

Tangles and Tectonics: basketry as prototype of 'slow' design

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Abstract

An expanded and contemporary notion of basketry might include drawing, performance, engineering, digital technology and fashion design as well as more familiar variations of art and craft. In articulating basketry as a prototypical process which intersects with a range of disciplines and contexts it becomes apparent that rather than being a modest craft with a finite future, basketry is endlessly adaptable and transformative, to be returned to again and again from a variety of cultural and creative perspectives. Following the transformation of subtle textile-engineering from tangles of scrambling vines or loosely woven nests to digitally-woven structures found in contemporary architectural design and the work of basketry artists, this paper considers the role of basketry in illuminating relationships between biological, proto-cultural, ecologically sensitive and ontologically pertinent structures. Thus refigured, basketry is envisaged as formative, rather than indicative, of the so-called intelligence that distinguishes humans from other animal species.

Phenotype and Prototype

In 2011 the networked world was momentarily bombarded with images from western Brazil of members of a so-called 'un-contacted tribe' standing in front of a palm-frond house surrounded by baskets for gathering and storing food (<http://www.uncontactedtribes.org> accessed 30.08.2013). Images were publicised within weeks of a fanciful, symbolic but meticulously crafted basketry-type cat-walk 'garment', a product of an *haute-couture* fashion tribe and a named contemporary Brazilian designer, Samuel Cirnansck (<http://wodumedia.com/today-in-pictures-jan-29-2011/sao-paulo-brazil-a-model-wears-a-creation-by-samuel-cirnansck-during-sao-paulo-fashion-week/> accessed 30.08.2013). The chains of continuity between cultivation and culture, function and aesthetics, anonymity and named designer appear extensive in this comparison but are held together through hand-crafted basketry or basketry-type technique and materials; the garment, the palm frond shelter and the baskets signify one formative process linking nature to culture and culture to nature, on equal terms within the orbit of the contemporary.

Such contrasting examples of basketry highlight an awkwardness in the way in which the term 'contemporary' is typically understood; examples point towards a unifying interweaving of nature and culture while at the same time demonstrating challenges that are not so easy to reconcile. In the so-called developed world, traditional basketry production rarely makes economic sense and typically makes excessive physical demands on the body. Further, the global onslaught of mass-production and advancements in materials science, computer-aided engineering and

production technologies have displaced or threatened patterns of inter-generational skill acquisition, apprenticeship and training of basket-makers. For example, in Nha Trang, in Vietnam, fishing-boat makers are engaged in a diminishing craft of bamboo boat building while in the same town, rattan furniture is being made for the rapacious market of a so-called developed world. Roughly 25% of the furniture produced in the Far East for export uses rattan in its construction, thus there is a fair chance that a basketry chair bought today in an out-of-town mega-store, will be made of it; it is abundant, lightweight, durable, relatively flexible, resistant to splintering and easily stained. But its 'success' is not without cost. As a result of over-production the last few years have witnessed uncontrolled harvesting, deforestation and a rapid decline of natural rattan resources. And when the seat of rattan chair comes to the end of its life the inclination will be to throw it away – the services of the local artisan who once specialized in chair-caning are also in decline.

Beyond the challenges that such examples represent, a larger picture emerges in which basketry can be figured as versatile, aesthetically distinctive and technically resilient, a medium which earns laurels as a survivor in an evolutionary survival of the fittest. Processes of formation disappear in one context only to re-appear in another, sustaining a balance between loss and gain as successions of makers and users embrace both its containment as a recognizable medium and its diversification. A simply-woven leaf construction from a remote village in the Amazon, a multi-national trade in rattan furniture, a digital sketch for a high-rise building, an *haute-couture* fashion statement, a finely-crafted artefact and an earthwork might all pertain to contemporary basketry. Thus rather than being perceived as anachronistic and of lowly status, basketry might be conceived as a prototypical medium of transferable knowledge, informed by and informing a variety of disciplines. Mediating evolution and the contemporary as a compelling archetype of 'slow' design, basketry-related practices can also stand for and contribute to the timely impulse for increased ecological sensitivity. Nature and culture are interwoven through basketry, each responding to the other in turn and moving with the times in endless reconfigurations but sometimes picking up a strand or pattern that links the process back to an ever-receding starting point.

In this paper the ethnographic and craft-based characterizations typically associated with basketry are re-figured as a hub in a web of exchange with related disciplines such as nest building, architecture, fine art and design, biomimetics and computation. Of course basketry has never been an isolated phenomenon and has always pertained to many such relationships, but one characteristic of a contemporary perspective might be a more focused and 'critical' articulation, explanation and communication of the interconnections, reflecting the open-endedness and continuing relevance of the medium.

Natural morphology, whether approached instinctively or reasoned through science, is a significant source of inspiration, frequently pitted against a perceived tide of consumerism. Within its embrace artists, craftsmen and designers are resisting the current of mass-production to explore the potential of contemporary basketry practices to rediscover and reinvigorate processes that are driven organically. In a parallel but interconnected development, basketry's affinities with morphogenesis have contributed to explorations in contemporary architectural practice involving new materials and digital technology. 'Tangles and Tectonics' follows the transformation of subtle textile-engineering from tangles of scrambling vines or loosely woven nests to digitally-woven structures found in contemporary architectural design and the work of basketry artists. This is not, however, a one-way trajectory; the relationship between tangle and tectonic is one in which the tectonic looks to the tangles that inform the ordering principles of morphology and construction. The generation of the basket as phenotype is interwoven with basketry as prototypical of a sophisticated ontology of making, a form of mediation, bridge-building or synthesis inter-linking diverse cultural manifestations of nature.

Tangles

It might seem curious to begin a discussion of basketry from the perspective of the tangle, but many contemporary artists and craftsmen have (re)discovered the potential of vines, twines, rods, grasses and twigs to describe irregular or chaotic form, despite the fact that irregular, rough, coarse, free or unsystematic weaving is rarely discussed in traditional basketry literature. As a sign of a rejection of the conventions of 'traditional' techniques and functions of basketry, the tangle has become one of the salient characteristics of contemporary work; certainly it is a trajectory opened up by an expanded context for contemporary basketry-type practice, as witnessed by the *haute couture* creations of Cirnansck. It may be instructive, therefore, to try to put this phenomenon into some form of perspective.

The engineering of living plants may be considered as one formative or intimately related aspect of the development of the irregular with reference to basketry. The adaptation of naturally-occurring, irregular interlacing of roots and vines has a long history but it is also one which is coming to the attention of contemporary designers for whom scientifically-verified, horticultural techniques are referred to as arbo-architecture or botany building. The traditional practice of interweaving the convoluting, living roots of the *Ficus elastica* tree, over a number of years, to form strong suspension bridges, up to a hundred meters in length, across raging torrents of water, in Cherrapunji, India, is a long-established example of botany building. Such engineering has its roots in a natural morphology that is as significant as a source of inspiration for many contemporary practitioners as are the products of historical basketry.

Techniques as adapted or mimetically transferred from nature through the materiality of gestures and ingenuity of technical know-how also offer a way of working that in part parallels constructions made by animals, notably the nests built by birds. Whether well-founded or not from a scientific perspective, the perceived link between non-human or animal 'architecture' and basketry is nevertheless resilient and it is common sense to suppose that the origins of basketry drew inspiration from nest building and shared at least some of the same materials. Not only the elegant, plecto-morphic constructions of weaver birds but also the more or less stacked stick formations of the stork or even the roughly thrown together nests of the gorilla might serve as example. In their 1984 study of *Nest Building and Bird Behaviour* Nicholas and Elsie Collias suggest that the early forms of weaving, of the kind associated with basketry, may not have been as regular and precisely symmetrical as later examples became, thus the fact that the earliest known baskets display symmetry and regularity should not be taken as a sign that this was always the case. They also note that weaving done by birds has itself evolved. (Collias & Collias, 1984: p.206)

The architect and theorist Juhani Pallasmaa suggested that "(c)onstruction in traditional cultures is guided by the body in the same way that a bird shapes its nest by movements of its body", a perception that might be equally true of much experimental basketry today. (Pallasmaa, 1996: p.16) Resisting the patterns, techniques and contexts of conventional structures and functions, such basketry is open to a renewed investigation of raw materials. Although never adrift from the social and cultural context in which they come to be shown and represented, such practices encourage sympathy for pre-cultural reflection and a sense of evolutionary coherence within the present. The relationship between natural morphology, animal architecture and the beginnings of architecture is one such chain of adaptive association, echoing Gottfried Semper's reflections on the origins of building in terms of "textile walls" that are "more or less artificially woven and seamed-together" in a "technique that nature, as it were, put into the hands of man". (Semper 1860, trans. Mallgrave and Hermann 1989: p.254-5)

The relationship between regular pattern and irregular formation is complex, and in basketry which makes use of natural materials there will always be both, despite the fact that historically it is the regular pattern-formation of plaits, coils and weaves that has predominated to date. Whether persuading withies and rods to conform to the geometry of a container or trap, managing the tangled vines of rattan to serve the needs of a market for modestly-priced furniture or articulating recognizable symbols in the ordered shapes and patterns of a basketry bowl, the controlling of wild and irregular nature typifies intentions that mirror a broader cultural impulse to order. The random, irregular, rough and chaotic might appear to represent the antithesis to such ordering but they also point to characteristics that are latent in the morphology of materials.

Plant materials have their own 'behaviour', as do the intentions of the maker. Each rod of willow or rush and each pine needle, sea grass or palm leaf is similar to the next, but each is different, subject to natural proclivities with respect to the circumstances of its growth. Each rod of willow, for example, is shaped not only in the narrowing from butt to tip but also by irregularities of growth or through variations that may have resulted from preparation processes. This shaping of the relationship between regularity and irregularity contributes to the distinctiveness of traditional basketry in which patterns of increase and decrease can be accommodated, variety can be exploited or tamed, pliability and rigidity can be encouraged or discouraged and techniques can be adapted to the inherent complexity of the material.

While such knowledge of materials may become mechanistic in some cultural contexts, for many contemporary makers, for whom tacit exploration is primary, the less regulated approach has much to offer in the exploration of basketry as a medium of invention, pointing towards configurations of material that represent less clearly mapped regimes of knowledge. The gathering and processing of the raw materials continue to be fundamental whether the contexts are creative or economically-driven, but there is increasing experimentation and articulation of the complex 'language' of materials in the expanded field of contemporary basketry practice. Performative, tacit knowledge is not easily verified except by example, but is nevertheless indicated through examples of contemporary basketry in which possibilities inherent in the properties of the materials themselves (and the discovery of new materials) are opened up and made visible through experiment and reflection.

Within the historical context for basketry, a technique of irregular woven structure has been familiar at least since the mid 19th century as one of the styles typical of Japanese ikebana basketry in which a technique known as *ara-ami*, meaning rough or coarse plaiting was sometimes employed. Later, *mizore-ami* indicated a further development in which random interlacing and 'the voice of the bamboo' was seen by some basket-makers of the Shokosai lineage as central to a shift between craft and art. (Coffland, 2011: p.4) Subsequently, with the development of 'studio' basketry in the 1970s and 1980s, notably inspired by the work of Ed Rossbach and John McQueen in the USA, creative basketry has further challenged the scope of traditional basketry to admit the irregular not simply as a basketry technique but as a creative credo.

The Japanese artist Hisako Sekijima (*Fig. 1*) was influenced by Ed Rossbach and John McQueen in the late 1970s before returning to Japan in the 1980s to live and work. One of the most articulate, innovative and influential of contemporary basketry artists, Hisako's work combines the irregular and the regular potential of materials as well as conveying this interweaving through language, thus extending and further exploring a sense of a pattern in terms of thought and behaviour. She says:

I define a basket as an object, often a vessel shape, created in a textile structure, where the dynamics of each component are visible. My expanded definition includes anything implying a relationship to

basketry in its technical, aesthetic or functional terms. To me that vocabulary includes: lines bending, looping, passing under, over, crossing; resilience; flexibility, self-supporting, standing, rigid; planes folding, bending, layering to obtain volume; drawing lines in space, filling space; eliminating material to form space into parts.....repetition, rhythm, texture, pattern, order, disorder....cutting, peeling, piercing; breaking, unweaving, making holes. (Sekijima, cited in Lonning 2007: p.117)

She also comments that she prefers working with “crude materials” “because they give...more problems” “in my effort to match *my* reality with *nature’s* rules”, (Sekijima, cited in Lonning 2007: p.117), and that “as soon as I stopped forcing materials into a pre-designed form and let natural materials transform themselves, I found the inherent properties were more effectively revealed” (Sekijima cited in Faulkner 1995: p.99). Expressed in these terms, basketry can be seen as an intersection between responsive patterns of making and patterns of morphology. The hand-made prefigures the machine made but both are prefigured by morphological structures as found or sensed in nature.



Fig. 1 Hisako Sekijima *A Hole to See*, 2006, black bamboo (Hisako Sekijima, with permission)

From an aesthetic perspective that which might appear relaxed or free-spirited is not necessarily easier to accomplish, technically speaking, and from an engineering perspective the regulated weave is not always more robust than the irregular. Whether formulaic or chaotic, the aesthetic and technical are often finely calibrated. Whereas it might be considered that a woven structure implies a more knowingly self-conscious configuration of forms than an apparently chaotic tangle, the reverse might be equally true. In effect, contemporary investigations of the irregular are always contained and fashioned to adapt to cultural contexts within which they are displayed, as if the irregular is but another type of pattern. Even the work of those artists whose entangled twigs are designed to return in time to the innocent state of ‘nature’, deep in a forest or park at the mercy of the elements, reflects the outcome of a conscious play of signification.

Laura Ellen Bacon is typical of many artists whose work explores a common morphology between the growth of a plant such as a tree, the construction of birds’ nests, the inventive work of nest-like basketry and proto-architecture. The result is nevertheless distinctive in the manner in which it is formed, of pairs or multiples of carefully selected willow rods woven together to form bulbous forms and deep convex hollows. The appearance is of a random weave but the process is one which demands a fine precision and modulation of the developing structure. As well as a careful study of animal architecture the dens she constructed as a child have been an important source of inspiration, the latter indicating that the affinities with nature may incorporate subjective reference as well as environmental concerns and biomimetic sympathies. In describing her work she has said that once she developed a way of working with the

materials “I quickly began an instinctive process of weaving around myself with whatever was to hand”. (Bacon 2010: p.13) *Oak Forms* (2006) (Fig. 2) is sited, in a landscaped garden open to the public, amongst the branches of a tall oak. The forms convey the poetic allusion of a cathedral for birds or squirrels.



Fig. 2 Laura Ellen Bacon, *Oak Forms*, willow, Sir Harold Hillier Gardens, Hampshire, U.K. 2006 (Laura Ellen Bacon, with permission)

Follies

In Japan and China the irregular tangle has long been an established trope of philosophical speculation. Thus in the seventeenth century the British emissary Sir William Temple referred to aspects of Chinese gardening which were haphazard, irregular and asymmetrical as *sharawadgi* or *sharawadgi*, a term thought likely to be a Chinese-whispers rendering of the Japanese *sorowaji* or *shorowaji* meaning asymmetry, unevenness or irregularity or even to the word *sawarinai* (触らない) “do not touch; leave things alone” (Takau, 1997). Something of this philosophy was referred to and represented in the follies and grottoes that countered the severity of classical architecture in the context of eighteenth-century landscape gardening. It could be argued that the many contemporary structures using basketry techniques and materials that have appeared in parks and gardens in recent years are reminiscent of such follies, examples of picturesque longing which sets the romance of the other against the tide of urban development.

Often made out-of-doors in parks, fields or woods such structures might be characterized not so much as forms of sculpture, craft or design but rather as locations of retreat or shelter from urban dystopia. These contemporary follies offer a mutation of specific functions; animals might build their homes and the garden dens of childhood might be revisited in tandem. While most basketry has traditionally been inseparable from practical application or strategies for survival, the contemporary cultural climate of fields such as fine art encourages the generation of abstract, symbolic and conceptual representations for which basketry-related practices address audiences rather than users. The semiotic associations of basketry are identified and explored. Shelters, domes, dens, nests, hollows and excrescences are knowingly constructed, perhaps in remote locations (which are then, typically, photographed) or as performative-type installations in public view. Such work communicates an escape from and reflection on human culture but also enables basketry to unleash some of its previously ‘hidden’ potential as a typology which shares many characteristics with construction activities in a garden.

Very simple approximations of basketry technique have been important features of much environmental artwork in recent years. Roughly woven or stacked sticks, sometimes bound together for support, are not unknown as a 'studio' or even traditional basketry technique. But in this broader context they can assume monumental and thus heightened symbolic scale. Techniques might include the binding, nailing or knotting together of stems, rods or twigs or even the simple sticking together with earth, of stacks of sticks, as in Nils Udo's *The Nest* (http://greenmuseum.org/content/artist_index/artist_id-36.html accessed 30.08.2013). Technically speaking we are on the edges of basketry here, in the manner of an extended family creating new allegiances and contexts to which an expanded perspective on basketry might refer. Typically sited, as is *The Nest*, within a natural environment, the symbolic 'natural habitat' resonance of such structures can also be located in the centre of the urban environment. Rather than being *in* an art gallery, they can, on occasion, be on top of it, as if indicating the larger environment within which the iconic spaces of modern culture are contained. It is also indicative of the scale of such constructions, whether in nature or the city, that they have become spaces to be inhabited rather than simply observed.

As nature and artifice grew together in the wake of Land Art and Arte Povera in the late 1960s, the artist-makers of nests (and baskets) grew in ambition. Publications such as Buckminster Fuller's *Ideas and Integrities* (1963), Bernard Rudofsky's *Architecture Without Architects* (1964) and *The Whole Earth Catalog* (1968 onwards) established further contexts to which basketry might refer. In an indicative chain of association, Buckminster Fuller references basketry as seminal in the construction of the geodesic dome, thus

Class one of all history's domes is comprised of the hundreds of millenniums-old upside-down baskets which include the later evolution of baskets into boats and the re-upside-downing, once more, of boats to form the roofs of community meeting places and its later derivative *cathedral*. (Fuller, 1963: p.202)

Parallels between building and basketry can be particularly revealing. Pallasmaa describes buildings as "usually complex practical devices, made to facilitate and organize human activities. They also structure human relations, interactions, perceptions and behaviour". He suggests that, like architectural constructions, basketry constructions provide "important frames and horizons for understanding the world and the *conditio humana*" (Pallasmaa *et al*, 2002: p.20).

Such constructions can present this condition as predominantly chaotic. *Big Bambú: You Can't, You Don't, and You Won't Stop* (2010) was a temporary bamboo structure on the roof of the Metropolitan Museum of Modern Art in New York, constructed by a team of rock climbers led by artists Mike and Doug Starn, the interior of which visitors could explore. "Inside you feel that you are in an extremely weird sort of housing constructed by gigantic creatures – dinosaurs or extinct birds, perhaps." (Temin, 2010: p.33). The following year the work was re-incarnated, as a hollow sixty-foot tower, close to the Peggy Guggenheim Collection, for the 54th Venice Biennale (http://www.dmstarn.com/big_bambu_venice.html accessed 30.08.2013). Working from scale models made of willow, the skill of the rock climbers included a variety of knotting and binding techniques which were essential in strengthening the random interlocking of thousands of 30-40 foot lengths of bamboo with nylon rope; 'the rock climbers were our hands and our bodies that allowed this organism to grow' (Starn and Vogel, 2011: p.2). In both New York and Venice, communicating a sense of engineered chaos as organism was an essential characteristic:

we have a philosophy of chaotic interdependence; of how every complex thing grows and evolves (animal, social structures, etc...), and *Big Bambú* actually physically presents it, it is philosophical engineering. Everything depends upon one another and the loads are distributed throughout, the interdependence is natural and fluid. (Starn, 2011)

In Venice visitors were able to climb a spiralling ramp within the mesh-like network of the tower walls, to a *belvedere* platform overlooking the Grand Canal. From above and from below, the visual effect was that of a folly in the form of a very large basket or tall nest. The effect of four different kinds of bamboo, many still with leaves attached, added to the sense of inhabitation.

As the work of Bacon and the Starns indicates, irregular structures are not necessarily weak. Within contemporary architectural design the term 'chaotic weaving' is used in the context of computational and algorithmic systems to pertain to patterns of energy that may not be visible except with the aid of microscopic photography. The idea is that multidirectional structures use fibres in a random pattern to resist multiple loads, acting as membranes because they can deform without breaking, like non-wovens such as felt. At the School of Architecture of the Universitat Internacional de Catalunya a team of architect students have used computational systems for calibrating the unseen structures of an eggshell with a view to reproducing the shell's membrane in a form that can be developed in architectural contexts (Estevez, 2005, pp. 114-115). The resulting patterns and models resemble those of many artists and craftsmen working by hand with traditional basketry materials.

Towards the Tectonic

Biological systems and morphological structures can be described in terms of self-organization, in other words they demonstrate a tendency to organization, however random they may at first appear to be. In locating basketry within an extended evolutionary context (in which weaver birds and *homo sapiens* are both recent or late developers) the sponge known as *Euplectella aspergillum* or, more commonly as the Venus' Flower Basket, is of interest. It is formed biologically of fine glass-like fibres which appear to the human eye in the form of a geometrically configured skeletal or cellular structure. It functions as a home to shrimps, and like all sponges it is shaped in such a way as to maximise the flow of water through itself, the means through which it functions as a living organism in the deepest of seas. Figuratively speaking it is both nest and basket. Enlarged in scale it is not dissimilar in appearance to the Starns' Venetian tower.

Given the extent of affinities between the materials and processes of basketry and living forms, the relationship between biological and proto-cultural structures might be further addressed with reference to biomimetics, the application of the engineering principles of biological systems to tectonic design. In this respect it is instructive to be reminded of D'Arcy Wentworth Thompson's 1917 book *On Growth and Form*, a long-standing formative source of basic biomimetic principles for artists and designers, in which he considers morphology within the context of mathematical theory, uncovering "homologies or identities which were not obvious before, and which our descriptions obscured rather than revealed" (Thompson 1961: 270). The system of Co-ordinates, which he adapts from Descartes, is a way of transforming an irregular shaped object (it could be a fish or a willow rod, or a bone) into a net formation. Once the net has been established (which will translate into a table of numbers) the object can then be reconstructed over and over again ('at pleasure', according to Thompson). His intentions were to create a model for comparative zoology, especially as regards evolutionary morphology, but the net can also be deformed or transformed, in other words creativity with the system can allow it to be used for hypothetical structures or to transform one object into another, "as ... the sculptor models his artistic product" (Thompson 1961: 273).

Nets are, of course, in a different context, forms of baskets, and knowledge of mathematically cognate forms of pattern are intrinsic to basketry technique. What Thompson envisages is that through mathematical theory it might be possible to “rise from the conception of form to an understanding of the forces which gave rise to it” (Thompson 1961: 270).

Thus the mathematical systems that hide within the molecular structure of plant materials might be intrinsic to the forms that are made manifest through basketry-type processes. Basketry engages with species-specific patterns of growth such that different basketry techniques and structures are moulded by the inherent characteristics of the (sometimes processed) raw material. Pattern, so often misunderstood as some form of the decorative, is a mechanism of articulation, in the sense both of engineering and of comprehension arising from neurological adaptation. Interaction between material and maker takes the form of a mechanism which has been described as a ‘dynamic process of pattern formation’ (Camarzine *et al*, 2001: p.29). Transitions from one pattern to another may emerge through stimulus-response relations, thus

a particular structure stimulates certain building behavior (*sic*) that gives rise to a new aspect of the structure that provides a stimulus for the next phase of construction. Through a chain of such linked stimulus-response relations, the structure arises, following a fairly rigid construction sequence. Deviations from this sequence caused by accidents...are managed by backup stimulus-response relations. (Camazine *et al*, 2001: p.53)

We might argue that basketry is an intermediary level of complexity within a dynamic process of pattern formation. Michael Hensel, Achim Menges and Michael Weinstock, formerly directors of the Emergence and Design Group at the Architectural Association in London are currently developing dynamic systems of interaction and integration within natural ecosystems for use in architecture and design (Hensel, Menges and Weinstock 2004, 2006, 2010). They are in effect adapting morphogenesis and structures in nature to computational systems, incorporating ‘iterations of physical [phenotypic] modelling’ (Weinstock 2004: p.11) which, among other sources draw on D’Arcy Thompson’s consideration of the relationship between biology and mathematics, the pioneering tectonic work of architect Frei Otto and on principles of self-organization within biological contexts. What is interesting is the way that many of the forms that emerge have affinities with, or are inspired by basketry. Especially they consider the relationship between ‘flexure’ and ‘stiffness’ in terms of the continual feedback loop between form and the ever-changing dynamic of pattern in which ‘the change in geometry disrupts the pattern and a new pattern emerges, which initiates new morphogenetic movements’ (Weinstock 2004: p.15). In accordance with the dynamic formation of pattern, processes produce, elaborate and maintain the form of natural systems, and those processes include dynamic exchanges with the environment.

Managing the relationship between flexure and stiffness is one of the defining technical skills of basketry, and it is therefore not surprising that Hensel describes one of his form-finding projects, for a World Centre for Human Concerns articulated as two large interlocking structures with the ‘potential of the envelope to flex and to redistribute forces across the strands of the basket’, in terms of ‘basket-type morphologies’ (Hensel *et al* 2004: p.31). In another project (*Fig. 5*), the architects explore high rise structures in which the support system and the intelligent skin are integrated, referencing basket-type morphology in terms of the organization of ‘differentiated bundles and braids’ (Hensel *et al* 2004: p.43). Baskets are important as models for architecture because they are flexible but don’t collapse; they ‘can accept several local disruptions without collapsing globally’ (p.41). Interestingly, the architects suggest that baskets have more material than is strictly necessary for supporting simple loads, indicating that basketry might learn

from architecture ways in which it might be possible to do more with less.



Fig. 3, Michael Hensel, Achim Menges and Michael Weinstock, Evolved double-helix structure, 2004

A further contribution from the Emergence and Design Group concerns their interest in the biology of plants, analysing, for example, minute variations from one part of a plant to another, or even from one movement of neurological behaviour to another. According to their analysis of bamboo, the distribution of fibres and bundles of bamboo according to height and slenderness behaves in such a way that strength increases at the thinner end of the bamboo in proportion to the stress effect of wind and water, leading to the conclusion that bamboo has ‘twice the compressive strength of concrete and roughly the same strength-to-weight ratio of steel in tension’ (Weinstock in Hensel *et al*, 2006: p.31).

For the Japanese basketry-artist Ueno Masao (b. 1949), such research is likely to confirm the knowledge which he has developed through his extensive experience as a maker who, in his sculptures and site-specific installations, has explored variations of the traditional technique of circular plaiting known as *rinko ami*, using madake bamboo which has been very carefully selected from bamboo groves close to his mountain-village home. Perhaps in response to the proximity of the grove he has described space itself as “filled with materials, in a manner akin to a woven bamboo basket” (East Meets West, 2007: p. 64). In his *Bamboo Shoot* of 2007 (Fig. 4) the intimate knowledge of bamboo pervades the space which is inhabited by the sculpture. He begins his sculptures by drawing a series of lines to form a volume and structure which lets “the light and air invade the inside”, allowing the surface of the volume to penetrate the environment around and within the form (Ueno, 2011). The intimate relationship between the forms of Ueno’s basketry sculpture and the environment in which they are formed parallels patterns of association pertinent to the architecture of emergence.¹

1 Michael Hensel and Achim Menges draw on Jacob von Uexküll’s notion of *Umwelt* to elaborate their account of the spatial relationship between material forms and the environment. (Hensel *et al* 2009 pp. 195-215)



Fig. 4 Ueno Masao, *Bamboo Shoot*, 2007, bamboo, gold dust, lacquer
 Fig. 5 Ueno Masao, *The Snail*, 2009-11, bamboo, gold dust, lacquer
 Fig. 6 Ueno Masao, preparatory y axes diagram for *The Snail*, 2009-11
 (Ueno Masao, with permission)

Ueno trained as an architect before studying bamboo and his designs are inspired by architecture and mathematics and sometimes developed through computer-assisted design software, but he has remarked that this aspect does not account for the work; “computers and mathematics don’t make any kind of images by themselves” (Ueno 2011). For *The Snail* (2009-11) the shell form itself and initial hand-drawn sketches precede the parametric equations of computer modelling but even the final form is not an exact translation of the digital diagram which informed it. (Figs. 5 & 6). The process is envisaged by Ueno as a continuum informed and guided by the “natural”.

Conclusion

The singular act of making a basketry artefact draws on and informs skill-sets and ways of knowing that are transferable, elucidating aspects of culture and technology in the light of their interface with the natural world. Basketry might in conclusion be envisaged as formative, rather than indicative, of the so-called intelligence that distinguishes humans from other animal species. With the advent of theories of emergence in contemporary architecture alongside current ecological circumstances necessitating a concern for economy in the distribution and deployment of raw materials and energy, it is timely for basketry to be redefined. The contemporary enthusiasm for adding the prefix *bio* to terms for systems and processes that look towards ‘nature’ for explanation or understanding or new knowledge, as in biomimetics, bio-culture, engineering, genetics, technology, morphology and ethics, parallels the needs of a contemporary cultural outlook that finds itself threatened by its own success to attend to the sometimes invisible ‘roots’ of nature. But whereas a notion of culture ‘rooted’ in nature suggests a Cartesian, diachronic and etiological evolution, a more synchronically intertwined relationship, combining inchoate tangle and tectonic construction might reflect a more coherent sense of continuity across time. Basketry, in the interdisciplinary intertwining outlined here, might exemplify such continuity.

Sources

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