Sophia Banou

ANIMATED GAZES:
REPRESENTATION AND MOTION IN THE KALEIDOSCOPIC CITY

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ABSTRACT

This project critically addresses modes of graphic representations of the city prevalent in architectural discourse, while seeking new ways to make visible the complex weave of movements that form the contemporary urban condition. The architectural conventions employed in transitioning from situated experience to drawing favour the static, while omitting certain fundamental aspects of that situated experience. Through these gaps the inability of normative modes of representation to communicate the kinetic is made clear. Using Edinburgh, birthplace of the kaleidoscope (Brewster) and the panorama (Barker), as a site of investigation this paper examines the discrepancies that appear between matter and appearance (Bergson) within the modalities of urban representations. Moreover, it attempts to reassess the productive agencies of both space and drawing that are lost in the translation from actuality to representation. To this end, and drawing on previous experimentations with notation, the paper introduces the author's installation Kaleidoscopic City, *a representation of a part of the city of Edinburgh first presented at the* Plenitude and Emptiness Symposium on Architectural Research by Design *(2013).*

BIOGRAPHY

Sophia-Konstantina Banou studied architecture at the National Technical University of Athens, School of Architecture (Diploma in Architectural Engineering, 2008) and the University of Edinburgh (MSc in Advanced Architectural Design, 2009). She practised as an architect in Greece between 2008 and 2011 and is a member of the TEE/TCG (Technical Chambers of Greece). She is currently undertaking a PhD in Architecture by Design at the University of Edinburgh, while teaching as a studio tutor in architecture at Newcastle University (UK). Her research, funded by the Bodossaki Foundation, explores the conventional material and temporal limits of architectural representation.

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The field of optics expanded rapidly throughout the nineteenth century with the development of a series of devices that imitated or expanded the capabilities of the eye, including Sir Charles Wheatstone's stereoscope (1838), and Joseph Plateau's phenakistoscope (1829).[1] At the same time, established technologies such as the camera obscura evolved, leading to both the fixing of the image through photography and the moving image of the cinematograph. The city of Edinburgh holds significant status in this history of visual culture, as home to the photographic studio of painter Octavius Hill and engineer Robert Adamson (1843-48), as birthplace of the panorama invented by Robert Barker in 1792, and as home to Robert Adam's panoptical Brideswell Prison (constructed between 1791-96).[2]

In the same period, the increase in the mobility of everyday life (brought about by the mechanization of production and locomotion that marked the advent of modernity) combined with these new kinds of visual experience (a respective mechanization of seeing), giving rise to a new visual culture. At the beginning of the twentieth century this shift in the modalities of observation also coincided with the development of theories on the interrelation between space and time, emerging through the work of physicists Henri Poincaré, Hermann Minkowski and Albert Einstein, and the writings of philosophers such as Henri Bergson.[3] The idea of time as the fourth dimension expanded the three-dimensional model of space that had prevailed since the Renaissance, and the representation of objects and space in light of the rising awareness of motion came to preoccupy modernist artists.[4] Taking Edinburgh as the site of investigation, I will discuss the implications of the legacy of modernity's visual culture on the image of the city in architectural discourse, while reconsidering certain techniques of architectural representation.

Unlike in the pictorial arts, where radical changes in urban life were accompanied by explorations of perception, this new understanding of space as a kinetic condition did not find a direct counterpart in the graphic codes and techniques that define architectural representation. Here, the image of the city is still largely governed by conventions established as long ago as the 15th century.[5] Bird's-eye views that dominated urban representation until the 15th century were predominantly intended as 'encomiastic' symbolic and artistic impressions rather than factual representations.[6] The emergence of the ichnographic plan introduced an alternative 'scientific' form of urban representation, in which topographical relationships were accurately depicted.[7] Since these early ichnographic city plans – Leonardo da Vinci's plan of Imola (c.1503), Nolli's plan of Rome (1748), etc. – the quantitative relation between referent and representation has been conveyed through the rigid alternation of solid and void of the figure-ground plan. However, the image of the city that these representations produce – which to a large extent defines our understanding of urbanity – is a fundamentally selective invention that consistently omits, as suggested above, the kinetic.

The contradiction between such totalizing visualizations and the complex reality of city is drawn out in Bruno Latour and Emilie Hermant's *Paris: Invisible City*. Here, Latour traces the 'real' image of the city between its

infrastructural "oligopticons," which are places that offer views of the city's 'internal' functions (such as water services and traffic) through abstractions, and the variety of urban artefacts that allow the immediate experience and comprehension of the city.[8] This 'image' emphasizes the intrinsic mobility of the city as well as the importance of the mediating 'secondary' architecture that, in effect, configures both the figure and the ground of urban space through its interaction with the animated – be it animal or machine.

But despite Latour's attempts to revise the image of the city we might ask: is the discrepancy between reality and representation merely a result of graphic abstraction, or is there perhaps a need to redefine the very subject matter of representation? The question that arises here, in light of the changes in our understanding of space-time relations mentioned above, is, therefore, not only how can we expand the capacities of architectural representation, but furthermore, what do we consider physically present and thus worthy of re-presenting? It could be considered that traditionally architectural convention has established a material criterion for the visual. That which is tangible, quantifiable or, visually constant is regarded as legible and can thus be depicted through lines, the essential syntax of the drawing.[9] In contrast, that which does not conform to the habits of our vision remains un-rendered, un-expressed in the conventions of our notations. One might say, therefore, that as visual constancy overtakes our perceptive mechanism, material duration becomes, in architectural representation, a key criterion of visibility.[10]

Through a discussion of the installation Kaleidoscopic City, the second of two installations contributing to an on-going project entitled The Kinematography of a City, this paper will propose an expansion of architecture's normative techniques of urban representation by pushing existing codified modes to incorporate that which is conventionally excluded.[11] This proceeds by exerting pressure upon the historical constitution of architecture's codes, not by contravening these codes but by expanding their scope in a manner analogous to and informed by the expansion of our visual modalities under the influence of modernity and the associated expansion of our perception of space. While this emergent comprehension of space continues to expand, always in parallel to practices of spatial representation (such as digital modes of visualization), what is at stake here is the critical importance of architectural representation as a visual language in itself – at once figural and notational – as well as the act of visual translation that this form of abstraction entails.

INVESTIGATION 01: WEAVING LINES/LOOMING NARRATIVES

Artist and theorist Paul Carter highlights that which escapes our graphic representations of the world, and the inconsistency between the stagnant character of graphic representations and the mobility of experience. In his definition of 'dark writing' Carter notes:

> When the dark writing that informs our environments is perceived, it can be discerned in everything. The pied beauty of clouds, foliage, and limestone walls comes into view not as a background to important events but offering an alternative focus of its own (...) Dark writing indicates the swarm of possibilities that had to be left out when this line was taken. It notates reflections, warping the grids of harborside facades into tremulous concentricities. The assembly of shadows, the organization of optical phenomena that resist the light, the look of things that suggest a face, the depth of bodies that cannot be unconcealed – all of these fall under dark writing's jurisdiction.[12]

Furthermore, Carter describes how the notion of the trace or the track might provide us with a means of rethinking cartographic and consequently architectural representation by unveiling this 'dark writing':

> Our world is composed of the traces of movement, but our representations conceal this. Our thinking is a movement of the mind, but our forms of thought are static.[13]

Taking this notion of trace – both materially and visually as a manifestation of the foregone yet intrinsic mobility of the world – as belonging to both the reality of a current field and an (absent) origin, my initial investigations into representation focused on a small site, a fragment of the city of Edinburgh.[14] In these investigations I consciously avoided the ways in which urban space is traditionally observed by architects, while considering the implications of understanding the city as a dynamic kinetic ensemble. The result of this investigation was an installation entitled Weaving Lines/Looming Narratives, which served to test some of the principles that informed the consequent installation Kaleidoscopic City.[15]

As this initial investigation sought to re-think the process of surveying a site, I began by reconsidering the act of observation, and by establishing the rules of my own observational practices. The result was that this initial installation, or rather this representation, would not dissect the space under investigation through the sight of an observer, as the conventions of the architectural plan dictate, nor would it be concerned with offering the aerial panoptic view of an urban planner. Rather, in a manner similar to an archaeological dig, it would be concerned with cutting through and graphically unfolding the various levels of action within the site, disregarding conventional limitations such as the segregation of things according to scales, both technological and temporal.[16] Moreover, this representation would purposefully shift focus from the material primacy conventionally afforded to the static architecture of the city to the transitory events that, collectively, constitute the 'urban'. In this way, this transversal section from air to ground sought to reveal the intricacy of the structure of urban space by offering an insight into the variety of movements, interactions and reconfigurations that can take place within a sample urban site as small as 15x15 metres. To this end this investigation involved the surveying of six characters, both animate and inanimate: [1] a fish, [2] a fish-monger, [3] a domestic tenant, [4] my camera, [5] the constellations crossing the sky, and [6] the water crossing the street and pavement. In so doing, the emergent mode of representation aimed to confer upon these characters a visible materiality by acknowledging their existence as agents of both the visual and the spatial.

This project provided an opportunity to investigate notation and techniques of representation. Juxtaposing planimetric tracings with sequential perspectival representations, it evolved as a collection of traces of both presence and movement that remained faithful to architectural representation's principle of a projective measured linearity. To collect the traces I employed a variety of techniques, ranging from brush rubbing to notational observation, supported by long-exposure photography that acted as an extension of my own visual experience and perception.[17] Presented at a scale that can be primarily anchored to 1:2, this mapping of the actions of the characters on surfaces of tracing paper and plywood demanded the inclusion of time as a fourth dimension within the 'drawing'.[18] This was expressed by a weave of thread that concretized and rendered visible the density of material shifts in space over time resulting from inhabitation, thus revealing an alternative image of the site.

VISION AND ORDER

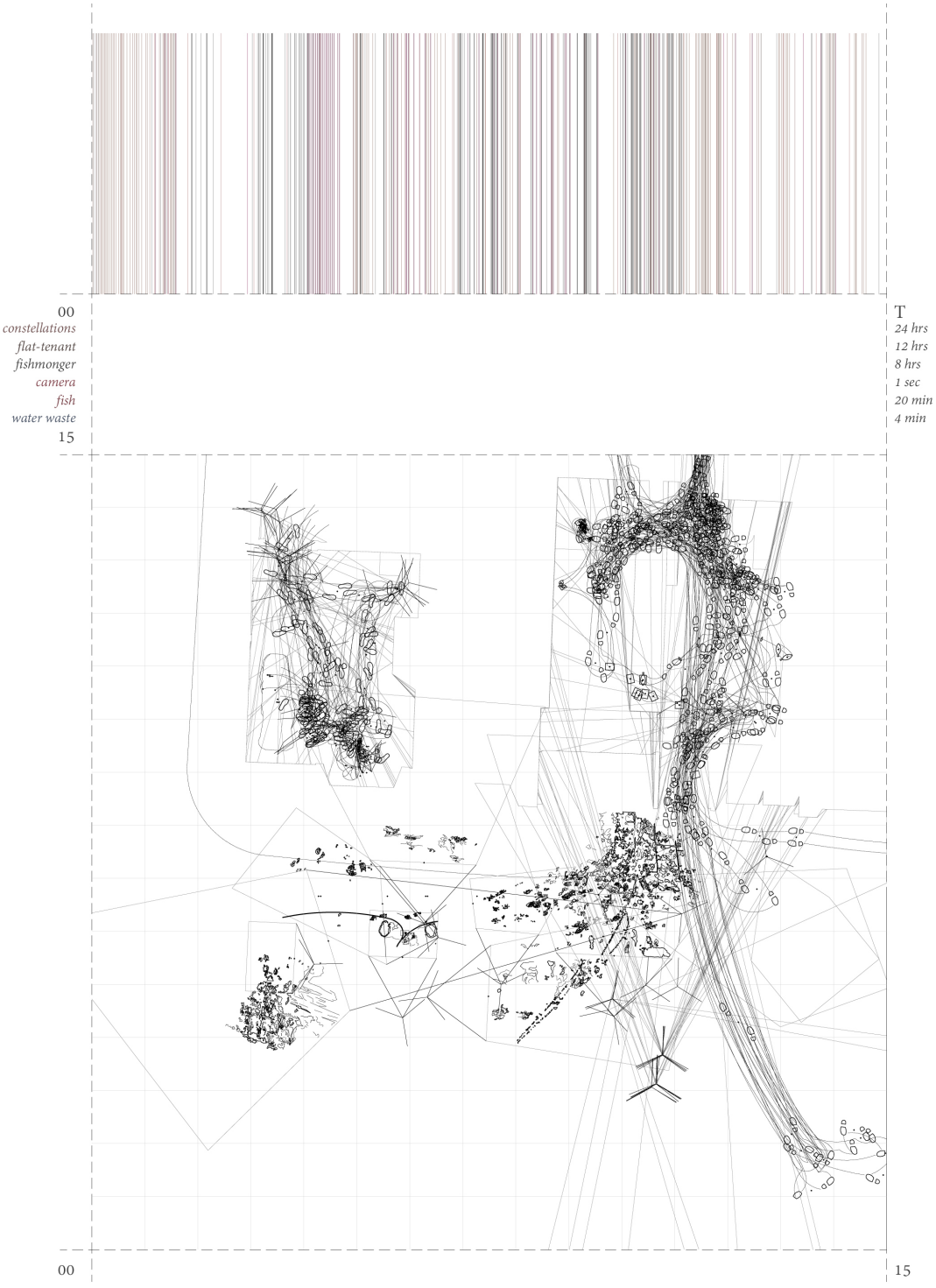
In 1814 Scottish scientist Sir David Brewster was performing an experiment on the polarization of light. While placing a series of reflecting plates in a parallel array he noticed a phenomenon entailing the multiplication of an image around a centre. This accidental observation led Brewster to the development of the kaleidoscope, which he described in his treatise on the device as "an optical instrument for creating and exhibiting beautiful forms to look at."[19]

Proposed, as an object of "rational amusement," the kaleidoscope was seen by Brewster as a mechanical means of artistic production:

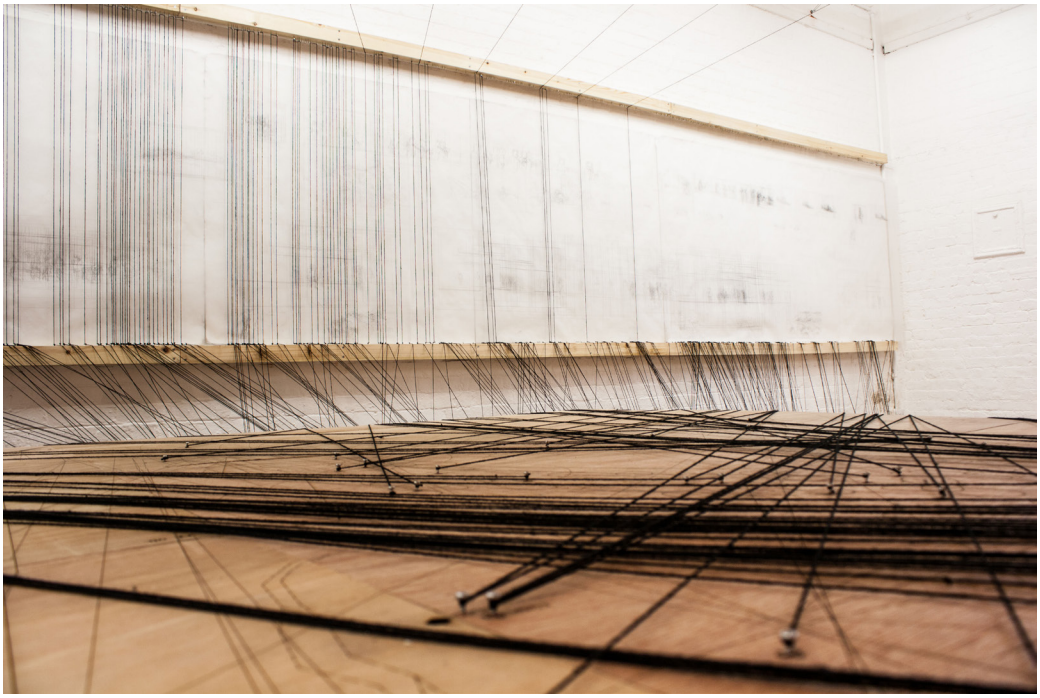
> It will create in an hour, what a thousand artists could not invent in the course of a year; and while it works with such unexampled rapidity, it works also with a corresponding beauty and precision.[20]

According to Brewster, the success of the kaleidoscope as a device for artistic production was based on two things: the limitless possibility of images offered by the mobilisation of the instrument, and the precise symmetry of the images produced. The images produced by the kaleidoscope are, according to Brewster, only rendered 'beautiful' by the symmetry afforded them by the device itself, and by the order implied by this symmetry. The multiple reflections contained within the kaleidoscope (images of disparate, seemingly useless fragments of matter such as pieces of glass, cloth, etc.) thus produce order out of otherwise disorderly material. In short, the kaleidoscope becomes a form of beautifying optical filter for the seemingly disordered world beyond.

The understanding of a geometric order as a criterion of beauty is, of course, not confined to Brewster's personal tastes. Architectural historiography is littered with rules and orders aimed at codifying the principles of a spatial order for both the city and its architecture based on geometry, codifications that have effectively defined the image of cities up until the advent of modernity.[21] Indeed, architecture has consistently sought to introduce rational order to seemingly erratic nature, not entirely but most frequently through visual means. Consequently, in reading



01:
Weaving Lines/ Looming Narratives: Plan of terrestrial traces and timeline.



02:
Weaving Lines/ Looming Narratives: Timeline Loom and Weave detail.

03:
Weaving Lines/ Looming Narratives: General view.

the city it is habitually to the ordered constant that is architecture that we turn as a means of understanding that city. As noted above the figure-ground plan exemplifies this paradigm, exalting the primacy of the figure against the seemingly neutral ground defined purely as figure's negative. Similarly the Ordnance Survey, the official British surveying authority,[22] suggests (through its relation to artillery and military surveying) the once literal but now visual conquest of the ground, and at the same time an imposed design order that can be traced to Claude Perrault's description of "ordonnance" in the seventeenth century as "the systematic arrangement of the parts of architecture."[23]

Interestingly, even in Kevin Lynch's writings on the Image of the City, which in 1960 sought to place a critical pressure on the effect of modernity on American cities, we still see order appearing as a criterion for the 'desired', legible, image:

> Obviously a clear image enables one to move about easily and quickly: to find a friend's house or a policeman or a button store. But an ordered environment can do more than this; it may serve as a broad frame of reference, an organizer of activity or belief or knowledge... A clear image of the surroundings is thus a useful basis for individual growth.[24]

Lynch is referring here to an order that, although artificially invoked, is meant to inhere in the structure of the urban environment, rather than an order that is secondarily attributed by a kind of visual distortion. He is therefore underlining the importance of a clear structure with regards to the legibility of the 'image', which appears here to surpass the concept of a perceptive experience. Nevertheless, Lynch does not neglect to point out the importance of the moving elements of the city:

> We are not simply observers of this spectacle, but are ourselves a part of it, on the stage with the other participants. Most often, our perception of the city is not sustained, but rather partial, fragmentary, mixed with other concerns. Nearly every sense is in operation, and the image is the composite of them all... While it may be stable in general outlines for some time, it is ever changing in detail.[25]

What Lynch appears to suggest here is the importance of the multiplicity and fluidity of the image of the city, which derives from the subjectivity of the viewer in conjunction with a collective memory and – moreover – from the participation of humans in shifting the actual form of urban space by means of their actions. It is thus implied that it is not only design that is essential, but also the adaptation of our perception to achieve the necessary clarity for a 'legible image'.[26] It is interesting that Lynch concludes this chapter with philosopher Suzanne Langer's definition of architecture as "the total environment made visible."[27] Langer's definition points out not only the highly ocular-centric character of architecture but, more importantly, the role this ocular-centric architecture plays as a system through which the city is comprehended. So, to return to Brewster, if in the kaleidoscope order is implied by the presentation to the eye of the symmetrical reflection of a coincidental material array, as produced by the fixed structure of the lenses, in the city it is architecture that imposes an order upon the otherwise arbitrary visual experience through the structured, rigid form of a materially fixed environment that derives from that same history of vision and order as Brewster's device.

As noted above, the instrumentality of the kaleidoscope lies both in the precision of the imposed visual order and in the multiplicity of images afforded by the mobility of the objects contained within and the lenses held by the device. In his essay 'The Painter of Modern Life', the kaleidoscope serves Baudelaire as a metaphor for the kinetic experience of the city:

> [The flâneur] the lover of universal life enters into the crowd as though it were an immense reservoir of electrical energy. Or we might liken him to a mirror as vast as the crowd itself; or to a kaleidoscope gifted with consciousness, responding to each one of its movements and reproducing the multiplicity of life and the flickering grace of all the elements of life.[28]

In Baudelaire movement thus becomes a tool for uncovering the multiplicity of life, as expressed by the flâneur/observer, while the conscious interaction of humans with their urban surroundings is compared to the multiplicity of images as produced by the kaleidoscope. Similarly, Henri Bergson, examining the transition from the physicality of matter to the mental image of perception in Matter and Memory, points out the consciousness – or rather unconsciousness – of human perception as the driving force of another kaleidoscope.[29]

Bergson distinguishes the actuality of matter from the virtual image of perception, but does not propose a clear opposition between the physical and the mental. Rather, Bergson attempts to reassess the meaning of the image by locating it between the idealist representation and

the realist thing, thus placing the conception of matter between appearance and existence:

> [R]ealism and idealism both go too far... it is a mistake to reduce matter to the perception which we have of it, a mistake also to make of it a thing able to produce in us perceptions, but in itself of another nature than they [our perceptions].[30]

Matter is then defined as an aggregate of such images.[31] In Bergson's work this concern for the material and the mental is transposed to the relation between body and mind. In detaching the material from the predominance of the physical, and placing it concurrently within the scope of the "cerebral," which is both bodily and mental,[32] Bergson is not, however, denouncing materialism; rather perception and material reality are bound together through the body as a centre of action, establishing a materiality of perception. Perception, as understood by Bergson, is thus a kind of action inseparable from images of matter. If, as Bergson suggests, the relation between the mental and the cerebral – the bodily – is relational and not constant, the difference between perception and matter becomes, in essence, a difference of degree.[33] According to Bergson space therefore appears to oscillate between the physical and the mental as our concept of materiality expands, therefore including all the elusive, illegible or intangible intermediate states of matter through the image. All facets of space are therefore considered material as all facets of matter are considered images.

The body thus comes to be considered a kind of privileged image that deals with two kinds of movement: an internal movement that refers to the mental and an external movement that refers to its surroundings and its interaction with other images. It is the animate then that constitutes "living matter" as each of its movements changes the image of space around it "as though," Bergson writes, "by a turn of a kaleidoscope."[34]

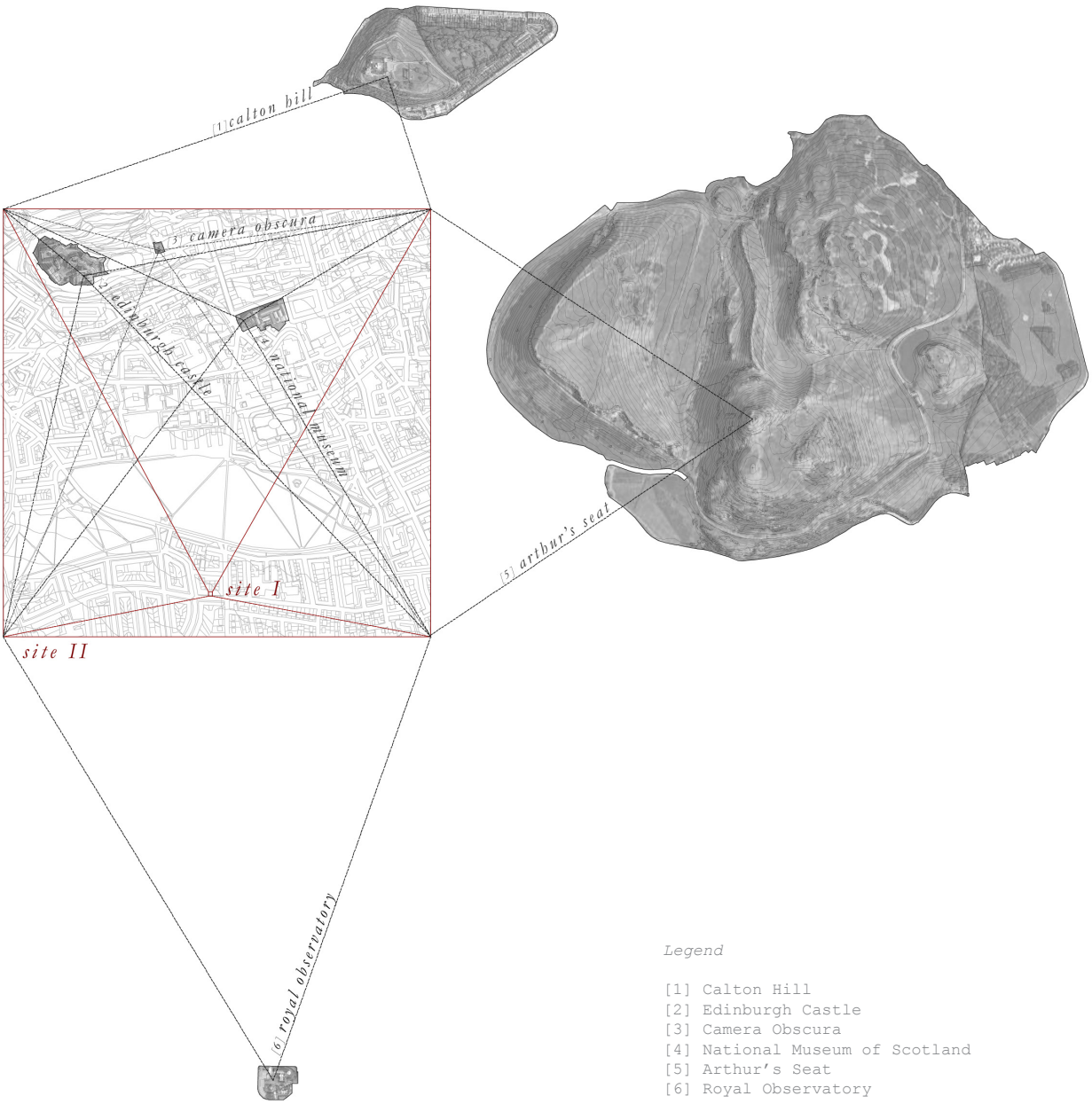
Here, the kaleidoscope does not propose a mechanical paradigm for the city's structure nor for the forms of its representation, but rather is an analogy for a complex visual process of comprehension and knowledge.[35] The virtue of this analogy is that through the kaleidoscopic mechanism it suggests an inter-dependence between presence and perception, between the disorderly randomness of a multiplicity and the imposition of an order that is singular and external – the product of a subjectivity. To return to the topic under consideration here, these inter-dependencies are intrinsic to the unfolding of what is effectively an act of translation, a movement itself from one space to another, in the form of a shift from the space of the city to the space of architectural representation.

INVESTIGATION 02: THE KALEIDOSCOPIC CITY

In this second study of representation I return to the concept of the transversal section arising from the earlier investigation Weaving Lines/Looming Narratives. Shifting my attention from site to city, this investigation engages with a field one hundred times larger (1500×1500 metres), encapsulating the largest part of the Old Town of Edinburgh, yet still seeks to uncover the multiplicity of the city as expressed through a sum of movements.

Once again, I am visually cutting through the infinite layers of space from air to ground. The criteria for inclusion are the same as before, with regards to scale, matter, and duration, however the object of my investigation this time is not an arbitrary fragment of urban reality but a city with a collectively understood character and a series of well-established images. Predetermined images such as Robert Barker's panorama from Calton Hill, James Hutton's geological notes on the volcanic rock of Arthur's Seat,[36] or the reputation of Edinburgh as the Athens of the North flickering in the minds of tourists,[37] are themselves pieces of the image of the city. As manifestations of imposed orders acting upon the city, they also constitute part of its cumulative identity.

These preceding images become part of the multi-vocal content and context of this second investigation. Six viewing devices that look at the city were identified – [1] Calton Hill Observation Tower, [2] Edinburgh Castle, [3] the Camera Obscura tower (previously 'Short's Observatory' and later Patrick Geddes' 'Outlook Tower'), [4] the National Museum of Scotland, [5] Arthur's Seat and [6] the Royal Observatory – as relating to various forms of representation of the city – [1] the geological map, [2] the panorama, [3] the sky map, [4] the postcard, [5] the bird's eye view and [6] the aerial view. Each one is carried into the process of drawing through the surveying of a character (respectively, [1] my camera, [2] a seagull, [3] the aeroplanes that approach the city, [4] a tourist, [5] the volcanic terrain and [6] the constellations of stars above).

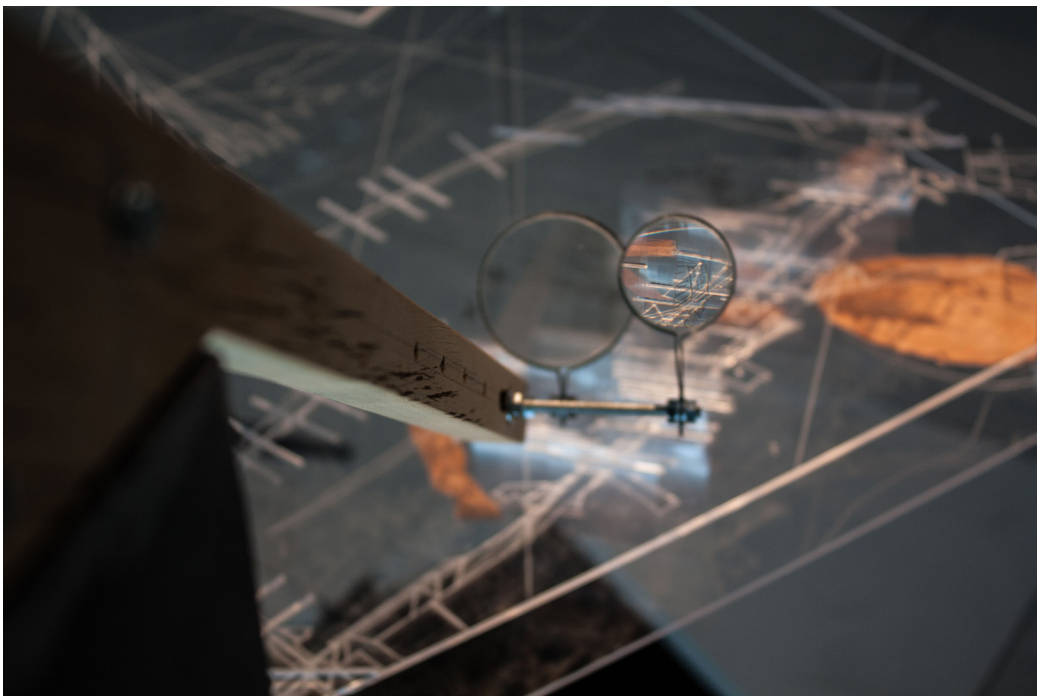


Legend

[1] Calton Hill
[2] Edinburgh Castle
[3] Camera Obscura
[4] National Museum of Scotland
[5] Arthur's Seat
[6] Royal Observatory

04:
From Marchmont to the City: Mapping the shift of the visual field from the site of the first investigation to the second and its associated constellation of viewing devices.

05:
Kaleidoscopic City: Views and reflections.



06:
Kaleidoscopic City: Instances of the Tourist character (pieces of acetate film situated on the acrylic plate) that spread through the city's streets are seen magnified through the lenses of The Telescope

07:
Kaleidoscopic City: The Observatory guiding the observer's gaze through the slit onto The Mirror. The mirror, the same dimensions as the 25 cm square reflector found in Edinburgh's Camera Obscura, offers a view from above of both the terrestrial traces as seen through the acryllic plates of the Aeroplanes' and their own tilted aerial view of the city mass.

08:
Kaleidoscopic City: The Terrain's fragments spreading from the peak of Arthur's Seat. The Terrain serves as a legend for the reading of the whole work.

09:
Kaleidoscopic City: View from the South-East, viewed from outside the Gallery on Potterrow.

Each character thus, becomes much more than themselves. In experiencing the scale of the city, they become charged with the visual-material culture related to the historic modalities of experiencing and, more specifically, looking at the city that they subsequently index and within which they become enmeshed. Seemingly separated across five different levels (each represented upon a layer of clear cast acrylic), but in reality brought together through the transparency and reflectivity of this series of 'lenses', the linear traces of the characters remain almost immaterial, hovering in the air rather than being confined to the two dimensions of a surface of paper.[38]

As the characters and devices are transposed to the space of the representation they begin to acquire a new nature. Working in pairs, six new optical devices – [1] The Telescope and [4] The Cabinet, [3] The Mirror and [6] The Observatory, and [2/5] The Terrain, connecting the Castle to Arthur's Seat – offer a multiplicity of readings that are not antagonistic but complementary to one another and toward the reading of a whole.[39]

The main aim of this piece is to abolish the distances between these various views of one common object, namely the city, by introducing the conventions established by each to the codes of architectural drawing. In this way I compose a new image on the basis that these distinct visual approaches are essential contributors to a representation capable of embracing the multiple facets of the urban. If the city can be considered as a weave of complex interactions between the various agencies that inhabit it, then its representation must be considered as such. From matter to perception and back to representation, whether through the human eye or a graphic system of representation the image of the city is not reduced but rather constantly reconstructed through sensory processes of comprehension.

In the kaleidoscope it is only through disorder that 'order' is produced, only through the re-presentation of the seemingly useless and chaotic that an acceptable, 'beautiful' image emerges. Similarly, in the kaleidoscopic city it is only through uncovering the secondary that a new "space for action" is revealed.[40] Although a form of representation itself, the Kaleidoscopic City is not intended as an alternative to normative representations. It is rather a mapping out of the negotiations of seeing that compose the image of the city and, in effect, could define the possible scope of its representation in architectural practices. Distilled through the consequent processes of signification that mark the transition from the physical image(s) of the city to the image of its representation, the interpretations that are produced out of these ways of seeing are carried through to the space of the drawing.

To conclude, I do not in fact consider the product of this investigation an installation. It is a single drawing in the making presenting a small sample of the multiple 'reflections' - the multiple images - of the city. These images, nested here within one another, each present the city through a new 'order'. Consequently, the Kaleidoscopic City itself awaits the re-ordering, animated gaze of a willing observer.

NOTES

1 Wheatstone, Walter. 1838. 'Contributions to the Physiology of Vision Part the First. On Some Remarkable, and Hitherto Unobserved, Phenomena of Binocular Vision', in *Philosophical Transactions of the Royal Society of London*, Vol.128. pp.371-394. The concept of the stereoscope was later developed by Sir David Brewster who presented the lenticular stereoscope – the first portable 3D viewing device – at the Great Exhibition in 1851.

2 The collaboration between painter David Octavius Hill and engineer Robert Adamson produced what are widely considered to be some of the earliest examples of photography with artistic value, and are specifically referred to by Walter Benjamin. See Benjamin, Walter. 1979. 'A Small History of Photography', in *One-Way Street, and Other Writings*, trans. Edmund Jephcott and Kingsley Shorter. London: New Left. pp.243-257. The concept of the panorama, a representation of a 360 degrees view, was developed in Edinburgh by Irish painter Robert Barker, inspired by the panoramic view of the city as offered to the viewer from the top of Calton Hill. Barker, who received a patent for his idea in 1796, produced drawings from the top of Calton Hill as well as from the steeple of the St. Giles Cathedral, which were later presented in London, in the first purpose-built panorama building.

3 For an introduction to these emergent modalities of observation see: Crary, Jonathan. 1992 (1990). *Techniques of the Observer: On vision and modernity in the nineteenth century*. Cambridge, MA & London: MIT Press. Herman Minkowski's work drew on Albert Einstein's theory of relativity as proposed in his 1905 paper 'On the Electrodynamics of Moving Bodies', see: Einstein, Albert. 1923 (1905). *The Principle of Relativity*, trans. George Barker Jeffrey and Wilfrid Perrett. London: Methuen and Company Ltd. Available at <http://www.fourmilab.ch/etexts/einstein/specrel/www/> (accessed 25th April 2013). See also Petkov, Vesselin (ed.). 2012. *Space and Time: Minkowski's Papers on Relativity*, trans. Fritz Lewertoff and Vesselin Petkov. Montréal: Minkowski Institute Press. Available at <http://www.minkowskiinstitute.org/mip/> (accessed 25th April 2013). For Bergson's work on time and space see: Bergson, Henri. 1910 (1889). *Time and Free Will: An Essay on the Immediate Data of Consciousness,* trans. Frank Lubecki Pogson. London: George Allen and Unwin Ltd.

4 See Moholy-Nagy, László. 1947. *Vision in motion*. Chicago: Paul Theobald and Company.

5 Ola Soderstrom traces the establishment of modern planimetry between Alberti's Descriptio de Urbis Romano and DaVinci's ichnographic plan. According to Soderstrom the instrumentality of the plan laid largely on the visual detachment of the image produced from the physical image of the city, due to the establishment of a code of conventions among 'specialists'. At once figurative and notational, the city plan offered by means of an ideal viewpoint the visualization of what was until then invisible, in Soderstom's words: "an expansion of the comprehension of the physical reality of the city' opening thus a 'space for new action, the urban space." Soderstrom, Ola. 1996. 'Paper Cities: Visual Thinking in Urban Planning' in *Ecumene: A journal of environment, culture, meaning*, Vol.3 No.3 (July), p.258.

6 Schulz, Juergen. 1978. 'Jacopo de Barbari's View of Venice: Map Making, City Views, and Moralized Geography before the year 1500' in *The Art Bulletin*, Vol.60 No.3 (September), p.458.

7 Pinto, John A. 1976. 'Origins and Development of the Ichnographic City Plan' in *Journal of the Society of Architectural Historians*, Vol. 35 No. 1 (March), p. 35.

8 Latour, Bruno and Hermant, Emilie. 2006. 'Paris: Invisible City'. Available at <http://www.bruno-latour.fr/sites/default/files/downloads/> (accessed 7th December 2011).

9 Allen, Stan. 2009 (2000). *Practice: Architecture, Technique and Representation*. London: Routledge.

10 On the effects of constancy on visual perception see Gibson, James M. (1965) 'Constancy and invariance in perception' in György Képes (ed.), *The Nature and Art of Motion*. London: Studio Vista. pp.60-70

11 Banou, Sophia. 2013. *Kaleidoscopic City*. Site-specific installation at Plenitude and Emptiness: Symposium on Architectural Research by Design, Inspace, Edinburgh, 4th - 6th October 2013.

12 Carter, Paul. 2009. *Dark Writing: Geography, Performance, Design*. Honolulu: University of Hawaii Press, p.1.

13 Carter, Paul. 2009. *Dark Writing*, p. 5.

14 "In ichnography, as in typography, the impression is the product of a relationship. The material in which the type is printed is as important as in drawing the track as the stamp, hoof, or foot pressing down... the ancient track is not simply the container of events... but an expression in its own right." Carter, Paul. 2009. *Dark Writing*, pp.165-166. It is pertinent to note here that 'trace' in Greek is ichnos (ίχνος); ichnography is, therefore, a writing or documentation of traces.

15 Banou, Sophia. 2013. *Weaving Lines/Looming Narratives*. Site-specific installation, Newcastle University School of Arts and Cultures, 28th January – 2nd February 2013.

16 "In a nutshell, the arguments of the authors proposing this radical erasure from our spatial vocabulary are the following: scale is not an ontological category but an epistemological one. There is no such thing as a nested hierarchy organizing the social world. [...] Non-geographers such as Bruno Latour and Arturo Escobar have developed broadly similar arguments... Like the deconstruction of other mega-categories such as culture and identity, the deconstruction of scale is both helpful and unsatisfactory. It is helpful because it alerts us to the possible confusions between things in the world and things in our heads, and because it opens up new and more complex ways of seeing the social and spatial organization of the world." Soderstrom, Ola. 2011. 'How Images assemble the image of the world' in *New Geographies 4: Scales of the Earth*. Cambridge, MA: Harvard University Press, p.113.

17 Developing from Georges Perec's attempt to 'exhaust' a place. Perec, Georges. 2010 (1974). *An attempt at exhausting a place in Paris*, trans. Marc Lowenthal. Cambridge, MA: Wakefield Press.

18 The majority of the traces were represented at 1:2, but the nature of certain traces made this impossible in some cases.

19 Hence the neologism deriving from Greek words kalos (κάλος) meaning beauty, eidos (είδος) form, and skopeo (σκοπέω-ώ) to see. Brewster, David. 1858. *The Kaleidoscope: Its history, theory and construction*. London: John Murray, p.1.

20 Brewster, David. 1858. *The Kaleidoscope*, pp.134-136.

21 Giacomo Barozzi da Vignola's Canon of the Five Orders of Architecture (1562) for instance, describes how mathematical and geometrical rules of harmony were carried through to an architectural aesthetics. This architectural treatise, comprising of 32 engravings as well as some brief accompanying texts, summarizes the forms and figures of the five architectural canons that allowed for the wider dissemination of the orders as a set of exemplary rules for architectural production. Vignola's work was influenced by the work of Vitruvius in compiling *De Architectura* (ca. 30BCE), the first architectural rule book that also distinctively suggested the symmetry and proportions of the human body

as a paradigm for the achievement of *venustas* (beauty) in architectural design.

22 The United Kingdom Ordnance Survey maintains its name from its original role of mapping areas of Scotland during the Jacobite Rebellion of 1745 for military purposes.

23 In 'The Figure from Above: On the obliqueness of the Plan in Urbanism and Architecture', John Macarthur writes on Captain Gordon H. G. Holt's techniques of aerial photography as a tool for "the architectural understanding of cities." Macarthur points out Holt's description of "what needs to be understood" through his photography as "*ordonnance*," tracing the etymology of the term to both Holt's background as an RAF pilot and Claude Perrault's definition of the term in the essay 'Ordonnance Des Cinq Espèces des Colonnes Selon la Méthode Des Anciens'. Macarthur, John. 2013. 'The Figure from Above: On the obliqueness of the Plan in Urbanism and Architecture' in Mark Dorrian and Frederic Pousin (eds.), *Seeing from Above: The Aerial View in Visual Culture*. London & New York: I.B. Tauris. p.190.

24 Lynch, Kevin. 1960. *The Image of the City*. Cambridge, MA & London: MIT Press. p.4.

25 Lynch, Kevin. 1960. *The Image of the City*, p.2.

26 Lynch, Kevin. 1960. *The Image of the City*, pp.12-13.

27 Lynch, Kevin. 1960. *The Image of the City*, p.13.

28 Baudelaire, Charles. 1863. 'The Painter of Modern Life', trans. Jonathan Mayne In J. Mayne (ed.). 1995. *The Painter of Modern Life and Other Essays*. London: Phaidon Press, p. 9.

29 Bergson, Henri. 1908 (1896). *Matter and Memory*, trans. Nancy Margaret Paul and W. Scott Palmer. London: George Allen and Unwin, p.12. Available at <www.reasoned.org/dir/> (accessed 11th September 2013).

30 Bergson, Henri. 1908 (1896). *Matter and Memory*, p.xi.

31 Bergson, Henri. 1908 (1896). *Matter and Memory*, p.xvii.

32 Bergson, Henri. 1908 (1896). *Matter and Memory*, p.xviii.

33 "When a ray of light passes from one medium into another, it usually traverses it with a change of direction. But the respective densities of the two media may be such that, for a given angle of incidence, refraction is no longer possible. Then we have total reflexion... Perception is just a phenomenon of the same kind... there is for images merely a difference of degree, and not of kind, between being and being consciously perceived." Bergson, Henri. 1908 (1896). *Matter and Memory*, p.12.

34 Bergson, Henri. 1908 (1896). *Matter and Memory*, p.12.

35 "The course of history as represented in the concept of catastrophe has no more claim on the attention of the thinking mind than the kaleidoscope in the hand of a child which, with each turn, collapses everything ordered into new order. The justness of this image is well-founded. The concept of the rulers has always been the mirror by means of whose image an 'order' was established. This kaleidoscope must be smashed." Walter Benjamin parallels the kaleidoscope to history as a process of knowledge that progresses through the decomposition and re-composition of an image. Benjamin's understanding of a 'mirrored order' suggests the potential subjectivity of an interpretative manipulation of this re-composed image. Benjamin, Walter. 1985. 'Central Park' in *New German Critique*, No.34 (Winter), Telos Press, p.34.

36 Playfair, John. 1802. *Illustrations of the Huttonian Theory of the Earth*. Edinburgh: William Creech.

37 Hague, Cliff and Jenkins, Paul. 2005. 'The changing image and identity of the city in the 21st century: 'Athens of the North' or 'North of Athens'' in B. Edwards and P. Jenkins (eds.). *Edinburgh: The Making of a Capital City*. Edinburgh: Edinburgh University Press, p. 218.

38 The traces were imprinted on the acrylics as engravings produced by a laser cutter.

39 These 'new' optical devices constitute representations of the respective six found in the city. Inheriting characteristics of the original into the installation these are intended to function as optical devices within the representation; that is as devices that visually facilitate the reading of the traces.

40 Soderstrom, Ola. 1996. 'Paper Cities', p.258

FIGURES

All of the drawings and photographs included in this piece were produced by the author.

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