

## TITLE

### REFORMULATING URBAN LANDSCAPES: FIGURE-GROUND MAPS

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Refereed Paper

## PAPER

A type of map traditionally used in the analysis of urban form is figure-ground, a drawing that traditionally depicts the buildings as figures against a visually contrasting ground. It finds certain antecedents in Gestalt psychology, as both drawings rely on the perceptible difference between figure and ground. However an unwanted extrapolation from Gestalt is the imposition of hierarchies, indispensable for visual segregation of figure and ground, but detrimental for the potential of figure-ground as mapping. Mapping is a creative and cognitive activity, ruled by processes of selection and schematization. The potential of the figure-ground map to reveal new relationships and scenarios is only limited by the speculation, inquiry and criticism involved in their production. This paper argues that figure-ground mappings in urban conditions can provide an abstract and interpretative framework for the reading of the city as a living entity. While figure-ground as binomial building-void mapping is successful in analysing urban form and spatial configuration, conditions like climate change and population growth emphasize the need to engage in adaptive strategies that respond to the effects of environmental and social change on urban and landscape forms. This paper identifies Gestalt principles as the source of hierarchical organizations in figure-ground mapping, and by manipulating one of them (contour) it proposes a reformulation of the technique. This is done using subtropical climate case studies, where the definition of edges plays a significant role in identifying urban landscape relationships.

Keywords: Figure-ground, binary, mapping, Gestalt psychology, perception, edge.

## Introduction

In the opening paragraph of 'The Expanded Field of Landscape Architecture', Elizabeth Meyer questions the frequent tendency of landscape architects to 'describe the world and their work in pairs of terms', such as culture and nature, city and country, public and private<sup>1</sup>. Binary thinking is more evident in the description and organization of 'space', where binomial relationships draw differences between inside and outside, solid and open, mass and void. Binary offers the most basic level of organization as two and only two parts are involved and differentiated. However, it has been criticized as a tool for controlling power and making false dichotomies and hierarchies. Has the criticism of a hierarchical 'binary thinking' undermined its capabilities as an organizational system, and shifted from being a useful simplifivative abstraction to simplistic? Is figure-ground mapping, a type of binary thinking, able of mapping the temporal transformation of urban landscapes?

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<sup>1</sup> Meyer, Elizabeth. 'The Expanded Field of Landscape Architecture', in *Ecological Design and Planning*, New York, John Wiley, 1997, pp. 45-79.

This paper offers an investigation into the designation of figure-ground mapping as a false hierarchical organization. The premise is that hierarchical attributions are result of Gestalt psychology extrapolation, specifically its 'principles of perception'. If figure-ground mapping is disengaged from ranked associations, it provides an abstract and interpretative framework for mapping. A reformulation of figure-ground maps allows latent relationships to emerge. The revision of an existing representational convention not only questions the construction of the technique, but also suggests new formations for the map. James Corner has stressed the importance of realigning codes of existing conventions and techniques, highlighting their potential in the generation of new possibilities<sup>2</sup>.

## Mapping

Acts of mapping are 'creative moments in coming to knowledge of the world', and the map is both 'the spatial embodiment of knowledge and a stimulus to further cognitive engagements'<sup>3</sup>. However throughout the twentieth century this activity has been undertaken conventionally as a quantitative and analytical survey of existing conditions, preceding the design of a new project; furthermore most designers and planners consider mapping a rather 'unimaginative, analytical practice'<sup>4</sup>. This results in a map which is codified, naturalized and taken for granted as institutional convention. One of these conventions is the *poché* plan, an image erroneously mistaken with the figure-ground map. In the *poché* plan, the city blocks and building-objects have been represented as solids, and are rendered as a black, defined figure against a white, limitless ground. This technique has been used by Colin Rowe to contrast the classical and the modernist European city<sup>5</sup>, and by Mario Gandelsonas to differentiate between the compact fabric and the fields of 'building objects' in Manhattan<sup>6</sup>. The *poché* plan requires the mapping of large urban areas with a considerable accumulation of figures (buildings) in order to 'provide an acceptable graphic, but not necessarily urban ground condition'<sup>7</sup>.

## Figure-ground

Figure-ground drawings are effective means of visual communication as they filter information in a binary categorization that assigns values of figure and ground. The figure-ground relationship is 'the simplest perceptual organization of the visual field'<sup>8</sup>, and bases its organization in attributes via a critical selection process. If certain criteria are met, the components will belong to that category: otherwise they will be part of a complementary set. For example in the *poché* plan, city blocks or buildings are rendered in black and all other elements that do not match these criteria (trees, roads, plazas, etc) are left as white. The construction of a figure-ground map has two main stages: *selection* and *perception*. *Selection* implies a critical discernment of the elements that will be included and excluded from the map. The assignment of figure and ground values is result of a meticulous fulfillment of specific conditions. *Selection* is not exclusive for figure-ground maps, but it is present in all types of maps, as acts of selection, removal and omission of specific

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<sup>2</sup> Corner, James. 'Eidetic Operations and New Landscapes', in *Recovering Landscape: Essays in Contemporary Landscape Architecture*, New York: Princeton Architectural Press, 1999, p. 164.

<sup>3</sup> Cosgrove, Denis, 'Introduction', *Mappings* (Ed. Denis Cosgrove), Reaktion Books, London 1999, p. 2.

<sup>4</sup> James Corner, 'The Agency of Mapping', in *Mappings* (Ed. Denis Cosgrove), Reaktion Books, London 1999, p. 216.

<sup>5</sup> Rowe, Colin and Fred Koetter. *Collage City*. The MIT Press, 1978, pp. 62-63.

<sup>6</sup> Gandelsonas, Mario. *X-Urbanism: Architecture and the American city*. Princeton Architectural Press, New York, 1999. p. 90.

<sup>7</sup> Murray, Shane. *Architectural Design and Discourse* (Doctoral Thesis), RMIT University, May 2004, p. 16.

<sup>8</sup> Dent, Borden. 'Visual Organization and Thematic Map Communication', in *Annals of the Association of American Geographers*, Vol. 62, No. 1, 1972, p. 82.

phenomena are inherent in the making and meaning of maps<sup>9</sup>. On the other hand *perception* is specific to figure-ground maps and analyses the negotiations that graphically define figure and ground. *Perception*, in this context, does not mean the physiological or neurophysiological relationship between the initial incidence of light on the corner of the eye and the perceptual experience. It involves the visual assignment of edges and boundaries between object and non-object, and it is here where 'most cartographers have turned to Gestalt psychology for guidance'<sup>10</sup>.

### **Gestalt**

Gestalt research focuses in explaining the stability and coherence of everyday experiences by perceptual theories, being most important the distinction between figure and ground. This theory is based on the tendency to organize precepts in certain manner during all perceiving. Figures tend to be complete and placed in front of the ground, which is less distinct and important, and floats endlessly behind them. This organization identifies only two dimensions in the picture: one which is the figure, closer to the viewer, and another one is the 'canvas' or ground, which seems to extend in an infinite background. Consequence of this organization is its *reversibility*: in certain images it is possible that the figure appears as ground and the ground as figure. A classic example is the face-vase illusion, where one can see two profiles facing each other, or one vase, depending on what is perceived as figure and what as ground. The phenomenon is crucial to Gestalt theorists as they are interested in identifying tendencies for visual organization. Gestalt drawings panels are specifically made to demonstrate the role of perceptual hypothesis-making using illusions and effects. The drawing is modified by using 'principles of organization', or the rules that organize how features are perceived as a coherent whole. In these a figure is always 'closer' to the observer (protrusion of figural field), it has definite contour in contrast to a formless ground (shape) and it has a surfaced texture, while the ground is filmy or translucent (texture). It also comprehends heterogeneity (a figure emerges when a visual field is organized in groups), contour (objects are seen as figure if they have a definite edge), surroundedness (completely surrounded objects tend to be seen as figure) and orientation (objects oriented horizontally and vertically tend to be seen as figure)<sup>11</sup>. These principles assign desirable (positive) and undesirable (negative) connotations *only* to figure. Pragnanz (translated as 'good form') defines a set of principles that create a good figure, using principles as continuity, symmetry, closure and similarity to produce 'good forms', which are easier to see than 'less good forms'.

The application of gestalt principles has been extrapolated to figure-ground mappings, with the consequent allocation of hierarchies: figure is 'good' and ground is the blank canvas, a leftover space. The application of these principles in mapping has restricted the potential for figure and ground definition, establishing strict rules that characterize each of them. Hierarchical relationships have been promoted in other types of mappings, particularly thematic maps. In these 'the important elements in the map should appear as figures', and the objects of 'little consequence' should not dominate as the map may communicate an incorrect message<sup>12</sup>. However in the case of figure-ground mappings, drawings should be detached from any hierarchical organization, as the importance is not the figure (or ground) by itself, but the reciprocal definition of the two. Colin Rowe recurred to Gestalt principles when identifying transparency as a phenomenon that identifies horizontal and vertical

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<sup>9</sup> Cosgrove, op cit.

<sup>10</sup> MacEachren, Alan. *How Maps Work. Representation, Visualization and Design*, New York: Guilford Press, 1995, p. 108.

<sup>11</sup> Alan M. MacEachren, Op cit.

<sup>12</sup> Dent, Borden. *Visual Organization and Thematic Map Communication*. *Annals of the Association of American Geographers*, Vol 62, No. 1, 1972, p. 82.

figures to reveal spatial depth<sup>33</sup>, and Bernard Hoesli, referring to Giambattista Nolli 1748 Plan of Rome, addressed the *reversibility* phenomenon by producing a negative image of the plan<sup>34</sup>. Both authors sustain that figure and ground are complementary conditions, a 'structure which becomes significant by reason of reciprocal action between the whole and its parts'. Rather than guidelines and rules, the principles of organization should represent a challenge for mapping. A re-examination of these turns away from conventions into new perspectives enables a critical approach to methods of mapping. The limitations and rules of a conventional technique are turned on themselves and used to reformulate representational processes for figure-ground mapping.

*The following experimentation exercises in figure-ground mapping reveal some of the potentials result of a realignment of conventions in the technique. They address the Gestalt principle of 'contour', in which objects are experienced as figures if the contour (or a line that separates the regions) is strong, creating an edge between them. The edge analysis is done in sectional studies, comparing use and appropriation of urban parks from two different two cities (one of them of subtropical climate). The second exercise redefines an edge between object and non-object, analysing Hong Kong reclamation process in time.*

### Urban parks

A comparison study of urban parks in Melbourne (Australia) and Puebla (Mexico) revealed that their edges play an important role in the use and appropriation of public space. Three parks in Puebla (Jardín Víctor Hugo, Jardín Federico Escobedo and Jardín El Carmen) and two in Melbourne (Argyle Square and Murchinson Square) were used for the study. These parks are within a 1.5 km radius distance from the city centre (zócalo and CBD), they are located in residential areas and have the same radial configuration with orthogonal and diagonal axis. Cross-sections of these parks mapped five conditions: *edges* (the physical definition of edges as kerbs and bollards), *thresholds* (limits between two surfaces as pedestrian paths, vehicular roads, sidewalk, etc), *spatial* volumes (the perceptual space in the park as 'open' or 'closed'), *activities* (pre-defined program for the park which included sitting, walking, strolling, eating lunch, etc) and appropriation (undefined activities happening in the park as beggars, vendors, car washers, etc). They were mapped in section, with horizontal bars hatched in black representing the existence and occurrence of these conditions (Figure 1).

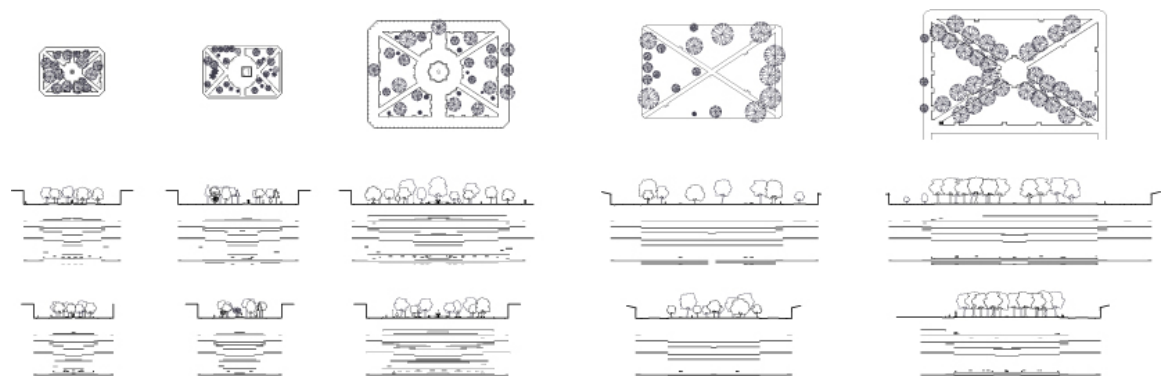


Figure 1. From left to right: Jardín Víctor Hugo, Jardín Federico Escobedo, Jardín El Carmen, Murchison Square and Argyle Square

<sup>33</sup> Rowe, Colin. *As I Was Sying. Recollections and Miscellaneous Essays* (edited by Alexander Caragone), Volume I, The MIT Press, Massachusetts, 1996, p. 100. Referring to the façade studies he did in regards to transparency, Rowe describes them as 'elaborate orchestrations of the rather curious little diagrams which are to be found so profusely scattered through any treatise on gestalt'.

<sup>34</sup> Hoesli, Bernhard. *Addedum*, in Colin Rowe 'Transparency', Library of Congress, Washington, 1997, p 95.

The parks in Melbourne revealed a 'geometric' and 'regular' definition of thresholds, while the ones in Puebla refused a sharp definition of edges. Activities in Melbournian parks seem to take place in 'areas' or 'zones' designed for a specific purpose, while appropriation and improvisation characterize the edges of parks in Puebla. Examples are the sitting patterns: while all parks have benches along the paths, people often sit on the grass in Melbourne during lunchtime. It is in this period of time that parks have the most activity, especially in summer. In Puebla parks have a more occupation from mid-morning until lunchtime (around two o'clock) and then it increases until early evening. Here people prefer to sit under shaded areas (even in winter) transforming the 'sitting plan' according to the time of the day and the season (Figure 2). Although there may be other factors that contribute to this occupation (social behaviours, local economy, etc), the climate in Puebla promotes outdoor activities, increasing opportunities for occupation and appropriation of public spaces.

The definition of edges, or rather their blurring, operates not only at a small scale (urban parks) but also in larger scale mappings (city). Edges are the most important organizational condition for figure-ground, and can occur as processes of *discrimination* and *differentiation*. *Discrimination* segregates figure and ground by drawing a line, which consequently gives and edge to the figure (it comes from the Latin prefix *discrimin*, which means 'separating line'). Applied to figure-ground, discrimination is the process that assigns figure and ground characteristics to components based on the delineation of edges that surround a figure (the poché plan is an example of discrimination).



Figure 2. Sitting areas in Puebla are defined by those areas which are shaded, and varies according to the time of the day.

*Differentiation* proposes an alternate segregation between figure and ground: rather than focusing in edges or separations, it identifies the presence or absence of characteristics, qualities and features. This allows superimposition of various layers of information based on multiple patterns and scales. This process is similar to halftone, a reprographic technique that simulates a continuous tone by superimposing spaced dots of varying sizes, as it happens in newspaper photographs.

A *discrimination* approach towards a clearly defined figure and an empty ground is the basis of corpuscular theory in physics, which contrasts with field theory. In the corpuscular theory, 'well defined, self-contained objects are seen as "figure" in empty or otherwise qualitatively different space, which serves as "ground"'. An example of this theory is the atomic model of Rutherford and Bohr. In Bohr model, the atom is surrounded by electrons that travel in circular orbits around the positively charged nucleus, with electrostatic forces providing the attraction. This model contrasts with field theory in physics (analogous to

*differentiation*), where Michael Faraday eliminated the separation of matter and force, and the object is understood as a bundle of energy. This means that the situations are not unalterable but subject to change in time<sup>15</sup>.

Discrimination does not aim to produce a figured-ground, or an *in-between* condition; it acknowledges their complementary and reciprocal character while disregarding hierarchies. Built following this principle, figure-ground maps are not necessarily 'flat' constructions: they can accommodate various levels of information if figure and ground are understood as configured three-dimensionally as layered axonometric sections or overlaid permeable layers, which can show the complex behaviour of components.

### Halftone

The second exercise presented here used animated techniques to identify object and non-object definition by manipulating edges. It analysed Hong Kong reclamation process by superimposing series of figure-ground maps (Figure 3). The figures mapped in these were roads, tunnels, railways, built-up areas and coastlines. They were later organized in a sequential arrangement and animated. The short movies revealed an arithmetical increase in the area of the mapped condition; for example, in the case of coastline, the area mapped only seemed to grow in the edges, without any modification to the land conditions. However when various mappings were overlaid the result was not a regular increase in area but an interesting interference produced by the mappings. The growth and behaviour of the reclamation process revealed unexpected patterns product of the internal forces and relationships. The effect created is similar to the moiré produced by the superimposition of two patterns. Stan Allen affirms that the figure should not be considered a demarcated object, but an effect emerging from the field itself, as 'moments of intensity, as peaks or valleys within a continuous field'. He also suggests that 'in the [...] urban context, the example of moiré effects begs the question of surface'<sup>16</sup>.

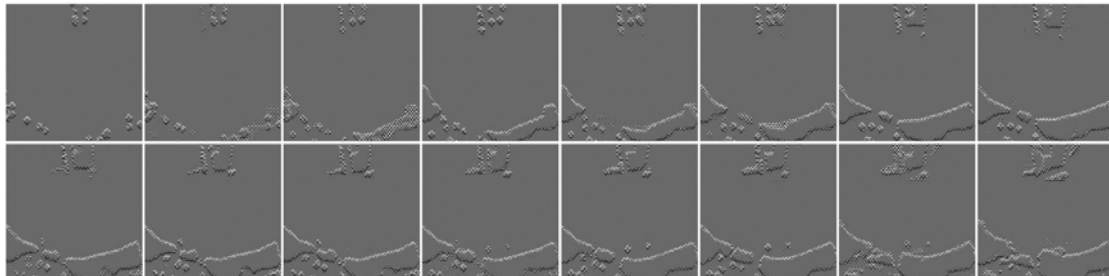


Figure 3. Animation of Hong Kong waterfront reclamation (1887-1996)

The 'zones' generated by halftoning offer the opportunity of growth and transformation as there is not an 'edge' that limits or restricts them: they become a field that shows irregular behaviours.

A variant of this exercise was a design strategy for Hong Kong waterfront development. Instead of defining solid areas in a map, these were composed by patterns of dots with varying alignment and distribution. The aim was to render a permeable figure-ground map that allows multiple readings based on the temporality of the project. The production was not only a conversion of a polychromatic image into monochromatic regions, but a manipulation of the technique that allows new scenarios to emerge. When the plan is seen

<sup>15</sup> Arnheim, Rudolf. *Visual Thinking*, London: Faber, 1970 p. 286.

<sup>16</sup> Stan Allen, 'From Object to Field' in *Architecture After Geometry*, (ed. Peter Davidson and Donald Bates) England: Architectural Design, 1997, p. 28.

at a close distance (eg. reading distance) the patterns are easily discerned based on their individual colours: at this scale there is no edge definition, as it is more a transitional zone where the points emerge. Nevertheless when the drawing is seen from far (a few meters away) the fields become sharper, and the superimposition of patterns reveals varied colours in the overlapped areas. The aim here is not to produce an in-between condition or *figural-ground*. It aims to reveal operations at different scales and disclose unexpected outcomes by redefining figure and ground edges. A consequence is the generation of blurred edges, which may provide equivocal delineations between figure and ground.

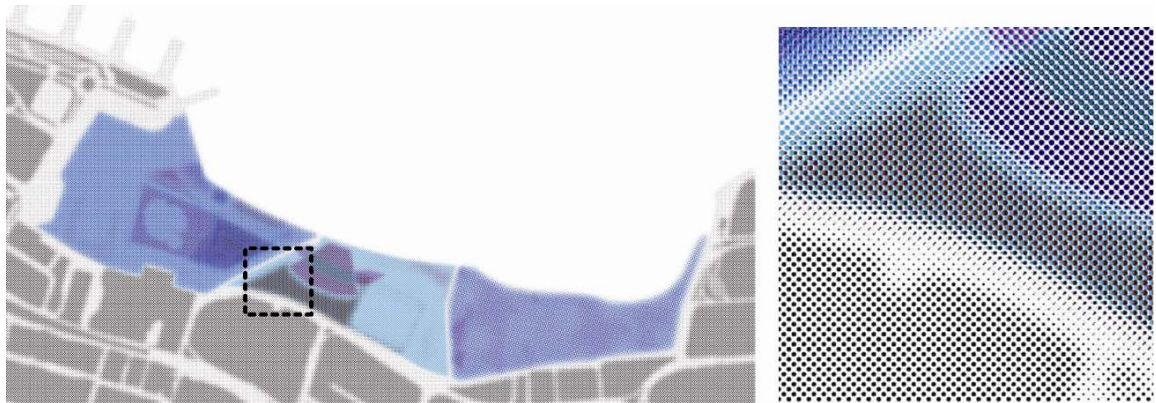


Figure 4. Halftone technique and figure-ground overlapping. The square in the left mapping is augmented on the right.

## CONCLUSION

The making of a map has to offer critical interpretation and serve as stimuli for the production of new scenarios. Traditionally figure-ground maps produce a schema that has become standardised and depicts the technique as a convention. An example of this is the *poché plan*, *ichnography* where buildings are indicated in solid black and the 'space between them' is left as white, and it has an inherent hierarchical imposition. This one is inherited from Gestalt psychology, where figures are the important and dominant group and ground is the undifferentiated and subordinate one.

Experimentation using Gestalt principles probed the figure-ground technique in mapping, inverting and subverting its rules as a convention. While this investigation into the temporality of urban landscape is not exclusive to subtropical climate cities, these scenarios offer abundant strata in analysing the use and appropriation of urban public space, specifically in the definition of edges. A reformulation of the technique gives new meanings to figure and ground, not in terms of their binary opposition proceedings—as this is the essence of figure-ground relationships—but in the visual perception of figure and ground as such.