Zeitschrift: Pamphlet
Herausgeber: Professur für Landschaftsarchitektur, Christophe Girot, ETH Zürich
Band: - (2015)
Heft: 19: Field instruments of design

Artikel: A return to terrain
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DOI: https://doi.org/10.5169/seals-984659

A RETURN TO TERRAIN

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Prologue

Each and every landscape on earth is unique because of its particular cultural context, climate, topography and location. In light of this assertion, why have we accepted to work with landscape methods that tend to be systematic, universal and oblivious to most of these local nuances? Whereas architecture can effectively lay claim to some international form of design through Modernism and Postmodernism, with ready examples that attest to the existence of a built culture that is common to many regions of the globe, landscape architecture can rarely make such a claim. Landscape, in general, tends to remain very regional in scope because it is intimately bound to local language, forms of dwelling and customs. This essay is a plea for a return to terrain, for the recovery of a fuller understanding of the potential and meaning of a site, using appropriate instruments and methods.

In spite of our rapid ascent into a world of advanced computerized landscape design, we must step aside from virtual reality in order to come to grips, once more, with the thorny and sometimes treacherous reality of terrain. The reason for this renewed awareness of terrain is the increasing pace at which change is occurring in many regions of the world. Terrains are being rapidly altered due to marked social and environmental factors, such as floods, droughts, sea level rise, urbanization and increasing needs for transportation, to name but a few. We need to cultivate an intelligence of place in the form of an informed awareness that can become a prelude to design. The embodiment of a landscape has always been a strong cultural act of transformation, which engages our understanding of scales, in terms of space and time, and both physically and emotionally. For this reason, precise measurements and field investigations are essential to a renewed understanding of terrain.

Origins of Terrain

Terrain is a notion that reaches all the way back to a time when simple human and animal paths canvassed the territory. These early paths trailed over long distances and reflected the natural features and unique qualities of ground. Simply put, back then a path was just a stretch of trodden ground, be it mud, soil, sand or stone. This primitive

trampling brought out the distinct character of a place. With gravel cracking and dried leaves crunching beneath our feet today, sounds and smells still evoke place as if they expressed the very substance of the land. Likewise, treading on an "original," untouched terrain might awaken our sensory impressions to qualities that are distinct from any other place. But the ancient trail winding through the territory gradually became a geographic trajectory, a Broadway of sorts, experienced as a transect resolving distinct problems on a terrain through the application of complex systems that tend to challenge a place's local properties, quirks and accidents. Over time, our understanding of terrain has become much more abstract. It now signifies the bare expression of particular ground conditions within various gradients—of naturalness, urbanity, dryness, humidity, flatness and roughness.

Recently, terrain has acquired a different meaning and dimension altogether. It has become more quantitative and geographic in its purpose and, at the same time, somehow also further removed from the haptic reality it originally embodied. Our primitive feet, which once walked the ancient paths, have been replaced by a pair of hands diligently typing away at data reflected to us on some digital display. Terrain, divorced from the reality of the ground, has become a geographic tract seen through the lens of investigative maps, in which trails and strategies are shown as vividly-colored lines and surfaces that reveal the potential for either conservation or rapid transformation. Although it would be interesting to trace back the genealogy of this actual withdrawal from physical terrain, this is not the subject of this essay. The topic at hand is how one goes about apprehending a landscape today, and with what intent or purpose. One cannot stress enough the significance of one's first encounter with the actual touch and smell of a terrain. This emphasis on direct contact with terrain is not necessarily to re-enact some archaic form of relationship to place—invoking, for instance, the long lost genius loci; the intent is to investigate more accurate and genuine ways of returning to a terrain, to develop a projective approach, which will, in turn, considerably affect the way we design. This informed approach has the potential to completely change the course of a project and to alter our way of acting upon a landscape.

Sensing Terrain

Despite all our noble intentions, the question remains: What is the key to a sensible return to terrain? And how does one enter, see, feel and respond to a landscape with proper intelligence in today's context? A genealogy of remote sensing could help us to better understand the situation at hand. The earliest examples reach back to ancient Sumerian times when engraving plots of land onto small clay tablets established a form of mapping terrain. The groove carved into the surface of the clay by the reed stylus was an exact dimensional reduction of the actual field as surveyed with rope and chain and marked by a plough. Each tablet described and precisely quantified large tracts of land onto the planar surface of a small tablet that could be held in the palm of a hand. Although the tablet did not mention anything about the particular qualities of the terrain apart from its specific shape, dimensional ratio and area, the land between the Tigris and the Euphrates proved monotonous and relatively flat—in other words, it didn't necessarily call for additional information. The materials of the tools, that is to say, the clay of the tablet and reed of the stylus, gave birth to cuneiform writing and mathematics, further expressions of the essence of place. It is the intelligence of this early surveying technique and its subsequent translation onto clay tablets that marks the first conceptual shift in our understanding of terrain.

The earliest maps from China, made in the State of Qin, were of a completely different order than the clay tablets of Mesopotamia. They were painted onto blocks of pinewood with a brush and black ink and intended to show the geography of the entire Jialing River and its tributaries as they flowed through a district of Sichuan. These maps did not depict parcels of allotted land but rather the particular morphology of the terrain within the kingdom. The early Qin maps were less a commentary on man-made design and more a depiction of a natural landscape, a microcosm in its entirety. Nothing in the depiction hints at human intervention; it only shows rocks, trees and riverbeds. The terrain is, essentially, shown in its natural state. What is surprising in this early work is the quest to describe terrain, even the world, as a whole.

In Roman times, terrain came to be gridded. It stood for the cardinal expression of the *cardo decumanus*, which defined not only a matrix of roads with the help of a *groma*, but also the entire perimeter of a city with the help of a plough. The *sulcus primigenius* was the effective action of ploughing and carefully urbanizing a particular place, circumscribing the *domi* toward the inside and the *foras* toward the outside. Landscape was seldom drawn on parchment, and in that case, only to show an *itinerarium* at a continental scale, as with the famous *Tabula Peutingeriana*. Romans were the great fabricators of terrain across the Empire; their grid system was repetitive but it adapted well to local conditions. It is remarkable to think that most Roman aqueducts were placed so precisely on the incline of a given terrain at the periphery of a town that these structures still serve the same purpose to this day. It is not so much the drawing as the expression of a particular intelligence of landscape that affects the terrain.

The Renaissance and Baroque periods saw the emergence of tools focused on perspectival projection, which entirely changed the relationship to terrain. It is worth noting that the plan was not always used as a tool in landscape design; rather, a landscape was conceived directly on site with chains, poles, ropes and the help of range finders. The overall plan was only drawn thereafter, once the landscape had been made, in accordance with the canons of perspective. Most early geometric and curvilinear landscape projects were indeed traced, modelled and tested directly on site. Those built in Baroque times used an elaborate system of triangulation, employing devices such as the graphometer to produce complex anamorphic effects. Later, in the eighteenth and nineteenth centuries, the English Picturesque tradition applied its aesthetic principles with tangents, placing ropes on elliptical foci. The foci were fixed and triangulated with very precise measurements enabled by the theodolite.

Physical Terrain

In considering a new topological approach to landscape design, it is precisely the recovery of this direct, physical relationship with the terrain that is at stake. Since the first sedentary rituals were staged, changing the aspect of a terrain has determined the founding

act of landscape architecture. From that moment on there has been a relentless need to adapt terrain for the purpose of society. Society proceeded to modify and alter surfaces, often building on archetypes that were modified under various tropes. The fact is that few landscape architects today intervene topologically. For some reason, perhaps a result of basic landscape education, this capacity to work with terrain has, for the most part, been handed over to architects and engineers. A return to terrain would necessitate mastery of the tools that prepare the physical transformation of a terrain. Taking the case of topology further, landscape architecture has little to do with inventing new forms in landscape for each generation. Instead it focuses on best practices and the improvement of well-established types. One could say, for instance, that Beemster, the Dutch polder in North Holland set on a 1.8 km square grid in the early seventeenth century, strongly influenced the development of the one square mile grid by Thomas Jefferson more than a century later. But the idea of gridding a terrain is not really new—what has changed are the customs, practices and ethical beliefs. We inhabit a world that is constantly experimenting with terrain yet reinventing, over and over again, the same basic landscape principles, albeit through different tropes.

What is particularly important in taking a topological approach to terrain is embracing the site as a complete body, to understand it as a whole. What makes each place unique is a combination of existing physical and natural features that are framed by cultural artifacts. History must be understood diachronically as it transcends nature through time and becomes the expression of the terrain itself. The solid grounding of a project in a particular place depends on the capacity of a designer to recognize what is truly topical and unique to that place. The emphasis placed on any particular, cultural artifact over the existing natural features depends entirely on the problem to be solved and the degree of abstraction that it requires. This approach, however, reflects a certain belief in Nature that changes with each epoch and society. Factors vary strongly from one culture to the next and from one language to another.

How does one enter a site, topically? With a topological method specific to landscape architecture that is able to contend with the physical exigencies of a project. With the advanced capabilities of a geographically-positioned point cloud terrain model, topology can now simulate the fully physical aspects of a site. Whether this method leads to a better design depends on the designer's poetic and creative capacity to grasp a landscape's essence. There is no such thing as a foolproof method in applying topology since with each given terrain the intervention relies on the designer's full, critical judgement. As a method, then, it is neither infallible nor does it guarantee better designs. With a renewed effort to employ physical landscape models as departure points for design, rather than a set of conceptual plans, topology can cast an entirely different light on our approach to design. It is precisely this faculty—to navigate a terrain precisely via a geographically-informed, three-dimensional digital space—that makes the difference in both the approach and final resolution of a design. Beyond the explicit, physical properties of a site, topology brings up the cultural limitations with which the designer is faced: language and concepts of nature that he or she may have to promote. But through repeated testing, it is possible to see a project evolve virtually before its eventual realization. Looking at and understanding a landscape for future intervention as a full, physical body provides an entirely different reading than a conventional two-dimensional layered map, and as a result, also promotes a different mode of design. Topological methods place the designer at the heart of a virtual site and help distinguish various landscape elements with a differentiated and subjective viewpoint. The virtual space of a point cloud model enables entirely new relationships and meanings to emerge between the very same landscape elements, namely because they now appear in a completely different order than in a plan. In this way, the point cloud model introduces the notion of perceptual relativity in design, which is quite different from conventional codes of planning and perspectival imaging.

Working with terrain means shaping the land, continuously moving all kinds of soil and other materials around. The use of instruments in determining the nature of a ground surface is not new; throughout

history instruments have always remained at the very heart of landscape design. Surveyor Humphry Repton used theodolites for the construction of his English parks, André Le Nôtre used graphometers to determine precise view angles and sectional interventions, Jacopo Barozzi da Vignola used a Lancy machine at Villa Lante, an instrument that projected perspective onto paper and from paper onto the terrain, and the Romans used the *groma*, a surveying instrument, for the layout of the grid of the *cardo* (north–south) and *decumanus* (east–west) main roads. Each landscape epoch since Sumerian times has been supported in its efforts toward accuracy in drainage, construction and irrigation, by the surveying technology of its age. And each epoch expresses either the best or the worst practice through the means of the times. The terrestrial laser scanner and the three-dimensional, geographically-informed point cloud model that it generates are the latest of these inventions. They are going to transform our entire approach to terrain in the coming years. Present-day surveying techniques that have been inherited from engineers are able to deliver extremely precise three-dimensional point cloud models, even for sites that are only remotely known. These models describe the spatial and physical properties of a terrain with centimeter accuracy.

A Return to Terrain

These digital terrain models, which can be scaled at will, both on site and remotely, display an extraordinary aesthetic and experiential quality—this adds considerably to the physical description of landscape. The point cloud model has become a very significant complement to more conventional forms of notation in landscape design, particularly in terms of the terrain. A three-dimensional model confers more control and authority on a site under investigation: each and every slope, surface, level and accident in the terrain can be virtually considered, modified and tested. The point cloud model significantly helps the designer become immersed in the physical qualities of a terrain and get a better sense of place. In landscape, a "sense of place" is not merely conceptual; it is tangible and immediate. It demands a way of acting on terrain that is in accordance with a sense of belonging.

The point cloud model is an invitation to imagine a landscape in its fullest dimension. It enables the invention of various physical design interventions on the terrain through a virtual interface. While it proves a useful tool for physically testing a broad range of proposals, it does not, in itself, guarantee good design. What it does provide is a much more informed vision of the terrain in question. Each designer pursues a specific design choice within a complex set of decisions. These, in turn, are based on a combination of site conditions, program and individual intuition, which can be read inductively into the model. The intelligence of a landscape project can be tested through a virtual-physical embodiment of the place, which allows for design proposals to be reiterated at will. There is no doubt that the point cloud model invites the designer to a more direct physical and topological apprehension of terrain. As in any topical approach, the clarity of surface design and scales is of the essence in landscape design. Topology is about reappropriating a site by making sense of its traces. The work need not be nostalgic, but it must act on landscape as a living body, complete with its own intuition, empathy and feeling, and take the marks and scars of a terrain as essential elements of the composition and understanding of a place. Topology is far removed from a nostalgic understanding of the genius loci. On the contrary, it acts on a terrain through selection, critically tackling the very substance of a place. It looks carefully at terrain and different ways of appropriating and channelling the natural phenomena that occur there. Because it has the ability to deal with the physical terrain through virtual means, topology is local, and powerfully so, in its determination of design.

The manner in which we apprehend and deal with terrain topologically also defines a unique approach to problem solving. It is only through the apprehension of landscape as a continuous whole that terrain can be thought of differently. The point cloud model, with its precise geographic information, heralds a revolution in all design- and engineering-related professions. By generating extremely precise sections and elevations, it opens up an entire range of work in the field that was barely possible before. And because such a model reveals even the most demanding and difficult aspects of a terrain, it quickly has us facing the challenges at hand with both rigour and physical accuracy.

Point cloud models have now become an essential complement to the established plan layer method: They help the designer cut through the complexity and stratification of a plan while still remaining aware of a site's physical properties. Furthermore, these models allow the designer to simulate various dynamic flows (i.e., wind, water and temperature) simultaneously within a three-dimensional model space. This marks the first instance in which the varied aspects of a landscape design can be worked through in a single terrain model. In the thick of a design, the designer faces many difficult choices. It is now possible to enter a point cloud of the site under investigation and to examine and test the multitude of design choices from all sides and at all scales. By visualizing the choices in real time, and thereby eliminating the need to render them, point cloud modelling announces a new age of design methods: Through this careful weighing and comparing of choices and approaches, the designer finally returns to terrain.