweight substrates, has led advances in artificial nutrients and irrigation technology.

The structural and horticultural origins of vertical planting are relatively easy to retrace, yet the theoretical origins remained sketchy. In his notes for a 1931 lecture on the modern garden at the University of Illinois, Stanley Hart White conceived a modern vertical garden characterized by modified lightweight substrate and hydroponic irrigation. His lecture notes and sketches of the era reveal two distinct ideas. First, that the "green wall" should incorporate the elements of the landscape—among them soil, plants, water, and birds—composed on a vertical plane rather than on the ground [11-14]. Secondly, structural garden elements supporting plant growth should allow for the free movement of occupants encouraged by a suitably open plan. White advanced this thinking on the subject in an essay titled "What Is Modern?" in which he theorized gardening on the vertical plane in order to free the ground plane for the practice of modern living. "In the first place, there is little reason for introducing extreme decoration into the ground plan," he writes.

> *New ideas of living call for such absolute simplicity that if the plan is perfectly plain it may be best in character. In the next place, a vast field of possibility lies open for development, of the walls in a modern garden and its conceivable that fabricated metal compost filled walls with interior irrigation might be easily devised to produce fine sheets of greenery or color in which the most fanciful imagination of the designer could be expressed in insets of lights, sculpture, or bird cages, fish globes and any other extravagances.*[8]

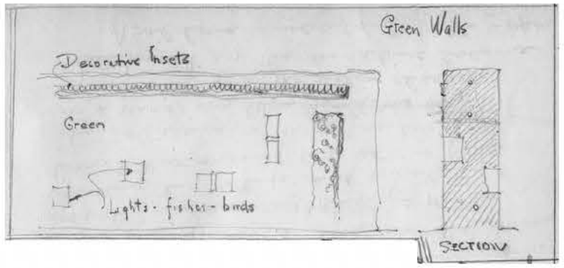
White was not alone in his preoccupation with vertical dimensions in the modern garden. Experiments in volume and spatial layering lead to the creation of new garden prototypes, such as the temporary sculpture garden at the Museum of Modern Art by John McAndrew with Alfred Barr Jr., built in 1939. Garrett Eckbo pioneered theories of the "garden as stage" in his hypothetical project for "Small Gardens in the City," published in 1937, in which

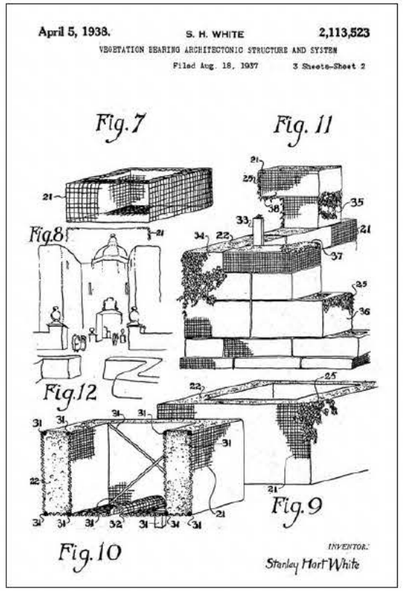
garden designs were developed using axonometric drawing conventions that prioritize vertical elements and spatial layering. Perhaps echoing White, in 1937 Eckbo declared that every "garden is a stage and every person and actor." For White, the solution to this modernist paradigm of the free plan and an increasing reliance on technology were walls tectonic and verdant, and in 1938 he even patented his design as the "Vegetation-Bearing Architectonic Structure and System"—or "botanical brick," as it was referred to, perhaps sarcastically, by his brother E. B. White [11-15].

Tectonically, White's invention was a peculiar inversion of the stone or brick construction utilized by Jekyll in her wall gardens, where the face of the masonry provided the support for the plant. In White's design, a steel frame carried the loads. The utilization of the steel frame to construct buildings of greater height emerged in Chicago near the end of the nineteenth century, when skyscrapers by Louis Sullivan and Daniel Burnham left the ground to seemingly defy gravity. White deftly adapted this structural idea to create the first "modern" vertical garden that set off a chain reaction in which his students and collaborators obtained their own patents for new structural plant hybrids. These included the "Vegetation-Bearing Cellular Structure and System" by William M. Macpherson and the "Vegetation-Bearing Display Surface and System" by Elmer Hovendon Gates also in 1938 [11-16]. A review of patents for other of the era's vegetated structures reveals a diverse set of structural adaptations—after all, modernism sought a "total design" in which every element of architecture and landscape could be reinvented, manufactured, and produced to suit the diverse modes of modern living and, later, rapid postwar urbanization. Modernist principles were not restricted to architectural construction but also propelled the invention of landscape elements that included frames, trellises, and other armatures for hedges; bricks that integrated soils and living plants in the courses of masonry walls; and an array of other planting technologies [11-17].

Thickness, Thinness, and the Role of Substrates in Vertical Planting

The structural hybridity of vertical planting is not strictly limited to aboveground growth. The planting mediums (i.e., substrates) and spatial configuration provide the essential elements for cultivating plants—water, oxygen, and nutrients—in addition to the structural support for botanical architecture and an anchorage for the plant roots. The volume, thickness, and orientation of the substrate play an integral role in structuring vertical planting as they dictate the location of



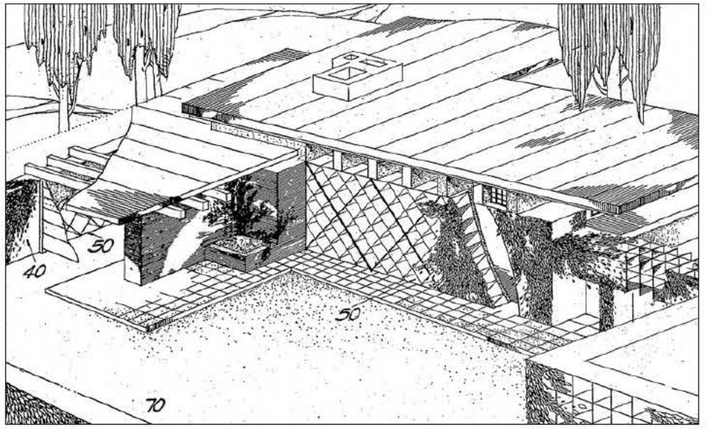


11-15

Stanley Hart White. Green walls, 1932. A conceptual sketch showing plants and voids for lights, fishes, birds, and irrigation. [University of Illinois Archives]

11-16

Stanley Hart White. "Vegetation Bearing Architectonic Structure and System," U.S. Patent #2,113,523 (1938). Drawing of a "botanical brick" and system of assembly. [U.S. Patent and Trademark Office]

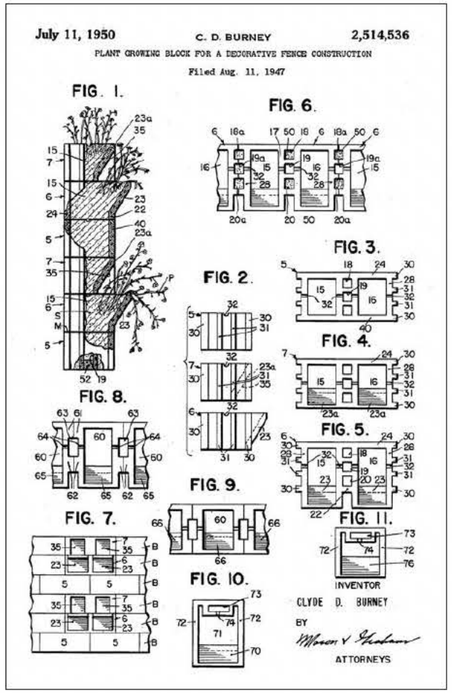


11-17

William MacPherson. "Vegetation Bearing Cellular Structure and System," U.S. Patent # 2,121,173 (1938). Planting substrate and integrated structural system. [U.S. Patent and Trademark Office]

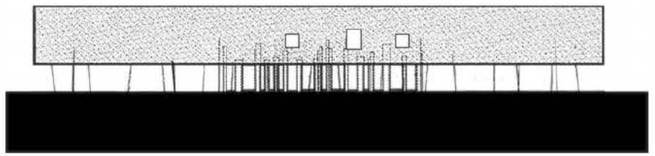
11-18

Clyde Burney. "Plant Growing Block for Decorative Fence Construction," U.S. Patent #2,514,536 (1947). A modified concrete unit in which the planting substrate fills the voids and plants grow from the apertures. [U.S. Patent and Trademark Office]



11-19

Jeff Koons.
Puppy, 1992.
Guggenheim Museum Bilbao.
Bilbao, Spain.
Plants grow on a thin structure of stainless steel.
[Marc Treib]



11-20

Édouard François and Duncan Lewis, architects.
Gites Ruraux.
La Chauvinière, Jupilles, France, 1997.
The drawing shows the relationship of the ground (black) to the vertical structure (hatched) that bounds the planting.
[Richard Hindle]

the plant's root volume and therefore the organization of the planting as a whole. Although substrates and mediums are often masked by living vegetation, when foregrounded the configuration of the planting substrate becomes an important design component that is unfortunately often left unstudied and underrepresented—especially in relationship to aesthetics and plant composition.

Vertical planting can be studied in terms of the relationship of plants to their substrate, and substrates to their structure and/or vessel. Vertical planting on terra firma easily coaxes upwards plants supported by a structure. In addition, vertical planting can also be accomplished by using thin substrates such as felt mounted on a load-bearing wall, or with elevated planters of varied geometrical forms filled with modified planting mediums. Studying the thickness, orientation, and mass of vertical elements hearkens back to the architectural reference to poché (i.e., representation of thickness)—retrieved from Beaux Arts methods as a counternarrative to modernist theories of thinness and transparency. Spence R. Kass has written that

> *If recognition of the poché has helped to reestablish a dialogue between the wall and the plan, it may be expedient to divert some attention to effects of poché on the vertical surface as well, and initiate an argument for façades not as autonomous screens, but as integral to the wall matrix behind. Poché, then, is seen not merely as planar organization, but as a three-dimensional cement that merges throughout the building mass.*[9]

Although anachronistic, arguments for thickening walls may be particularly salient to the discussion of vertical planting. Substrates used in vertical planting may be understood as a three-dimensional material integrated into structure that organizes the distribution of plants through its position and relative thickness.

Four works clearly illustrate these relations among elements and allude to the possibilities of designing with substrate (more accurately, its vessel) as an architectonic element: *Puppy* by the artist Jeff Koons, re-erected in 1992 at the Guggenheim Museum in Bilbao, Spain; the 1996 Gites Ruraux, by Édouard François and Duncan Lewis in France; the 2013 Wall of Hope (Kibo no Kabe) in Osaka, Japan, by Tadao Ando, and the "I'm Lost in Paris" house designed by R&Sie(n) Architects in 2008. To create distinct forms, each project used the volumes of substrate/soil in radically different ways.

Puppy was adorned with 60,000 petunias, impatiens, marigolds, and other annual bedding plants. The vegetation was planted in a thin modified soil retained by a geotextile and wire frame that covered a primary structure of stainless steel. The thinness of the soil and relatively low height of the annual bedding plants were appropriate choices for covering the frame [11-18]. On its web page, the Guggenheim Museum Bilbao describes *Puppy* in this way:

> *With* Puppy, *Koons engaged both past and present, employing sophisticated computer modeling to create a work that references the 18th-century formal European garden. A behemoth West Highland terrier carpeted in bedding plants,* Puppy *employs the most saccharine of iconography—flowers and puppies—in a monument to the sentimental. Imposing in scale, its size both tightly contained and seemingly out of control (it is both literally and figuratively still growing), and juxtaposing elite and mass-cultural references (topiary and dog breeding, Chia Pets and Hallmark greeting cards), the work may be read as an allegory of contemporary culture.*[10]

Beneath the overly saturated color of the planted surface, a thinly veiled layer of soil masks the technological mastery that makes the sculpture possible, and provides not only an enduring critique of culture and its architecture, but also a critical window into many vertical plantings and their greenwashing. The Gites Ruraux, designed by Édouard François and Duncan Lewis in 1996, utilized a different approach. These tourist cottages, situated far from the city center, are set among agricultural fields and a forest of mixed species. The designers of the buildings brought forest planting into dialogue with the structure by surrounding the building with a densely planted bosk, enclosing the planting within an architectonic frame. The trees that accompany the building are planted in soil and their foliage becomes a vertical composition that blurs the line between bosk, frame, and façade. This relationship shapes a distinct perspective on vertical planting, that is, using terra firma as the substrate and the structural frame to organize the form of the aboveground parts of the planting [11-19].

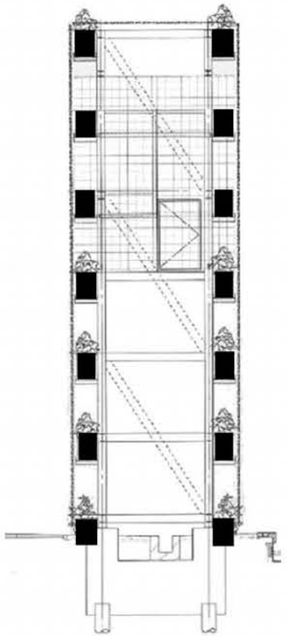
Tadao Ando's thirty-foot–high, 312 -oot-long Wall of Hope in Osaka, Japan, spans a public space at the base of the Umeda Sky Building [11-21]. An architectural frame supports its planting with woody shrubs, flowers, and ground covers. Lines of elevated boxes positioned at each level of the structure feed the woody plants that cover a massive construction that exceeds the growth potential of any individual plant. Pruning follows the guide provided by the architectural frame, creating the impression of a clearly shaped rectilinear mass [11-22]. Horizontal banding is created by the plant species in relationship to the arrangement of the planting troughs. Although masked by foliage, these boxes of soil express the arrangement of plants

11-21

Tadao Ando.
Wall of Hope
(Kibo no Kabe).
Osaka, Japan, 2013.
A green wall 30 feet high, and a 250-foot-long vegetated wall seen from the street.
[Richard Hindle]

11-22

Tadao Ando.
Wall of Hope
(Kibo no Kabe)..
Section showingthe distribution of planters, substrate, and plants within the structural frame.
[Richard Hindle]



within the structure. The "I'm Lost in Paris" House, designed by R&Sie(n) Architects in 2008, enshrouds the building in a blanket of ferns supported by a tensile mesh separated from the concrete walls of the building by a moisture barrier and stanchions [11-23]. Pots, attached at the intersection points of the mesh, are filled with ferns and watered by a concealed system. The result is an integrated mix of vegetation, substrate, and irrigation whose repetitive elements and structure evoke a woven textile, a textile that wraps in greenery the building's volume.

Conclusion

Vertical planting creates unique challenges in terms of spatial design, challenges that necessitate hybrid frameworks and muddle widely accepted practices in planting design. In essence, vertical planting rotates the direction of the surface, and upsets the once stable relationship between ground plane and vegetal compositions. In addition, in rotating the planting plan, the elevation represents an experience modified from the one secured at normal eye level. As a result, certain designs feel thin, while others read as volumetric and highly spatial. These shifts are often made possible by the tight bonds between plants and architecture. When considered broadly, we can trace the evolution of solutions that combine plant and structure that date to early glasshouse experiments, espaliers, sod roofs, and other precedents. Although vertical planting has been part of the designers' repertoire for more than a century, its more theoretical aspects emerged only during the modern era, as formulated by Stanley Hart White. In his patented green wall designs, White integrated vegetation with structure in novel configurations, positing that the vertical garden was the backdrop for the "pageantry of modern living." Whether or not we will turn more fully to vertically orientated planting in the future, opportunities for new configurations exist for restructuring ground plane, plants, and support. This will require new forms of thinking, new substrates, and new structures to support these vertical gardens.

Notes

1 Florence B. Robinson, *Planting Design*, New York: McGraw-Hill, 1940.

2 Marc Treib, "On Plans," in *Representing Landscape Architecture*, London: Taylor & Francis, 2008.

3 Jeffrey Kipnis, "The Cunning of Cosmetics: A Personal Reflection on the Architecture of Herzog & de Meuron," *El Croquis* 3, 2002, pp. 22–28. [[Confirm not vol. 84 in 1997 (could still be no. 3)]]

4 John Hix, *The Glass House*, London: Phaidon, 1996.

5 Brent Richards, *New Glass Architecture*, London: Laurence King, 2006.

6 Laura A. Ackley, *San Francisco's Jewel City: The Panama- Pacific International Exposition of 1915*, Berkeley: Heyday; San Francisco: California Historical Society, 2014.

7 William Frederick Gericke, "Water Culture Experimentation," *Science*, 1450, 1922, pp. 421–422. [[possibly vol. 56, no. 1450??]]

8 Richard L. Hindle, "Stanley Hart White and the Question of 'What Is Modern?,'" *Studies in the History of Gardens & Designed Landscapes*, 3, 2013, pp. 170–177.

9 Spence R. Kass, "The Voluminous Wall," *Cornell Journal of Architecture* 1, 1987, pp. 44–55. [[Possibly vol. 3???]]

10 Guggenheim Collection Online, Jeff Koons, Puppy, https://www.guggenheim.org/artwork/48.

11-23

New-Territories,
R&Sie(n), architects.
"I'm Lost in Paris"
House.
Paris, France, 2008.
Substrate and vessel are arrayed on a tensile steel mesh, allowing for the distribution of plants over the building envelope.
[François Roche,
New-Territories,
R&Sie(n)]