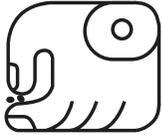


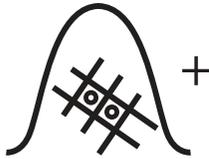


Hong Knog = tea shop

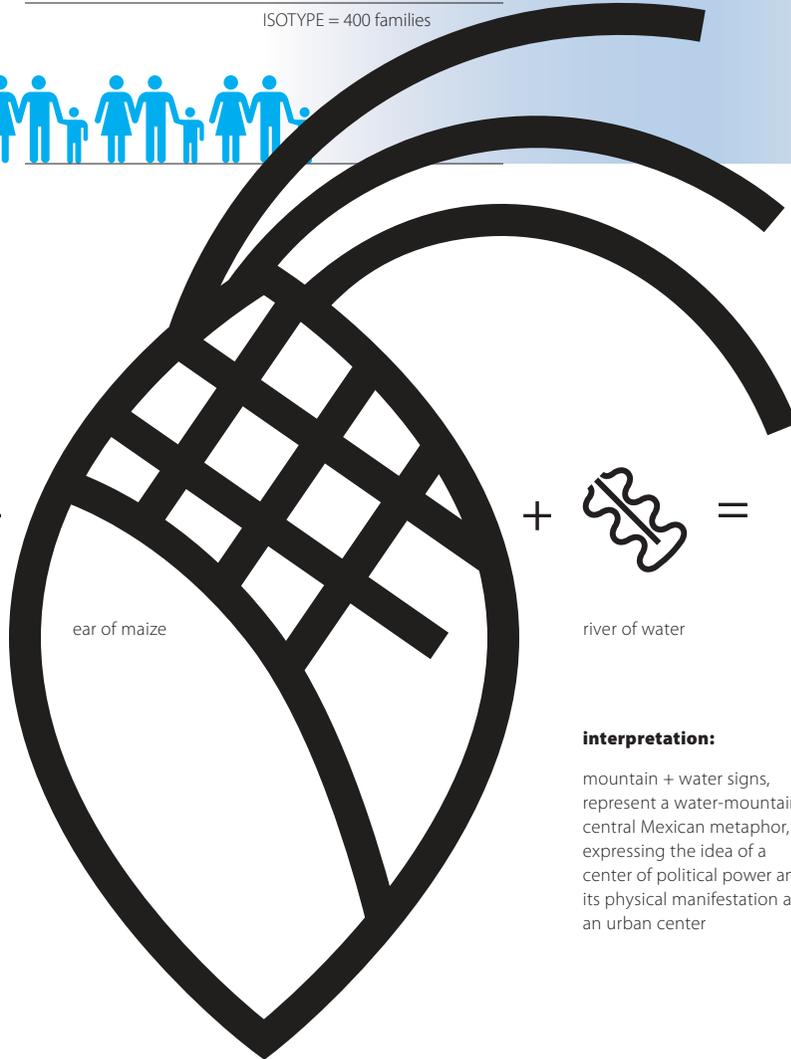


Maya text = sow

ISOTYPE = 400 families



a stylized mountain pattern of rhomboids and circles used to express the idea of the reptilian skin of the Earth



ear of maize



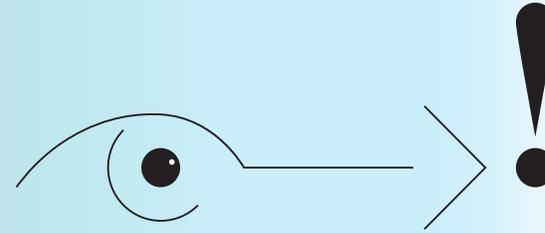
river of water

interpretation:

mountain + water signs, represent a water-mountain, central Mexican metaphor, expressing the idea of a center of political power and its physical manifestation as an urban center

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51 . 1

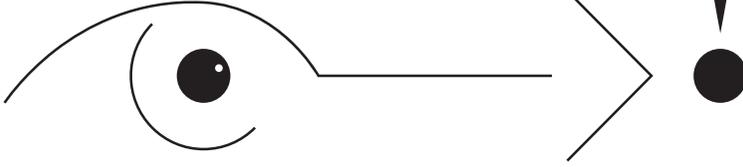
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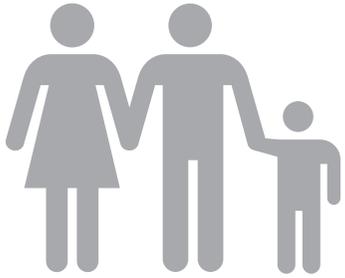
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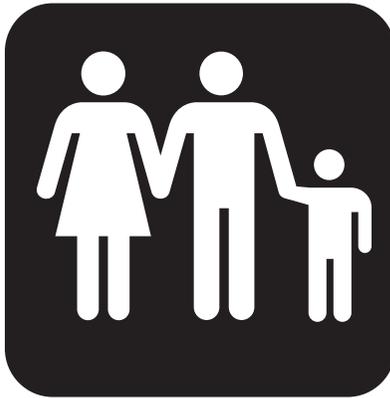
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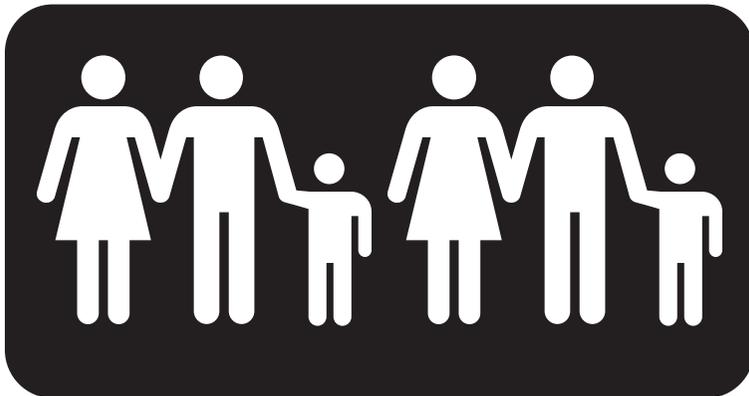
1 Isotype icon represents 100 families



transformation design quandary:
Represent 128 families with 1 icon or 2 icons?



1 icon **under represents** the data by 21.88%



2 icons **over represents** the data by 56.2%

NOTE:
The family icons used above are not ISOTYPE icons but are from the publically available Hablamos Juntos icon set designed in part by students at the University of Cincinnati.

“Maria Neurath created an exaggeration of 56.2% in favor of Williams’ political agenda.” (see pg. 27)

Behind Isotype Charts:

The Design of Number-Fact Pictures

Pia Pedersen, PhD

For more than 40 years, Marie Neurath designed ISOTYPE charts using pictograms as graphical units to make a variety of information more accessible for the layman. She was a transformer linking science and design by using the benefits of both worlds to meet the public’s interests. Significant insight could be gained from this innovative work. However, many relevant aspects of the transformation process remain elusive and are far too often imitated and misunderstood as simply drawing ‘rows of little men’.

The purpose of this article is to demonstrate the use and implementation of pictograms by examining how Marie Neurath designed ‘number-fact pictures’. A selection of specific examples from an in-depth case study of Marie Neurath’s sketches created while she was designing a post-war exhibition in Bilston, England, in 1946 forms the basis for a discussion of how pictograms were used as fractions, arrangement, and message accentuation. These three aspects outline recurrent approaches and actions of the transformation process that were shaped according to the situation at hand. The paper provides an in-depth practical perspective on the work and reveals how Marie Neurath, by shaping facts and using pictograms constructively as convincing communication tools, deliberately guided the reader towards a specific agenda.

Keywords:

- icons
- pictograms
- sketching

Introduction

Austrian sociologist Otto Neurath (1882–1945) believed in pictures as a means of communication; attractive and informative pictures could help make information more accessible for the layman. Together with his associates he developed the now century-old graphic approach ISOTYPE (International System Of Typographic Picture Education) in which pictograms¹ were the core component for designing a variety of information. What is interesting about Isotype charts is not only the famous and well-designed pictograms by the German Modernist artist, Gerd Arntz (1900–1988) – what many people think of as Isotype – but how the pictograms were applied and combined deliberately and distinctively according to the situation at hand.

Marie Neurath (1898–1986, née Reidemeister) dedicated her life to what the Isotype team called transformation – the process of assembling, selecting and configuring the factual information provided by the expert into a rough chart which was handed over to the artist who then did the finishing touches. As a link between expert and artist, Marie Neurath took on the responsibility of ‘trustee of the public’, choosing factual information in accordance with the public’s interests. Today transformation may be seen as a way of thinking (Kinross and Neurath (2009), 7) or as information design (Burke, Kindel, and Walker (2013), 14).

Although the work of the transformer originated almost a century ago it still contains key lessons, such as the use and implementation of pictograms as aids of communication in ‘number-fact pictures’². These lessons, however, are challenging to explain in words, because the apprenticeship and integrative model of transformation has given the work some implied features. The Neuraths used their skills and experience to teach transformation, but no manual exists explaining how to transform.

In 1945, Otto Neurath was asked to assist in a slum clearance project in Bilston, a small industrial town in the ‘Black Country’ of the West Midlands in England. The social and political aims of the project – the Bilston Venture – culminated in a local exhibition that opened in November 1946. Twelve Isotype charts were created as a means to engage the slum dwellers in the planning project. The comprehensive sketching and collaboration process that was part of the preparations for the project provides a rare opportunity to shed light on the activities and practices of the Isotype transformer, particularly in relation to the design of number-fact pictures.

While Isotype has often been associated with its front figures, Otto Neurath and Gerd Arntz, recent re-evaluations of Isotype now give Marie Neurath’s work significance (e.g. Macdonald-Ross and Waller (2000); Kinross and Neurath (2009); Burke, Kindel, and Walker (2013)). Robin Kinross, for instance, claims that the significance of Isotype lies “in the process of visu-

ally configuring material” (Kinross and Neurath (2009), 6); yet, precisely this process remains obscure or is shown mainly through individual sketches. The Bilston Venture, more explicitly, has received little attention academically from a graphic design historical perspective. It was not part of the projects researched by *Isotype Revisited*³; it was not represented in *Isotype: Design and Contexts 1925-1971* (Burke, Kindel, and Walker (2013)) nor in *The Transformer* (Kinross and Neurath (2009)). Thus, until recently, the Bilston Venture has mostly been explored from other perspectives such as planning theory and education (Larkham (2006); Whyte (2007); Amati (2014)), philosophy of science (Nikolow (2004)) and cultural studies (Henning (2007)).

Marie Neurath claimed that one could understand what her work entailed by analyzing the process “from the table to the graph and from the graph to the Isotype chart” (M. Neurath (1955), 34). This was the purpose of a recent PhD project (Pedersen (2016)), whose findings form the basis for examining how Marie Neurath used pictograms in the process of designing number-fact pictures. The present article is based on a limited selection of all-inclusive material which scrutinizes practical details of Marie Neurath’s work. Assembled from the Otto and Marie Neurath Isotype Collection, Department of Typography & Graphic Communication, University of Reading (henceforth IC), the Isotype material related to Bilston consists of data sheets, reports, letters, sketches and reproductions of the final charts in B&W. This material exemplifies how Marie Neurath worked from one sketch to the next and then discusses how pictograms were used as fractions, arrangement and message accentuation⁴. The present article provides a more practical perspective of the work that clarifies some of the everyday details (e.g. the selection and shaping of facts) that normally remain hidden in single pieces of archive material. This is important in order to avoid misconceptions of the Isotype work and, from a broader perspective, to further understand symbolic communication.

3.

A research project by the Department of Typography & Graphic Communication at the University of Reading.

4.

Note of source of pictures:

All images are published with the permission of the Otto and Marie Neurath Isotype Collection, University of Reading.

Background

Otto and Marie Neurath had no background in design; they were scientists who approached graphic design as a means to meet social needs (Twyman (1975), 7). The purpose of Isotype was therefore not to make data decorative, but rather to generate a unified international pictorial language for educating the layman. It was in this context, in finding “the best way” to state something visually (Kinross and Neurath (2009), 9), that the characteristic pictograms and the idea of the Isotype transformer arose.

In its first five years (1925–) the graphic approach was subject to

1.

The term ‘pictogram’ is employed to denote the individual Isotype pictures principally designed by Gerd Arntz. For the majority of cases these are icons, because they have a resemblance to the object they represent and the pictogram is therefore suitable. Some Isotype pictures, however, are symbols because they have a form that does not bear a direct resemblance to the object or the concept they represent, such as the cogwheel that stands for industry.

2.

Term employed by Otto Neurath (see O. Neurath, 1936, 73).

5. Originally Isotype was named the Vienna Method (Wiener Methode der Bildstatistik). The name Isotype was coined in the mid-1930s by Marie Neurath.

many revisions⁵; afterwards, it mostly underwent refinements and extensions. Likewise, Marie Neurath gradually grew into a transformer: From learning to select relevant statistics, she eventually became capable of seeing projects as a whole and transform in a way that created connections between charts by using the Isotype principles and rules constructively across media and culture. Thus, when Marie Neurath began to create the Bilston charts in 1946 she was transforming within predefined conventions and no longer focusing on developing a graphic approach. Otto and Marie Neurath were co-directors of the Isotype Institute in Oxford (1941–8). Isotype had by now gained maturity, won great international reputation and was even expanding into the realm of children's books and documentaries. The Bilston project was part of a stream of post-war Isotype projects on social welfare and planning, such as the booklets *Social Security* (1943) and *Social Insurance* (1944), and the documentaries 'World of Plenty' (Rotha (1943), Youtube) and 'Land of Promise' (1946).

Isotype rules of transforming

Otto and Marie Neurath saw transformation as central to the graphic approach both in its development and in everyday practice. Otto Neurath described transformation as "the first step from the statements of science to the pictures", a step that could not be explained by "the work of a man of science or of a designer" even though it was a combination of the two. It was a "delicate business" that required more than knowledge of the rules; it was a matter of "training in their use" (O. Neurath (1936), 8–9). The following statement elaborates this further:

There are many transformation rules, some hundreds of them. Since the application of the rules cannot become standardized, but each new picture needs, as it were, a somewhat new invention of combinations, There is no possibility to transfer the rules in a simple way, one has to become acquainted with the whole structure of rules and to learn to weigh them from case to case, i.e. transformation needs rules plus much routine. (Neurath (1944)⁶)

6. Quoted from Burke et al. (2013), 337

As implied here the essence of transforming lies in the way of combining rules according to the needs of the specific case. This was also confirmed by Marie Neurath who saw the rules as more as a help to "avoid mistakes than to find solutions" (M. Neurath (1947), 600). Marie Neurath compared an Isotype chart to an essay in which an argument could be presented in many different ways (ibid.). She was educated as a teacher of mathematics and physics which was echoed in the notion of the Isotype transformer who was often compared to a teacher. Transformation, as explained by Marie Neurath, was finding a way to extract the essential facts

of the material and put them into picture form (M. Neurath (1974), 136). This process involved tasks such as collecting, understanding, selecting and making the data understandable in the most efficient way. Marie Neurath saw transformation as a process of simplification involving deconstruction and reconstruction: "We must grasp a story thoroughly, then forget the terms in which we have learned it and rebuild it in the simple bricks which are at our disposal" (M. Neurath (1954), 34). When the transformation was complete, she explained, it had the form of a blueprint wherein "words, title, arrangement, type, number and color of symbols, caption etc." had been decided (ibid.).

The primary rule for creating such charts is letting one pictogram represent a certain number, whereas larger numbers are shown not by enlarging the pictograms but by adding a relevant number of pictograms of the same size (O. Neurath (1936), 71–72). Finding the right numerical unit for the pictograms was vital, and Otto Neurath stressed that it "had to be as great as possible but not greater than it could show a development or diversity in the numbers" (ibid. 79). As will be explained later, Isotype charts often have larger units and fewer pictograms than other charts using the same principle. In general, the Isotype rules guiding the transformer included the use of color, pictograms, signs and configuration, and they were the basis for creating an effective educational picture understood by casting no more than three glances: first, the most important points, second, the less important points, and third, the details (ibid., 27). Otto Neurath argued that "a simple picture kept in memory is better than any number of complex ones which have gone out of it" (ibid., 28), not because he disrespected statistical information, on the contrary; it was the basis to meet social needs. Marie Neurath stated that in spite of their apparent simplicity it requires some effort to understand Isotype charts (M. Neurath (1947), 603).

The Bilston Venture

In mid-1945, Otto Neurath was contacted by A.V. Williams, the Town Clerk of Bilston, who wanted his advice for the planning of a slum-clearance project. Williams was an active writer and member of the Labour Party and he was particularly interested in Otto Neurath's experiences from his involvement with housing in the 1920's Social Democratic Vienna. According to Marie Neurath "it was a matter of a plan for an exhibition to win over public opinion against the Conservative majority of the Council" (M. Neurath (1980), 84) – hence there was a political agenda behind Otto Neurath's involvement.

After the Second World War, the slums in Bilston were in such bad state that new town planning was an acute matter of health. Bilston was not damaged by the Blitz but by the effects of long-lasting coal and iron production as well as population increases. Workers were living under conditions so bad that the population's health was menaced and further aggravated by heavy air pollution. The extent of these problems was revealed in a civic

survey from 1944 that would guide the plans for the city.

Otto Neurath's answer to a successful slum clearance was visual education as a means to showing the slum dwellers a new and happy way of living. His idea was to organize an exhibition with charts and models, where the relevant questions in relation to the slum clearance would be displayed and discussed in a way that could arouse the slum dwellers' curiosity and participation in building a new community.

Under normal circumstances, Otto and Marie Neurath worked in close collaboration. However, a few months into the project Otto Neurath died and Marie Neurath was forced to complete the work alone. Marie Neurath's contribution to the project was 12 large multi-colored charts of 4 ft. square, created as mediation devices with four topics: The housing situation and future scheme (charts no. 1–4), planning conditions (charts no. 5–6), air pollution and health (charts no. 7–10) and finally leisure facilities (charts no. 11–12).

The exhibition opened in Bilston in November 1946, reaching the target audience directly in their neighborhood. However, shortly after its opening, the exhibition began to encounter political opposition and closed down. Likewise, due to a series of unforeseen events, the housing scheme was never completed according to the original plan. Therefore, as the exhibition became entangled in political and economic issues and a series of unfortunate circumstances, it is difficult to determine the influence and success of Marie Neurath's charts.

In practice

In 1944, before Isotype's collaboration with the Bilston Council, the city had hosted another exhibition named the *Bilston Civic Survey* in which Bilston's problems were outlined through maps and charts. The following example compares two charts – one from the *Bilston Civic Survey*, the other an Isotype chart. Both are based on the same statistical table (figure 1) and the principle of repeating pictograms of the same size; however they are very different in terms of graphics and statement.

Many differences emerge when comparing the two charts in Figure 2, where chart A is from the first exhibition and chart B from the second.

First, looking at the factual content, they both contain statistical data about the housing situation dispersed over the eight districts in Bilston. Chart A "Urban Blight" focuses on the unfit houses only (row A1) whereas chart B "Bilston – The Houses" includes four rows from the table (A1, A2, A3 and E13) displaying the whole housing situation in Bilston. In spite of this, chart A includes more pictograms than chart B because the chosen unit is lower. Each house pictogram stands for 10 houses, while in chart B they stand for 100 houses or families. Chart B might therefore include more

Figure 1

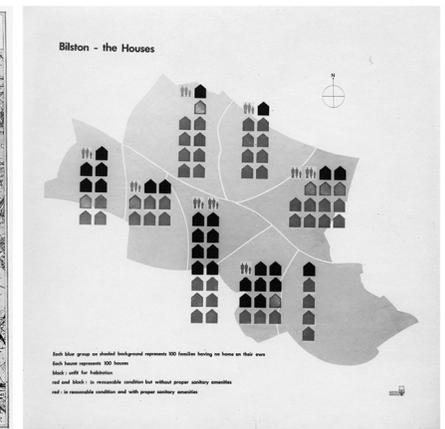
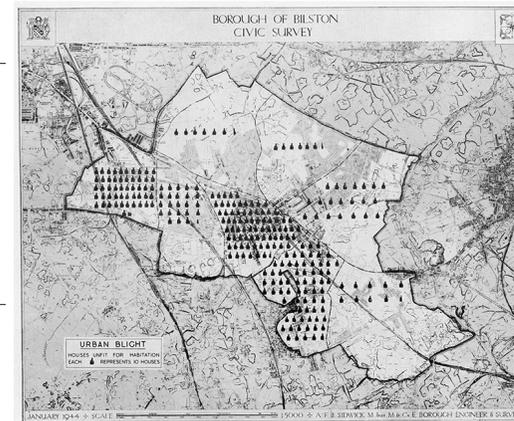
The table from the civic survey report

Source: Barnett (1944), 5; Otto and Marie Neurath Isotype Collection, University of Reading

SUMMARY OF HOUSING AND OVERCROWDING

AREAS 1 - 8

| Area | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total |
|---|-----|-----|-----|------|-----|-----|-----|-----|-------|
| A. State of Repair and General Condition | | | | | | | | | |
| 1. Houses unfit for habitation by reason of disrepair and sanitary defects | 518 | 233 | 68 | 775 | 65 | 212 | 689 | 95 | 2,655 |
| 2. Houses in a reasonable state of repair but without proper sanitary amenities | 205 | 80 | 88 | 358 | 51 | 293 | 65 | 36 | 1,176 |
| 3. Houses in a reasonable state of repair and with proper sanitary amenities | 219 | 456 | 817 | 188 | 764 | 816 | 307 | 373 | 3,940 |
| B. Age of Structures | | | | | | | | | |
| 4. Houses 0 - 29 years of age | 194 | 452 | 787 | 65 | 698 | 816 | 284 | 372 | 3,752 |
| 5. Houses 30 - 39 years of age | 115 | 67 | 73 | 40 | 68 | 186 | 24 | 8 | 497 |
| 6. Houses 40 - 59 years of age | 141 | 36 | 77 | 265 | 67 | 96 | 22 | - | 704 |
| 7. Houses 60 - 79 years of age | 260 | 76 | 9 | 384 | 14 | 98 | 130 | 53 | 1,024 |
| 8. Houses 80 years of age and over | 232 | 138 | 27 | 567 | 33 | 125 | 601 | 71 | 1,794 |
| C. Houses Economic Life Exceeded | | | | | | | | | |
| 9. Houses 60 years of age and over | 492 | 214 | 36 | 951 | 47 | 223 | 731 | 124 | 2,818 |
| D. Ownership | | | | | | | | | |
| 10. Houses owned by Corporation | 92 | 400 | 463 | 51 | 543 | 759 | 258 | 151 | 2,717 |
| 11. Houses privately owned | 850 | 369 | 510 | 1270 | 337 | 562 | 803 | 353 | 5,053 |
| E. Overcrowding | | | | | | | | | |
| 12. Houses overcrowded | 70 | 84 | 41 | 106 | 75 | 186 | 135 | 48 | 745 |
| 13. Houses occupied by more than one family | 68 | 82 | 80 | 150 | 64 | 128 | 99 | 37 | 708 |



🏠 = 10 houses unfit for habitation

🏠 = 100 families with no home of their own

🏠 = 100 houses unfit for habitation

🏠 = 100 houses in reasonable condition but without proper sanitary amenities

🏠 = 100 houses in reasonable condition with proper sanitary amenities

Figure 2

Left (chart A): Chart titled "Urban Blight". Right (chart B): Chart from the Isotype exhibition 1946 titled "Bilston – The Houses" (colored by the author)

Source: Chart A: "Bilston Civic Survey Exhibition" 1944, Town Hall Bilston. Exhibition pamphlet; Otto and Marie Neurath Isotype Collection, University of Reading

data; however, it is less accurate because in order to reach the unit 100, the numbers have been substantially rounded off. The written information also differs; chart A contains more written information such as scale and date, while chart B only contains a title on top and a caption on the bottom. It should be mentioned that each of the Isotype charts was accompanied by short explanatory texts presented in a small exhibition pamphlet handed out at the exhibition entrance.

7.

In previous research the Bilston material was thoroughly mapped in a combination of design historical analysis and information visualisation methods. For a thorough description of the method as well as the process for each of the 12 charts and the exhibition as a whole (see Pedersen (2016)).

Second, looking at the graphics, the level of detail in chart B is generally reduced. The map is simply constructed around the contour of the districts. The same applies to the pictograms, where the house in chart B is simpler than the one in chart A. The additional data included in chart B results in an extra pictogram (the families) and color codes. When it comes to the implementation of the pictograms, in chart A they are cut into halves and placed at varying distances from one district to the next. In chart B, all pictograms are whole and placed consistently according to a grid.

By simplifying the graphics and cutting the number of pictograms, Marie Neurath creates a chart which is less accurate but raises a more complex question than chart A. Marie Neurath shows the overall picture from which the reader can create his own comparisons, associate himself with the gravity of the situation and comprehend the importance of the new housing scheme. Using the approach in chart A it would have taken four charts, which would then make the comparison between housing conditions difficult. Later on in the article it will become evident how the visual content in chart B is deliberately constructed to guide the reader in making the right conclusions.

Through a selection of examples, the purpose of the following section is to elaborate on the process from the statistical table to the final chart⁷. The examples are selected because they demonstrate some transformation approaches that are interesting in the discussion of how pictograms are used in Isotype charts.

Example: Rows of little lines

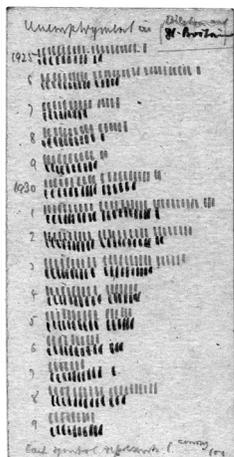


Figure 3

Sketch titled "Unemployment in Bilston and Great Britain"

There is a similarity between what can be observed in Figure 3 and what Marie Neurath described as, "We must grasp a story thoroughly, then forget the terms in which we have learned it and rebuild it in the simple bricks which are at our disposal" (M. Neurath (1954), 6).

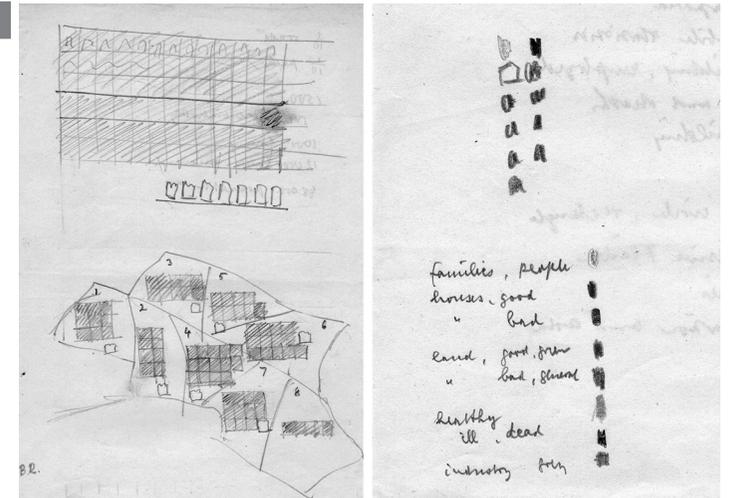
Figure 3 was never developed into a chart; however, it represents one of the basic steps of transformation that often would occur, not only in the Bilston case, but also in the additional material collection at the IC collection at Reading. It was an early step of materializing Isotype's principle of repeating pictograms. By drawing rows of small lines, squares or other forms Marie Neurath visually calculated and analyzed the data, the chosen units and their respective size.

Source: Otto and Marie Neurath Isotype Collection, University of Reading

Figure 4

The first sketches

Source: Otto and Marie Neurath Isotype Collection, University of Reading



Example: Chart no. 1. Bilston –

The Houses

The process behind chart no. 1 is purely to illustrate how Marie Neurath proceeds from the statistical table to the final chart. This example presents a less complex process that is easier to comprehend than the rest of the charts. As mentioned earlier, Marie Neurath chooses rows 1, 2, 3 and 13 of the statistical table in Figure 1 to show the general housing situation in Bilston. In the first sketch (see figure 4, left) Marie Neurath already sets the pictogram unit to 100 houses and most probably tests it through the colored squares based on the totals. Below, on the same piece of paper, the squares are dispersed on the Bilston map according to the district they belong to.

Marie Neurath proceeds (figure 4, right) by trying out color conventions of the exhibition on the basis of the pictograms from chart no. 1. The color conventions for all charts were thus decided upon while designing this first chart. In the first sketch, the color blue represents houses in a reasonable state, which is later changed in Figure 5, left, because blue was now chosen as the color for families. In Figure 5, Marie Neurath has applied the new color conventions, adding a title and a caption, and from this sketch it is easier to demonstrate how the numbers are rounded off. Looking at row 13 in the table (figure 1) the district numbers of families with no home of their own go from 37 to 150. On the sketch district 8 is the only district without a family pictogram, the rest have one family pictogram.

In the following sketch (figure 5, right) districts no. 4 and 6 suddenly have two pictograms instead of one, because Marie Neurath decides to exaggerate the gravity of the situation. In terms of statistical accuracy this means that 150 (district 4) and 128 (district 6) are rounded off to 200 families without a house of their own, which is a radical simplification of the original numbers.

A comparison between the two sketches in Figure 5 furthermore reveals how the pictograms become bricks to create an arrangement that conveys the message in the best visual way. The note "Housing facilities /

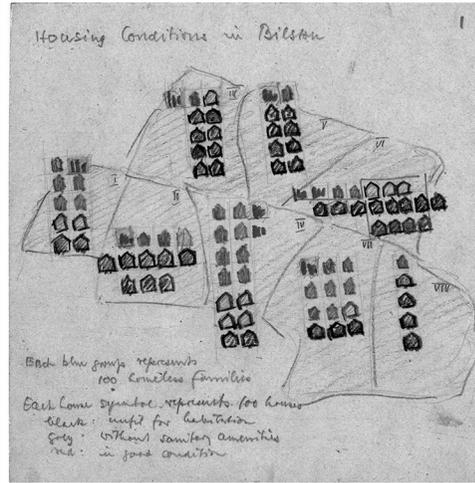
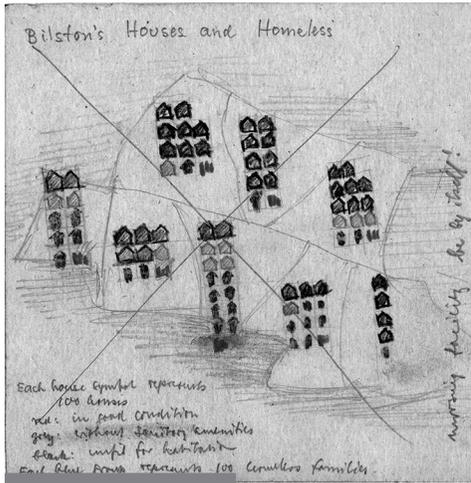


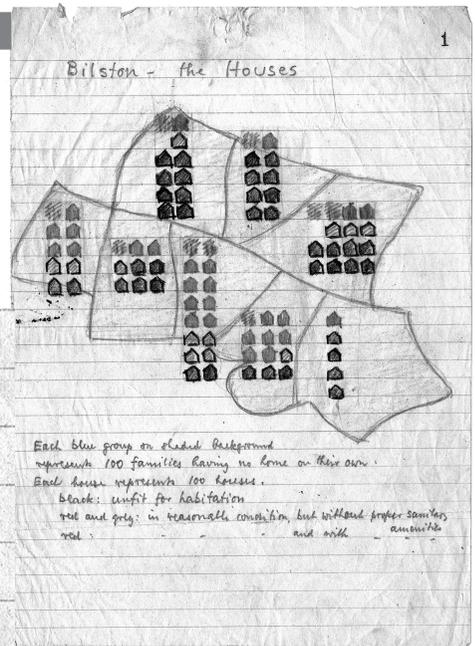
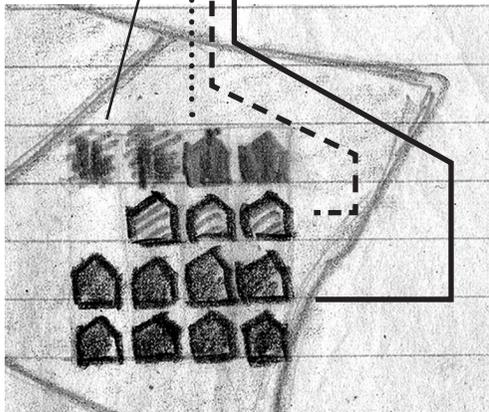
Figure 5

Figure 6

The first attempt (left) is abandoned and a new version is created (right).

Final sketch for chart no. 1

Figure 6 detail (below) shows
blue - families with no home;
black (gray here) - unfit for habitation;
gray (with dark/red outline here) - without sanitary amenities;
red - in good condition.



Source: Otto and Marie Neurath Isotype Collection, University of Reading

be by itself!" on Figure 5, left reveals that Marie Neurath wants to change her approach to presenting the argument. From one sketch to the next the position of the homeless is changed from the bottom to the top. Likewise, in the caption the homeless are now on top. The opposite happens in the title where the homeless are removed; from "Bilston's Houses and Homeless" the title becomes "Housing Conditions in Bilston".

In the final sketch (figure 6) the title is further simplified to "Bilston - The Houses", which is neutral and straightforward. However, the position and number of pictograms are deliberately formed to highlight the gravity of the situation and thus guiding the readers' understanding.

Figure 7

Illustration of how Marie Neurath rotates pictograms while reformulating the title.

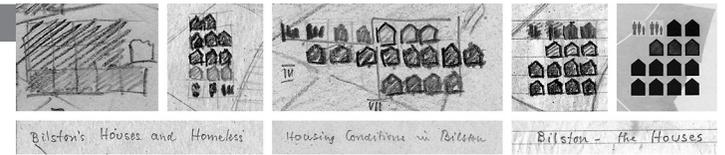


Figure 7 further illustrates how, from the first sketch to the last, the pictograms are rotated again and again while the title is altered three times (originally the title of the statistical table was "Summary of Housing and Overcrowding"). In the first half of the excerpts, as explained above, the pictograms are rotated to highlight the homeless; then Marie Neurath proceeds by arranging the pictograms in a more logical and aesthetical way. Here, in the middle excerpt, one can observe that Marie Neurath draws a square and crosses over some of the red houses outside. She reorganizes the pictograms in rows of four rather than two, most probably because it makes the comparison with the neighboring districts easier and because it creates a better graphical balance that also fits into the district.

In the final chart (see figure 2) the position of the pictograms is limited by the map and graphical grid, which at times means that they are decentralized and exceed the district borders. This reduces the aesthetic quality⁸, but Marie Neurath succeeds in creating a chart from which the reader can learn about the housing conditions in Bilston and make comparisons on different levels: 1) different conditions within the district, 2) from one district to the next and finally 3) in the whole of Bilston. In the exhibition pamphlet the reader was presented with this text: "1. BILSTON, the houses good and bad. There are far too few houses. Many families have no house of their own. Are all parts of Bilston equally badly off? No; they are quite different. In the center 4 in 7 are bad, but in some parts only 1 in 5. What should be done? Take the bad houses away and replace them by good ones – but how?" The text thus guides and encourages the reader to look further into the chart and to engage with the planning discussion.

8.

The Bilston material does not reveal how Marie Neurath collaborated with the artist; however in general, the artwork finishing of the final charts does not reach the aesthetic quality perceived in the Isotype charts created when Gerd Arntz was part of the team (from around 1929-40).

Example: Chart no. 2. Bilston -

The Land and the People

The following sample of sketches created while designing chart no. 2 demonstrates how Marie Neurath uses some of the same approaches as example 2 in a different way. An early sketch titled "Bilston's Building Program" (not shown here) reveals that Marie Neurath's original plan was to show the planned use of land in Bilston by including the total numbers from chart no. 1, probably in an attempt to create a good connection. The idea is dismissed; instead Marie Neurath changes her approach and creates a comparative chart displaying the population in Bilston in the present and in the future use of land.

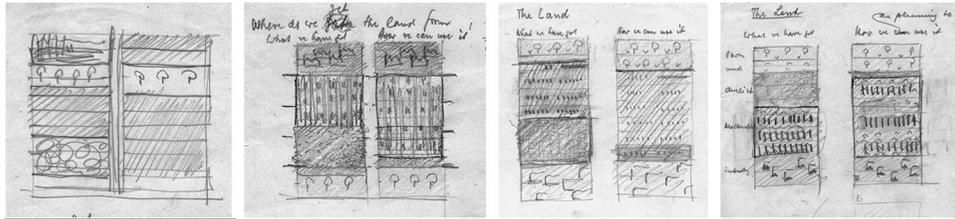


Figure 8

Sketches of the new idea

Source: Otto and Marie Neurath Isotype Collection, University of Reading

First Marie Neurath creates a rough drawing of the new idea (figure 8, first sketch), then proceeds with a more detailed drawing on the basis of different calculations. In the sketch, the total land is divided into ten sections displaying the relationship between (from above) the “industrial”, “residential”, “derelict” and “parks and open spaces”. These are contrasted through two columns depicting “land we have got” and “how can we use it”. The small lines in the residential part symbolize the population of Bilston – 31,248 people in total (Williams (1943), 14) – thus visualized through 30 lines each standing for 1000 people. Later, in the last sketch of Figure 8, Marie Neurath decides to arrange the pictograms on three lines; one line is equal to 10,000 people. Using green squares around the people in the second column (continuing with figure 8, second sketch) is probably to emphasize the added greens in the new scheme; it was rejected in the subsequent sketches.

Like in the process of chart no. 1, Marie Neurath searches for the best arrangement of the pictograms. For instance, from the first to the last sketch, the open land (green trees) is altered three times. A further look at the proportions between the types of land shows how she creates a logical arrangement that fits the visual statement she wants to convey. The industrial land (grey factories) stays unchanged in the new scheme, and by placing it at the bottom of the column it becomes devaluated. In addition, the three other areas are now easier to compare. Visually the open land stays almost unchanged in the new scheme (from 12.6% to 20%); however, in reality this would have been a significant increase, which is difficult to see from the present chart. In the final arrangement, the open land is placed on top thus becoming more noticeable. The result is an arrangement from which the reader can clearly notice that, by reclaiming the derelict land, houses in the new scheme will have more room. Furthermore, in the final sketch (figure 9, left), Marie Neurath removes the derelict land of the future scheme (61 acres ≈ 3.3%), which enlarges the area of the residential space and accentuates the advantages of the new scheme.

Like in chart no. 1, while sketching the configuration, Marie Neurath alters the title several times, from “Where do we get the land from” to “The land” to the final title “Bilston The Land and The People”. In contrast to chart no. 1, Marie Neurath decides to emphasize the people both in the title and in the visualization, most probably to underscore that this includes the whole population. The bulldozer symbol in the final chart was added because Williams (the Town Clerk) wanted to emphasize that the derelict land was almost reclaimed, that “these lands are actually under way” (Williams (17 July 1946)). He suggested a subdivision; however, to avoid complicating the

Figure 9

Final sketch and chart

Source: Otto and Marie Neurath Isotype Collection, University of Reading

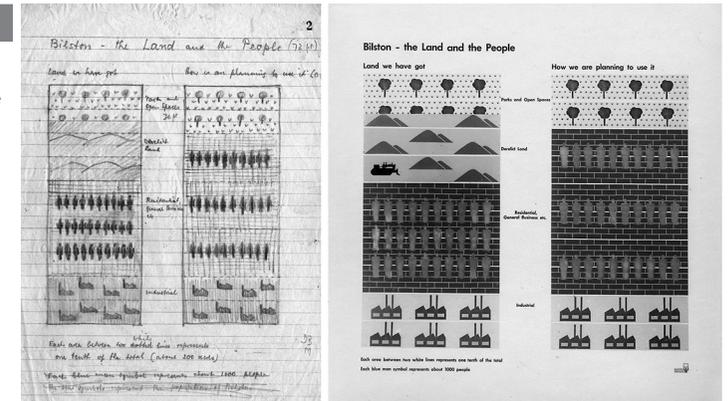


chart further, Marie Neurath recommended the bulldozer.

In a simple manner, chart no. 2, displays the whole population in Bilston in the new and planned scheme, demonstrating how the new scheme will solve the housing situation. Again, Marie Neurath does not give the accurate picture, rather she shows a visual argument, created on the basis of her judgement of the statistics.

Example: Mixing charts no. 3 and 4

The selection and shaping of data was a complex and ongoing process with Marie Neurath searching for the relevant connections or contrasts that would make a meaningful visual argument. Occasionally she started sketching before having the data. Sometimes she questioned the data, and in order to get the most relevant message in the picture, she insisted on receiving the right data. This happened in the case of charts no. 3 and 4 where she wanted to show the housing needs according to family sizes and how these fit with the houses available and planned. However, when Marie Neurath starting sketching and examining the data she discovered a discrepancy between the planned houses and the needs according to family size. Their content was therefore discussed in detail with the Town Clerk (see Pedersen (2016), 164–70), and subsequently, with the right data, the content of the two charts was completely reorganized.

9. On the sketch Figure 11, below left, one may notice some blue pencil corrections which correspond to the planned houses used in the following sketch, Figure 11, below right.

While reorganizing the content, the unit of the family and house pictograms were modified from 100 to 400 (see figure 10). This modification resulted in a reduced number of pictograms, which gave more space to combine and add new data. As the arrows illustrate (see figure 11), the “house sizes needed” from chart no. 4 were placed below the “sizes of families” in chart no. 3, while – in chart no. 4 – the “house sizes available” were vertically juxtaposed with new data, i.e. the “planned houses” according to house size⁹.

Marie Neurath’s way of reorganizing the content in these sketches demonstrates how the process could influence more than one chart. By

Figure 10

Excerpt demonstrating how modifying the content, unit and arrangement of the pictograms creates more space to create a comparative chart.

Source: Otto and Marie Neurath Isotype Collection, University of Reading

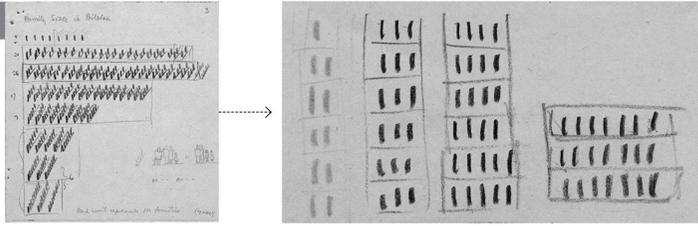
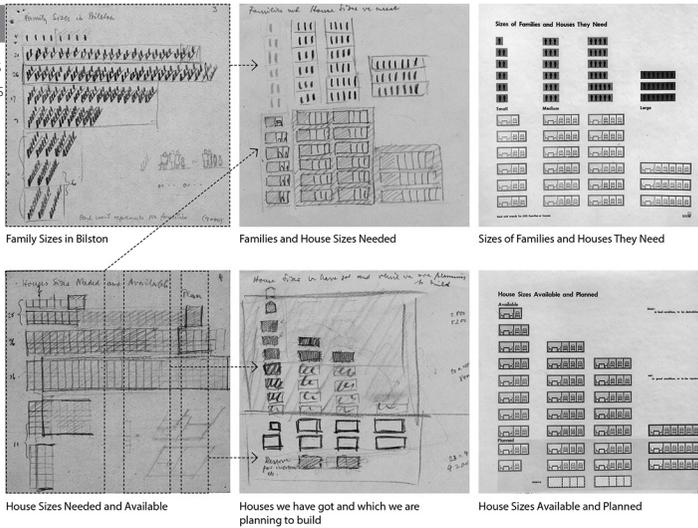


Figure 11

Left and middle: Four sketches created while designing charts no. 3 and 4. The arrows and outlines demonstrate how the content of charts no. 3 and 4 was reorganized. Right: Final charts no. 3 and 4.

Source: Otto and Marie Neurath Isotype Collection, University of Reading



questioning data, modifying the units of the pictograms and mixing content two new and comprehensive charts arose that differ from the initial 'rows of little men' style seen in the two left sketches of Figure 11. The two final charts display comprehensive data in a simple way that lets the reader make his own interpretation. Hence in chart no. 3 the reader can see the numbers and sizes of families and what kind of house the different families need, and chart no. 4 illustrates how the houses to be built add to the actual housing situation. Marie Neurath furthermore elaborates on the story from chart no. 1 by showing how many houses are going "to be demolished", how many are "in good condition and how many are going to be repaired". By comparing the two charts the reader can see that there will be enough houses in the planned scheme. One may also notice how a house type is simply visualized through a square with pictograms indicating the numbers of living rooms and bedrooms.

Example: Chart no. 8. How 300

persons are housed in old and new parts of Bilston

Where the example of charts 3 and 4 illustrates how Marie Neurath would reorganize content on a more general level, the following and last example displays the reorganization of content on a more detailed level within a single chart.

Figure 12

Early sketches displaying that in the future districts there will be more sun.

Source: Otto and Marie Neurath Isotype Collection, University of Reading

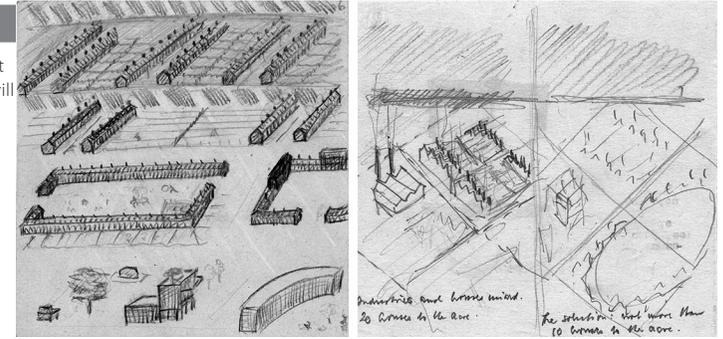
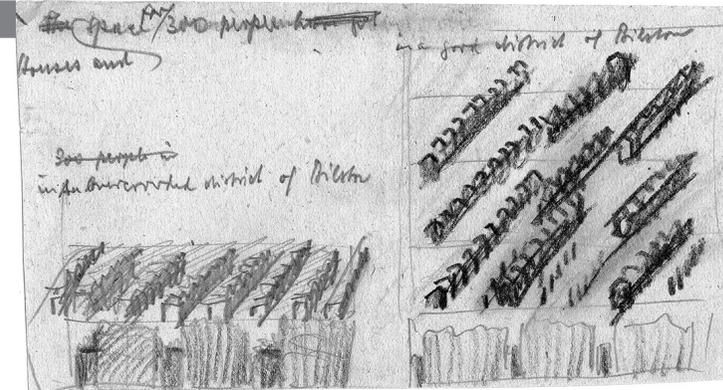


Figure 13

Sketch titled "Houses and space for 300 people"

Source: Otto and Marie Neurath Isotype Collection, University of Reading



The Bilston Council planned to build 4,000 houses with an average density of ten houses pr. acre. The purpose of chart no. 8 was to show that in the good districts there is more sun than in the crowded areas. In the early stages of designing chart no. 8, Marie Neurath tries to find a suitable way of contrasting good and bad housing densities. First, she makes four rows, showing more and more space between houses which allows more sun to reach the ground (*figure 12, left*). In the following sketch, instead of the four rows, two columns now contrast an overcrowded area ("Industries and houses mixed. 20 houses to the acre.") with the future housing schemes ("The solution: not more than 10 houses to the acre") and each diagonal square representing one acre.

Marie Neurath then changes the content (*see figure 13*). Instead of presenting the future scheme, the starting point becomes the actual housing situation, where one of the worst slum districts is contrasted with one of the best districts of the city. Through the use of straight instead of diagonal squares, it now becomes possible to include additional acres in the good district, an effective way to visually point out the added space between the houses. Furthermore, the people are now included, not only in the title, but also visually through three people pictograms each representing 100 people at the bottom of both columns.

In the following two sketches (*see figure 14*) the three groups of 100 people are transformed into four groups of 75. Furthermore, suns and a smoke cloud are added. Most significantly, the four squares from the bad

Figure 14

Two untitled sketches with small alterations

Source: Otto and Marie Neurath Isotype Collection, University of Reading

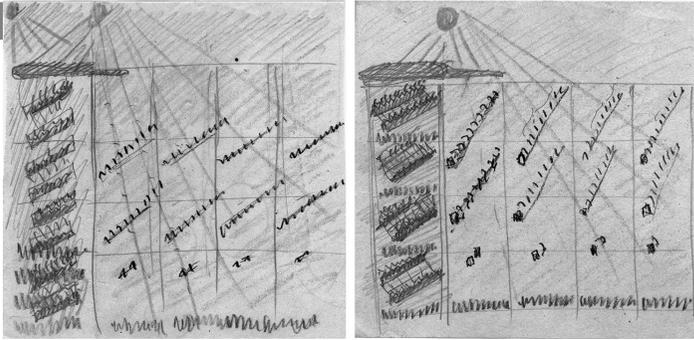
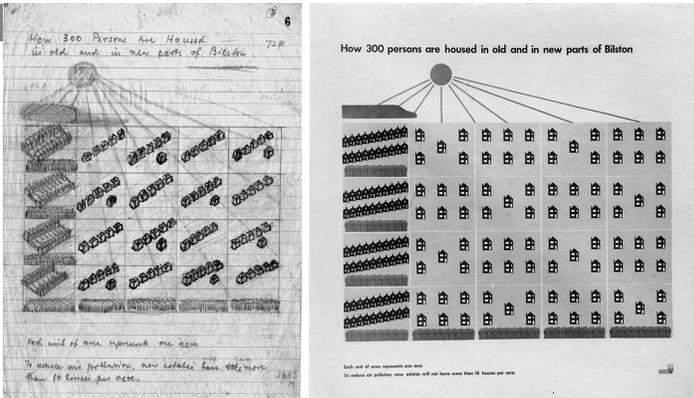


Figure 15

Final sketch and chart

Source: Otto and Marie Neurath Isotype Collection, University of Reading



district are now placed on top of each other, which creates a whole square, a simpler picture and a more straightforward comparison. However, there is a discrepancy between the original data and the number of squares now visualized in the good district, because the actual number should be 20 acres and not 16 acres for 300 persons. On the sketch in Figure 13 it is difficult to see the exact number of squares; however, a sketch created for another chart (no. 9 “Deaths in the First Year of Life in Bad and in Good Houses”) reveals that Marie Neurath initially visualized 20 acres and included written information about the districts in question. In its new square form the 20 acres would need 5 rows, which would destroy the equal ratio four people pictograms between the contrasted districts. In order to solve the puzzle and make the data fit into the square, the solution was to leave out the four ‘excess’ acres in the good district. There is proof in the sketching material for chart no. 9 that Marie Neurath changes the specific information about the visualized districts into two unspecified districts. Thus Marie Neurath made her own interpretation of the numbers and must have determined that this was necessary in order to create the best educational picture.

From one sketch to the next in Figure 14, Marie Neurath proceeds with small alterations. One sun is removed and the four people pictograms in the bad districts are dispersed into each of the four squares. Here one should notice that the suns do not have a numerical value. They are ‘Führungsbilder’, i.e. guiding pictures, whose role is to help indicate the subject matter of a chart or differentiate between sections as the smoke cloud does.

In the final sketch, Figure 15, left, now with the title “How 300 persons are housed in old and new parts of Bilston”, the house pictograms in the good district have been equally dispersed into the different squares. The position of the houses is further improved in the final chart. Here Marie Neurath adds space between the houses and disperses them over the whole square. Altogether these small adjustments help accentuate the message further.

Through this chart the reader can see that the new parts of Bilston have less air pollution. Below, the caption reveals that there will be “no more than 10 houses to the acre” in the new scheme, hence the reader can easily conclude that the overcrowded areas will at least be half as crowded in the future scheme.

Chart no. 8 continues the story of former chart no. 7 “Air Pollution in Bilston” where the air pollution was contrasted with information about rickets (childhood disease due to a lack of vitamin D), showing that without sun children may get rickets. The smoke path thus creates a good connection to chart no. 7, and this illustrates another aspect of Marie Neurath approach, that it was important to construct a coherent exhibition narrative with clear connections between the charts, also in the detail.

Pictograms in number - fact pictures

Some of the approaches seen in the sketches may be distinct to this particular case that clearly was guided by the political agenda of the Bilston exhibition. In other less political Isotype projects, such as the children’s books, there might not have been the same emphasis on highlighting certain parts. Furthermore, the examples constitute only a small part of the whole process of designing the 12 charts for the Bilston exhibition, and many details from the material and design historical context have been omitted. The presented picture of the process is therefore far from comprehensive; however, within the purpose of this article, namely to examine how Marie Neurath used pictograms for the design of number-fact pictures, the different examples clearly show how this was done. By breaking up the use of pictograms into three perspectives – *numerical units*, *arrangement* and *message accentuation*, the purpose of the forthcoming section is to outline some specific transformation approaches and principles.

Numerical Units

Marie Neurath’s mathematical background echoes in her way of designing charts. At first glance this is particularly evident in the sketches with small lines or squares (figure 3), where statistics were approached as units from the

early stages of the process in order to illustrate Isotype's principle of repeating pictograms. More generally, the chosen unit of the pictograms could vary significantly according to the given data, and it would often be modified/increased in the course of the process. When choosing or modifying the unit Marie Neurath always aimed at having as few pictograms as possible, which was a principle put forward by Otto Neurath (O. Neurath (1936), 79). However, this presented a challenge, because the larger the unit, the more difficult it would be to keep the diversity in the statistics. Numbers were sometimes shaped and rounded off so much that the pictogram landscape became too homogeneous, as in the example of chart no. 1, where Marie Neurath added pictograms from one sketch to the next in order to create a more diverse picture. "The purpose of teaching pictures", as Otto Neurath stated, "is to have an effect on the mind" (ibid., 62) and Marie Neurath created such an effect though the choice of the pictogram unit, and if the right effect was not achieved, she either adjusted the number of pictograms (according to the chosen unit) or modified the unit.

Arrangements

As the different examples illustrate, the arrangement in a chart is often closely related to the pictogram unit because it impacts the quantity of pictograms and therefore also the possibility of including additional data in a logical and structured manner. Marie Neurath stated that "comparison is vital in visual teaching" (M. Neurath (1955), 36), and in order to do so the value, number and position of pictograms was repeatedly modified while shaping the configuration: On a general level, often by making or restructuring axes, which helped create a logical and simple configuration; on a more detailed level, by rotating within a small segment of a chart, which helped make the parts fit the overall configuration and highlight the statement.

"The order of signs seen by the eye", as Otto Neurath stated "has to be in relation to the best order for keeping in memory marks in the mind" (O. Neurath (1936), 64). In so doing, the key way of constructing the arrangement was through the rotation of groups of pictograms or single pictograms. Rotation is a standard act of visualization; however, the way Marie Neurath did it was exemplary. By combining mathematical logic with educational and creative knowledge, the arrangement of the pictograms was altered in accordance with what the numbers indicated or what was important to emphasize. It was a process of simplification where the different types of rotations were steps in becoming more and more specific while also including contrasting data. These series of actions were a way of working towards a clearer visual statement and could also influence other charts as seen in the process of charts no. 3 and 4. Title and argument therefore did not necessarily fit from the beginning but were formed along the process. The use of color on the pictograms was also concentrated upon and part of

creating the arrangement. Even though Marie Neurath had chosen a color configuration for all 12 charts early in the process she would often reconsider the chosen color within the individual charts right to the end.

When analyzing the use of pictograms as arrangement, it is surprising to see how far Marie Neurath would go in order to create the right educational picture and statement. One thing is choosing a numerical unit that fits the Isotype principle of repeating pictograms; another is to deliberately add pictograms or omit information in order to make the information fit. In chart no. 8, for instance, Marie Neurath went as far as deleting a whole row. Marie Neurath took statistical information seriously. In order to create a good educational picture and decide what details could be omitted, it was crucial for her to understand the facts and have the right data. This was demonstrated in the example of charts no. 3 and 4, where she insisted on receiving the suitable data. On the other hand, the good educational picture was prioritized over the accurate one. In practice, what was "considered as essential and what as detail, which can be sacrificed in the process of simplification" (M. Neurath (1955), 34) is shown as a process that at times involved a rather free interpretation of the existing numbers.

A closer study of the use of pictograms as arrangement thus illustrates a process that may be compared to solving an equation or puzzle. Hence by making the pictograms come together they all fit within the whole in a logical way in accordance with the *right* visual statement.

Message Accentuation

One of the key features in Isotype charts is that "everything in the picture had to be useful for information" (M. Neurath (1971), 17). When Marie Neurath approached the solution to a configuration she would consider the relevance of every detail and search for ways to emphasize the message further. Items without teaching value would be removed. For instance, in chart no. 8 one of the two suns was omitted because only one was relevant to convey the message (*figure 14*). Furthermore, without changing the overall configuration, small alterations in the position of the symbols were often performed in order to accentuate the meaning of the numbers. In the case of chart no. 8 Marie Neurath worked with the space between the house pictograms to make it as clear as possible that the district was spacious. Looking back at Figure 13 the space between the houses in the bad and the good district was similar; however, in each of the following sketches, while shaping the overall configuration, the detailed position of the houses is also reconsidered again and again. A different way of using pictograms was found in chart no. 2, where the bulldozer was added without a numerical value, to emphasize a scheme in action. Its function may be compared to a guiding picture.

_____ In summary, Marie Neurath used pictograms to accentuate messages by reconsidering their importance and by making small alternations in their position.

Understanding the complex underlying pattern

Both in their design and implementation pictograms remain a challenging task; however, when done well, they become strong tools of communication. Isotype charts are still imitated and misunderstood as ‘rows of little men’ without going beyond Marie Neurath’s very early sketches with rows of small lines, and it is therefore important that the graphic approach is properly understood.

_____ The Bilston material suggests that pictograms were used constructively as numerical units that were *chosen* and *modified* in the course of the process, as arrangement by being *grouped*, *separated*, *juxtaposed*, *excluded* and *rotated* on different levels, and finally as message accentuation by being slightly *repositioned*, *reconsidered*, *added* or *deleted*. These recurrent actions and approaches are only a selection of the ones which can be perceived in Marie Neurath’s process and are part of a larger and more complex pattern of use. In the beginning of the process, the Bilston charts were often visually complex while the content was simpler. Later on, the charts became visually simpler while the content became more multifaceted. Marie Neurath would switch between working on several charts at the same time to working only on a small part of a chart that needed more attention. In this way, by thinking through drawing, she worked towards a consistent exhibition character, from small visual details within a chart to the whole exhibition narrative. Her persistence existed on all levels: Right to the end of the process all aspects were evaluated and given importance, from the data to the configuration, the use of color, text, pictograms etc.

_____ Considering the material in light of Marie Neurath’s experience she was in a constant process of learning while designing, approaching each project and chart as unique even though she worked within a set of pre-defined conventions. Marie Neurath had a load of transformation experience from which she developed the Isotype principles in such a comprehensive way that they could be reused and interpreted in new ways according to the specific situation and material. Transformation therefore appears as a non-linear and multifaceted process, where the visual statement based on pictograms is not necessarily predetermined but arrived at.

_____ Marie Neurath claimed that Isotype charts could “introduce people to problems new to them without influencing them in a particular direction” (M. Neurath (1947), 603). However, the Bilston material suggests that Marie Neurath did want to influence the Bilstonians in the direction of William’s

social agenda. In addition to the choice of content and wording and the intelligible position of the pictograms the data distortions visible in the charts are indications of Marie Neurath’s intentions. A comparison between the original and the visualized data in chart 1 shows that there was a maximum discrepancy of 56.2% (from 128 to 200 families). This exaggeration was made later in the process, when Marie Neurath added family pictograms. Thus, from a discrepancy of 21.88 % (from 128 to 100 families) Maria Neurath created an exaggeration of 56.2% in favor of Williams’ political agenda. Likewise, in chart 2, derelict land was later omitted in the second row, which visually added space between the houses in the future scheme in an exaggeration of 6.25 %. In other circumstances, the original data suggests distortions with the purpose of creating good and logical teaching pictures. In chart 8, for instance, where Marie Neurath deleted a row, the area between houses in the new parts of Bilston was reduced by 23.81% to make the data visually fit into a square.

_____ Either way, be it to create a good teaching picture or a convincing picture, Marie Neurath empowered the reader through simple pictures with relevant questions rather than statistically accurate information. This raises a more general discussion of how much the reader should and wants to be guided? When does the simplification override the truthfulness of statistical information? Such issues could partly be solved today, where the digital world provides the opportunity to create interactive charts, different levels of information or links to the exact figures. But this does not answer the question of who is in a position to judge and use content to create empowering numerical fact pictures. The latter was Marie Neurath’s role, i.e. to be a trustee of the public, as opposed to the expert and the artist whose focus was on their professions rather than on the reader. Nevertheless, as seen in the Bilston project, she functioned as the trustee of the public only within the social agenda she believed in. Isotype charts *are* “telling us what to think”, as Waller and Macdonald Ross state (Macdonald-Ross and Waller (2000), 192); to what extent it is acceptable and how we should balance science and design, information and attractiveness, and simplicity and complexity remains an open question.

_____ With the different templates and applications floating around from which anyone can create automatically generated number fact pictures (e.g. isomatic.de) it will be increasingly important to demonstrate and verbalize how visual communication design may go beyond these applications and empower the reader. The small adjustments in the positions of the pictograms, for instance, that further accentuate the topic of the material are just one of the aspects which cannot be accomplished by following rules or generating charts automatically through apps and templates.

_____ The work of Isotype thus presents a way to approach the visualization of statistics and also the reward of visual experimentation – a time-consuming process that needs to be taken into consideration. Another

aspect, not discussed in the present article but no less important, is that the work of Isotype highlights the importance of feedback and good teamwork across disciplines. Science and design came together through a predefined and unique team structure, and within the field of information design this is one of Isotype's strong legacies (e.g. Macdonald-Ross and Waller (2000)). The work thus also presents a way to explain and adopt an integrative approach through interdisciplinary teamwork.

Conclusion

By exemplifying the way Marie Neurath transformed a more practical picture of the use of pictograms in Isotype charts emerges. Pictograms were the core bricks to create proportions, relationships and connections in the overall configuration, to emphasize shifts and contrasts in parts and to accentuate a topic through their detailed positions. Although this paper is based on a limited selection of material one may conclude that Marie Neurath developed the Isotype principles so thoroughly that they could be reused and interpreted in new ways through her transformation actions and approaches. This confirms that what characterizes Isotype transformation is the pattern of employing the rules rather than the rules themselves. Marie Neurath's work furthermore presents an innovative example of how mathematical analysis and creative thinking processes can go hand in hand in constructive ways.

_____ The practical examples of Marie Neurath's working method are relevant for any contemporary designer working within the field of visualization of information who wishes to create results that go beyond drawing 'rows of little men'. Among other things the examples point to ways of working with visual systems, to ways of selecting and organizing data, and to ways of using pictograms as communicative tools through visual experimentation.

_____ In contrast, some questions regarding the twisting of statistical information emerge that should be considered by every designer. To create the Bilston charts, statistical information was found, shaped and visualized according to the ideas and purposes of a specific social agenda; and the content was even adapted to fit the arrangement of pictograms. The Bilston charts were therefore not only a tool for public education; they were also a tool for public involvement and propaganda.

_____ The Bilston case study shows that even for an experienced designer like Marie Neurath transformation is a "delicate business" with ethical and moral dilemmas. In what circumstances, for instance, is it acceptable to twist statistics with the purpose of having the right "effect on the mind" of the reader, and who is in the position of being the 'trustee' and decide the good of the reader? Today, with the political polarization and fake news, designers will be confronted with similar ethical dilemmas. The digital world

has provided the opportunity to create, store and distribute data. Anyone has access to computer apps and templates that help create infographics and data visualizations, visualizations that are used as tools for argument and decision making. With reference to the lessons of the Bilston case, these circumstances suggest the need for practicing designers to be concerned with the authenticity of the data and the sources they choose or are asked to visualize. Designers need to be aware of the effects of their visualization choices and how these will affect the reader, because they might point in directions that are not directly inherent in the data. Designers could counter this by considering their own biases, the intentions of the client and most importantly whether their visualizations serve the good of the reader. Nevertheless, further discussion is needed as to the best approach for transforming information into visually intelligible and instructive images.

Acknowledgements

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References

- Amati, Marco. 2014. "Engagement And Exhibitionism In The Era Of High Modernism: Otto Neurath And The Example Of 1940S Bilston." In Exhibitions And The Development Of Modern Planning Culture, Edited By Marco Amati And Robert Freestone, 149–62. Ashgate.
- Barnett, F. 1944. "Housing And Overcrowding In Bilston." In Bilston Civic Survey. Bilston.
- Burke, Christopher, Eric Kindel, And Sue Walker, Eds. 2013. Isotype: Design And Contexts, 1925–1971. London: Hyphen Press.
- Henning, Michelle. 2007. "The Pig In The Bath: New Materialisms And Cultural Studies." *Radical Philosophy*, No. 145 (October): 11–19.
- Kinross, Robin, And Marie Neurath. 2009. *The Transformer: Principles Of Making Isotype Charts*. London: Hyphen Press.
- Larkham, Peter J. 2006. "People, Planning And Place: The Roles Of Client And Consultants In Reconstructing Postwar Bilston And Dudley." *The Town Planning Review* Vol. 77 (No. 5): 557–82.
- Macdonald-Ross, Michael, And Robert Waller. 2000. "The Transformer Revisited." *Information Design Journal* 9 (2 & 3): 177–93.
- Neurath, Marie. 1947. "An Isotype Exhibition On Housing." *Journal Of The Royal Institute Of British Architects*, 3Rd, 54 (13): 600–603.
- . 1954. "Isotype Charts." *Medical & Biological Illustration* Volume 4 (1).
- . 1955. "Isotype." *Health Education Journal*, No. 13.1: 28–38.
- . 1971. "Otto Neurath And Isotype." *Graphic Design*, No. 42 (June).
- . 1974. "Isotype." *Instructional Science* 3 (2): 127–150.
- . 1980. "What I Remember." Unpublished Typescript Memoir "Told And Written Down For Henk Mulder." Ic 8.1C.
- Neurath, Otto. 1936. *International Picture Language: The First Rules Of Isotype*. London: Kegan Paul, Trench, Trubner & Co., Ltd.
- . 1944. "Memorandum: Dovetailed Plans Of Series Of Books, Textbooks, Books For Children." Typescript. Ic 3.2/61.

Nikolow, Sybilla. 2004. "Planning, Democratization And Popularization With Isotype, Ca. 1945. A Study Of Otto Neurath's Pictorial Statistics On The Example Of Bilston, England." Edited By Friedrich Stadler. *Vienna Circle Yearbook, Induction And Deduction In The Sciences*, No. 11: 299–329.

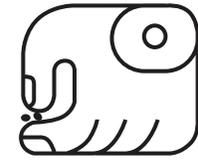
Pedersen, Pia. 2016. "Beyond Rows Of Little Men – Resuming Isotype Transformation With The Case Of The Bilston Venture Exhibition 1946." Phd Thesis, Denmark: Design School Kolding.

Rotha, Paul. 1943. *World Of Plenty*. <https://youtu.be/5Tdocub4kfk>.

Twyman, Michael. 1975. "Graphic Communication Through Isotype." In *The Significance Of Isotype*, 7–18.

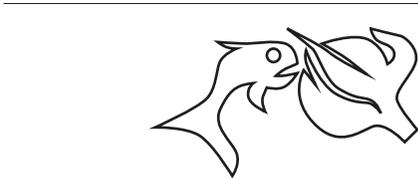
Whyte, Iain Boyd. 2007. "Otto Neurath And The Sociology Of Happiness." In *Man-Made Future. Planning, Education And Design In Mid-Twentieth-Century Britain*, 16–37. London & New York: Routledge.

Williams, A.v. 1943. "The Re-Organisation Of Local Government In Relation To The County Districts Of Bilston, Coseley, Segley." Report. Ic-3.2/93.



text

SOW



**pictorial
signs**



gesture

scattering
gesture



composition

Tz'ihb 'write/paint'

Multimodality in Maya glyphic texts

Agnieszka Hamann

In the times when Maya writing was an enigma, the analysis of Maya inscriptions necessarily focused on iconography and the purely visual aspect of an inscription. Once the writing system was satisfactorily deciphered, the main focus shifted to epigraphic analysis of glyphs and linguistic analysis of texts recorded by glyphs, frequently leaving out the accompanying image. Yet it seems that Maya scribes did not develop the concept of strict division between image and text: the same hands drew both, freely combining elements belonging to the visual and linguistic modalities. This project attempts to define and describe the multimodality of ancient Maya inscriptions, including identifying modalities utilized by ancient scribes. It analyses how the composition, gestures, pictorial signs, and text contribute to deliver the final message. On the example of three texts (Cancuen Panel 3, Laxtunich Panel 1 and Aguateca Stela 1) it attempts to develop methodology appropriate for the analysis of the genre of Maya glyphic inscriptions.

Keywords:

Maya glyphs

multimodality

cognitive linguistics

If a language has one word for a concept that in other languages is expressed by two or more words, it indicates that its users understand this concept as one category – in Classic Mayan, *tz'ihb* 'write/paint' is one conceptual category which can be contrasted, for example, with *uxul* 'carve/sculpt'. Maya hieroglyphic inscriptions are, in fact, based on continuous interplay of what in English is differentiated into writing and painting, text and image, verbal and visual modality. In Classic Mayan, this is one and the same medium of communication - a text is usually accompanied by an image, and an image is very often accompanied by a text, with certain graphic elements repeated in the text and iconography. It is only the interaction of verbal and visual elements that conveys the final message.

To illustrate this interaction: because Classic Mayan is a theme-oriented language¹ (Hamann in press), the main text of the inscription is frequently a one-argument predicative, intransitive or intransitivized clause which focuses on events, objects and locations rather than on people doing things. However, even if the text does not mention him/her, the agent of the event is always provided by the image (see the case studies below for examples).

Importantly, Maya inscriptions show that metaphor and metonymy are not only linguistic but also conceptual phenomena. There are ample examples of metaphors and metonymies expressed both in the textual and visual modalities, and some of them will be discussed below.

This paper investigates the multimodality of Maya glyphic inscriptions. First, it attempts to define multimodality as it appears in Maya glyphic texts and identify modalities characteristic of this genre. Then, it discusses three case studies to illustrate how the modalities work together on the example of Cancuen Panel 3, Laxtunich Panel 1 and Aguateca Stela 1, which were chosen for their variety of approach to how to utilize different modalities. Finally, it summarizes the phenomenon of multimodality in Maya text outlining a spectrum of media used by ancient scribes to deliver the final message.

1. In agent-oriented languages, the default clause structure focuses on the agent as the source of energy that makes things happen, e.g. *Floyd broke the glass*, while in theme-oriented ones, the default is to focus on non-agentive participants of an event – patients, locations, etc., e.g. *The glass broke*, *The book lies on the table*. Of course, each language also provides means to talk about the non-default semantic roles, so in English it is common to use active voice, but the passive can be used if the speaker wishes to background agentivity and highlight another aspect of the situation (see Langacker 2008).

Multimodality

Based on Forceville's definition of multimodal metaphor (2009, 22–23), I would like to propose to define **multimodality** as communicating the message via more than one modality (or mode), where **modalities** are generally such channels of communication as: "(1) pictorial signs; (2) written signs; (3) spoken signs; (4) gestures; (5) sounds; (6) music (7) smells; (8) tastes; (9) touch". Forceville's approach was chosen here as the basis for developing methodology appropriate for the genre at hand because (1) Forceville operates within cognitive linguistics framework, which ensures consistency in terminology and assumptions about language and communication, (2) a lot

of his research concentrates on multimodality in genres reasonably similar to the genre analysed here, that is on multimodality in comic stories and advertisements, where the text and image cooperate to deliver the final message.

Due to the specificity of the genre (Classic Period monumental inscriptions carved in stone), the list of modalities showing up in the analysed examples includes as a minimum: (1) the overall composition of the image and text, (2) gestures performed by the characters, (3) pictorial signs and (4) written signs. (5) Colour, whose traces can be seen on some monuments and which for the ancient Maya probably carried an additional layer of information, will not be included in the analysis, firstly, because it is mostly gone, and secondly, because our understanding of colour use by the ancient Maya is very limited (S. Houston et al. 2009)

The **composition** of the image and text is understood here as the spatial organization of the elements of the image in relation to each other and to the text, as well as details of imagery which are not recognizably pictorial in nature, such as clothes or interiors, though it is sometimes difficult to separate them, e.g. headdresses sometimes include glyphic signs which identify people (see Tuszyńska 2017). The **gestural** modality is amply manifested in Maya imagery, it is extremely conventionalized and it must have been highly meaningful, though just like in the case of colour, we do not fully comprehend the meaning of different gestures adopted by depicted figures (Ancona-Ha, Perez de Lara, and Stone 2000; Miller 1983). Thus, gestures will be described in the process of analysis, but alas not fully explicated. **Pictorial** signs are mainly what Stone and Zender (2011, 13–15) call 'property qualifiers', that is basically glyphic symbols or their diagnostic features embedded in the image to convey certain properties, such as material: *te'* 'wood'; *tun* 'stone'; colour: *ihk'* 'black'; *k'an* 'yellow, ripe'; classification: *ak'ab* 'darkness, night, nocturnal'; sound: *ik'* 'wind, breath' on musical instruments, speech scrolls linking the mouth of the speaker with his words, etc. They are not meant to be read out as linguistic units but to clarify an image which is not fully realistic and is complemented with a sign which in other contexts may be linguistic. **Written** signs are understood as a string of glyphs recording spoken language with its whole complexity, that is word order, grammar, etc. The general rule adopted here is that "text" (or "written signs") includes strings of glyphs organized in square glyph blocks and in clearly delineated rows and/or columns, while "pictorial signs" are single signs embedded within the image. Though again, some fragments may be ambiguous, e.g. captions can be interpreted in two ways: as simple captions stating e.g. *ajaw* 'ruler' (which would qualify them to the pictorial modality as signs simply denoting a property or a position of a person) or as clauses *ajaw-ø* (ruler-3SA) 'he (is) the/a ruler'. Thus, the categories' boundaries tend to be fuzzy and at times image, gesture, pictorial signs and text morph into each other, which the following examples will illustrate.

material:

te'  wood

tun  stone

colour:

ihk'  black

k'an  yellow
ripe

classification:

ak'ab  darkness
night
nocturnal

sound:

ik'  wind
breath



Figure 1
Cancuen Panel 3
(photo Authenticmaya / Creative Commons Attribution-Share Alike 2.5 license)

Caption 2
Clauses 1 & 2

Cancuen Panel 3

Composition

The panel depicts three figures and at first glance it is obvious who the most important person is. Firstly, the central figure is much bigger compared to the other two people. Secondly, the focal figure occupies the very centre of the image, while the other figures flank him. Thirdly, the focal figure is seated on an object, which in itself is the sign of a high rank, while the secondary figures are kneeling on both sides, facing the central figure, which underlines their lower status. Thus, the composition of the image is motivated by such conceptual metaphors as *IMPORTANT IS BIG*, *IMPORTANT IS CENTRAL*, *IMPORTANT IS UP* (and their counterparts *UNIMPORTANT IS SMALL*, *UNIMPORTANT IS PERIPHERAL*, *UNIMPORTANT IS DOWN*), and it immediately informs viewers of the social relations between depicted characters.

Moreover, the general composition of the inscription follows the Maya artistic conventions (Palka 2002; S. D. Houston and Stuart 1998; Loughmiller-Newman 2008). The ruler's body is depicted in frontal view, head in profile facing his right and the right hand is used to perform an action – 85% of focal figures are shown in this kind of position (Palka 2002, 423–24, 428). Secondary figures are generally shown “shown in the less-important profile view, where the front of the body is not seen” (Palka 2002, 428).

Gestural modality

All three people perform characteristic gestures, which is common in Maya art (see Ancona-Ha, Perez de Lara, and Stone 2000; Miller 1983). The secondary figures keep their arms folded across their chests, with one hand resting

on the opposite arm, which reminds Gesture 4 identified by Ancona-Ha et al. (2000), except that they are kneeling and not sitting here. This gesture is typically adopted by non-focal figures of secondary but nonetheless high rank (Ancona-Ha, Perez de Lara, and Stone 2000), so the two kneeling people may be high-ranking court officials/priests assisting someone of a higher rank.

The focal figure keeps his both hands stretched slightly to the right. The right-hand's gesture is not clear because of damage to this part of the image, but the palm seems to be up with fingers bent and possibly the index finger pointing to something. The left-hand gesture is clearly visible – the palm is directed down, the thumb straight, the index finger partly bent as if pointing to the ground or to the face emerging from a floral element beneath his foot, while the other fingers are fully bent. Though obviously meaningful, the gesture is difficult to interpret, as it was probably a culturally determined symbol, whose meaning would have been clear for ancient Maya but is lost to us.

Thus, gestures in multifigural compositions seem to clarify the social status and relations between figures, though they might also convey all sorts of other denotations and connotations, whose meaning is not immediately clear for non-members of the cultural group.

Pictorial modality

ha  water

Apart from human figures and a glyphic text, the inscription also includes a number of pictorial elements. First of all, aquatic motifs are prominent. The focal figure sits on the head of the enigmatic Water Lily Monster (McDonald and Stross 2012) with a *ha* ‘water’ sign on its forehead. There are water lilies in the corners of the panel and stylized water drops (smaller, bigger, smaller again) all around it. The focal figure's headdress features a fish nibbling at a water lily sticking out from the snout of an amphibian. Unlike Laxtunich Panel 1 below which is a court scene, Cancuen Panel 3 seems to be immersed in water. “Because water was path to the Underworld, water lilies are often associated with death imagery” (Stone and Zender 2011, 173), so all the aquatic motifs might point to a death-related context, which is not signalled in other modalities.

ik'  wind breath

Another pictorial element is not so conspicuous, but at closer examination one might notice that secondary figures have a glyphic sign on their visible arms. The one on the left has the *ik'* ‘wind, breath’ sign, the concept related to life and vitality (Stone and Zender 2011, 175), the one on the right is partially eroded and difficult to classify. Nevertheless, these signs seem to identify the personages, possibly naming their functions in a way understandable even to illiterate audience.

Textual modality

2. Note on Maya epigraphy: The first line of the analysis (in bold) is the transliteration, that is glyph-by-glyph description of the original text: all-caps stand for logograms (word signs), small letters for syllabograms (syllabic signs). The second line (italics) is the transcription – how we think the ancient Maya would pronounce the words. The third line is the morphological analysis, where NUM is numeral, CAL – calendrics, 3E – 3rd person ergative pronoun, 3SA – 3rd person singular absolutive pronoun, MED – mediopassive, ADJ – adjective, AG – agentive, CAUS – causative.

The main text is in the right top corner, complemented by captions for secondary figures beneath and on the left, as well as a heavily eroded carver's signature on the left frame. The main text consists of two clauses (see example 1 below): an equative clause which says "it is a Period Ending" and a mediopassive clause which says that something which is the house of the ruler is dedicated. Both clauses are agentless, which is consistent with the language of Maya inscriptions being theme-oriented (see Hamann in press) – they focus on themes: events, objects and locations, while the agent is typically omitted. What the text is not telling us is that between the event described in clause 1 and the event described in clause 2, the ruler dies, which here is only clued by the pictorial modality. Thus, the ruler most likely is the agent of the first event, but he cannot be the agent of the second event, so this is why the secondary figures are depicted – they are the people responsible for the ruler's funerary ceremonies.

Example 1

Clause 1²:

4-AJAW 13-CHAK?-SIHOM
chan ajaw huxlajuun chak sihoom
 NUM-CAL NUM-CAL
 (on) 4 Ajaw 13 Keh

u-NAH-5-TUN-ni
u naah ho' tuun
 u-naah-5-tuun-ø
 3E-first-NUM-stone/year-3SA
 it (is) first 5-year (the date of of 9.18.5.0.0³)

Clause 2:

3. 9.18.5.0.0 is a date in the Maya 'Long Count' calendar – a count of days from its beginning on 13 August 3114 BCE and equals 1,427,400 days, which renders approximately 15 September 795 CE in the Gregorian calendar.

9-AJAW 18-mo-lo **T'AB-yi?** [undeciphered]
balun ajaw waxaklajuun mol t'abaay ?
 t'ab-aay-ø
 NUM-CAL NUM-CAL dedicate-MED-3SA ?
 (on) 9 Ajaw 18 Mol gets dedicated ?

yo-OTOT-ti TAJ-[CHAN]AHK AJ-ma-xi?-? K'UH?-?[K'IN]AHK-AJAW K'UH?-AJAW
yotoot taj chan ahk aj maax? k'uh[ul] k'in ahk ajaw k'uh[ul] ? ajaw
 y-otoot-ø taj chan ahk aj maax? k'uh-ul k'in ahk ajaw k'uh-ul ? ajaw
 E3-house-A3S taj chan ahk aj maax? god-ADJ k'in ahk ruler god-ADJ ? ruler
 the house of Taj Chan Ahk Aj Maax, Divine Lord of Cancuen, Divine Lord of Machaquila

Caption 1:

AJ-3?-?-na **sa-ja-la**
aj ux ? sajal
 aj-3-? sajal
 AG-3-? sajal
 He of 3 ... Sajal

Caption 2:

AJ-TZ'AK-bu? **AJ-K'UH-na**
aj tz'akbu aj k'uhun
 aj-tz'ak-bu aj-k'uh-hun
 AG-count-CAUS AG-god-paper
 One Who Puts Things in Order One Who Worships (Jackson and Stuart 2001)

To sum up, the different modalities work together to deliver the final message. Agentless clauses describe two events – the Period Ending celebration and the dedication of the house of the ruler, while the pictorial mode provides information about the death of the ruler, which complements the textual message. The composition of the image helps, firstly, to identify the protagonists – who is the focal figure, who is of secondary importance, and secondly, to assign agents to the events: from cultural context we understand that the ruler was the agent of the Period Ending celebration because it is part of his royal duties (Stuart 2011, 266), while his lords are agents of the dedication event as part of the ruler's funerary rites.

Table 1:

Events in Cancuen Panel 3

| Long Count | Calendar Round | Gregorian date | Event | Modality |
|---------------|----------------|----------------|--|-----------|
| 9.18.05.00.00 | 4 Ajaw 13 Keh | 15/09/795 | Period ending celebration | Written |
| | | c. 799 | Death of Taj Chan Ahk Aj Maax | Pictorial |
| 9.19.00.00.00 | 9 Ajaw 18 Mol | 28/06/810 | Dedication of the house of Taj Chan Ahk Aj Maax, Divine Lord of Cancuen and Machaquila | Written |



Figure 2:

Laxtunich Panel 1

(photo FA2010 / public domain)

Laxtunich Panel 1

Composition

The vertical composition of the monument is organized around the central axis created by the main text and the main protagonist of the text (the man sitting on the floor). The steps organizing the scene horizontally define the social hierarchy – the ruler is seated on an elevated throne, the secondary figure is half-kneeling half-standing on a platform in front of the ruler, and the least important figures are sitting or kneeling on the floor at their feet. All secondary figures are depicted in profile, while the ruler's body and upper part of the right-hand man's body are in frontal position. The elaborate curtains show it takes place indoors in a palace room (see also Martin and Grube 2008, 135).

The most prominent figure seems to be the person on the right who, because of his standing position, visually occupies the majority of

space of the whole image. He wears an elaborate headdress and clothes with ornaments, and, what is more, although it is a palace scene, he has something resembling a weapon (a club) in his hand, which is most likely another symbol of his status, though he carries it in his left or “weak” hand (Palka 2002, 419, 421, 428) away from the ruler as a likely sign of non-aggression. The upper part of his body (but not his legs) is presented in frontal view, his head – in profile facing right with his right hand performing an action – a setting usually reserved for the focal person (see Palka 2002). This emphasizes his agential role as the source of energy flow in the depicted and described event.

The ruler's position is emphasized by his elevated position, headdress and ornaments, but rather surprisingly he occupies the left side of the whole scene and faces left. However, it is likely that the fact that his name carved on the side of the throne is written from right to left instructs viewers to conceptualize this part of the scene as a mirror image. Maya texts are generally written left to right, while the reverse direction is rare and here doubly surprising because the main text and captions are written in the standard manner. This kind of anomaly immediately draws attention and makes one wonder on the reason for employing such a compositional trick. Palka (2002, 431) hypothesizes that “some reversed images in Maya and Mesoamerican art may represent either ritual reversals, events associated with the supernatural and the Otherworld, or scenes reflected in ceremonial mirrors”. Thus, at the very least, the ruler's reversed caption and image instructs the audience to create a mirror reflection space with a more canonical depiction of the ruler, where he is the most prominent figure. At most, it may emphasize the ruler's agential powers in rituals and ceremonies, where his presence is required to the ceremony to be valid.

The other person whose name is written in the reversed order, which also makes him stand out, is the man in the left-hand bottom corner. At first sight, he seems to be part of the captive group at the bottom of the image (see e.g. Martin and Grube 2008, 135; Akers 2008, 4), but, firstly, his name is reversed unlike theirs, and, secondly, the lack of ropes on his neck and arms indicates that he might not be a captive like the other two figures sitting on the floor. Another possibility, which will be discussed below, might be suggested by the text.

The captives are tied but otherwise treated with respect, which is likely to be the mark of their high status (Coe 1998, 97), as captives are frequently depicted (almost) naked, lying on the floor, sometimes in awkward positions or trampled by the victorious king. Here there are no traces of violence or bad treatment.

On closer inspection of the surface of the monument, one might also notice traces of paint which once completed the image and probably carried additional information. From what we know, ancient Maya liked strong bright colours – red, green (green-blue), yellow, as well as white and

black (S. Houston et al. 2009) However, the symbolic dimension of colour use in the Classic Period is not clear nowadays and, as already mentioned, it is difficult to hypothesize about its input into the overall meaning of the inscription.

Gestural modality

The gestural modality is richly exemplified in this inscription. The ruler sits with his right palm rested on this right knee and his left elbow on his left knee, while the palm is stretched out in front of him. The man on the right very obviously hands something over – there is an object in his right hand stretched out towards the ruler. The captive on the right - sitting cross-legged with his head proudly up - has an object in his outstretched right hand and his left is palm up and a bit stretched out in front of him. The other captive with his head down touches his forehead with the top of his left hand while the other hand seems to be closed in a fist. The right hand of the man in the corner is also closed in a fist, while his left hand seems to be stretched out upright in front of his face as if obscuring it from sight. Alternatively, he may be at an early stage of the same gesture as the man in front of him.

All the gestures are no doubt meaningful. The ruler's gesture and posture possibly expresses his dominance over the scene and/or identifies him as the receiver of an action. The gesture of the man on the right seems to be a straightforward gesture of handing something over, which will be confirmed by the accompanying text, while the act of holding his weapon behind his back and away from the ruler might be a sign of peaceful intentions. From captives one might expect gestures of submission and indeed, the gesture performed by the captive on the left has been interpreted as such, with some reservations though. (Miller 1983).

Pictorial modality

The ruler has the characteristic horizontal bar pendant on his chest – a symbol of his power. The warrior has an *ik'* 'wind, breath' earring and a pendant with some markings which are difficult to identify. Also other elements of headdresses and ornaments might be potentially meaningful.

Textual modality

The main text (see example 2 below) consists of two clauses in the passive voice, which makes one of the captives, and not the warrior or ruler, the main protagonist of the text. It is Baah Wayaab who is caught by Aj Chak Maax and then presented to the ruler.

Example 2

Clause 1:

| | | | |
|--|--|--|--|
| chu-ku-ja <i>chuhkaj</i> chu<h->k-aj-ø catch-PASS-3SA caught is | ba-wa-WAY-bi <i>baah wayaab</i> baah way-aab first way-NOM First Wayaab | u-KAB-ji-ya <i>ukabjiy</i> ukabjiy REL by | a-CHAK-ma-xi <i>aj chak maax</i> aj chak maax aj chak maax Aj Chak Maax |
|--|--|--|--|

Clause 2:

| | | | |
|---|--|---|--|
| 3-la-ta <i>ux lat</i> ux lat 3 days [after] 3 days | na-wa-ja <i>nahwaj</i> na<h->w-aj-ø present-PASS-3SA presented is | u-BAK-ki <i>u baak</i> u-baak 3E-captive his captive | ti-ya-AJAW <i>ti yajaw</i> ti y-ajaw PREP-3E-ruler to his ruler |
|---|--|---|--|

Caption 1 (mirror image):

| | |
|---|--|
| che-le-we CHAN-na K'IN-ni-chi <i>chelew chan k'inich</i> Chelew Chan K'inich | u-cha-nu TAJ-MO' <i>u cha'n taj mo'</i> the Captor of Taj Mo' |
| K'UH-PA'CHAN- AJAW <i>k'uhul pa'chan ajaw</i> Divine Ruler of Pa'chan & Kaaj (Yaxchilan) | K'UH-KAJ-AJAW <i>k'uhul kaaj ajaw</i> |

Caption 2:

| | | |
|---|--|--|
| ba-wa-WAY-bi <i>baah wayaab</i> First Wayaab | AJ-ch'o-ko <i>aj ch'ok</i> heir/the young one | TE'-le-NAH <i>te'l naah</i> wooden house(?) |
|---|--|--|

Caption 3:

| | |
|---|--|
| YAX-SUTZ' <i>yax suutz'</i> First/Grue Bat | to-k'a <i>to'k'</i> Flint |
|---|--|

Caption 4 (mirror image):

| | |
|--|---|
| 4-JINAJ?-ji <i>chan jinaaj?</i> Four Sprouts? | ba-BAK-ki <i>baak or baah baak</i> captive or Master of Captives (see below) |
|--|---|

The other figures are not mentioned in the main text but identified by captions: the king's name is on the side of his throne – two of his titles are mentioned: the Captor of Taj Mo' and the double emblem glyph of Yaxchilan. Baah Wayaab's caption is carved on the step to the right of him and his titles include *baah wayaab* 'first dreamer/kind of priest' (Beliaev 2004) and *aj ch'ok* 'heir/junior'. The second captive's name is visible between his hands. Finally, the 4-block text in the middle is the carver's signature.

The reversed caption of the man in the left bottom corner is somewhat hanging in the air left of the ruler's right knee. It identifies the man either as simply *baak* 'captive' with the initial syllable **ba** being a phonetic complement or as *baah baak* – literary – 'head captive', though from the main text we know that it is Baah Wayaab who is the main captive. The phonetic complementation hypothesis is quite plausible, though having two phonetic complements (**ba** and **ki**) on one word is not very common and it does not explain the reversed reading order. On the other hand, *baah* + noun is a well attested pattern for title designation: *baah cheb* 'first of the brush/ head brush/ brush master', *baah pakal* 'first of the shield', *baah poom* 'first of the incense', *baah tuun* 'first of the stone', etc. (Boot 2009, 28–29; Johnson 2014, 247), so *baah baak* could, actually, be 'the master of captives/ captives' master', an official who oversees prisoners. This would explain why his caption is written right-to-left, just like the king's, which draws our attention to his actual identity and prompts us to investigate it. The weak point of this hypothesis is that this series of titles is usually spelled with the logographic **BAH** sign, except for the *baah kab* 'first of the earth' title which is routinely spelled with syllabic **ba**, like Caption 4.

Thus, Laxtunich Panel 1 describes two events: the capture and presentation of captives to the ruler. It presents (both visually and verbally) the captor as the agent of the clauses, the ruler as the receiver of the action, captives as the object of the transaction and possibly the captives' master as an additional participant of the event. The most intriguing aspect of the inscription is why part of the text is a mirror reflection of the canonical word order, which – I would like to argue – was done to focus readers' attention on certain aspects of the situation. The mirror reflection, so to speak, projects the ruler's image onto the right hand side of the panel, which is significant, since in numerous visually bipartite inscriptions the more important participant of the event tends to be depicted on the right (compare Bonampak Sculpted Stone 1 and 4, La Pasadita Lintel 3, Palenque Central Tablet from Temple XIV, Palenque Palace House E Oval Tablet, Piedras Negras Panel 2, Site R Lintel 1 and 4, Yaxchilan Lintel 2, 3, 8, 9, 16, etc.). Here Aj Chak Maax is the main actor, so he occupies the most prominent spot on the right, but nevertheless the ruler's status is unquestionable, so the reversed order might be an instruction for the audience to conceptualize the ruler's position as equally important. Similarly, the reversed order of Baah Baak's caption might extricate him from the captives' group and place him in the VIP space. This would give us the following hierarchy: Aj Maax is the most important because he occupies the most prominent spot and is mentioned in the main text as the agent of the capturing event. The ruler is equally important because he is depicted in a frontal and seated position on an elevated throne plus his caption is a mirror image. Then possibly comes the captives' master because his caption is also a mirror image, although in the iconography itself he occupies a humble position. Finally, there is Baah Wayaab who is the main protagonist of the text and occupies a position on the axis of the whole panel, and at the very end there is the second captive identified as such only by ropes on his arms and his caption. Alternatively, the third men of the bottom group might be just another captive.

Table 2:
Events described in
Laxtunich Panel 1.

| Long Count | Calendar Round | Gregorian date | Event | Modality |
|---------------|----------------|----------------|--|----------|
| 9.17.12.13.14 | 5 Hix 8 Sak | 23.08.783 | Baah Wayaab is caught by Aj Chak Maax n | Written |
| 9.17.12.13.17 | 8 Kaban 10 Sak | 6.08.783 | captive is presented to Chelew Chan Kinich / Itzamnaaj Bahlam IV | Written |

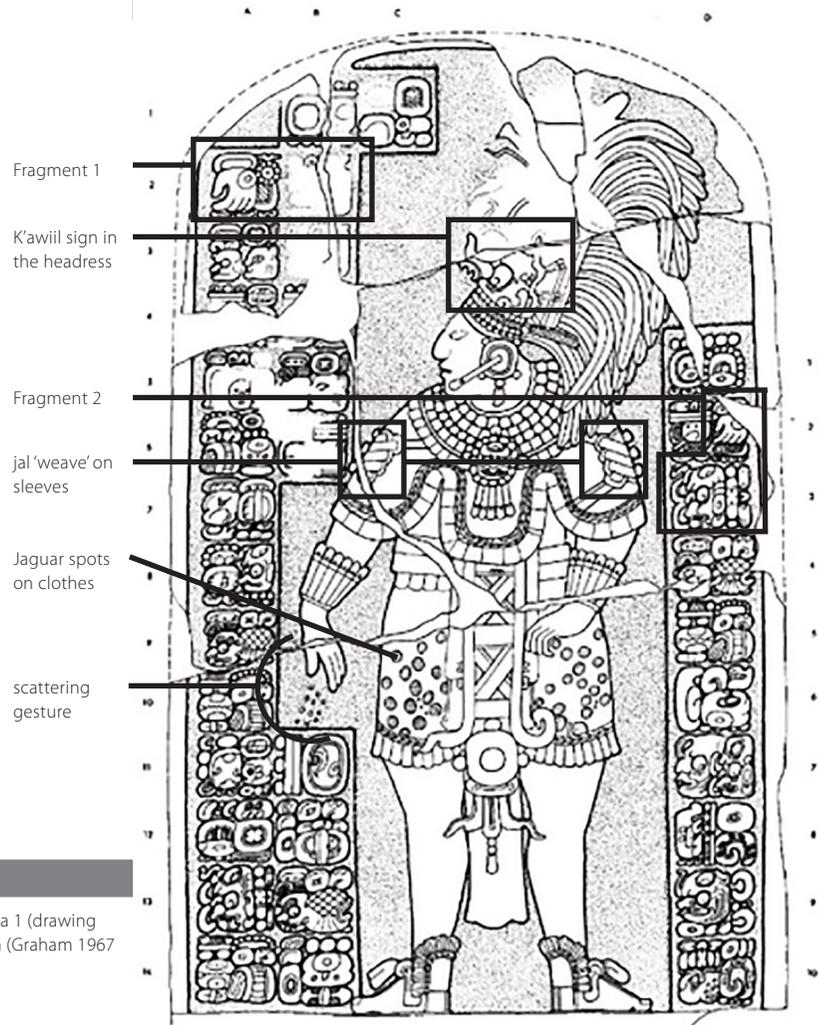


Figure 3: Aguateca Stela 1 (drawing Ian Graham in (Graham 1967 Figure 3))

Aguateca Stela 1

Composition

The composition of Aguateca Stela 1 is very simple with one figure occupying the central position and longer stretches of text on both sides. The body is in frontal position, the head in profile facing his right. The headdress, clothes, sandals and ornaments inform of high social position of the person.

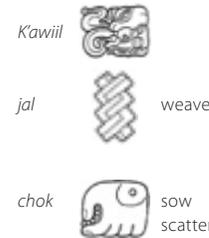
Gestural modality

The person performs so called “scattering” gesture – in Maya art a highly conventionalized way of representing a ritual action nowadays interpreted as a sacrificial ceremony in which the ruler scatters incense, blood, maize

or another precious material to communicate with the other world (Stone and Zender 2011, 69). It was performed at Period Endings and most likely was part of a tradition of calendar ritualism still observed today by the Maya (Stuart 2011, 265).

Understanding this kind of image actually requires quite complex processing including a double conceptual mapping: first the gesture is interpreted metonymically as STAGE OF ACTION FOR WHOLE ACTION OF PART FOR WHOLE, then its meaning is interpreted metaphorically (Mittelberg and Waugh 2009, 339, 349). Thus, though we only can see a fragment of the ceremony, we nevertheless understand that the whole event is meant – the gesture is the metonymic vehicle for the whole event. Then, the metonymic vehicle becomes the metaphoric source for a metaphoric mapping, and via the KINGS ARE FARMERS conceptual metaphor (Hamann 2014, 33), we deduce that the sowing gesture denotes, in fact, a ritual scattering of incense and not a simple agricultural activity.

Pictorial modality



The pictorial modality includes the headdress spelling out the protagonists name (at least partially) – the face of *K'awiil* is quite well visible in spite of some damage (compare Tuszyńska 2017), as well as *jal* 'weave' sign on the sleeve (Stone and Zender 2011, 81; Macri andLooper 2003, 228) and jaguar spots on the skirt – a symbol of wealth and royal status (Stone and Zender 2011, 195). However, the scattering gesture itself resembles the *chok* 'sow, scatter' sign so closely that it might actually be listed in this category as well. This shows how difficult it might be to separate the gestural and pictorial modalities because they work together, alongside the text.

Textual modality

The scattering event is mentioned twice in the text (see example 3): at the very beginning (A2-B2) and in the second part of the text (D2b-D3), so there are two candidates to be portrayed and we need to turn to the headdress to tell us who is actually depicted in the image – it is the second of the rulers, *K'awiil K'inich*.

Example 3

Fragment 1:

| | |
|---------------------------------------|----------------------|
| u-CHOK-wa-ch'a-ji | [name eroded] |
| <i>u chokow ch'aaj</i> | ? |
| <i>u-chok-ow-ø ch'aaj</i> | ? |
| 3E-scatter/sow-ACT-3SA droplets | ? |
| s/he (Ruler 3) scatters incense/blood | |

Fragment 2:

u-CHOK-ch'a-ji*u chok ch'aaj*

u-chok

3E-scatter/sow droplets

it [is] the incense-scattering of K'awiil K'inich

K'AWIL-K'INICH*K'awiil k'inich*

ch'aaj k'awiil k'inich

K'awiil K'inich

_____ Aguateca Stela 1 is an example of a heavily textual inscription which mentions several events, while the image only illustrates one of them. It is extremely interesting, though, because it illustrates how the modalities are closely intertwined to an extent that it is difficult to separate them: the scattering gesture and name-tag headdress repeat and illustrate part of the textual information.

Conclusions

It is evident that Maya inscriptions are highly multimodal, as was foretold by the polysemy of the word *tzihb* 'write/paint'. It is the interaction of all modalities that delivers the whole message: the composition indicates hierarchy and relations between people, gestures refine this message and possibly also carry all sorts of other information, pictorial signs show properties of objects and people (e.g. their ranks), the main text describes the event(s), captions precisely identify people giving their names and titles, and the carver's signature identifies authorship. While the language is theme-oriented and mostly focuses on events, very often ignoring agent(s), they are always provided by the image and can be safely identified based on the situational context and cultural knowledge (see Cancuen Panel 3).

_____ The various modalities present in Maya texts are not always so easily delineated and differentiated. They seem to form a certain kind of continuum with areas of overlap and a certain degree of fuzziness in category boundaries. On one end of the spectrum, there is the pure image – depictions of people and objects – fairly realistic in style, though conventionalized to a large extent. On its other end, there is pure text – written signs recording language, though taking into consideration the visual realism of many glyphs (see the *chok* 'scatter' glyph and the scattering gesture) there are often significant parallels between the visual and textual modality. In-between, there is a spectrum of other means of communication, such as pictorial signs which are close to the textual end of the spectrum in their form and meaning but are embedded physically in the imagery (e.g. water droplets – a diagnostic feature of all aquatic signs to depict watery landscape). On the other hand, gestures generally belong to the image, but because they are highly conventionalized and meaningful, they deliver an

Figure 4

The multimodality of Maya glyphic texts: a spectrum of media that deliver the message

important part of the message. Figure 4 visualizes the idea.

_____ Finally, the ancient Maya scribes seem to have employed different strategies for the organization of an inscription with different levels of utilization of multimodality. In some cases, such as Cancuen Panel 3, the image and text complement each other delivering different parts of the message. In others, such as Aguateca Stela 1, the image and text tell the same story with various degrees of detail. This makes part of the message available even to illiterate or foreign audiences, while what was encoded in the glyphic text itself was accessible only to those in the know, which may also have been purposeful. Thus, the manipulation of text and image may hide and highlight different parts of the message targeted at different audiences. Finally, Laxtunich Panel 1 seems to sit somewhere in-between with a more balanced approach to how to exploit different modalities, though it is extremely interesting for its use of the changing reading order to manipulate the spatial layout.

References

- Akers, Danielle C. 2008. 'The Presentation of Captives to a Maya Ruler at the Kimbell Art Museum'. Master of Arts Thesis, Fort Worth, Texas: Texas Christian University.
- Ancona-Ha, Patricia, Jorge Perez de Lara, and Mark Van Stone. 2000. 'Some Observations on Hand Gestures in Maya Art'. In *The Maya Vase Book: A Corpus of Rollout Photographs of Maya Vases, Volume 6*, edited by Barbara Kerr and Justin Kerr. New York: Kerr Associates.
- Beliaev, Dmitri D. 2004. 'Wayaab' Title in Maya Hieroglyphic Inscriptions: On the Problem of Religious Specialization in Classic Maya Society'. In *Acta Mesoamericana*, edited by Daniel Graña Behrens, Nikolai Grube, Christian Prager, Frauke Sachse, Stefanie Teufel, and Elisabeth Wagner, Maya Religious Practices: Processes of Change and Adaptation:121–30. 14.
- Boot, Erik. 2009. *The Updated Preliminary Classic Maya-English, English-Classic Maya Vocabulary of Hieroglyphic Readings*. Mesoweb Resources. <http://www.mesoweb.com/resources/vocabulary/Vocabulary-2009.01.pdf>.
- Coe, Michael. 1998. *Art of the Maya Scribe*. 1st edition. New York: Harry N. Abrams.
- Forceville, Charles J. 2009. 'Non-Verbal and Multimodal Metaphor in a Cognitivist Framework: Agendas for Research'. In *Multimodal Metaphor*, edited by Charles J. Forceville and Eduardo Urios-

Aparisi, 19–42. Berlin, Boston: De Gruyter Mouton. <https://www.degruyter.com/view/product/38481>.

Graham, Ian. 1967. *Archaeological Explorations in El Peten, Guatemala*. New Orleans: Middle American Research Institute, Tulane University, Publication 33.

Hamann, Agnieszka. in press. 'Why "he/She" Is Not a Relevant Distinction in Classic Mayan? How Grammar Reveals Patterns of Thought'. *Contributions in New World Archaeology*.

———. 2014. 'Why Is It so Difficult to Understand the Language of a Culture That Is Gone? The Challenges of Maya Decipherment in Cognitive Linguistic Perspective'. *Contributions in New World Archaeology* 7: 15–36.

Houston, Stephen, Claudia Brittenham, Cassandra Mesick, Alexandre Tokovinine, and Christina Warinner. 2009. *Veiled Brightness: A History of Ancient Maya Color*. First Edition edition. Austin: University of Texas Press.

Houston, Stephen D, and David Stuart. 1998. 'The Ancient Maya Self: Personhood and Portraiture in the Classic Period'. *RES: Anthropology and Aesthetics*.

Jackson, Sarah, and David Stuart. 2001. 'THE AJ K'UHUN TITLE'. *Ancient Mesoamerica* 12 (02): 217–228. doi:null.

Johnson, Scott A. J. 2014. *Translating Maya Hieroglyphs*. Reprint edition. Place of publication not identified: University of Oklahoma Press.

Langacker, Ronald W. 2008. *Cognitive Grammar: A Basic Introduction*. 1 edition. Oxford ; New York: Oxford University Press.

Loughmiller-Newman, Jennifer A. 2008. 'Canons of Maya Painting: A Spatial Analysis of Classic Period Polychromes'. *Ancient Mesoamerica* 19 (1): 29–42. doi:10.1017/S0956536108000308.

Macri, Martha J., and Matthew G. Looper. 2003. *The New Catalog of Maya Hieroglyphs, Volume One: The Classic Period Inscriptions*. Reprint edition. Norman Okla.: University of Oklahoma Press.

Martin, Simon, and Nikolai Grube. 2008. *Chronicle of the Maya Kings and Queens: Deciphering The Dynasties of the Ancient Maya*. 2nd ed. edition. London: Thames & Hudson.

McDonald, J. Andrew, and Brian Stross. 2012. 'Water Lily and Cosmic Serpent: Equivalent Conduits of the Maya Spirit Realm'. *Journal of Ethnobiology* 32 (1): 74–107.

Miller, Virginia E. 1983. 'A Reexamination of the Maya Gesture of Submission'. *Journal of Latin American Lore*.

Mittelberg, Irene, and Linda R. Waugh. 2009. 'Metonymy First, Metaphor Second: A Cognitive-Semiotic Approach to Multimodal Figures of Thought in Co-Speech Gesture'. In *Multimodal Metaphor*, edited by Charles J. Forceville and Eduardo Urios-Aparisi, 329–56. Applications of Cognitive Linguistics (ApCL): 11. Berlin, Germany: Mouton de Gruyter.

Palka, Joel W. 2002. 'Left/Right Symbolism and the Body in Ancient Maya Iconography and Culture'. *Latin American Antiquity* 13 (4): 419–43. doi:10.2307/972224.

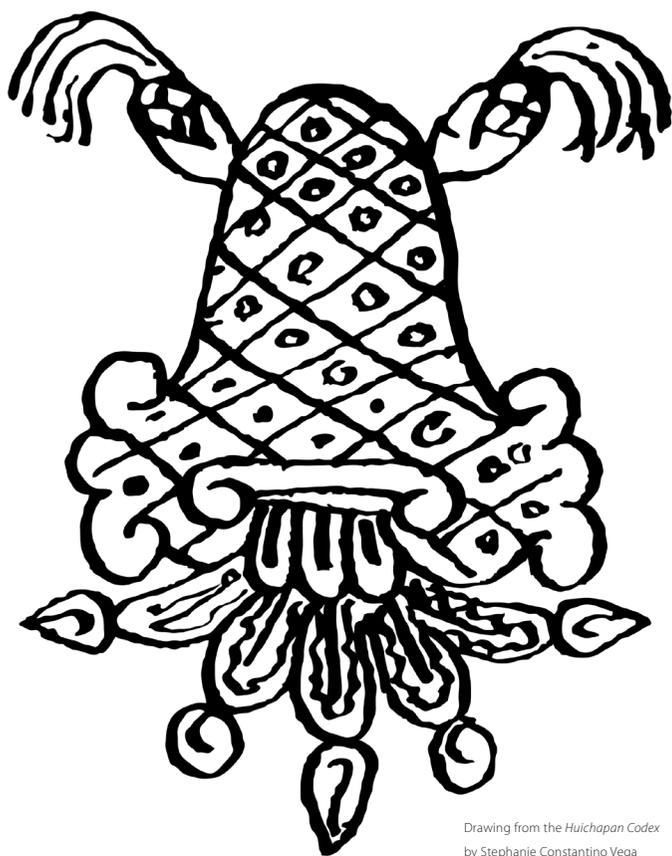
Stone, Andrea, and Marc Zender. 2011. *Reading Maya Art: A Hieroglyphic Guide to Ancient Maya Painting and Sculpture*. London: Thames & Hudson. <http://www.thamesandhudsonusa.com/books/reading-maya-art-a-hieroglyphic-guide-to-ancient-maya-painting-and-sculpture-hardcover>.

Stuart, David. 2011. *The Order of Days: Unlocking the Secrets of the Ancient Maya*. New York: Three Rivers Press.

Tuszyńska, Boguchwała. 2017. 'What's in a Headdress? The Maya Glyphic Names Integrated into a Visual Narrative'. *Visible Language Journal*, no. Special Issue Symbols/Icons/Pictograms (April).

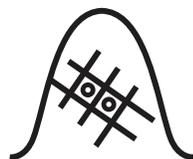
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Drawing from the *Huichapan Codex*
by Stephanie Constantino Vega

ears of maize



a stylized mountain
pattern of rhomboids and
circles used to express the
idea of the reptilian skin of
the Earth

five rivulets of water



interpretation:

mountain + water signs,
represent a water-mountain,
central Mexican metaphor,
expressing the idea of a
center of political power and
its physical manifestation as
an urban center

meaning:

the kingdom/town at the
Mountain of the Tender Ears
of Maize.

Signs of resistance:

Iconography and semasiography in Otomi architectural decoration and manuscripts of the early colonial period

David Charles Wright-Carr

The indigenous peoples of central Mexico developed a complex and sophisticated system for the visual expression of culture during the three millennia preceding the Spanish conquest. Central Mexican imagery was materialized in sculpture and painting, in monumental and portable formats, including the embellishment of architectural surfaces and the painting of manuscripts. This system continued to function in a variety of cultural contexts for over a century after the conquest, as native peoples adapted to colonial rule and interaction with European colonists. In this article, a brief review of the fundamental principles of central Mexican visual language is presented, then examples of sculpted images from early colonial public architecture in Otomi towns are discussed, comparing their signs to those found in pictorial manuscripts painted in the early colonial period. These examples reflect the cultural tenacity and ethnic resistance of the indigenous sculptors and painters. They also reveal the resilience of central Mexican visual language, which continued to serve the interests of native peoples coping with life under Spanish rule.

Keywords:

ethnicity
iconography
semasiography

Introduction

During the late pre-Hispanic period, there was a relatively homogenous plurilingual culture in central Mexico. Among the linguistic groups that participated in this culture were the Otomi and the Nahuatl. They shared a system of visual communication with each other and with other linguistic groups, among them speakers of Mixtec, Zapotec and Tlapanec languages. This system of pictorial signs was essentially semasiographic in nature, communicating ideas without necessarily being bound to verbal language, although it occasionally exploited the possibilities afforded by homophonic or quasihomophonic substitution to express words, morphemes, and phonemes specific to a given language, like modern rebus writing. This system lies on the blurry border between the Western concepts of iconography and writing, making its classification problematic. Mesoamericanists continue to debate whether it qualifies as a writing system. The problem, however, lies more in the insufficiency of our Western conceptual categories than in the intrinsic nature of the system.

During the early colonial period, native peoples in this region continued to employ their ancestral system of visual communication in diverse social contexts, including the use of the ancient Mesoamerican calendrical system for ritual and divination, the recording of historical memory, cartographic documentation, economic record-keeping, and the meaningful decoration of architectural and urban spaces. Novel uses, reflecting efforts by native peoples to adapt to the colonial regime, included graphic representations of the European calendar using pre-Hispanic conventions, and the invention of new motivated graphs to express concepts related to Spanish political authority, monetary units, Catholic doctrine, and Christian saints, which became especially relevant due to their use in personal names, place names and the feast days of the liturgical year. At the same time, European materials, graphic techniques, forms, and symbols increasingly found their way into the native system, until they had all but replaced pre-Hispanic conventions by the mid-eighteenth century (Escalante 2010).

In this article, four examples of decoration found in the public architecture of the Mezquital Valley will be analyzed, using contemporary pictorial manuscripts as auxiliary sources for the interpretation of individual signs and for a deeper understanding of these images, in the context of local resistance to the efforts of European missionaries to transform native worldview and ritual traditions. The four images I have chosen are exceptional, as most decoration in missionary architecture expresses orthodox Catholic doctrine, but they are far from unique, as native sculptors and painters often included symbols related to their ancestral worldview, often in subtle ways, in the convents, churches, and chapels built throughout New Spain as part of the political, social, and religious transformation promoted by the Spanish government. These visual signs served as vehicles for the reaffirmation of

ethnic identity and political legitimacy in public spaces.

Central Mexican

visual communication

For the purposes of this study, the region called 'central Mexico' includes much of Mesoamerica, excluding most of western Mexico and the Maya area, two regions where visual communication presents distinct stylistic traits that require a separate treatment, despite sharing some pan-Mesoamerican features (Hernández 2013; Schele 2001). Within central Mexico, in the centuries preceding and following the fall of the Aztec capital of Tenochtitlan in 1521, a relatively homogenous pictorial style may be found, with regional variations morphing gradually through time and space. This style has its roots in the highly conventional sacred imagery of the Middle Preclassic period, or Olmec horizon, that developed from around 1200 to 600 B.C., when a visual style emerged throughout Mesoamerica, from central Mexico to Central America. Regional variants branched off from this tradition during the Late Preclassic, Protoclassic, and Classic periods, from 600 B.C. to A.D. 600. In the Epiclassic period, from A.D. 600 to 900, a tendency toward interregional stylistic integration began to emerge, and this tendency continued through the Postclassic, from A.D. 900 until the time of the Spanish Conquest in the early sixteenth century.¹

To understand this visual language, it is important to consider its intermediate nature, between what some specialists call 'iconography' and 'writing.' The category of semasiography occupies this middle area. Its boundaries cannot be drawn with precision, as there is a gradation from iconography to semasiography to writing. Experts continue to discuss the definitions of these terms, and the usefulness (or uselessness, as some Mesoamericanists continue to insist) of the concept of semasiography.

To avoid contributing to the scholarly babel by introducing novel ways of talking and writing about central Mexican visual communication, during the last fifteen years I have adopted the concepts, terms and definitions provided by linguist Geoffrey Sampson in 1985.² He classifies writing systems by the structures they represent. His classification is well suited for central Mexican visual language, although it has not been adopted by many Mesoamericanists.³ Sampson's conceptual toolkit is useful for comprehending the relations between visual signs, ideas, and verbal signs, but this is only part of what we need to appreciate the complexity of central Mexican visual language in its material, formal, semantic, and cognitive dimensions. Since this form of pictorial and graphic communication straddles the blurry boundary between iconography and writing, the tools traditionally employed by specialists in writing systems are insufficient when working with

1. For an overview of

Mesoamerican visual communication, from the perspective of the study of writing systems, see Marcus 1992.

2. The second edition, published in 2015, will be used here.

3. For a notable exception, where the concept of semasiography is discussed and employed in a more systematic way, see Mikulska 2015.

systems that correspond only in part with what we traditionally consider writing. In these cases, semiotics or iconological methods have been used.

While combining writing systems theory with semiotic and iconological analysis has permitted important advances, a more integrated approach is now needed to bring the study of Mesoamerican visual communication into alignment with recent developments in cognitive science. I propose that this field could benefit from a thorough revision, drawing on the emerging paradigm of embodied, enactive, extended, embedded, and situated cognition. This transdisciplinary perspective considers human cognition as emerging from the interaction of our bodies with our environmental, social, and cultural contexts. In its more radical form, it denies that we rely on internal representations of external reality. This has important implications for understanding how humans interact with visual and verbal languages.⁴

The blending of imagery and language in systems of visual communication reflects essential aspects of human cognition. Thoughts are not strings of verbal signs, but reflect conscious and unconscious processes arising from multisensorial bodily impressions of our experience of ourselves and our environment, structured by culturally conditioned patterns of meaning-making. The cognitivist paradigm of the second half of the twentieth century, in which cognition is seen as the computer-like manipulation of symbolic representations, seems inadequate to explain the use of visual signs as a medium for the intersubjective communication of thoughts, impressions, and feelings, with or without a direct linkage to spoken language.⁵

Sampson (2015, 18-24) defines semasiography as those relatively permanent, specific, and conventional systems of visual communication that do not depend on spoken language. Whether semasiography is considered a class of writing, he tells us, depends on how we define writing, and he leaves this open to question. He exemplifies with international garment-care symbols, road signs, and mathematical notation, three systems that function within narrow semantic domains. He considers Siberian and American semasiographic systems to be limited; while he doesn't mention central Mexican semasiography in the body of his text, a footnote cites a collective volume about semasiography in Mesoamerica and the Andes. For a more syntactically complete semasiographic system, he describes Blissymbolics, invented by an Austro-Hungarian engineer at the end of the nineteenth century.

For Sampson, glottography is writing that depends on spoken language, although the degree of correspondence between visual and oral signs varies between systems and is never absolute. Glottography represents linguistic structures, and is subdivided into logography –representing words or morphemes–, and phonography –representing syllables, segments (phonemes), or phonetic features– (Sampson 2015, 24-26).

There are critical distinctions between semasiography, logography, and phonography. In semasiography, elementary signs –graphemes– repre-

sent ideas, without being necessarily linked to the structures of verbal language. In logography, graphemes represent linguistic units –words or morphemes– that possess both semantic and phonemic properties, and thus are necessarily linked to structures in a given language (or set of closely related languages). In phonography, graphemes represent phonemic or phonic elements –phonemes, allophones, and features– that in themselves have no precise meaning.⁶ Thus semasiography represents ideas alone, logography represents ideas with sound, and phonography represents sound alone.

These distinctions are not always made clear in studies of Mesoamerican systems of visual communication, and those of other regions and eras.

Most historical writing systems are mixed, so I prefer to speak of individual semasiograms and glottograms (the latter including logograms and phonograms, as noted above) within these systems, rather than speaking of semasiographic, glottographic, logographic, or phonographic systems. Such generalizations can lead to unnecessary confusion. Another point to consider is that within a mixed system, a compound sign may include individual graphemes from more than one category. For example, a semasiogram may be bound to a phonogram, the latter sign serving as a complement, to ensure that the compound graph is interpreted phonetically as the author intended. By the same token, a glottogram may have a semasiographic complement to resolve potential homophonic ambiguity, insuring that the intended meaning is comprehended by the reader. In these cases, a visual sign may be more comprehensible than the corresponding oral sign.

A grapheme can be located on a gradation between motivated signs –those that pictorially represent things that exist in the world– and arbitrary –abstract– signs. The motivated or arbitrary nature of a grapheme is independent from its quality as a semasiographic or glottographic sign. That is, a semasiogram may be motivated –for example, a smiley emoticon 😊– or arbitrary –the interrogative punctuation mark '?'–. The same may be said of a glottogram: a motivated sign representing a human eye '👁' in addition to its potential use as a semasiogram, may stand for the first person singular pronoun 'I' in a rebus, exploiting the homophony between the English words 'eye' and 'I'. In the latter case, the motivated sign '👁' is logographic, representing the word 'I', while the arbitrary alphabetical sign 'I' is phonographic, representing the phoneme /i/, which, when written with a capital letter, stands for the same pronoun. In central Mexican visual communication, nearly all graphic signs are motivated. This is why the phrase 'pictorial writing' and the word 'pictography' are often used to describe this system.

Distinguishing between semasiograms and glottograms is simple in principle: if a graph may be 'read' (verbalized) in two or more languages –excluding tongues that are closely related–, then it is a semasiogram, since it expresses an idea without being necessarily linked to a verbal element in a specific language. If, on the other hand, a graph is clearly linked to a linguistic element in a given language, then it is a glottogram, and its subclass de-

6. A phoneme is a minimal linguistic unit that if substituted for another can affect the meaning of a word. An allophone is a variant of a phoneme that differs in pronunciation –sometimes very subtly– from other variants, without affecting meaning. A phonetic feature is a characteristic of sound quality, determined by articulation; the sum of several features determines the sound of an allophone (Sampson 2015, 11-17).

depends on the element represented, as explained above. Despite the relative clarity and simplicity of this principle, complications arise when attempting to classify graphs in a given system of visual communication, often because of a lack of certainty regarding the meaning of a graph, or regarding the etymology of the verbal signs associated with it.⁷

Central Mexican visual language around the time of the Spanish conquest was essentially semasiographic. This system, however, permits the inclusion of glottograms through homophonic or quasihomophonic substitution –rebus writing–, producing logographic and phonographic signs. These glottograms were used most often for representing personal and place names (Marcus 1992; Nicholson 1973; Whittaker 2009). There are a few examples of glottography in pre-Hispanic central Mexican painting and sculpture, some clear and others mere possibilities, showing that this was part of the system before the arrival of Europeans and the alphabet (Marcus 1992; Mikulska 2015; Wright-Carr 2009b). In certain regions, the use of glottography appears to have increased during the early colonial period. In some codices, an incomplete syllabary was used for writing proper names, particularly in the Tepetlaoztoc region of the eastern Valley of Mexico (Valle 1994; Williams and Harvey 1997). This did not occur everywhere, however. As we shall see, the signs that are discussed in this article, found in monumental decoration and pictorial manuscripts, are iconographic and semasiographic in nature. A few possible glottograms employing the traditional central Mexican system of visual communication have been identified in other colonial period codices by Otomi authors, notably the *Huichapan Codex* (Wright-Carr 2012), but these exceptional cases will not be discussed in this article.

The frontier between semasiography and iconography, or images that are less like writing (being less specific and conventional) is quite blurry. In Western culture, during the last quarter of a millennium, the latter signs are considered ‘art,’ and their study can be called ‘iconography’ or ‘iconology.’⁸ We use mutually exclusive conceptual categories, ‘writing’ and ‘art,’ but this dichotomy can be an obstacle in understanding how visual communication can work on multiple cognitive levels. Contemporary graphic designers are acutely aware of the communicative value of the composition, size, color, shape, and surface treatment of alphabetic graphemes, and of their combination with iconic elements and background colors, textures, or images. By the same token, ‘artistic’ compositions may incorporate arbitrary or motivated glottographic elements. ‘Art’ and ‘writing’ are combined in many ways in contemporary visual language. Such combinations may also be found in the visual communication of other human cultures throughout time and space (Coulmas 2003; Sampson 2015). This tells us something profound about human cognition. Rudolf Arnheim’s (1969) call to reconsider the importance of images in human thought is currently being vindicated by the advances in cognitive science discussed above.

In pre-Hispanic Mesoamerica, the activities we call ‘writing’ and ‘painting’ were not two distinct semantic categories, but a unified concept. This is reflected in speech: when we consult native-language vocabularies, we often find the same word associated with the Spanish terms for both writing and painting. The Otomi verb was *ofo*; in Nahuatl it was *tlahcuiloa*.⁹ A kenning, or metaphorical couplet, expressed the profound cultural importance of central Mexican visual language. The Otomi said *mayati nekuhu*, the Nahuatl-speakers *in tilli in tlapalli*. Both phrases have the same meaning: “the black ink, the colored paint.” This kenning has three layers of meaning: on a superficial level, it refers to the pigments used to paint codices, murals, sculptures, and human bodies; on an intermediate level, it denotes the paintings produced with these materials; on a deeper level, it evokes the ancestral knowledge and wisdom contained in the painted images (Wright-Carr 2011).

The signs in pre-Hispanic and early colonial imagery and writing did not function in isolation. There was a performative aspect to the ‘reading’ of codices. The painted and sculpted images on the surfaces of public architecture contributed to the symbolic meaning of the rituals performed in the spaces defined by these buildings. Performance included complex aesthetic manifestations, combining the experience of images with verbal discourse, music, dance, theatrical performance, ephemeral installations, the burning of incense, and other forms of carefully coordinated sensorial stimulation. These traditions survived into the colonial period and beyond, in the context of Catholic ritual, native celebrations, and the syncretic fusion of Western and Mesoamerican traditions.¹⁰

Visual communication in public architecture

The traditional view, found in many historical studies from the twentieth and early twenty-first centuries, tells of a broken-spirited indigenous population in central Mexico, submissively adapting to Spanish colonial rule and abandoning their ancestral deities, rituals, and beliefs in favor of Christianity. A closer look at the historical, archaeological, monumental, and ethnographic records shows that the Indians indeed had to adapt to the new political, social, and religious order, but that their leaders were skillful in negotiating power, while much of the population developed strategies to maintain their worldview and ritual tradition, ranging from subtle syncretic blending of Mesoamerican and European traditions to clandestine ritual and, on occasion, open rebellion (Gruzinski 1989; Lara 2007). In this section, we shall look at images from the decoration of four public monuments in Otomi towns of the Mezquital Valley, showing how the pre-Hispanic tradition of visual

7. For examples of semasiography and glottography in central Mexican pictorial writing, produced by Nahuatl and Otomi painter-scribes, see Wright-Carr 2005a; 2009b; 2012; and 2013.

9. This can be found in Tarascan (Gilberti 1990), Yucatec (Barrera 1995), Pocomam (Smith-Stark 1994), Zapotec (Córdova 1987), Mixtec (Alvarado 1962), and Pipil (Smith-Stark 1994), as well as Otomi (Urbano 1990) and Nahuatl (Molina 1571).
10. Boone (1994, 71–72) and Johansson (2000, 143) describe the public performance of Aztec painted histories. Monaghan (1990; 1994) and Pohl (1994, 12–13; 2001, vol. 1, 5–6) point out the theatrical aspects of the public display and declamation of Mixtec codices. For a description of the ritual performance of a pictorial manuscript in sixteenth century Yucatán, see Landa 2000, 40 recto–40 verso.

8. I use the words ‘iconography’ and ‘iconology’ here in the Panofskian sense, where the former implies identifying individual iconic elements and interpreting them within their cultural context, and the latter seeks to arrive at a deeper understanding of the image after analyzing its constituent parts (Panofsky 1982).

communication survived and adapted in the context of colonial New Spain. Otomi manuscripts will be used as auxiliary resources for understanding the formal, iconographic, and iconological aspects of these pictorial signs.

The examples discussed in this section are atypical. They were selected because they provide examples of the survival of pre-Hispanic worldview in the decoration of Christian architecture. There are many examples of ideological and iconic persistence in pictorial manuscripts produced during the early colonial period, but the public display of native visual language is relatively rare and, when found, it tends to be more discreet, with several notable exceptions.¹¹

11. Reyes-Valerio (1978; 2000) provides an exhaustive review of native imagery and signage in the architecture of sixteenth-century New Spain.

Convent of Saint Peter, Jilotepec

At the time of the Spanish conquest, the Otomi kingdom of Jilotepec was a regional capital that dominated the western half of the Mezquital Valley, north of the Valley of Mexico, integrated into the Aztec tribute state. The nobility of Jilotepec had close dynastic ties to the ruling families of Tenochtitlan, the preeminent Aztec kingdom with its seat in the Valley of Mexico. Like many pre-Hispanic kingdoms of central Mexico following the Spanish conquest, Jilotepec became an Indian town, where native rulers continued to govern the population under the town's jurisdiction, as a political unit under the control of the Spanish colonial administration. After a period of transition, in which pre-Hispanic political structures remained intact, the kingdom was substituted with a *cabildo* or town council modeled on the Spanish *ayuntamiento* system, with native officials elected under the vigilance of colonial authorities. *Cabildo* members were generally descendants of the ruling class that had been educated by friars. The Indian towns paid tribute, in goods and services, first to Spanish *encomenderos* –conquistadors who had been granted the right to exploit native polities–, then to royal officials as the *encomienda* system was phased out of existence. The conquest was legally and morally 'justified' by the claim that the natives' souls would be saved by their adopting the Christian faith. European friars and secular clergy embarked on a massive campaign of forced conversion, using methods of coercion ranging from public humiliation and incarceration to the death penalty (Gerhard 1993, 3-34; González 2002; Wright 2005a, vol. 1, 130, 167-169, 192-218).

The Franciscan convent of Saint Peter at Jilotepec was probably founded between 1530 and 1540 by Friar Alonso Rengel, the first Christian priest to learn the Otomi language. Rengel distinguished himself by tearing down temples and smashing sacred images in his missionary zeal. Two times Indians tried unsuccessfully to kill him. He died at sea in 1547, on his way to a meeting of Franciscan friars in Assisi (Mendieta 1997, vol. 2, 378-379). Jilotepec had been an influential kingdom in the late pre-Hispanic period, and

maintained its prominence in the decades following the Spanish conquest, until it was eclipsed by the nearby town of Huichapan (Gerhard 1993, 383-386; Wright-Carr 2005a, vol. 1, 167-169, 199-202, 213-218).

Archaeologist Felipe Solís (1997) found five slabs of worked volcanic stone in the storage vaults of the National Museum of Anthropology. These were identified as part of a lot of seven slabs that were once embedded in a wall of the Franciscan convent at Jilotepec. Whether they were carved for this building or recycled from some pre-Hispanic structure has not been determined. Solís favors the latter hypothesis, but the persistence of the native pictorial system for over a century after the fall of Tenochtitlan makes it impossible to rule out the former on stylistic grounds alone. Each slab bears a relief carving with a conventional motivated sign pertaining to the central Mexican system of visual communication. Solís compared these slabs with painted signs in the *Huichapan Codex*, a pictorial manuscript containing the historical memory of Jilotepec and Huichapan. He was able to match four reliefs to similar signs in the codex. The fifth relief is difficult to interpret and was not included in Solís's article.

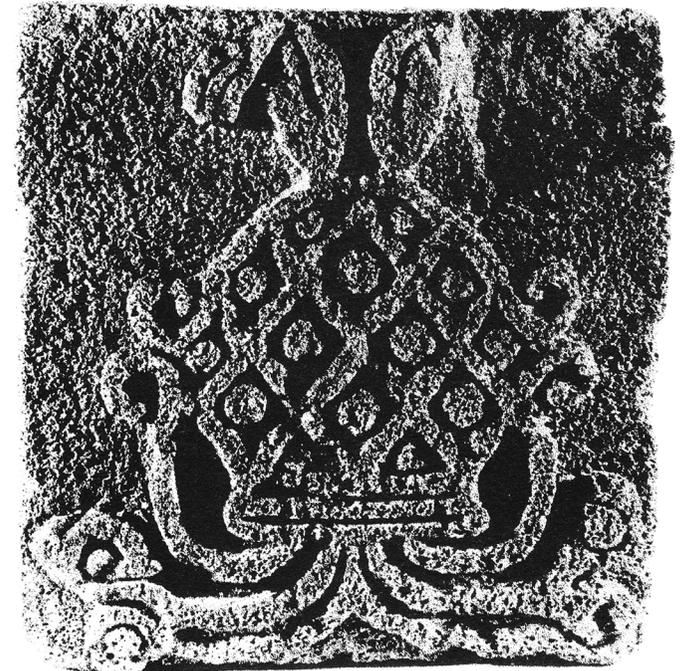
One of the slabs from Jilotepec bears a toponymic sign representing the pre-Hispanic kingdom, or colonial period Indian town, of Jilotepec (*figure 1*). The image is highly conventional, combining several iconic elements or graphemes. The central element represents a stylized mountain

Figure 1.

Relief expressing the name of the 'water-mountain' (kingdom or town) of Jilotepec.

Convent of Saint Peter, Jilotepec (National Museum of Anthropology, Mexico City).

Solís 1997, 44.



with a straight bar at the bottom, as if it had been severed from its rocky substrate. It has an unusual contour, resembling an inverted pot. Pairs of volutes on its sides conventionally express its rocky complexion. Within the mountain sign is a net pattern with circular elements in each of the diamond shapes defined by the crisscrossing bands. This pattern of rhomboids and circles was commonly used to express the idea of the reptilian skin of the Earth. It is found in central Mexican codices on the body of the Earth monster and on mountain and cave signs. The same pattern covers the serpent bodies carved into the Aztec sculpture of *Cōātl Īcue*,¹² a telluric goddess whose name in Nahuatl means “Snake is Her Skirt.”¹³ On top of the mountain are twin motifs representing ears of maize. Under the mountain is a sign representing six rivulets of water, each terminating in either a ring-shaped element, expressing the idea of a jade bead –and by metaphorical extension the precious nature of water– or a stylized sea shell, evoking the life-giving quality of the vital liquid while reiterating its preciousness.

The mountain and water signs, when juxtaposed, represent a water-mountain, another central Mexican metaphorical kenning, expressing the idea of a center of political power and its physical manifestation as an urban center. The pictorial sign displays a stylized mountain with water gushing from its base. In Otomi documents the verbal equivalent is *andehent'ohō* (Urbano 1990);¹⁴ in Nahuatl we find the lexicalized phrase *āltepētl* (Molina 1571). The words in both languages literally mean “the water, the mountain.”

This modern name of this town, Jilotepec, is derived from the Nahuatl toponym *Xilōtepēc*, “On the Mountain of the Tender Ears of Maize.” Its Otomi name was *Amadontäxi*, “Place of the Flowering Tender Ears of Maize.” Most toponyms in central Mexico were calques, or semantic loans in which the idea behind the name was reconstructed using the morphemes of each language. Unlike most European toponyms, what mattered most was the meaning, not the sound. This compound sign may be ‘read’ in Otomi, Nahuatl, or any other language spoken in this region. A feasible reading in Otomi of the entire relief is *Andehent'ohō Amadontäxi*, “the kingdom/town at the Place of Flowering Tender Ears of Maize.” In Nahuatl, the same compound sign may be expressed as *Āltepētl Xilōtepēc*, “the kingdom/town at the Mountain of the Tender Ears of Maize.” Thus each iconic element, as well as their sum, may be classified as semasiographic, expressing concepts visually, without being necessarily linked to a particular language. An interesting feature of the semiotic interplay between the visual sign and the two verbal expressions is that in the Otomi phrase, the image of the mountain is verbalized only once, in the word meaning ‘water-mountain’ – *t'ohō* means ‘mountain’ in this language–. In the equivalent phrase in Nahuatl, it is verbalized twice, using the nominal root *tepē*, ‘mountain.’ once in the ‘water-mountain’ kenning and again in the name of the pre-Hispanic kingdom or the colonial town (Wright-Carr 2013).

Similar compound graphs may be found in the *Huichapan Codex*,

which includes a pictorial history of the kingdom of Jilotepec during the late pre-Hispanic and early colonial periods. In one instance (*figure 2*), we find the same combination of iconic or semasiographic signs: a mountain with net-and-circle pattern, lateral volutes, and horizontal incision at its base; rivulets of water with jade beads and shells; and two ears of corn sprouting from the top of the mountain. Unfortunately, the alphabetical gloss is lost, due to the deterioration of the edges of the manuscript. In other parts of this document we find the Otomi name of Jilotepec, *Amadontäxi*, confirming the translinguistic and semasiographic nature of this compound sign.¹⁵ The painted sign in the codex is stylistically within the native tradition, with no Western influence, in spite of the fact that it was painted on European paper over a century after the fall of the Aztec capital.

Neither the relief slab from Jilotepec nor the painted sign in the *Huichapan Codex* show influences from the Western tradition of visual communication, except for the use of European paper as a support in the case of the codex. As noted above, the relief may have been carved before the Spanish conquest and later incorporated into a wall of the Franciscan

12. Nahuatl words in this article were translated using the method developed by Wright-Carr (2007); long vowels (marked with macrons: ā, ē, ī, ō) and *saltillos* (a phoneme usually pronounced as a glottal stop) were restored using the extensive vocabulary prepared by Wimmer (n.d.).

13. See López Luján (2009) for a detailed iconographic study of the Aztec sculpture commonly called Coatlucue.

14. Otomi spelling has been standardized in this article with the orthography currently used in bilingual education programs of the Secretariat of Education (*Njau nt'ot'ira hñähñu* 2008), consulting the dictionary by Hernández, Victoria, and Sinclair (2010). The variant used in the colonial period has been translated and reconstructed using the vocabulary prepared in the early seventeenth century by Friar Alonso Urbano (1990).

15. The Nahuatl word, *Xilōtepēc*, is found as an alphabetical gloss associated with a similar pictorial sign (but without the net-and-dot pattern nor the rivulets of water) in the tribute lists of the *Codex Mendoza* (Berdan and Anawalt 1992, vol. 3, 31 *recto*).

Figure 2.

Painted toponymic sign for the kingdom or town of Jilotepec.

Huichapan Codex, circa 1632, 5 *recto*.

Reyes Retana 1992, plate 9.



convent, or it may be contemporary with the construction of this Christian missionary establishment. In either case, the native iconographic or semasiographic sign was effectively framed by its integration into this architectural context. The presence of the toponymic sign expressing the idea of Jilotepec as a water-mountain or kingdom, together with other toponymic signs –presumably of subordinate towns, according to Solís–, appears to represent the continuing political legitimacy of this regional capital during the early colonial period, through the use of native imagery.

Church of Saint Anthony of Padua, Mixquiahuala

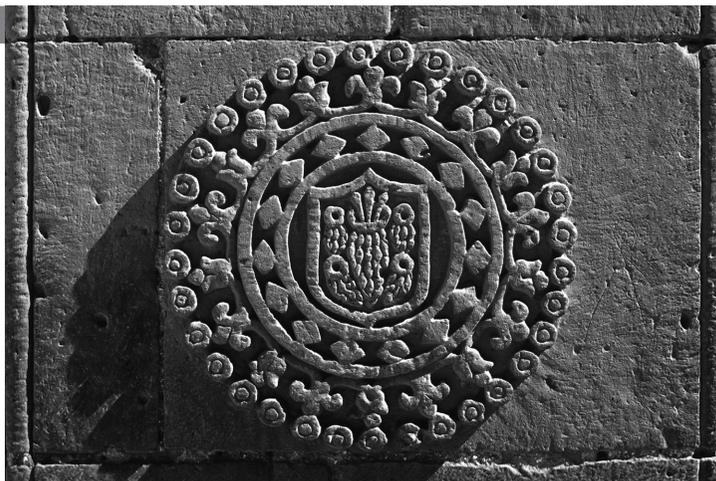
Mixquiahuala is another town, originally populated by the Otomi, in the southern Mezquital Valley. In late pre-Hispanic and early colonial times, it fell outside of the political jurisdiction of Jilotepec, paying tribute first to Tula or Axocopan, kingdoms that formed part of the Aztec tribute state, then to Spanish *encomenderos*, and finally to the Crown (Wright-Carr 2009a). Its Nahuatl name, *Mizquiyahualah*, means ‘Place Surrounded by an Abundance of Mesquites.’ The Otomi toponym was *Tsit’ähi* (López Yepes 1826, 192), which can be translated as ‘Little Mesquite’ or ‘Revered Mesquite.’

The evangelization of this Otomi town was initially undertaken by Franciscan friars stationed at the convent in the nearby town of Tula, to the southwest, and Augustinians from the convent at Actopan, to the east. At some time before 1569 its first secular parish priest was appointed. Franciscan motifs in the two identical relief carvings on the pilasters flanking the entrance of the church of Saint Anthony of Padua (figure 3), and the choice of this saint as the town’s patron, speak of the missionary efforts of the order founded by Saint Francis (Wright-Carr 2009a). These same reliefs reveal, in a subtle way, the persistence of native worldview.

Figure 3. Relief depicting the wounds of Jesus and Francis of Assisi.

Church of Saint Anthony of Padua, Mixquiahuala.

Photograph by the author, 2000.



At first glance this composition does not look overtly indigenous. A medieval escutcheon contains a representation of the ‘five holy wounds’ of Jesus. From the larger wound, corresponding to the lance cut on the side of Jesus’s chest, emerge the three nails used to fix his extremities to the cross. This symbol was often used by the Franciscan order, alluding to the stigmata received by Saint Francis at La Verna in 1224 (Duchet-Suchaux and Pastoureau 1994, 152-153, 317). This escutcheon is framed by two concentric bands framing a circular row of diamond motifs, another ring formed by interlaced *fleurs-de-lis*, and an outer ring of disks, each containing a circular incision.

The hand of a native sculptor may be inferred from the circular elements, used to represent the wounds in Jesus’s and Francis’s hands and feet. In pre-Hispanic central Mexican iconography and semasiography, similar representations of jade beads were associated with precious things and substances, particularly water and blood.¹⁶ We have seen this sign in the rivulets of water in two compound ‘water-mountain’ signs; it is clearly associated with blood on the reverse of the *Teocalli of the Sacred War*, an Aztec sculpture in the National Museum of Anthropology, where it emerges from signs representing human hearts that grow from a prickly pear cactus (genus *Opuntia*) (Wright-Carr 1998, 100). Blood was an essential element in central Mexican rites. Blood drawn from the bodies of participants, and the blood of sacrificed animals and human beings, was offered to nature deities in propitiatory rites. The Sun was fed with human hearts and blood to maintain cosmic equilibrium. The diamond motifs surrounding the escutcheon may be related to patterns in the dorsal scales of rattlesnakes; serpents are ubiquitous in Mesoamerican iconography and semasiography, representing diverse aspects of a sacred, sentient universe. Finally, the radial composition recalls representations of the Sun in central Mexican sculpture and painting (Matos and Solís, 2004).

An example of such a solar disc is found in the *Huamantla Map* (ca. 1567-1598), a large historical and cartographic manuscript from the Otomi town of Huamantla, in the eastern part of Tlaxcala, painted on native paper made from the inner bark of a fig tree. In the visual narration of a native cosmogonic myth, the god *Nānāhuatzin*, ‘the revered (or the poor little) pustulent one,’ sacrifices himself in the sacred bonfire at Teotihuacan, rising as the Fifth Sun and initiating a cosmic era (figure 4).¹⁷ In this solar disk, the profile face of the deity has a feathered headdress and speech scroll in front of his mouth. This central motif is surrounded by concentric circles. Four ‘v’-shaped elements, with curled ends representing solar rays, occupy the space between the inner circles and the outer ring. Between these are banded triangular signs, each with three feathers, suggesting sculptures called *cuauhxicalli*, ‘the food-bowl of the eagle,’ in which human hearts were placed as offerings to the solar deity, metaphorically associated with the eagle (Gutiérrez 1983, 82-115). Touching the feathers are four circular beads,

16. The use of bead signs in representations of the wounds of Jesus and the stigmata of Francis is found in the decoration of other sixteenth-century convents in Mexico. This iconographic syncretism was pointed out by Reyes-Valerio (1978; 2000) in his classic study of native art in early colonial New Spain.

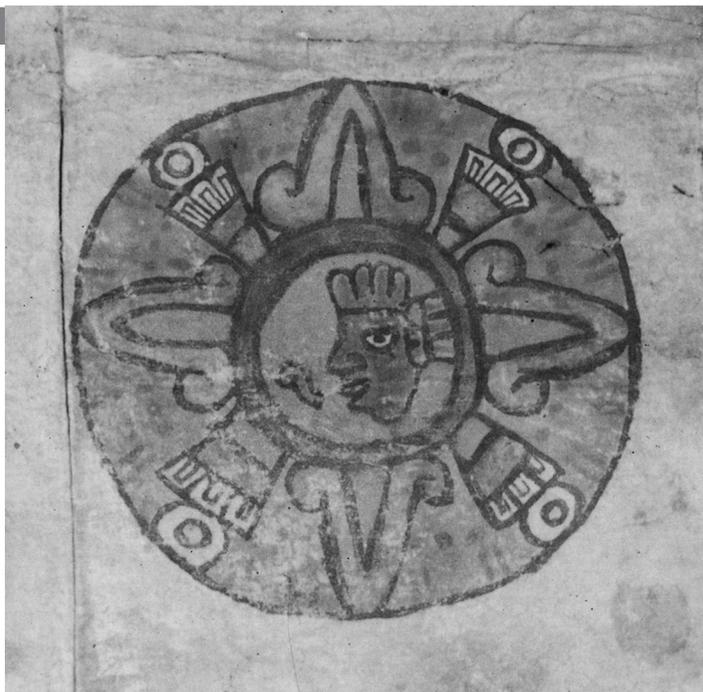
17. Aguilera 1984; Sahagún 1979: vol. 2, 228 verso-233 recto.

Figure 4.

Painting of the rising of the Fifth Sun at Teotihuacan.

Huamantla Map, circa 1567-1598.

Aguilera 1984, plate 7.



evoking the idea of precious blood, analogous to the four beads representing the wounds of Christ in the escutcheon at Mixquiahuala.

The twin radial designs flanking the entrance to the church at Mixquiahuala, as noted, do not contain overt pre-Hispanic iconic or semasiographic signs, beyond the circular bead-like elements related to jade and, by extension, to preciousness, as a sort of visual adjective. The placement of an escutcheon containing the five wounds of Christ with these precious bead elements at the center of a radial design with patterns arranged in concentric bands, however, suggest that the designer was relating the concept of the redemptive blood of the Christian savior to native religion, specifically the offering of human sacrificial blood to the solar deity. This possibility is supported by solar imagery integrated into a few other missionary buildings erected in New Spain during the sixteenth century. The alternation of concentric rings with Western and central Mexican iconic elements – or semasiograms – suggests a complex pattern of mutual framing, with the precious beads at both the center of the composition, where they are framed by the European escutcheon, and in the outer ring, framing the entire design. The overall effect is not unlike that of the solar disc from the *Huamantla Map*, which, despite its origin in the last third of the sixteenth century, over a generation after the conquest, does not display any stylistic influences from the Western tradition of pictorial communication.

Figure 5.

Relief with a representation of Snake Mountain framed by Christian signs.

Chapel of Saint Mary, Amealco.

Photograph by the author, 2002.



Chapel of Saint Mary, Amealco

Amealco is a village located in the central Mezquital Valley, near Chapantongo, within the former tributary province of Jilotepec. Its modern name comes from the Nahuatl toponym *Āmēyalco*, 'By the Spring.' Little is known about its history. This village lies about five kilometers south of a prominent mountain now called Hualtepec. Geographic, historical and archaeological evidence suggests that Hualtepec may be the mountain formerly called *Cōātepēc*, 'On Snake Mountain,' that appears in Aztec cosmogonic myths and in the story of their migration into central Mexico (Gelo and López 1998).

The chapel of Saint Mary at Amealco was built in a style like that of other examples of Christian architecture from the sixteenth century, although a carved stone over the entrance bears the date 1609. Several reliefs adorn the facade. One of them (*figure 5*) has a compound toponymic graph with the mountain sign, like the two examples discussed above, with a net-and-dot pattern and severed base, in this case without the rivulets of water. On top of the mountain is a detailed representation of a rattlesnake with a forked tongue, ventral scales, and a diamond-and-circle pattern suggesting the dorsal scales of the genus *Crotalus*. This is clearly a visual expression of the toponym *Cōātepēc*, 'On Snake Mountain,' a meaning which may be expressed in Otomi as *Ank'ēnt'ōho*.¹⁸ This sign is framed by a knotted cord commonly found in Franciscan iconography, representing the waist cord worn by friars of this order, with three knots to remind the wearer of his vows of poverty, chastity, and obedience (Duchet-Suchaux and Pastoureaux 1994, 153). Alternative meanings in the native central Mexican tradition are possible, as cords are found in a variety of iconographic contexts. Filling the

18. The latter toponym is unattested in documentary sources known to the author, although this reconstruction is feasible, as toponyms commonly passed as calques from one language to another. In early colonial period Otomi, *An-* is a nominal prefix often found in toponyms; *k'ēn* is an apocopated form of the noun *k'ēnyā*, 'snake,' *t'ōho* is a noun meaning 'mountain' (Urbano, 1990).

upper space defined by the knotted cord are two Christian monograms in circular frames: IHS –the first three letters of the name Jesus in Greek– and XPS –three letters of the word Christ in Greek– (Ferguson 1961, 150). The centrality of the Snake Mountain sign, and the placement of the monograms above it, suggest that the circular frames could have been interpreted by the native sculptor and viewers as the Sun and Moon, the Christian monograms serving to placate Spanish priests. Today the phrase *Zi Dada Hyadi*, 'Venerable Father Sun,' is used by the Otomi of the Mezquital Valley, while Jesus Christ is called *Zi Dada Jesu*, 'Venerable Father Jesus.' The phrase *Zi Nānā*, 'Venerable Mother,' is used to speak of both the Moon and Mary, mother of Jesus (Wright-Carr 2005b).

In an Aztec myth, the solar deity called *Huitzilopochtli*, 'Left Hand of the Hummingbird,' was born to the Earth Goddess on Snake Mountain, armed as a warrior. He promptly vanquished the Lunar deity, decapitating and dismembering her, and chased away the stars, killing most of them (Sahagún 1979, vol. 1, 202 *recto*-204 *verso*). This myth, in which the forces of light and life triumph over the forces of darkness and death, was central to Aztec ritual. The Great Temple in Mexico City was an architectural metaphor for Snake Mountain. Each human sacrifice, performed in front of the temple of *Huitzilopochtli* on its summit, symbolically and magically recreated the defeat of the nocturnal deities by the Sun, thus insuring the stability of the universe (Matos 1987).

In an illustration of this cosmogonic myth from the *Florentine Codex* (figure 6), a toponymic sign, composed of the mountain graph with a snake on its summit, visually locates the scene where Left Hand of the Hummingbird vanquishes the nocturnal deities at Snake Mountain. This compound graph has the same essential elements as the central motif of the relief at Amealco: a mountain with a severed base and a rattlesnake. The *Florentine Codex* was painted on European paper by native scribes educated in Franciscan convents, as part of a grand project of ethnographic documentation undertaken by Friar Bernardino de Sahagún in the mid-sixteenth century (Sahagún 1979).

The central iconic or semasiographic motive in the relief at Amealco, the mountain and the rattlesnake, are stylistically very close to the pre-Hispanic central Mexican tradition, except for the *fleur-de-lis* on the serpent's back. Circular bands frame the Christian monograms, creating a potentially ambiguous symbolism, between the holy names of Jesus Christ and the two main astral bodies that travel across the sky daily. The entire iconic-semasiographic complex is framed by a Franciscan cord, seemingly to integrate this sign complex into its architectural context on the facade of a Christian chapel, acknowledging the religious authority of the Franciscan order without abandoning native worldview. The illustration from the *Florentine Codex* has a purely indigenous content, while Western stylistic conventions may be seen in the proportions and poses of the human figures, the use of overlap

Figure 6.

Painting of the birth of Left Hand of the Hummingbird at Snake Mountain.

Florentine Codex, circa 1578.

Sahagún 1989, vol. 1, 204 *verso*.



to give a limited illusion of spatial depth, and in the timid use of shading to suggest volume; within this hybrid style, the compound Snake Mountain graph conserves the essential properties of its pre-Hispanic antecedents.

.....
Church of Saint Michael the Archangel, Ixmiquilpan

The town of Ixmiquilpan is the political and commercial hub of the north central Mezquital Valley. The modern toponym derives from the Nahuatl word *Ītzmiquilpan*, 'The Obsidian-Arrow Edible Herb.' Its Otomi name, *Nts'utk'ani*, means 'The Thin Edible Herb' (Hernández, Victoria, and Sinclair 2010). Both names refer to purslane (*Portulaca oleracea*), a nutritious plant with small oval leaves that grows in the maize fields of central Mexico.

Ixmiquilpan was a middle-ranking kingdom before the Spanish conquest, paying tribute to Axocopan as part of the Aztec state (Berdan and Anawalt 1992, vol. 3, 27 *recto*). After the fall of Tenochtitlan, Spanish

encomenderos collected the tribute, and in 1550 Augustinian friars arrived in Ixmiquilpan. The friars directed the construction of a monumental convent dedicated to Saint Michael the Archangel, consisting of a cloister, a church, a walled atrium with a chapel for the celebration of open-air masses, and an orchard. The church is famous for the polychrome mural paintings in its interior. A large frieze runs around the nave at eye-level, with a looping acanthus scroll inspired by Renaissance friezes, providing the compositional structure for a scene where native warriors and composite man-animal-plant creatures do battle, in a fusion of grotesque imagery derived from classical antiquity and native iconographic and formal features. Similar pictorial elements are found in the lunettes painted between the lower frieze and the ribbed vault supporting the choir loft, and between the ribs of this vault and another vault over the presbytery. Another frieze, with a more orthodox use of Renaissance forms and symbols, runs around the upper walls, at the spring line of the barrel vault. The murals of the lower frieze, the lunettes, and the ribbed vaults incorporate an articulated set of signs linked to pre-Hispanic iconography and semasiography, expressing the native concept of sacred war, waged to obtain human sacrificial victims for the sustenance of the solar deity. The Sun is represented in this church, in reliefs on the facade and in the paintings inside the church, by an eagle, perched on a prickly pear cactus bearing red fruits, metaphors for human hearts. At the time these murals were painted, around the decade of 1571-1580, Otomi warriors from towns in the Mezquital Valley were aiding the Spaniards in the conquest of north central Mexico, home to the nomadic and seminomadic Chichimec tribes (Wright 1998; 2005b).

I shall limit the present discussion to one of the two escutcheons carved high up on the plateresque facade of the church, flanking the window of the choir loft. The images in these escutcheons echo, in a simplified form, the murals painted in the lunettes at the foot of the nave, under a choir loft supported by ribbed vaults. The composition on the northern side of the facade is framed by an escutcheon suspended by a band or strap from the mouth of a lion head carved in high relief; this much of the design would not be out of place on a Spanish church from the same period. The native signs are carved in low relief within the frame of the escutcheon. The details cannot be seen from the atrium; a telescope, binoculars, or zoom lens is required to appreciate the symbolism, which is clearly visible only in the early afternoon light (figure 7).

The central element in this composition is an eagle, viewed from the front, wings spread, head in profile. As mentioned above, the eagle was a metaphor for the Sun. This example shares attributes with solar eagles in pre-Hispanic imagery: a disc-shaped ornament on its chest, a feathered headdress, and a banner, albeit a European-style bifurcated flag, suggesting warfare. The eagle perches on a prickly pear cactus bearing metaphorical human hearts, the food of the Sun god. On both sides of the cactus are

Figure 7.

Relief with an escutcheon framing an eagle, flanked by jaguars, perching on a toponymic sign.

Church of Saint Michael the Archangel, Ixmiquilpan.

Photograph by the author, 1982.



Figure 8.

Painting of an eagle perching on a toponymic sign.

Codex Mendoza, circa 1535-1550.

Berdan and Anawalt 1992, vol. 3, 2 recto.



sprigs of purslane, the oval-shaped leaves blown up to approximately the same size as the cladodes of the cactus. This is not obvious when looking at the relief, even with proper optical magnification and illumination, but a parallel iconographic complex is repeated in the lunette under the choir, where despite the mural's fragmentary state, the juxtaposition of the cactus and the purslane is clear. The cactus in the relief emerges from a stone-sign with lateral volutes to indicate its hardness. Together, the cactus and the stone express the name of the former Aztec capital, *Tenōchtitlan*, 'By the stone prickly pear,' in Otomi *Anbondā*, 'the red-violet prickly pear.'¹⁹ The stone is superimposed on a mountain sign with water flowing from its severed base, visually expressing the 'water-mountain' metaphor which, as seen above, signifies a seat of political power. Flanking the solar eagle in the relief on the facade, and in the painting on the lunette, are two jaguars with quetzal-feather headdresses, armed with *mācuahuitl* (literally 'hand-stick'), wooden weapons with razor-sharp obsidian blades on both sides. The jaguars carved on the facade also carry feathered shields.²⁰

In the context of pre-Hispanic and early colonial central Mexican iconography and semasiography, the meaning of this complex of signs is evident. The opposition of an eagle with jaguars refers to the daily combat between the solar deity and the nocturnal astral deities, as these nocturnal felines are associated with the underworld, through which astral deities travel after setting below the western horizon and before their rebirth in the east. Eagles and jaguars also represent elite military orders. Warriors who had demonstrated their prowess on the battlefield were entitled to wear suits covered with eagle feathers or jaguar skins. Eagle warriors and jaguar warriors are represented in the frieze painted on the walls of the nave in the church at Ixmiquilpan. The solar eagle perches on the prickly pear cactus, associated with the Nahuatl and Otomi names of the Aztec city, *Tenōchtitlan* and *Anbondā*. The cactus provides red, juicy fruit for the sustenance of the eagle, just as the Aztec capital provided the human hearts of sacrificed warriors for the sustenance of the Sun. The juxtaposition of purslane with the cactus suggests a replacement: it is now Ixmiquilpan, the place of purslane, that sustains the Sun through warfare, as the ruins of the Aztec capital lie beneath the buildings, streets, and plazas of Mexico City.

On folio 2 *recto* of the *Codex Mendoza* (figure 8), we find another example of an iconographic-semasiographic complex showing an eagle, perched on a prickly pear cactus, associated with martial symbols: a feathered shield with arrows or darts. This central image is framed and criss-crossed by aquatic bands representing, in a simplified manner, the system of canals that penetrated the island city of *Tenōchtitlan*. In the quadrants defined by the canals are a skull rack, a thatched hut, two kinds of reeds, and men seated on reed mats, representing the founding fathers of the Aztec city, including their leader *Tenōch*, whose name in Nahuatl coincides with the nominal root meaning prickly pear, also found the name of the city. This

composition has multiple layers of meaning: beyond the literal interpretation of its iconic elements or semasiograms, it represents the founding of *Tenōchtitlan*, recalling a legend in which the Aztecs find the portent promised by their god *Huitzilopochtli*, an eagle perched on a prickly pear cactus that had sprouted from the heart of their enemy Copil (Berdan and Anawalt 1992, vol. 2, 3-5). A deeper, iconological layer is the one discussed above, in reference to the escutcheon on the facade of the church at Ixmiquilpan: the eagle is a metaphor for the solar deity, while the prickly pears growing on the cactus are metaphors for the hearts of sacrificed warriors, procured through warfare to sustain the Sun.

The iconic-semasiographic complex in the relief at Ixmiquilpan would not look out of place on a pre-Hispanic monument, if the European-style flag were replaced by a native banner like those carried by Aztec and Otomi warriors in the codices (two such banners are associated with the human figures in the upper quadrant of the image in figure 8). Once again, a Western motive, the escutcheon suspended from the mouth of a lion, frames the Mesoamerican signs, integrating them seamlessly into the general composition of a plateresque church facade. The central complex of signs in figure 8 provides an iconographic and semasiographic parallel, aiding us in our interpretation of the relief as a solar eagle consuming metaphorical prickly-pear hearts provided through warfare. As in the relief, these painted signs show little European influence in their material aspects, content, and form, other than their support of European paper and occasional shading.

Closing remarks

The Western concept of 'art' is not very productive for the study of images created before the eighteenth century. Our categories of 'writing' and 'sculpture' or 'painting' create a false dichotomy that limits our understanding of native central Mexican visual culture. Rather than attempting to translate visual signs into a verbal discourse, I have attempted here to understand the concepts expressed in a visual language, comparing these concepts to words and phrases in two verbal languages spoken in the region where the relief carvings and pictorial manuscripts discussed here were produced. The same conceptual metaphors were reflected in both visual language and in verbal expressions found in Otomi and Nahuatl.

The images discussed here, carved in stone and painted on paper, occupy the blurry border between iconography and semasiography, as they share characteristics with Western iconography and with the highly conventional and specific system of visual communication of the indigenous peoples of central Mexico, including concrete links between visual signs and verbal signs, especially evident in the toponymic signs. In none of these sign-clusters do we find clear examples of glottography, in which graphs

19. Reyes Retana 1992: plate 2;

Wright 2005a: vol. 2, 331-332.

20. A similar composition, better preserved than the image on the lunette, was painted on the ribbed vault over the presbytery of the same church. It lacks the jaguars, which would not have fit in the elongated triangular shape framed by the ribs. It includes an eagle with pectoral ring, headdress, and bifurcated banner, perched on a purslane superimposed on a water-mountain sign, with a prickly pear cactus behind it. In both paintings, an arrow-shaped tongue and speech scrolls emerge from the eagle's open beak.

can only be verbalized in a specific language. The contents of these reliefs and paintings were accessible to native viewers instructed in the interpretation of central Mexican visual communication, regardless of their linguistic affiliation.

The field of research that looks at the nature of central Mexican iconography and semasiography could benefit from a more profound understanding of the relations between visual language, verbal language, and human cognition. Following up on this line of inquiry is beyond the scope of this article, but I would like to suggest here that this is a promising area for future research that has the potential to move the discussion forward. An exploration of the cognitive foundations of visual thinking could help us get beyond the present tendency to merely 'read' these signs in verbal terms, rather than looking for deeper levels of meaning, involving our experience as embodied agents interacting with our environmental and cultural surroundings.

In the four examples discussed here, the intention of native sculptors and painters was to express vital aspects of their traditional worldview on the surfaces of Christian architecture. Doing so was an act of cultural resistance, in the face of the iconoclastic dogmatism of the European missionaries. This reveals the extent to which the natives manage to succeed in imposing their will within the asymmetrical negotiation of power in the colonial society of New Spain. An interesting feature shared by the four reliefs is how indigenous signs were framed by Western iconic elements as a way to integrate them into the overall decorative schemes of the monuments.

The indigenous peoples of central Mexico used imagery rooted in the traditions of their ancestors as a means for cultural, religious, and political resistance. The public display of images that express fundamental aspects of native ideology and worldview, particularly on the architectural surfaces of Christian temples –as seen in the examples presented here– testifies to processes of resistance to the imposition of European ideology and control. Central Mexican visual language was a means of asserting ethnic identity, and the material traces remaining testify to the efforts of the Otomi to conserve their dignity in the face of colonial repression. This process continues today, particularly in ritual settings involving dance, music, oral tradition, and visual manifestations of culture.

Another potentially fruitful line of inquiry, suggested by the concepts, ideas and conclusions presented in this article, would be to explore how visual communication in public spaces can serve as a vehicle for cultural resistance, and for the vindication of ethnic identity, in other contexts throughout time and space.

References

- Aguilera, Carmen, ed. 1984. *Códice de Huamantla*. Tlaxcala: Instituto Tlaxcalteca de la Cultura, Gobierno del Estado de Tlaxcala.
- Alvarado, Francisco. 1962. *Vocabulario en lengua mixteca*. Edited by Wigberto Jiménez Moreno. Mexico City: Instituto Nacional Indigenista and Instituto Nacional de Antropología e Historia.
- Arnheim, Rudolf. 1969. *Visual Thinking*. Berkeley, Los Angeles, and London: University of California Press.
- Barrera Vásquez, Alfredo. 1995. *Diccionario maya: Maya-español, español-maya*, 3rd. ed. Mexico City: Editorial Porrúa.
- Berdan, Frances F., and Patricia Rieff Anawalt, ed. 1992. *The Codex Mendoza*, 3 vols. Berkeley, Los Angeles, and Oxford: University of California Press.
- Boone, Elizabeth Hill. 1994. "Aztec Pictorial Histories: Records Without Words." In *Writing without Words: Alternative Literacies in Mesoamerica and the Andes*. Edited by Elizabeth Hill Boone and Walter D. Mignolo, 50-76. Durham and London: Duke University Press.
- Chemero, Anthony. 2013. "Radical Embodied Cognitive Science." *Review of General Psychology* 17(2):145-150.
- Córdova, Juan de. 1987. *Vocabulario en lengua çapoteca*. Mexico City: Ediciones Toledo and Instituto Nacional de Antropología e Historia.
- Coulmas, Florian. 2003. *Writing Systems: An Introduction to their Linguistic Analysis*. Cambridge: Cambridge University Press.
- Duchet-Suchaux, Gaston and Michel Pastoureau. 1994. *The Bible and the Saints*. Translated by David Radzinowicz Howell. Paris and New York: Flammarion.
- Escalante Gonzalbo, Pablo. 2010. *Los códices mesoamericanos antes y después de la conquista española: Historia de un lenguaje pictográfico*. Mexico City: Fondo de Cultura Económica.
- Ferguson, George. 1961. *Signs and Symbols in Christian Art*, 2nd ed. London, Oxford, New York: Oxford University Press.
- Gelo del Toro, Eduardo Yamil, and Fernando López Aguilar. 1998. "Hualtepec, Nonohualtepec y Cohuatepec: Lecturas a un cerro mítico." *Arqueología*, 2nd epoch, 20:65-78.

- Gerhard, Peter. 1993. *A Guide to the Historical Geography of New Spain: Revised Edition*. Norman and London: University of Oklahoma Press.
- Gibson, James J. 1986. *The Ecological Approach to Visual Perception*. New York and Hove: Psychology Press.
- Gilberti, Maturino. 1990. *Vocabulario en lengua de Mechuacan*. Mexico City: Centro de Estudios de Historia de México Condumex.
- González Obregón, Luis, ed. 2002. *Publicaciones del Archivo General de la Nación, III: Procesos de indios idólatras y hechiceros*. Mexico City: Archivo General de la Nación.
- Gruzinski, Serge. 1989. *Man-Gods in the Mexican highlands. Indian Power and Colonial Society, 1520-1800*. Translated by Eileen Corrigan. Stanford: Stanford University Press.
- Gutiérrez Solana Rickards, Nelly. 1983. *Objetos ceremoniales en piedra de la cultura mexicana*. Mexico City: Instituto de Investigaciones Estéticas, Universidad Nacional Autónoma de México.
- Hernández Cruz, Luis, Moisés Victoria Torquemada, and Donald Sinclair Crawford. 2010. *Diccionario del hñāhñu (otomí) del valle del Mezquital, estado de Hidalgo*, 2nd ed. Mexico City: Instituto Lingüístico de Verano. Accessed April 9, 2015. <http://www.sil.org/americas/mexico/otopame/mezquital/S045a-DicOtomimezq-ote.htm>.
- Hernández Díaz, Verónica. 2013. "Las formas del arte en el antiguo Occidente." In *Miradas renovadas al Occidente indígena de México*. Edited by Marie-Areti Hers, 21-77. Mexico City: Instituto de Investigaciones Estéticas, Universidad Nacional Autónoma de México; Instituto Nacional de Antropología e Historia; Centro de Estudios Mexicanos y Centroamericanos.
- Johansson K., Patrick. 2000. "De la imagen a la palabra: Un análisis comparativo entre la imagen del *Códice Boturini* y el texto correspondiente del *Códice Aubin*." In *Códices y Documentos sobre México, Tercer Simposio Internacional*. Edited by Constanza Vega Sosa, 143-164. Mexico City: Instituto Nacional de Antropología e Historia.
- Landa, Diego de. 2000. *Relación de las cosas de Yucatán: Manuscrito conservado en la Real Academia de la Historia, Madrid, España*. Edited by A. L. Vollemaere (private edition).
- Lara Cisneros, Gerardo. 2007. *El Cristo Viejo de Xichú: Resistencia y rebelión en la Sierra Gorda durante el siglo XVIII*. Mexico City and Ciudad Victoria: Dirección General de Culturas Populares,

- Consejo Nacional para la Cultura y las Artes and Instituto de Investigaciones Históricas, Universidad Autónoma de Tamaulipas.
- López Luján, Leonardo. 2009. "La Coatlicue." In *Escultura monumental mexicana*. Edited by José Ignacio González Manterola, 114-229. Mexico City: Fundación Conmemoraciones 2010.
- López Yepes, Joaquín. 1826. *Catecismo y declaración de la doctrina cristiana en lengua otomí, con un vocabulario del mismo idioma*. Mexico City: Oficina del Ciudadano Alejandro Valdés.
- Marcus, Joyce. 1992. *Mesoamerican Writing Systems: Propaganda, Myth, and History in Four Ancient Civilizations*. Princeton: Princeton University Press.
- Matos Moctezuma, Eduardo. 1987. "Symbolism of the Templo Mayor." In *The Aztec Templo Mayor: A symposium at Dumbarton Oaks, 8th and 9th October 1983*. Edited by Elizabeth Hill Boone, 185-209. Washington: Dumbarton Oaks.
- Matos Moctezuma, Eduardo, and Felipe R. Solís Olguín. 2004. *El Calendario azteca y otros monumentos solares*. Mexico City: Instituto Nacional de Antropología e Historia and Grupo Azabache.
- Mendieta, Gerónimo de. 1997. *Historia eclesiástica indiana*, 2 vols. Edited by Joaquín García Icazbalceta and Antonio Rubial García. Mexico City: Dirección General de Publicaciones, Consejo Nacional para la Cultura y las Artes.
- Merleau-Ponty, Maurice. 1945. *Phénoménologie de la perception*. Paris: Éditions Gallimard.
- Mikulska, Katarzyna. 2015. *Tejiendo destinos: Un acercamiento al sistema de comunicación gráfica en los códices adivinatorios*. Varsovia and Zinacantan: Universidad de Varsovia and El Colegio Mexiquense.
- Molina, Alonso de. 1571. *Vocabulario en lengua castellana y mexicana*. Mexico City: Casa de Antonio de Espinosa.
- Monaghan, John. 1990. "Performance and the Structure of the Mixtec Codices." *Ancient Mesoamerica* 1(1):133-140.
- Monaghan, John. 1994. "The Text in the Body, the Body in the Text: The Embodied Sign in Mixtec Writing." In *Writing without Words: Alternative Literacies in Mesoamerica & the Andes*. Edited by Elizabeth Hill Boone and Walter D. Mignolo, 87-101. Durham and London: Duke University Press.

Nicholson, Henry B. 1973. "Phoneticism in the Late Pre-Hispanic Central Mexican Writing System." In *Mesoamerican Writing Systems, a Conference at Dumbarton Oaks, October 30th and 31st, 1971*. Edited by Elizabeth P. Benson, 1-46. Washington: Dumbarton Oaks.

Njaua nt'ot'i ra hñähnu, Norma de escritura de la lengua hñähñu (otomí) de los estados de Guanajuato, Hidalgo, estado de México, Puebla, Querétaro, Tlaxcala, Michoacán y Veracruz. 2014. Mexico City: Instituto Nacional de Lenguas Indígenas.

Panofsky, Erwin. 1982. *Meaning in the Visual Arts*. Chicago: University of Chicago Press.

Pohl, John M. D. 1994. *The Politics of Symbolism in the Mixtec Codices*. Nashville: Department of Anthropology, Vanderbilt University.

Pohl, John M. D. 2001. *Notebook for the Mixtec Pictographic Writing Workshop at Texas, #8: The Selden Roll*. Austin: Maya Workshop Foundation.

Reyes Retana Márquez, Óscar, ed. 1992. *Códice de Huichapan, comentado por Alfonso Caso*. Studies by Alfonso Caso y Andrade. Mexico City: Telecomunicaciones de México.

Reyes-Valerio, Constantino. 1978. *Arte indocristiano: Escultura del siglo XVI en México*. Mexico City: Instituto Nacional de Antropología e Historia.

Reyes-Valerio, Constantino. 2000. *Arte indocristiano*. Mexico City: Instituto Nacional de Antropología e Historia.

Sahagún, Bernardino de. 1979. *Códice florentino*, 3 vols. Mexico City: Secretaría de Gobernación.

Sampson, Geoffrey. 1985. *Writing Systems: A Linguistic Introduction*. Stanford: Stanford University Press.

Sampson, Geoffrey. 2015. *Writing Systems*, 2nd ed. Sheffield and Bristol: Equinox Publishing.

Schele, Linda. 2001. "Introduction to reading Maya hieroglyphs." In *Notebook for the XXVth Maya Hieroglyphic Forum at Texas*, 1st pagination: 1-75. Austin: Maya Workshop Foundation.

Shapiro, Lawrence. 2011. *Embodied Cognition*. London and New York: Routledge.

Smith-Stark, Thomas C. 1994. "Mesoamerican calques." In *Investigaciones lingüísticas en Mesoamérica*. Edited by Carolyn J. MacKay and Verónica Vázquez, 15-50. Mexico City: Instituto de Investigaciones Filológicas, Universidad Nacional Autónoma de México.

Solís Olguín, Felipe R. 1997. "Andrés Molina Enríquez y la arqueología de Jilotepec, Estado de México." *Expresión Antropológica* 4-5:42-47.

Urbano, Alonso. 1990. *Arte breve de la lengua otomí y vocabulario trilingüe español-náhuatl-otomí*. Edited by René Acuña. Mexico City: Instituto de Investigaciones Filológicas, Universidad Nacional Autónoma de México.

Valle Pérez, Perla, ed. 1994. *Códice de Tepetlaoztoc (Códice Kingsborough), estado de México*. Zinacantepec: El Colegio Mexiquense.

Varela, Francisco J., Evan Thompson, and Eleanor Rosch. 1993. *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge and London: The MIT Press.

Ward, Dave, and Mog Stapleton. 2012. "Es are Good: Cognition as Enacted, Embodied, Embedded, Affective and Extended." In *Consciousness in Interaction: The Role of Natural and Social Context in Shaping Consciousness*. Edited by Fabio Paglieri, 89-104. Amsterdam and Philadelphia: John Benjamin Publishing Company.

Whittaker, Gordon. 2009. "The principles of Nahuatl writing." In *Göttinger Beiträge zur Sprachwissenschaft* 16:47-81.

Williams, Barbara J., and Herbert R. Harvey, eds. 1997. *The Códice de Santa María Asunción, Facsimile and Commentary: Households and Lands in Sixteenth-Century Tepetlaoztoc*. Salt Lake City: The University of Utah Press.

Wilson, Robert A., and Lucia Foglia. 2016. "Embodied Cognition." In *The Stanford Encyclopedia of Philosophy*. Edited by Edward N. Zalta. Stanford: Center for the Study of Language and Information, Stanford University. Accessed December 28, 2016. <https://plato.stanford.edu/archives/win2016/entries/embodied-cognition/>.

Wimmer, Alexis. n.d. *Dictionnaire de la langue Nahuatl classique*. Accessed December 21, 2016. <http://sites.estvideo.net/malinal>.

Wright-Carr, David Charles. 1998. "Sangre para el Sol: Las pinturas murales del siglo XVI en la parroquia de Ixmiquilpan, Hidalgo." *Memorias de la Academia Mexicana de la Historia, Correspondiente de la Real de Madrid* 41:73-103.

Wright-Carr, David Charles. 2005a. *Los otomíes: Cultura, lengua y escritura*, PhD thesis, 2 vols. Zamora: Doctorado en Ciencias Sociales, El Colegio de Michoacán.

Wright-Carr, David Charles. 2005b. "Zidada Hyadi: El venerado padre Sol en la parroquia de Ixmiquilpan, Hidalgo." *Arqueología Mexicana* 13(73):38-45.

Wright-Carr, David Charles. 2007. *Lectura del náhuatl: Fundamentos para la traducción de los textos en náhuatl del periodo Novohispano Temprano*. Mexico City: Instituto Nacional de Lenguas Indígenas.

Wright-Carr, David Charles. 2009a. "Mixquiahuala en el siglo XVI: Dominio y resistencia en un pueblo otomí." In *Estudios de antropología e historia: Historia colonial*. Verénice Cipatli Ramírez Calva and Francisco Luis Jiménez Abollado, eds., pp. 21-54. Pachuca: Universidad Autónoma del Estado de Hidalgo.

Wright-Carr, David Charles. 2009b. "Semasiografía y glotografía en las inscripciones de dos esculturas mexicas," In *Estudios acerca de las artes: Análisis, técnicas y reflexión*. Edited by Benjamín Valdivia, 226-253. Guanajuato: División de Arquitectura, Arte y Diseño, Universidad de Guanajuato and Azafrán y Cinabrio Ediciones.

Wright-Carr, David Charles. 2011. "La tinta negra, la pintura de colores: Los difrasismos metafóricos translingüísticos y sus implicaciones para la interpretación de los manuscritos centromexicanos de tradición indígena." *Estudios de Cultura Náhuatl* 42:285-298.

Wright-Carr, David Charles. 2012. "Los signos glotográficos en el *Códice de Huichapan*." *Relaciones: Estudios de Historia y Sociedad* 33(132 bis):33-73.

Wright-Carr, David Charles. 2013. "Cloud Serpent: King of the Place of the Flowering Tender Ears of Corn: An Interpretation of the Pictorial and Verbal Signs in an Otomi Codex." In *Enfoques de la investigación cualitativa; Approaches to Qualitative Research*. Edited by M. Martha Lengeling and Irasema Mora Pablo, 381-392. Guanajuato: Departamento de Lenguas, División de Ciencias Sociales y Humanidades, Campus Guanajuato, Universidad de Guanajuato.

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Illuminography:

a survey of the
pictorial language
of Hong Kong's neon signs

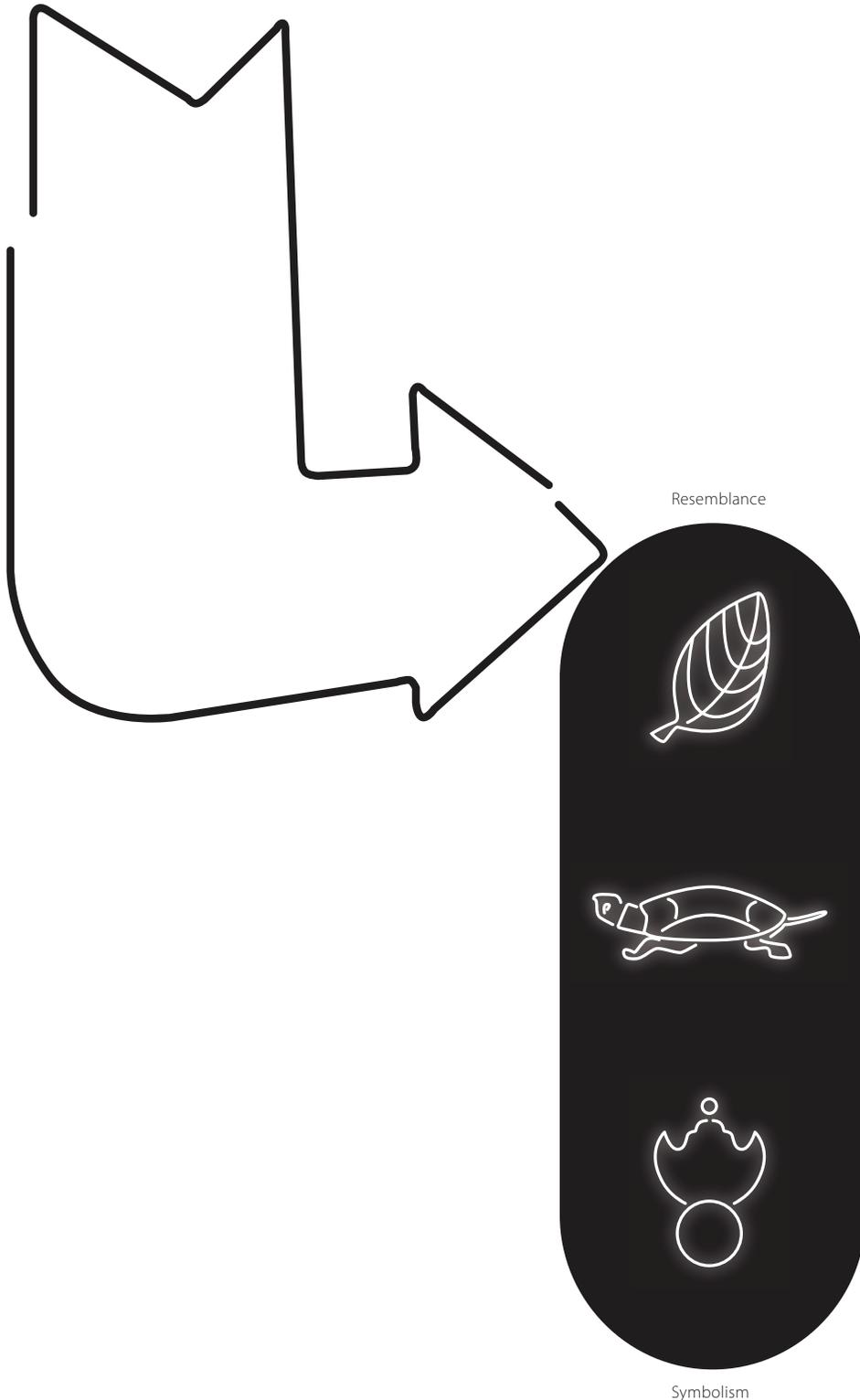
Brian Sze-Hang Kwok

Anneke Coppoolse

This article draws from a larger archival project in which still existing neon signs in much of Hong Kong's Kowloon peninsula have been photographed and subsequently preserved in the context of their imminent disappearance from the streets. Following the implementation of stricter regulations on sign sizes, the rise of cheaper and energy efficient LED solutions and urban redevelopment, Hong Kong's neon signs have an uncertain future. This article examines graphic forms of a range of icons and symbols used on neon signs plus their meanings. As Hong Kong's spectacular neonscape is (and was) a symbol of prosperity and consumerism, individual signs, icons and symbols of another kind present their own narratives. This article considers the relationship between icons and the city that they have prided for decades; specifically, it looks at its unique eclecticism. It reveals how a seeming spectacle of hues, lights, and images presents a story about Hong Kong's bicultural heritage. Indeed, what it intends to highlight is that even though neon signage is a Western technology and although it was used quite specifically in the context of consumerism, Hong Kong's adaptation indicates an eclecticism that has maintained traditional Chinese symbolism.

Keywords

Hong Kong
neon signs
pictorial imagery
streetscape
symbolism



Hong Kong's urban life and space have taken shape in the context of a colonial beginning and postcolonial continuation of international trade and commerce. Momentous verticality, illuminated streets in reds, blues, greens, and yellows, and the title "city that never sleeps" (The Hong Kong Tourism Board, 2016) are symbols of a modern city: of Hong Kong. Because the manufacturing industry significantly expanded in the mid-20th century and much of Shanghai's entertainment industry moved down to Hong Kong as a result of the Chinese Communist Revolution, neon signs (which technology came from the West) emerged rapidly and invited, accommodated, and highlighted a new lifestyle that was particularly consumerist. In the United States, neon signs had become "symbol[s] of urban decay" as early as the 1940s, with mainly liquor stores and deteriorated motels continuing their usage (Ribbat, 2013, p. 21). In Hong Kong, however, neon signs have symbolized unprecedented consumerism until today. Yet they have seen their own decline in recent years due to stricter government regulations (Building Department, 2013), the rise of cost-efficient LED technology (Tang, 2014), and urban redevelopment.

From the mid-20th century until today, Hong Kong's neon landscape has comprised a wide range of signs that display significant vernacular graphic styles, including an array of icons and symbols that feature different indicative, informative, decorative, and symbolic means to communicating with a consuming public. In light of their now imminent disappearance, it is important to take stock of their distinct visual form – to survey their significant lettering but also their unique collection of pictorial imagery – and attempt to understand what they can tell about Hong Kong as a modern city that is in popular writing often referred to a place where 'East meets West'. In this article, we therefore present what we call an illuminography of the pictorial language on neon signs in urban Hong Kong. Illuminography involves (1) a survey of the illuminated images on display in urban spaces, (2) a visual analysis and subsequent cataloguing of such images, and most importantly, (3) a study of their meaning in a certain context. The article is drawn from a larger project on Hong Kong neon signs that has at its core a growing database of photo-documented signs as they are found in Hong Kong streets today. In the course of the project, we have already witnessed the disappearance of numerous recorded signs, proving the endeavor ever more relevant as it both ensures a certain photographic conservation of an important aspect of Hong Kong's changing urban visual culture, and it allows close analysis of individual signs, lettering, and pictorial imagery through the photo database.

What we intend to highlight in this article more specifically is that even though neon signage is a Western technology and although it was used quite specifically in the context of consumerism, Hong Kong's adaptation indicates a rather particular eclecticism that has maintained traditional Chinese symbolism. Up until today, a pot pourri of icons and symbols has

illuminated Hong Kong streets, and as we attempt to articulate their significance, the apparent spectacle of signs presents a diverse range of visual markers that are highly representative of Hong Kong's bicultural heritage: they involve images that range from old Chinese symbols to global signs of desire, and in their eclectic fashion they represent Hong Kong as a melting pot of tradition, colonial implication, and particular consumption.

The following survey of pictorial imagery on Hong Kong neon signs is divided into two parts: (1) a visual analysis of the variant icons and symbols displayed on neon signs, which both allows us to take stock of the diverse graphic forms the pictorial imagery utilizes and provides a base for (2) understanding the meanings of these symbols and icons and their graphic forms in the context of Hong Kong as a modern city. In our analysis we consider the pictorial imagery of Hong Kong's neon signs as vernacular graphic forms and as illuminated markers of a discourse in place. The place of such markers (the center of a city) – as Roland Barthes emphasized – beholds social activities chiefly of purchase and meeting (Barthes, 1986, p. 101). Pictorial imagery on neon signs forms part of such activities as it functions to visually communicate between people through illuminated graphic forms and specific spatial arrangement. In combination with phonetic or alphabetic scripts (in the Hong Kong context including also the Chinese pictorial script) that convey information about certain shops, products, and services advertised in streets, the symbols and/or icons on signs "contribute to the making of recognizable social meanings of a place" (Papen, 2015, p. 3). Ingo H. Warnke (2013, p. 160 in Papen, 2015, p. 3) calls this the material manifestation of "discourses in urban space that are also discourses about urban space." Yet, while the discursive construction of space in urban centers is, as Barthes argued, primarily driven by commercial signs, when truly following the language of context as we consider the diverse icons and symbols in Hong Kong streets, we find stories that not only 'speak' consumption but that 'speak' Hong Kong.

We refer to the pictorial imagery on signs either as symbols or icons. As elaborated extensively in semiotic scholarship (e.g. Crow, 2003; Nöth, 1995; Peirce, 1991), a pure instance of an icon does not exist because the relation between the icon and the object it resembles would have to be one of absolute identity, meaning that it would be 'noncommunicative' (Nöth, 1995, p. 122). In other words, icons always take on – to a certain extent – a mode of signifying or meaning making and also have symbolic qualities (Kenner, 2010, p. 7). The level at which pictorial images "resemble" or "symbolize" differs however, and in light of our argument about how in Hong Kong the pictorial language of neon signs illuminates the territory's bicultural heritage, we make a point in referring to different images as either icons or symbols. In support of our argument, while acknowledging the above-mentioned semiotic complexity, we refer to pictorial imagery on neon signs as icons or symbols depending on whether they involve direct

visual resemblances of the products or services offered by the respective businesses (icons), or whether they require more expansive explanation – interpretation – about what they stand for (symbols).¹ Finally, in this endeavor, we have excluded icons and symbols that are brand or company logos. Although logos often feature on neon signs, they require their own theoretical and visual elaboration and deserve an article of their own.

Icons and symbols, a categorization

We begin our analysis by categorizing the icons and symbols as found on Hong Kong's neon signs. Or, as Ian Noble and Russell Bestley describe it, we compile "a classification of similar things that have common characteristics or traits" (Noble and Bestley, 2016: p. 108). We do so by creating a system that will allow "a process of comparison to reveal patterns and connections that may not have been obvious [upon a] first encounter [with] the body of material being analyzed or organized" (Ibid). This initial organization of types and their classification purposes further visual and semiotic inquiry into, and contextual understanding through, the pictorial language of Hong Kong's neon signs.

As mentioned in the introduction, this article is drawn from a collection of photo-documented neon signs as recorded in Hong Kong streets. The documenting of signs started in the summer of 2015 and is a continuing project. To date, most neon signs in the Kowloon peninsula have been photographed from diverse angles: in close-ups and wider shots, in the daytime and at night.² For the purpose of this article we have gathered additional photographs of significant signs on display in other relevant (commercial) urban areas and "new towns"³, in support of certain classifications that we knew we could make but had insufficient data for should we have only kept to the current database. For example, the old neighborhood of Kowloon City (whose neon signs are yet to be documented in the archival project)

1. This means that, for example, a pictorial image of abstracted feet indicating a (foot) massage salon is referred to as "icon", while an image of an abstracted Eiffel Tower on the neon sign of a French restaurant is considered a symbol as it does not directly resemble the product on offer and instead makes reference to France (or Paris) through an image of France's most "emblematic" architectural structure.

2. In this article, we will not elaborate visual differences between night and daytime shots as we focus primarily on what is represented through icons or symbols in the context of Hong Kong.

3. Hong Kong is a Special Administrative Region (SAR) that has urban, rural and, industrial areas, as well as a harbor. Yet, a large part of the Region consists of country and marine parks. In certain locations in what is called the New Territories – the largest area in the SAR which has historically been (and still is) mainly countryside and country park – new towns were developed from the 1970s to 1990s, to house Hong Kong's booming population. These new towns have an urban character.

is known specifically for its Southeast Asian restaurants. These restaurants feature a unique set of symbols that are mostly (but not only) found in this part of Hong Kong. When we added these newly made visual records from other commercial areas in Hong Kong, we had a pool of approximately 400 photographs of unique neon signs, almost half of which feature icons or symbols that are not brand or company logos.

Before we focus on the pictorial imagery, however, let us briefly describe the basic features of Hong Kong's neon signs and detail how pictorial imagery is displayed on or in these signs. There are different sign types. The most common signs are horizontal or vertical banners that extend into the streets: "projecting banners" (horizontal), "columnar projecting banners" (vertical), and "irregular projecting banners" (featuring non-rectangular shapes). Other common sign types are "shop front fascias" (horizontal) and "shop front columnar banners" (vertical), which are entirely attached to building façades (Tam, 2014). In the past even larger neon signs were found on top of low-rise buildings (which can be gathered from old Hong Kong street photos), yet as the city grew increasingly vertical, neon signs were made to fit the changing streetscape⁴, meaning that they came to be attached to higher-rising façades, together forming a patchwork of neon signs that extend into roads and streets from both sides (Tam, 2014).

In response to an argument Venturi et.al. made in their infamous book *Learning from Las Vegas* (1966), namely that the "architecture of styles and signs is antispatial; [that] it is an architecture of communication over space; [that] communication dominates space" (Venturi et.al., 1966, p. 8), one could argue that in the case of Hong Kong, although its signs are visually prominent (if not dominating), they also emphasize the architecture of the city in their verticality. That is, the spectacle of signs in Hong Kong streets affirms the spectacle of verticality of the city's architecture. It is, however, outside the scope of this article to further explore this relation between Hong Kong neon signs and the architectural form of the urban space in which they are displayed. Indeed, we keep to the visual significance of the signs themselves and more specifically their pictorial imagery.

On the above-mentioned sign types, symbols and icons are usually found at either the upper right corners or left corners, or in the middle of the banners (*figure 1a*), while some are instead found prominently featured entirely inside sign frames (*figure 1b*), which is also where icons and symbols are usually positioned on shop front fascias and columnar signs. Rarely are symbols or icons found at the bottom of banners, unless they are arrows indicating the direction in which shops can be found (namely, the ground floor at street level).⁵ Irregular projecting banners, in certain instances, present icons or symbols in their entirety, meaning that the frame of the

4. They were also largely aimed at pedestrian audiences rather than those using cars (Tam, 2014).

5. In the article, however, we have not included arrows as a category of icons on signs.

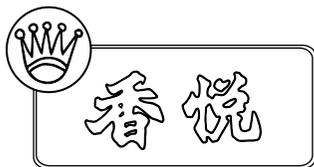


Figure 1a

Symbols and icons are often found at the upper right or left corners of banners, or in the middle.

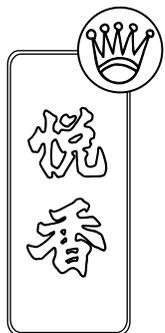


Figure 1b

Some symbols or icons are found prominently featured entirely inside sign frames.



Figure 1c

Irregular projecting banners may present icons or symbols in their entirety.



sign equals the shape of the image (*figure 1c*). There are other cases in which pictorial imagery is used (entirely or in part) as sign frames, usually either in the form of patterns of smaller icons or presenting larger symbols of which the shapes easily translate into sign frames, such as those of Roman columns (*figure 1d*). Finally, icons and symbols are also frequently applied in the backgrounds of neon signs (*figure 1e*). In those cases, they are used less straightforwardly as indicators of shops, venues, or products but mostly for decorative purposes.

In those signs where icons or symbols are featured prominently, lettering and pictorial imagery are similarly emphasized. The pictorial imagery either is positioned at the top of banners, takes up a prominent place inside sign frames, forms the outlines of irregular signs, or is otherwise used as sign frame. Lettering and pictorial imagery are balanced out between the actual icon and character sizes, their positioning in the signs, and their positioning in relation to each other. In those signs where icons are



Figure 1d

There are other cases in which pictorial imagery is used (entirely or in part) as sign frames.

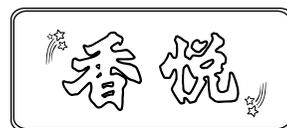


Figure 1e

Icons and symbols are also frequently used in the backgrounds of neon signs.

used predominantly as decoration, the lettering is more pronounced and icons are usually small in size, featuring in the background or as part of sign frames. In these instances, icons often feature in the form of patterns (e.g. wave shapes patterning the background or strips of mahjong tiles forming a sign's frame) or in combination with other icons (e.g. a visual whoosh of stars and strokes featuring beside emphasized lettering).

Prominently featured icons may be perceived more relevant when considering their meanings in relation to the shops, services, or products they indicate (i.e. they signify what is on offer and in so doing appeal to potential customers). Yet when understanding those icons that are used chiefly for decorative purposes in relation to the context of Hong Kong as a modern city, they are of equal importance no matter their minor position in the actual signs. Their featuring in the background helps to expand an understanding of the eclectic whole of pictorial imagery on Hong Kong neon signs. The smaller icons have therefore, without discrimination in priority, been taken up in our categorization. Icons and symbols are never only indicative or decorative, they serve both purposes, however to different degrees of emphasis. Ultimately, they are all intended to speak to a consuming public.

What we have omitted are "singulars": those icons or symbols that are entirely one of a kind. In other words, we have only considered icons or symbols of which there are three or more (i.e. if what an icon or symbol depicts matches that what two or more others depict: the same kind of object in visual form, in meaning, or both). Regardless, only a few odd ones have been eliminated in the process, as most occur plentifully in Hong Kong's neonscape and seem therefore to be following some kind of "illuminographic tradition".

Pictorial imagery on neon signs is used to visually communicate something about the businesses it represents: it advertises, emphasizes, decorates, and indicates. Or, as Venturi et.al. argue about neon signage in general, it is used "for commercial persuasion" (Venturi et.al., 1997, p. 9). In order to come to relevant categories of the imagery used on signs, we therefore first considered the kind of shops, services, and venues that display icons or symbols on their signs and came to three overarching business categories accordingly: commerce, food, and leisure. Three business types, however, did not fit any of these categories but feature, in light of our larger argument, some of the most relevant symbols. Let us elaborate. Neon signs (and neon signs with icons or symbols) belong to one of the following business types: bars, hotels, jewelers, karaoke bars, mahjong parlors, malls, massage salons, nightclubs, pawnshops, restaurants, saunas, shops, and snooker centers. Although this may suggest that most of them indicate businesses that offer leisure experiences, specifically at night, the actual neonscape is much more diverse. To better reflect this diversity, we expanded two of the business types – specifically "shops" and "restaurants" – by sub-categorizing

| Leisure | Food | Commerce |
|-----------------|---------------------|------------------------|
| Bars | Cha chaan tengs | Clothes shops |
| Hotels | Chinese restaurants | Electronic stores |
| Majong parlors | Hotpot restaurants | Malls |
| Massage salons | Noodle shops | |
| Nightclubs | Regional kitchens | Other |
| Saunas | Seafood restaurants | Chinese medicine shops |
| Snooker centers | | Pawn shops |
| | | Tea shops |

Figure 2

Categories of shops and services that feature icons or symbols on their neon signs.

them under “food” and “commerce” (figure 2). Under “food”, we find cha chaan tengs (Hong Kong-style cafés), Chinese restaurants, dessert shops, hotpot restaurants, noodle shops, regional kitchens, and seafood restaurants. Further, under “commerce”, we find clothes shops, electronics stores, the earlier mentioned jewelers, and malls in general. The three shop types that do not belong to any of the three larger categories, namely Chinese medicine shops, pawnshops, and tea shops, we have kept separate.

The individual symbols and icons that feature on the businesses of the above-mentioned categories either resemble what is on offer or connote an atmosphere or symbolize something other than the products and services on offer. Figure 3 presents the icons per business category either on the “resemblance” or “symbolism” side. Some icons and symbols, however, cannot be placed on either side as they both resemble the shop, product, or venue and symbolize something other than the product. For instance, both the rooster and the dragon under “leisure” directly reference the names of the respective businesses while an additional layer of symbolism ought to be taken into account when considering their meanings.⁶ In the table, we have presented the different icon and symbol types per business types under the business categories. While seafood restaurants feature crab, fish, shell, and shrimp icons, we have considered these “similar” icons and have chosen only one of those to represent the type in the table. Further, also the visual form and styles of icons of the same kind may differ. Whilst most icons display a similar level of detail, presenting outlines of an object or food item with minimal extra detail (see figures 4-7 in the appendix), some businesses have gone beyond such simplicity by dedicating more space on their signboards and allowing highly detailed pictorial imagery. Creating such complex imagery in neon signs also demands more skilled handwork in the production, which in turn means that a business has invested an extra sum

6. We will further elaborate on such symbolism below.

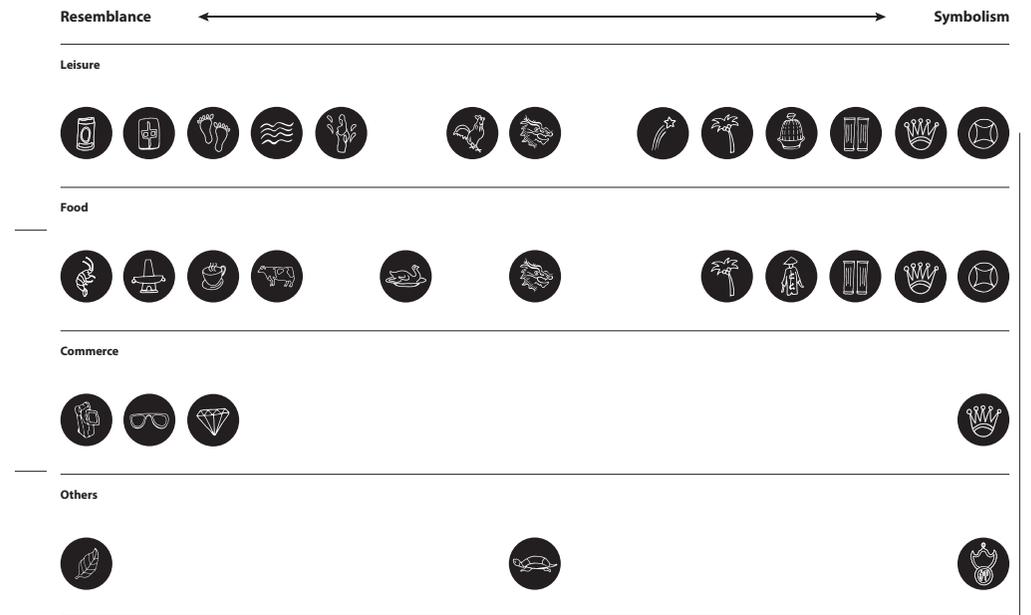


Figure 3

Icons and symbols per category, based on resemblance or symbolism.

in ordering such work. This extra investment involves an additional layer of communication as it seems to “persuade” the consuming public not merely with an icon but with a work of art that leaves an extra visual impression in support of brand awareness (see figures 8-9 in the appendix). In the table below, however, we have represented each icon type following its most common visual form, simply in outlines.

Leisure is not only the category that comprises the largest variety of icons and symbols, but also includes a significant range of pictorial images with diverse symbolic meanings. The businesses in this category sell experiences rather than products, which explains the use of symbols that signify certain spatial or location-based settings (roman columns, fountain, palm tree). For bars and clubs, the more universal (Western) choice for star symbols is equally explainable, in particular because such venues have historically had a large Western clientele. In the food category, approximately half of the pictorial imagery concerns icons that resemble the kinds of products on offer, specifically among the Chinese-style eateries such as seafood (shrimp, fish, crab), hotpot (an actual hotpot), and general Chinese restaurants (cooked chicken). In the commerce category (which is the smallest in terms of the quantity of signs in Hong Kong’s neonscape), most icons can be found on the resemblance side, since this category focuses primarily on the selling of commodities. Only one shop features a crown symbol on its façade; this shop not only sells clothes but also provides tailor services (to royal standard, as its symbol suggests). Finally, the uncategorizable business types and their icons and symbols involve significant examples of traditional Chinese symbolism and contribute to great effect to our argument about

how Hong Kong's neonscape tells stories not just about consumerism but about Hong Kong.

In the following two sections, we elaborate on specific types of icons and symbols as outlined in the table above. We do so from a socio-visual perspective, so as to not only take note of the graphic form of said imagery, but also to consider it in the context in which the symbols and icons came about: a moment of ever-growing consumerism that came to be adapted into an already existing local culture.

Resemblance in pictorial imagery

As has become apparent in the previous section, many neon signs present literal pictorial representations of what is offered by the respective shops, restaurants, or venues they illuminate. Yet regardless of their literal references, many of these icons also hold place-specific meaning. For example, the beer can icon that can be found on various nightclub signs indicates one type of alcoholic beverage served in nightclubs, yet it also references a significant local history (see figures 10-12). All nightclubs featuring beer cans feature the brand Blue Girl. Blue Girl is a German beer brand that was first introduced to the territory in the early 20th century, via Qingdao in Mainland China, after which it was acquired by the Jebson Group – a former shipping agency that was established in Hong Kong, in the late 19th century – which built up Blue Girl's position as 'leading premium beer brand' in Hong Kong (Blue Girl Beer, 2014). Regardless of its Western origin, it is precisely Hong Kong's history of trading that has adopted such a brand and made it its own.

The next icon in the leisure category is a mahjong tile as frequently displayed on signs of mahjong parlors – sometimes in abstracted tile shapes in red, green, and blue outlines alone (see figure 13) but usually with the inscriptions of the game's three dragon tiles (see figures 14-15). The dragon tiles are the game's higher scoring tiles, tiles that are most likely to contribute to a win. With the display of winning tiles, parlors not only indicate their venue, they emphasize a chance to win. Although icons usually portray inherent elements of universality and are not bound to a particular language (Horton, 2005, p. 158) and even though they resemble quite directly the objects they indicate (Peirce, 1991, p. 239), to truly comprehend what they resemble (and what they mean), shared experience is necessary, and this experience evolves at a level of socio-economic development (Sassoon and Gaur, 1997, p. 29).

The cooked chicken in the food category is an example that both directly represents the product on sale and signifies Chinese tradition, hence its position somewhere in the middle of the table. Myriad Chinese restaura-

rants have icons of cooked chickens heading their neon signs (see figures 16-18). These chickens are usually their signature dishes. To signal "royal" quality, the chicken icon in Figure 17 is even featured with a crown (interestingly, even though Chinese emperors wore crowns, the shape of this crown resembles its Western variant)⁷; in Figure 18, glow lines similarly suggest that the chicken shines like gold. Glow lines such as these are often-used graphic elements on neon signs, specifically with regard to jewelry items, indicating their sparkling qualities. Such lines are also easy to make with neon tubes and can subsequently be made to flash to increase the spectacle of illumination.

Although icons of cooked chickens on signs are not particularly Chinese, the way in which they are presented indicates more than just a dish. Indeed, where in the Western context "whole" chickens are cooked and served headless and icons usually present them as such (legs up), they need their heads following Chinese tradition. While there exist many diverse Chinese gastronomical cultures (Swanson, 1996, p. 33) and while Hong Kong's Chinese restaurants also often refer back to local cuisines of certain regions in China, chickens are usually cooked and served as a whole. In Chinese culture, following Confucian ideology, wholeness is an important concept: it is a "necessary condition for family happiness" (Zhao, 2006, p. 33). This idea has been transferred into kitchens. There is a Chinese saying "hou tau hou mei" (好頭好尾) which literally translates to "good head, good tail" and means precisely this: desired completeness. As a result, chicken icons on neon signs are featured in the same way. Indeed, the icon is not only supposed to indicate that the restaurant sells cooked chickens; it is to signify its symbolic meaning. What is more, as Neon Sign Master Lau (interview, 2015) mentioned, the way in which the chicken icon is designed is also of particular importance. Its leg should point slightly downward because then "it looks most tasty".

Another traditional product that can be found on neon signs in the form of icons is 'gwai ling gou' (龜苓膏): turtle jelly (see figures 19-21). It is a traditional Chinese medicine but is often served as dessert. Its turtle icon is therefore categorized not under "food" but under "others" and positioned, like the chicken icon, somewhere in the middle. The sign as a whole can be understood as a kind of rebus reading "gwai ling gou" from top to bottom: (1) turtle: 'gwai'; (2) 苓: 'ling' (which is a Chinese herb also used in the jelly), and (3) 'gou': the jelly itself. When zooming in at the turtle's shield, an interesting relation can be found between the neon outlines and the detailed drawing in the background. Turtles used in 'gwai ling gou' are of a particular kind: they are called 'cuora trifasciata', but they also go by the name "golden coin turtle". Their shields have a distinctive hexagonal pattern with brighter yellow or golden colors on the outer sides of the hexagons and darker shades towards the centers. These hexagons are seen to resemble old Chi-

7. Crowns are frequently used on neon signs to represent businesses' royal allure. We will return to this in the next section.

nese coins, hence the name of the turtle.

The neon sign's background painting presents a shield with precisely such a pattern painted in detail (see figure 21). Yet, its neon outlines only resemble one coin (see figures 19-20). Partly due to technical limitations of neon technology which do not allow too much detail, the turtle's shield in neon outlines has the form of just one coin with a square hole in the middle. Besides resembling the turtle as turtle, the neon outlines indicate the turtle's symbolic meaning through the coin shape: prosperity. Indeed, coins are elements that are frequently used in more traditional Chinese decorations, as well as they feature in Hong Kong's neon landscape. While their usage in charms, tassels, and other forms of decoration dates back to far before Hong Kong's turn to consumption and establishment, they are a unique example of an ancient Chinese symbol that has been smoothly integrated into the visibility of Hong Kong's modern urban and commercial life. The 'gwai ling gou' sign also shows that like many other signs (figures 25-27, 40, 58-59) it is not only its nightglow that is important. By day its painted background is – albeit different – equally significant. In some instances neon sign backgrounds even reveal additional information about the products they indicate.

Chinese tea is another traditional product that finds its icons represented in Hong Kong's neon landscape – either in the form of a tealeaf (indicating a tea shop) (figures 22-23) or in the form of a drink (figures 24-27). Where the tealeaf icon signifies a product with a history that can be traced back much further than the history of the modern city of Hong Kong, the latter icon indicates a kind of tea that is a product specific to the territory's colonial history. The neon sign in Figure 24 features – as understood in the Hong Kong context – an icon for milk tea and one for iced lemon tea. The former – milk tea (displayed in figures 26 and 27) – is inspired by the British tradition of drinking black tea with milk and is the most famous drink served in 'cha chaan tengs', Hong Kong-style cafés. The glass on the right, judging from the way the lemon is positioned and seeing the red-and-white striped straw in the background (see figure 25), is officially an icon of a glass of coke. Yet, in Hong Kong and specifically in combination with the icon on the left, it must be meant to resemble iced lemon tea, the second most famous drink served in cha chaan tengs.

Besides the above-mentioned icons with symbolic or context-specific subtexts which directly indicate the products they "advertise", another range of icons can be found in Hong Kong's neonscape that may be taken as fairly universal (yet not entirely context-less). Figures 28-30 present a few examples: jewelers are often indicated with a diamond icon (figure 28), electronics shops may be indicated with icons of cameras or computers (figures 29-30). We could continue this list, but in view of our argument that Hong Kong – an urban region that is largely influenced by flows of money, goods, and people (a space of and for consumption) – features icons as well as symbols that are manifestations of a particular socio-cultural location, we

continue our elaboration in the following section where we consider some of the most significant symbols of the city's neonscape.

Symbolism in pictorial imagery

Let us begin this section with the most apparent symbol on display in Hong Kong's streets, that of the pawnshop (figures 31-39). The pawnshop is one of the three uncategorizable business types; however, it is best taken as a category in itself because its neon signs are the most widely featured. In the modern world, the domains of consumption and credit are inextricably connected (McCants, 2007, p. 213). Pawnshops allow a form of reversed consumption (consumer goods are exchanged for credit), so it is not surprising that in a city such as Hong Kong they are plentiful. Pawnbroking was practiced before colonization, specifically in the old market town of Yuen Long. The pawnshop in Hong Kong continues to be a popular means to cash.⁸

Chun Yuen Pawnshop's⁹ wooden sign (figure 31) – which indicated the shop long before the arrival of neon sign technology to Hong Kong – is one of the oldest and still existing examples of an icon resembling a hanging bat holding a coin. The wooden sign has a golden frame and a red background with golden lettering presenting the company name inside the shape of the bat and the word 'ngat' (押) – pawn – inside the coin. Its neon counterparts (figures 32-39) have similar outlines, lettering, and background colors; however they are illuminated – depending on the shop owner's preference and on which neon sign factory manufactured it – with green, yellow, or white frames and with white or red lettering. One pawnshop group always features the double character 'hei' (囍) in its signs (figure 32), which means double happiness (Williams, 2006, p. 265).¹⁰ It is formally agreed that no other pawnshop ever incorporates this character (information acquired in an interview with Neon Sign Master Lau, 2016). The hanging bat (蝠, 'fuk', in Chinese) signifies good fortune due to its homophonous resemblance with the word '福' (also 'fuk' in Cantonese), which translates to "good fortune" (Williams, 1977: 35). The coin, as described before, signifies prosperity (Williams, 2006, p. 94). Indeed, bats as well as coins are conventionally used in Chinese

8. Specifically in the 1950s, Hong Kong saw many immigrants arriving from Communist China and although the manufacturing industry was on the rise and jobs were increasingly available, people struggled to get by. Pawning belongings was an easy way to make ends meet. Yet, even today, pawning goods is still a preferred practice. Different from getting loans from banks, at the pawnshop small amounts of credit can be acquired in a matter of minutes. Indeed, in Hong Kong, the pawnshop survived. What is more, Oi Wah Pawnshop has recently entered the Hong Kong stock market, having started to give out mortgage loans (SCMP Editorial, 2013).

9. Chun Yuen Pawnshop was in business for an equal amount of years until right after WWII (Hong Kong Memory, 2012).

10. The character is an ideogram – a ligature of 喜 ('hei') – which translates to 'joy' and is a commonly used ornamental design element, often at weddings however it also generally indicates 'good fortune'.

decorations and motifs, and they frequently appear together in charms or tassels.

Although some pawnshop signs feature single lines in their frames (figure 33) and show in that respect closer resemblance with the old wooden signs, they usually feature traditional geometric frames (figures 34-36). Further, most pawnshop signs display a yellow ring at the top when lit (figures 37-38). In the pre-neon past, the signs were mounted with a metal ring to a bar that was, in turn, attached to the façades of buildings (figure 39). This way of mounting the sign simulates more directly the way in which bats hang. With the arrival of neon sign technology, however, the signs demanded sturdier mounting from the side but in their designs, the rings at the top remained.

Another signboard of significance in Hong Kong's neon landscape is that Kai Kee (雞記) Mahjong Parlor (a company founded in 1933). Kai means rooster; the Parlor chain has featured iconic roosters on its neon signs for decades (figures 40-42). 'Kai' (雞) is also the nickname of the Parlor's old boss, "Uncle Kai" (Neonsigns.hk, 2014). The story goes that the night before he bought a winning lottery ticket, he dreamt about the bird, which made him decide on the name of his parlor (Ibid). Kai Kee's rooster has through the years gained fame. Upon the closing down of its Kwun Tong location due to urban redevelopment, Hong Kong's new museum for visual culture, M+, acquired it for its preservation.

Besides the direct resemblance of the Parlor's name in the figure of the rooster, the animal plays a symbolic role in Chinese culture. In Mandarin, it has a homophonous resemblance to the word "favorable" while it is also one of the Chinese zodiac signs implying honesty and moral fortitude and signifying "fortune, luck, fidelity, protection as well as bossiness" (Sharp, 2000, p. 138-40). More importantly, the rooster's form and behavior symbolize the five Confucian virtues: benevolence, justice, propriety, wisdom, and fidelity (Yao, 2000, p. 34). Its comb resembles the cap of the bureaucrat of the former imperial Chinese government (meaning civil culture or wisdom); its legs have spurs indicating the martial qualities (courage). Further, roosters (as well as chickens and pheasants) have the good habit of calling out to others when stumbling upon food (benevolence), and finally, the rooster is a "night-watcher" and does not lose track of time (fidelity) (Zhang, 2005, p. 613). In ancient China, people came to cultivate and monitor themselves by these virtues. In Confucianism, morality is based on family relationships, which feed through to the society as a whole (Yao, 2000, p. 33). Although Confucianism initially struggled with modernization and was set back by China's opening up to the world after the 19th-century Opium Wars, the ideology and its virtues have been carried through to modern life (Ibid, p. 245-49) and are continuously reproduced in social life. The illuminated roosters on Kai Kee's neon signs are mere examples of its graphic adaptation in commercial settings.

Western symbolism is also widely present in Hong Kong's neon landscape. The following symbols are largely informed by a Western tradition in which Classic and grandeur atmospheres of the Romans and the Greeks were celebrated. Roman columns on sauna signs are used when the business intends to make a reference of luxury. They do not necessarily – as may be presumed – resemble Roman bathhouses. Saunas in Hong Kong came to be indicated with outlines of columns, fountains, or larger ancient structures¹¹ (figures 43-48), for they expound luxury such as that of an emperor. The sign of a snooker hall in Tuen Mun, one of Hong Kong's new towns, also features Roman columns (figure 49). Snooker halls are perhaps not like hotels or saunas places expected to be luxurious. Yet, they are still venues that "sell" certain experiences. Even Tsui Wah teahouse, which is in essence a cha chaan teng like any other, presents Roman columns on one of its neon signs (figure 50). Rather, we should express that "especially" Tsui Wah presents Roman columns on one of its neon signs as it has historically been forward thinking in the development of its brand identity (Tsui Wah, 2015).¹²

Similar to the references of luxury through ancient structures, crown symbols are used to indicate mainly business types in the leisure category (figures 51-53). However, we have also come across two restaurants that featured them, one of which we addressed before (figure 17) and the other displays a crown symbol in reference to its name, "Prince" (figure 54). What is "consumed" in most of those venues indicated with crowns, columns, or fountains, is not just a good night's sleep, a game of mahjong, or a relaxing bath. A certain experience is bought into: an experience that relates not only to the product or service itself but also to what the sign signifies (Mathews, 2001, p. 288-89). This is what Gordon Matthews has labeled the "the cultural supermarket", where ideas and information "by which we live" (Ibid, p. 289) are consumed.

Finally, Hong Kong's neon landscape also beholds a range of symbols that indicates "foreign" places with a flair of exoticization – specifically symbols of restaurants offering Southeast Asian cuisine. A part of Southeast Asian restaurants tends to feature icons with human figures wearing "traditional" hats (figures 55-57): a Vietnamese restaurant has a symbol of a man

.....
11. These often also relate to the names of saunas (e.g. Noble Sauna, Empire Sauna, Venice Sauna).
.....

12. Tsui Wah started as a modest 'ice café' in the 1960s. An 'ice café' is a small family business – a cha chaan teng – that was able to serve cooled drinks as they had invested in a fridge, which was in those days not yet common for such local teahouses. Different from other cha chaan tengs, the teahouse evolved into an enterprise that is, since 2012, even listed on the Hong Kong Stock Exchange (Tsui Wah, 2015). Indeed, Tsui Wah claims to have lifted itself and the quality and identity of its cha chaan teng food and eating experience beyond that of an average Hong Kong teahouse. With now 20 outlets, the restaurant chain has, as per their website, purposefully invested in its interior design, differentiating itself further from other cha chaan tengs (Ibid). This approach, of course, matches the intended atmosphere of luxury that also the Roman columns on its neon sign expound.

figure wearing a Vietnamese hat (*figure 55*); a Cambodian restaurant presents a similar human figure wearing a similar triangular hat (*figure 56*); a Thai restaurant features a Thai farmer figure, also with hat (*figure 57*). Another part of Hong Kong's Southeast Asian restaurants is indicated (or decorated) with symbols as random as palm trees (*figures 58-60*). Like those sauna signs that try to buy into the idea of tropical beachy places (*figures 61-62*), such restaurant signs indicate a similar image but their display of palm trees over ancient columns really might also be understood in a more critical account of the experience of colonization and related hierarchizing of cultures.

In comparison to the neon signs of many Chinese restaurants that usually present signature dishes or significant ingredients, those restaurants serving foreign cuisines seem to merely display clichés. Between "emblematic" symbols of luxury and clichéd indicators of foreign places and foods, these examples again suggest that icons and symbols are never entirely one or the other. More generally, when understanding them in the context of Hong Kong as a modern city with a particular colonial history, these icons and symbols even have certain political implications as they add grandeur when referencing Western traditions (signifying columns that were once part of impressive structures of an even more impressive empire) while Southeast Asian references are merely made through palm trees or triangular hats. This relates to an issue much debated in Postcolonial Studies (e.g. Bhabha, 1994; Said, 1978), an issue of hierarchy and generalization from the dominant perspective of the West onto the East.

Conclusion

In conclusion, we focused on what kind of icons and symbols can be found in Hong Kong's neon landscape, how they are presented, and what they can tell about Hong Kong's unique location as a territory that is both a symbol of prosperity and consumerism and a city of very particular eclecticism. We considered the pictorial language of neon signs visually and semiotically – as illuminated markers of a discourse in place – and found in the pot pourri of symbols and icons as illuminated in Hong Kong's urban landscape – a story not just about consumption but about Hong Kong's diverse circumstance. We also confirmed that each icon or symbol is not simply one or the other but exists somewhere on a spectrum, between resemblance and symbolism. Those shops, products, restaurants, and venues that connect to longer Chinese traditions are often indicated with traditional symbols, symbols that are not originally consumerist but have been adapted into the context of consumerism. Those restaurants and shops that may have their own (modern) histories but are not particularly significant in terms of Chinese traditions are indicated with – to a greater or lesser extent – "universal" icons (e.g. seafood icons, diamond icons) or "universal" symbols (e.g. palm

tree symbols, the Eiffel Tower symbol). Finally, those experiences that are foreign (saunas, snooker halls) and the kind of places that are expected to sell certain experiences (hotels, nightclubs) are indicated mainly with Western symbols of grandeur (e.g. columns and crowns).

The blend of icons and symbols on neon signs may at first glance appear disorderly diverse in its imagery: a spectacle of images representing a modern city that is in itself a symbol of consumerism and global trade. A closer look has helped to understand that the blend of signs is in fact highly context-specific, displaying different layers of resemblance (in some instances negotiated between neon outlines and their background images) and meaning (such as the chicken, turtle, or milk tea icons). The pictorial language of Hong Kong neon signs tells a story about Hong Kong as a place of eclectic coherence in apparent disorder. The images as presented on neon signs do not only indicate products and services; they indicate ideas, concepts, and information. They (and specifically their meanings) are items on display in Gordon Matthew's "cultural supermarket"; and even though they appear from a distance to be globally relevant, their correlation presents a story about Hong Kong.

Acknowledgements

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Figure 4: Icon seafood restaurant



Figure 5: Icon seafood restaurant



Figure 6: Icon seafood restaurant



Figure 7: Icon seafood restaurant



Figure 8: Icon seafood restaurant, more detail



Figure 9: Icon seafood restaurant, more detail



Figure 10: Blue Girl beer can icon on nightclub sign



Figure 11: Blue Girl beer can icon on nightclub sign



Figure 12: Blue Girl beer can icon on nightclub sign



Figure 13: Mahjong tiles on mahjong parlor sign



Figure 14: Mahjong tiles on mahjong parlor sign



Figure 15: Mahjong tiles on mahjong parlor sign



Figure 16: Chicken icon on Chinese restaurant sign



Figure 17: Chicken icon on Chinese restaurant sign, with crown

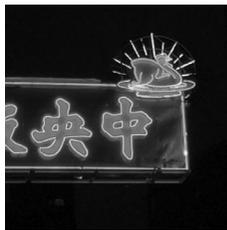


Figure 18: Chicken icon on Chinese restaurant sign, with glow



Figure 19: Turtle jelly sign



Figure 20: Turtle jelly sign at night



Figure 21: Turtle jelly sign, close up



Figure 22: Chinese tea shop sign



Figure 23: Chinese tea shop sign



Figure 24: Hot and cold drink icons on cha chaan teng sign



Figure 25: Cold drink icons on cha chaan teng sign



Figure 26: Milk tea icon on cha chaan teng sign



Figure 27: Milk tea icon on cha chaan teng sign



Figure 28: Diamond icon on jewelry shop



Figure 29: Electronics icons above entrance electronics mall



Figure 30: Electronics icons above entrance electronics store



Figure 31: Old sign Chun Yuen Pawnshop, Photo credit: Chong Fat



Figure 32: Pawnshop sign with the character 押



Figure 33: Pawnshop sign with simple outline



Figure 34: Pawnshop sign, geometric frame



Figure 35: Small pawnshop sign, geometric frame



Figure 36: Pawnshop sign, geometric frame

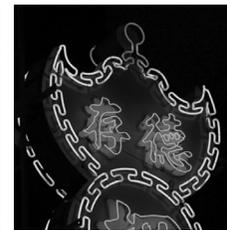


Figure 37: Yellow ring on pawnshop sign



Figure 38: Yellow ring on pawnshop sign



Figure 39: Pawnshop sign in Sheung Wan, 1910s, Source: Mr. Ko Tim-keung and Hong Kong Historical Postcards, Hong Kong Memory



Figure 40: Rooster on Kai Kee Mahjong Parlor sign



Figure 41: Rooster on Kai Kee Mahjong Parlor sign



Figure 42: Rooster on Kai Kee Mahjong Parlor sign

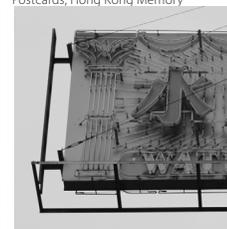


Figure 43: Column symbol on sauna sign

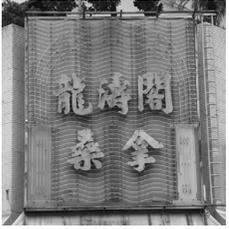


Figure 44: Column symbol on sauna sign



Figure 45: Column symbol on Yuppie Sauna sign



Figure 46: Roman column symbols on Venice Sauna sign

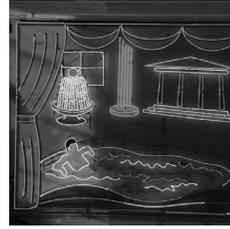


Figure 47: Various symbols on Noble Sauna sign



Figure 48: Fountain on Yuppie Sauna sign



Figure 49: Columns on chaan teng sign



Figure 50: Columns on chaan teng sign



Figure 51: Crown symbol on Club King sign



Figure 52: Crown symbol on nightclub sign



Figure 53: Crown symbol on Noble Sauna sign



Figure 54: Crown symbol on Prince Restaurant sign



Figure 55: Vietnamese figure on restaurant sign



Figure 56: Cambodian figure on restaurant sign



Figure 57: Thai farmer figure on restaurant sign



Figure 58: Palm tree on Southeast Asian restaurant sign



Figure 59: Palm tree on Indonesian restaurant sign



Figure 60: Palm tree on Thai restaurant sign

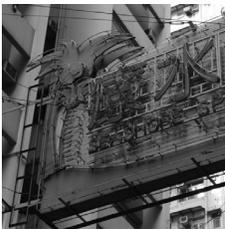


Figure 61: Palm tree on sauna sign



Figure 62: Palm tree on sauna sign

References

Barthes, Roland. "Semiology and the Urban." In *The City and the Sign: an Introduction to Urban Semiotics*, edited by Mark Gottdiener and Alexandros Ph. Lagopoulos, 96-105. New York: Columbia University Press, 1986.

Bhabha, Homi K. *The Location of Culture*. New York: Routledge, 1994.

Blue Girl Beer. "History." Bluegirlbeer.com. Last modified 2014. <http://www.bluegirlbeer.com/history>

Building Department. "APP-155: Validation Scheme for Unauthorised Signboards." Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers. Last modified 2013. <http://www.bd.gov.hk/english/documents/pnap/signed/APP155se.pdf>

Building Department. "APP-126: Erection of Signboards." Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers. Last modified 2013. <http://www.bd.gov.hk/english/documents/pnap/signed/APP126se.pdf>

Crow, David. *Visible Signs: an Introduction to Semiotics*. Lausanne: AVA Publishing, 2003.

The Hong Kong Tourism Board. "Our Brand." About Hong Kong Tourism Board. Last Modified in 2016. <http://www.discoverhongkong.com/eng/about-hktb/our-brand.jsp>

Horton, William. "Graphics: The Not Quite Universal Language." In *Usability and Internationalization of Information Technology*, edited by Nuray Aykin, 157-88. Boca Raton: Taylor & Francis, 2005.

Kenner, T. A. *Symbols and Their Hidden Meanings*. London: Carlton Books, 2010.

Matthews, Gordon and Tai-lok Lui, eds. *Consuming Hong Kong*. Hong Kong: Hong Kong University Press, 2002.

McCants, Anne E. C. "Goods at Pawn: The Overlapping Worlds of Material Possession and Family Finance in Early Modern Amsterdam," *Social Science History* 31, no. 2 (2007): 213-38.

Neonsigns.hk. "Neon Animals." New Post. Last modified April 25, 2014. <http://www.neonsigns.hk/new-posts/neon-animals/?lang=en>

Noble, Ian and Russell Bestley. *Visual Research: an Introduction to Research Methods in Graphic Design*. London: Bloomsbury, 2016.

Nöth, Winfried. *Handbook of Semiotics*. Bloomington: Indiana University Press, 1995.

Papen, Uta. "Signs in Cities: the Discursive Production and Commodification of Urban Spaces." *Sociolinguistic Studies* 9, no. 1 (2015): 1-26.

Peirce, Charles S. *Peirce on Signs: Writings on Semiotic*. Edited by James Hoopes. Chapel Hill: The University of North Carolina Press, 1991.

Peirce, Charles S. *Collected Papers of Charles Sanders Peirce*. Edited by Charles Hartshorne, Paul Weiss, and Arthur W. Burks. Cambridge: Belknap, 1931-1966.

Ribbat, Christoph. *Flickering Light: A History of Neon*. London: Reaktion Books, 2013.

Said, Edward. *Orientalism*. New York: Pantheon, 1978.

Sassoon, Rosemary and Albertine Gaur. *Signs, Symbols and Icons: Pre-history to the Computer Age*. Exeter: Intellect Books, 1997.

Sharp, Damian. *Simple Chinese Astrology*. Berkeley: Conari Press, 2000.

Swanson, Lauren A. "1.19850+ Billion Mouths to Feed: Food Linguistics and Cross-Cultural, Cross-"National" Food Consumption Habits in China." *British Food Journal* 98, no. 6 (1996): 33-44.

Tam, Keith. "The Architecture of Communication: the Visual Language of Hong Kong's Neon Signs." Neonsigns.hk. Last modified 2014. <http://www.neonsigns.hk/neon-in-visual-culture/the-architecture-of-communication/?lang=en>

Tang, Birde. "Neon Fades Out." Neonsigns.hk. Last modified 2014. <http://www.neonsigns.hk/neon-in-visual-culture/neon-fades-out/?lang=en>

Tsui Wah. "Milestones." Tsuiwah.com. Last modified 2015. <http://www.tsuiwah.com/about-tsui-wah/milestone/>

Venturi, Robert, Denise Scott Brown, and Steven Izenour. *Learning From Las Vegas, Revised Edition: the Forgotten Symbolism of Architectural Form*. Cambridge: MIT Press, 1977.

Warnke, Ingo H. "Making Place through Urban Epigraphy – Berlin Prenzlauer Berg and the Grammar of Linguistic Landscapes," *Zeitschrift für Diskursforschung* 2 (2013): 159–183.

Williams, Charles Alfred Speed. *Chinese Symbolism and Art Motifs: A Comprehensive Handbook on Symbolism in Chinese Art Through the Ages*. North Clarendon: Tuttle Publishing, 2006.

Williams, Charles Alfred Speed. *Outlines of Chinese Symbolism and Art Motives: An Alphabetical Compendium of Antique Legends and Beliefs, as Reflected in the Manners and Customs of the Chinese*. New York: Dover Publications, 1977.

Yao, Xinzhong. *An Introduction to Confucianism*. Cambridge: Cambridge University Press, 2000.

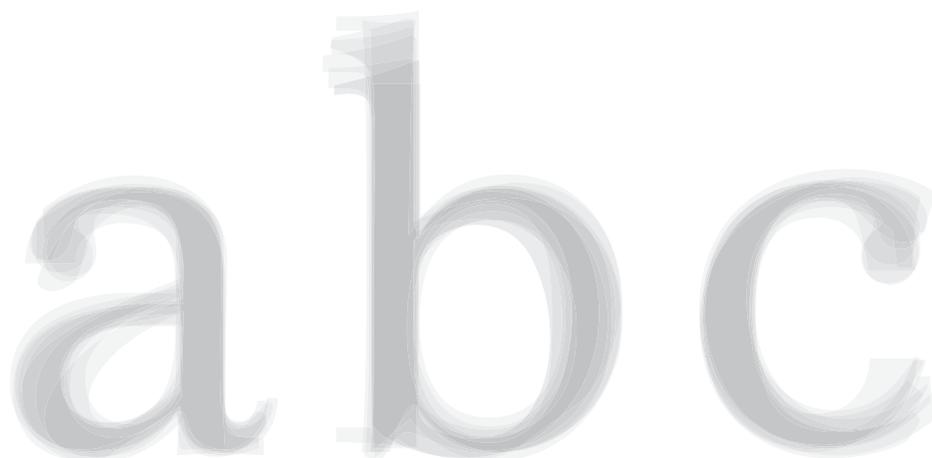
Zhang, Hongxing. "Re-Reading Inscriptions in Chinese Scroll Painting: The Eleventh to the Fourteenth Centuries," *Art History* 28, no. 5 (2005): 606-25.

Zhao, Tingyang. "Rethinking Empire from a Chinese Concept 'All-under-Heaven' (Tian-xia, 天下)," *Social Identities* 12, no. 1 (2006): 29-41.

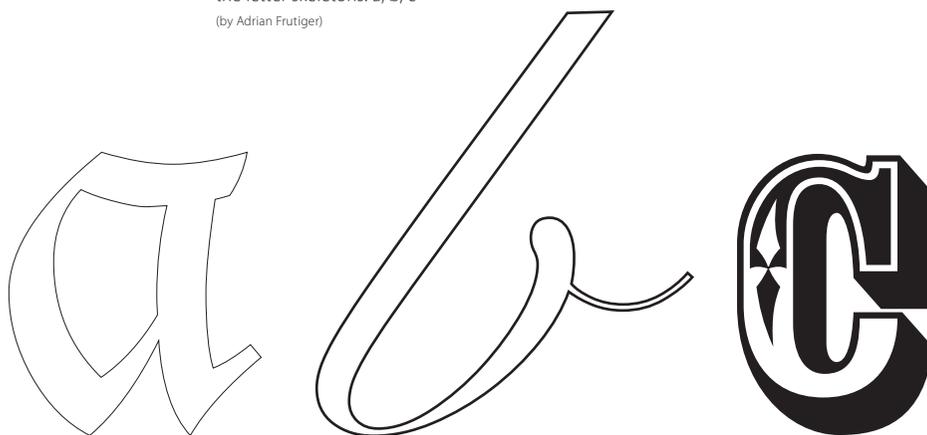
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the letter skeletons: a, b, c
(by Adrian Frutiger)



embellished display
letterforms that depart from
the letter skeletons: a, b, c

Legibility Implications of Embellished Display Typefaces

Sofie Beier

Katrine Sand

Randi Starrfelt

By subjecting participants to brief exposure of single letters in the peripheral visual field, we investigated 1) hemispheric differences in reading of embellished display typefaces, and 2) the legibility difference between different kinds of embellished display typefaces. The test typefaces are designed for the purpose of controlling for the variables of swashes, stroke contrast and drop shadow.

The results show that all fonts are processed more accurately in the right visual field (corresponding to initial processing in the left hemisphere), and this is mainly evident when exposure is very brief (Experiment 1). This is contrary to the expectation that embellished typefaces should have an advantage when presented to the right hemisphere /left hemifield. There was also a clear difference in overall performance between the different embellished typeface styles, suggesting that legibility is more affected by swashed features than by a reversed letter stroke, or by a drop shadow.

When choosing between different styles of embellished display typefaces, it is therefore recommended to choose typefaces where the letter skeleton is not too complicated to decode.

Keywords

legibility
readability
type design
fonts
perception
typeface style

Introduction

Designers will often choose embellished display typefaces for advertisement and for the design of corporate identities. This in contrast to typefaces selected for body text where the style most often is less notable. In this paper, we define an embellished display typeface as one which has additional graphics added to the basic letterform skeleton, as measured by perimetric complexity. An unadorned typeface is one adhering closely to the basic letterform skeleton without adding such embellishments. In spite of the legibility levels varying highly between the embellished display typefaces and the more unadorned body text typefaces, literature of psychophysics and typeface legibility rarely makes this distinction (Tracy 1986). The aim of the majority of legibility studies have been to identify the most legible typeface by comparing several different typefaces (see Dobres et al 2016; Bessemans 2016 for recent examples), or to identify the letter features that results in optimal identification (see Larsen & Carson 2016; Beier & Dyson 2014; Beier & Larson 2010 for recent examples:). Yet none of the studies have focused on the difference between typefaces for display and typefaces for body text, and none of the studies have focused on the legibility matters that specifically relate to display typefaces.

Embellished typefaces are more difficult to visually process than unadorned styles: Pellli and colleagues (2006) have found that the extended number of features in complex typefaces results in a 'bottleneck' in visual perception. This is additionally confirmed in a multidisciplinary collaboration between typographers and cognitive neuroscientists, who explored the discrimination processing of a number of different typeface styles using Electroencephalography (EEG) technology, and found that the brain works harder when exposed to the embellished typefaces *Lucida Blackletter* and *Edwardian Script*, compared to the unadorned typefaces *Arial* and *Times New Roman* (Thiessen et al. 2015). Bernard and Chung (2013) further found that – up to a certain value – the more complex the typeface the more difficult it is to identify a target letter within a letter string.

We are, however, yet to understand how the different features of embellished typefaces influences legibility.

The present paper presents experimental investigations on 1) whether it is possible to isolate specific character features that affect processing in the two hemifields / hemispheres differently, and 2) on the legibility implications that can follow with embellished typefaces.

Our understanding of the term 'legibility' follows the description of typographer writer Walter Tracy, who stated that: "...legibility is the term to use when discussing the clarity of single characters (Tracy, 1986, p.31)."

Brain mechanisms in perception of unadorned and embellished typefaces

There is evidence that somewhat different brain processes may be involved in reading of unadorned typeface styles than in reading embellished, more complex, display typefaces, such that unadorned typefaces would mainly draw on left hemisphere processing and some embellished typefaces would need additional processing in the right hemisphere (Wagner & Harris 1994; Bryden & Allard 1976).

It is well-documented that reading is predominantly subserved by the left hemisphere (e.g., Dehaene & Cohen, 2011), which is also the case in the reading of Urdu, Hebrew and Arabic that traditionally are read from right to left (Adamson & Hellige 2006; Eviatar & Ibrahim 2004). Visual areas in the right hemisphere, however, also contribute, and have been suggested to be particularly involved in processing of typefaces (Barton et al., 2010; Susilo et al., 2015).

Because visual areas in the left cerebral hemisphere receives the primary input from the right visual field, and the right hemisphere visual areas receives the primary input from the left visual field, this can be investigated in divided visual field paradigms. Bryden and Allard (1976) used such a paradigm to investigate how the two hemispheres of the brain contribute to the identification of different typographical material in a short exposure experiments (Figure 1), and found that, in general, letters were more accurately identified when presented to the left hemisphere (the right visual field), and that this was most evident in the more unadorned type styles tested. Interestingly, when some of the embellished typeface styles like *Palace Script* and *Profile* were presented, recognition was superior for letters presented to the right hemisphere (left visual field). The researchers suggested that in cases where the typeface requires considerable processing, the right hemisphere serves to isolate the relevant features in the letter shapes and at the same time, disregard the irrelevant ones. The results have later been supported by Wagner and Harris (1994) who applied a similar study design and also found a right hemisphere advantage for complex typefaces styles (figure 2). Testing the typeface *Helvetica* and two handwritten script styles, Hellige and Adamson (2007) found a general left hemisphere advantage in all styles, yet the left hemisphere advantage was significantly smaller with the handwritten script styles than with *Helvetica*. This division of labour between the two cerebral hemispheres is further demonstrated in studies of brain-injured patients (Barton et al., 2010). For instance, Barton and colleagues (2010) have found, that while patients with damage to posterior areas in the left hemisphere have deficits in reading letters and words, they may be unimpaired in categorizing samples of handwriting and different

Figure 1

The typefaces tested by Bryden & Allard (1976). The two typefaces marked by a star, both demonstrated right hemisphere advantage.

A B C D E F G H I J K
Gill Extra Bold

a b c d e f g h i j k
American Uncial

A B C D E F G H I J K★
Palace Script

A B C D E F G H I J K L M N
Countdown

A B C D E F G H I J
Kalligraphia

A B C D E F G H I
Old English

A B C D E F G H I J K
Flash

A B C D E F G H I J K★
Profil

A B C D E F G H I
Gold Rush

A B C D E F G H I J K
Times Bold Italic

typefaces. Patients with damage to posterior areas in the right hemisphere show the opposite pattern, they are impaired in sorting typefaces and handwriting, but have no problems reading words (Hills et al., 2015; Susilo et al., 2015).

To detect the characteristics that causes a right hemisphere advantage, Bryden and Allard had participants rate the 10 typefaces on the dimensions of 'familiar/unfamiliar', 'high/low internal confusability', and 'script like/print like' features. In addition, the researchers looked into typeface difficulty, by measuring the mean time from presentation to articulation of the letter name.

They demonstrated a correlation between the right/left hemisphere advantage determined in the short exposure experiment, and all of the dimensions except for 'familiar/unfamiliar'. In other words, the typefaces that were judged to be most script like, with high internal letter confusability, and most difficult to read, were also the typefaces that showed a right

Figure 2

Wagner and Harris (1994) tested 8 different typeface styles, and found the typefaces Murray Hill and Shotgun to demonstrated a right hemisphere advantage.

A B C D E F G H I J K★
Murray Hill

A B C D E F G H I J K L★
Shotgun

hemisphere advantage in the short exposure study.

However, a number of the typefaces received high ratings in several of the rated dimensions. As an example, the typefaces Palace Script and Old English were both rated as having high internal letter confusability and as being script like, while it was only Palace Script that showed significant right hemisphere advantage. It is therefore difficult to say whether it was the script style or the internal letter confusability that caused right hemisphere advantage.

By identifying the specific features within a given typeface design that causes a right hemisphere advantage, and by identifying the internal legibility relation between these typefaces, this investigation aims at a better understanding of how the brain processes different styles of typefaces.

Experimental investigation

A visual examination of the four typefaces known to result in right hemisphere advantage, demonstrates two major trends. One is related to the swash style and the uncommon skeletons of the typefaces Palace Script and Murray Hill, and the other is related to the excessive details and heavy weights of the otherwise relative common skeleton of the typefaces Profil and Shot Gun (figures 1 and 2). In this study we will investigate the effect of swash style and the effect of excessive added details. In addition to this, we study the effect of unfamiliar letter strokes. We have worked with two separate hypotheses: The first is related to hemisphere processing. We expect that the more complex and the more illegible typefaces will be better processed in the left visual field (right hemisphere). The second hypothesis is related to legibility, understood as the clarity of the single letter. As complex typefaces are more difficult to visually process than unadorned typefaces (Thiessen et al. 2015; Pelli et al 2006), and as embellished typefaces often have complex letter features, the embellished typefaces are expected to be less legible than the unadorned typeface. The focus is on whether the effect of swash style, the effect of excessive added details, or the effect of unfamiliar letter strokes, will influence legibility the most.

The two hypotheses are investigated through a method of short

exposure in the parafoveal field of vision. By exposing participants to the stimuli in left and right parafoveal fields, the study can both provide data on the left/right hemisphere processing, and shed light on more classic legibility related matters. Through a series of investigations carried out in the 1970s, Keith Rayner and colleagues have demonstrated that readers make great use of the parafoveal vision in reading (see Rayner & Pollatsek 1989 for an overview). They found that the easier it is to identify the letters in right parafoveal vision, the easier it is to locate where on the line of text, the eye should fixate next, which results in a more effortless reading experience. Following this, letters that demonstrate high legibility in parafoveal vision will result in better clarity, and hence less troubled reading. Based on these findings, the present study investigates legibility in parafoveal vision at 4.5 degrees.

Test typefaces

Most comparative studies of unadorned and embellished typefaces (Bryden & Allard 1976; Wagner & Harris 1994; Thiessen et al. 2015) include typefaces that vary on many dimensions. As an example, Palace Script and Old English are different in weight, letter slant, stroke contrast, letter skeleton, and in vertical and horizontal proportions. It is therefore difficult to identify which features of Palace Script that caused a right hemisphere advantage in the Bryden and Allard study. The test typefaces of the present study are designed for this experiment. By so doing, it is possible to control the variables that make two random typefaces different from each other. By ensuring that only one visual feature is altered at a time, it is possible to identify the one typeface-feature that causes a given difference in performance.

The test typefaces of the present study are divided into three categories of complexity (figure 3).

Figure 3 Designed for the experiments and with an outset in the Master typeface (NeutralTestRegular), the four expressive typefaces are designed to isolate specific features for investigation.



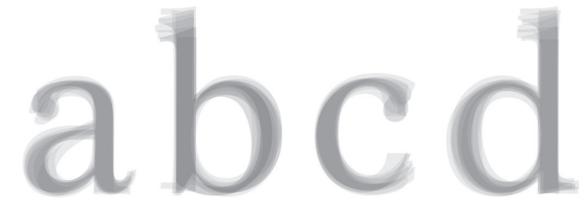
Level 1. An unadorned typeface

Master Typeface.

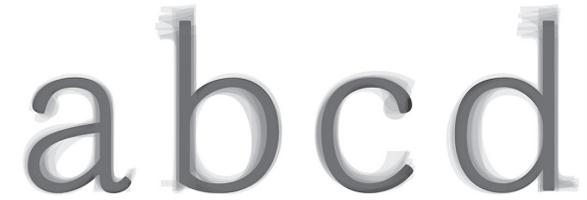
The typeface NeutralTestRegular (from here on identified as the Master) is developed for experimental investigations by Beier (Beier 2013) (Figure 4. second row). It is based on type designer Adrian Frutiger's idea of the letter matrix (1998; 2008) (Figure 4. top row). Frutiger argued that all readers have a letter matrix in their mind, and that this matrix is based on all the different representation of the letters that the reader has encountered during reading. Following this, Frutiger theorized that the optimal letter skeleton constitutes a neutral letter shape, and that this can be found in the surface area where the characters of the most popular common typefaces overlap. Each letter of the Master is designed based on the darkest overlapping areas of the most common typefaces superimposed. The resulting 'neutral letter shapes' hence follows the requirements for an unadorned typeface.

Figure 4

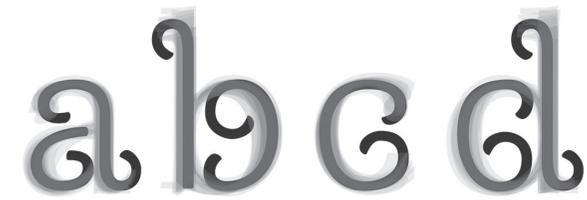
As suggested by type designer Adrian Frutiger (1998; 2008), the typefaces Garamond, Baskerville, Bodoni, Excelsior, Times, Palatino, Optima, and Helvetica, are superimposed (top row). The dark part where most letters overlap shows the basic letter skeleton.



The letter matrix by Adrian Frutiger



The typeface NeutralTestRegular superimposed on the letter matrix



The typeface NeutralTest Swash superimposed on the letter matrix



The typeface NeutralTest Contrast superimposed on the letter matrix

Level 2. Reversed Swash and Contrast typeface

NeutralTest Swash.

The only difference between the Master typeface and the Swash typeface is the added swashes to the letter skeleton, all other parameters such as stroke thickness, contrast, and letter proportions, remain identical between the two (Figure 4. third row). This is done to isolate the swash effect from the uncommon letter skeletons identified in the typefaces Palace Script and Murray Hill. The swashes do, however, dissolve the basic letter skeleton of the Master typeface.

NeutralTest Contrast.

The only difference between the Contrast style and the Master typeface is the unfamiliar added weight to the horizontal strokes, also called reversed stroke contrast. The tradition of Latin typefaces is that the vertical strokes are heavier than the horizontal strokes. The feature consequently also adds more weight to the letter (Figure 4. fourth row).

It is expected that the Swash and the Contrast typefaces are less legible than the Master typeface.

Level 3. Drop Shadow

NeutralTest SwashShadow and NeutralTest ContrastShadow.

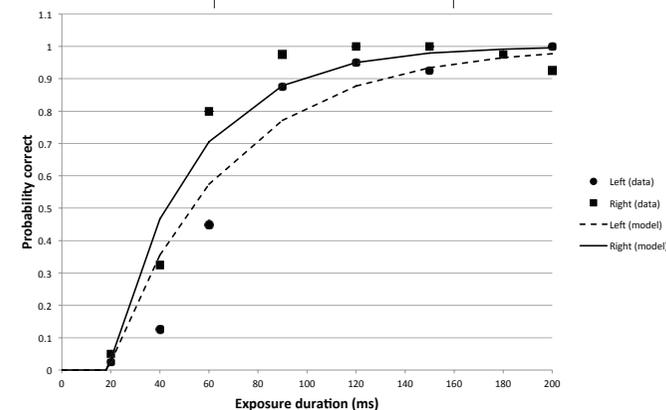
The drop shadow of this category adds excessive details to the letter. It is expected that these typefaces, are less legible, and demonstrate greater right hemisphere activity than the typefaces of level 1 and 2.

Experimental paradigm and data analysis

We tested the two hypotheses using a psychophysical paradigm, a single item report task, analysed within the framework of Bundesen's (1990) Theory of Visual Attention (TVA). Based on TVA, methods for investigating visual attention, as well as visual perceptual processes have been developed, enabling us to quantify aspects of perception like visual processing speed and the threshold for perception for different stimuli. Single item experiments within this framework use unspeeded, accuracy-based tasks, which are unconfounded by motor components. This means that response times are not measured. Rather, the exposure time of the stimulus is varied, and the increase in accuracy with increased exposure duration is measured. The method has previously been used to investigate visual perception of letters, numbers, and words both in normal (e.g. Starrfelt et al. 2013) and brain injured subjects, and also in studies comparing processing of such stimuli in the right and left visual fields (Sand, Habekost, Petersen, & Starrfelt, in press).

Figure 5

Performance for left and right visual fields of the Master typeface for a representative subject in experiment 2. The curve shows the probability of correct report as a function of stimulus duration. t_0 is the threshold of conscious perception and shows the longest ineffective exposure duration for the subject. v is the slope of the curve and reflects the perceptual processing speed.



Here, we use a single item report task to investigate differences in how different typefaces are perceived in the right and left visual fields. We focus on two parameters derived from the TVA: the temporal threshold of conscious perception (t_0), and the perceptual processing speed (v) (see Bundesen & Habekost, 2008; Habekost, 2015 for details).

In both experiment 1 and 2, the individual data were fitted to a maximum likelihood procedure using the LibTVA toolbox for MatLab (Dyrholm et al. 2011). Based on the assumption that there would be no laterality difference in t_0 for each typeface, we estimated a single t_0 -parameter and two v -parameters (the processing speed for the left and right side respectively). The parameters are illustrated in figure 5. We also report the overall proportion of correct responses across all exposure durations for each typeface, both in total and for each visual field. The overall correct scores, threshold, and visual processing speed across the participants were compared with paired-samples t-tests (two-tailed). Multiple t-tests were not corrected for, due to the exploratory nature of the study. Effect sizes are reported as Cohen's d .

Experiment 1

Participants

19 subjects participated in the experiment (11 males, mean age: 23.9, SD: 2.51, range: 21-30). The following inclusion criteria were used: the participants were right-handed, had normal or corrected-to-normal vision, no dyslexia, or psychiatric or neuropsychological condition. We only included subjects who had learned to read in a language using Latin letters. All provided written informed consent. All participants were given a product key for a product sponsored by Microsoft after participation in the experiment.

Materials

All experiments were conducted in a semi-darkened room. Subjects were seated with their head in a chin rest, 80 cm from a 20" CRT-monitor running at 150 Hz with a resolution of 800 x 600 pixels.

Figure 6

Trial outline for Experiments 1 and 2. The only difference between the experiments was the exposure durations used.

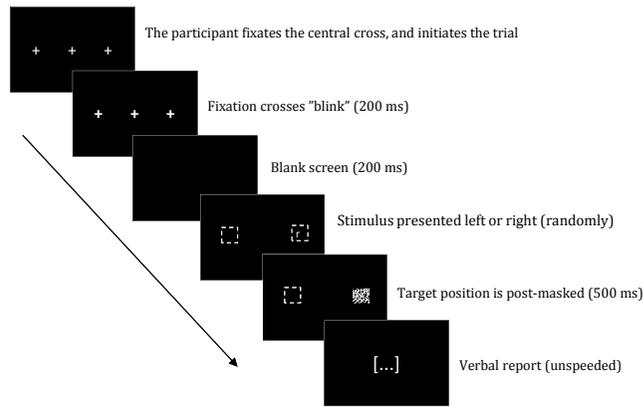


Table 1

Stimulus sizes for the five different typefaces in visual degrees

| | Width | | Height | |
|----------------|-------|-------------|--------|-------------|
| | Mean | Range | Mean | Range |
| Master | 0.67 | 0.29 - 1.1 | 0.9 | 0.72 - 1.43 |
| Swash | 0.85 | 0.57 - 1.3 | 0.9 | 0.72 - 1.43 |
| Contrast | 0.79 | 0.57 - 1.1 | 0.9 | 0.72 - 1.43 |
| SwashShadow | 1.04 | 0.72 - 1.43 | 1.04 | 0.86 - 1.43 |
| ContrastShadow | 0.84 | 0.57 - 1.23 | 1 | 0.79 - 1.58 |

Stimuli and masks

To minimize the backlight from the screen, the stimuli were presented in lower-case, point size 30 in white on a black background. The mean stimulus sizes for each typeface are presented in visual degrees in table 1. Eight different exposure durations (13, 27, 40, 53, 73, 93, 113, and 133 ms), and 16 letters of the alphabet were used (a, b, e, f, g, j, k, m, o, q, r, s, t, x, y, z). Each individual letter was shown the same number of times for each typeface. Stimuli were post-masked for 500 ms with rectangular pattern masks (2.51° x 1.93°), which were constructed of letter fragments, in order to erase the visual afterimage (figure 6).

The participant initiated each trial by pressing the space button when they fixated on a centrally placed fixation cross. When a trial started, the fixation crosses became bold for 200 ms (fixation flash), which was followed by a blank screen for 100 ms before the stimulus appeared on the screen. The stimuli were presented randomly at 4,5° of visual angle to the left or right of fixation. Participants were instructed to make a non-speeded report of the stimulus, and only to report a letter if they were "fairly certain" of what they had seen, in order to refrain from pure guessing but still use all the information available about the stimulus. Participants were informed of their accuracy after each block, and instructed to aim for an accuracy of 80-90% (correct responses of responses given). This is the standard instructions used in experimental paradigms based on TVA (see Habekost, 2015). Subjects completed 40 blocks of 80 trials, with breaks for every ten blocks. Each block consisted all 16 letters shown one time in each of the five fonts. Each font was shown one time randomly without replacement for each exposure duration in each visual field. The entire experiment took between 2.5 - 3 hours to complete.

Table 2

A comparison of visual processing speed (v) and overall correct scores between the left and right visual field in Experiment 1, showing higher processing speed and overall correct score in the right visual field for all typefaces.

| | Left visual field | | Right visual field | | Statistics | | |
|--|-------------------|---------|--------------------|---------|------------|--------|-------|
| | Mean | SD | Mean | SD | t | p | d |
| v - perceptual processing speed | | | | | | | |
| Master | 23.54 | (10.23) | 32.1 | (10.05) | -4.39 | < .001 | -0.84 |
| Swash | 7.03 | (2.71) | 8.78 | (3.84) | -2.62 | .017 | -0.53 |
| Contrast | 13.03 | (5.14) | 18.24 | (6.61) | -3.38 | .003 | -0.89 |
| SwashShadow | 6.26 | (2.31) | 8.39 | (3.93) | -3.21 | .005 | -0.68 |
| ContrastShadow | 9.68 | (3.02) | 14.21 | (5.94) | -3.21 | .005 | -1.49 |
| Overall correct score | | | | | | | |
| Master | 0.44 | (0.11) | 0.52 | (0.1) | -5.10 | < .001 | -0.76 |
| Swash | 0.23 | (0.08) | 0.27 | (0.11) | -2.69 | .015 | -0.42 |
| Contrast | 0.32 | (0.1) | 0.39 | (0.1) | -3.77 | < .001 | -0.7 |
| SwashShadow | 0.2 | (0.06) | 0.25 | (0.09) | -3.55 | .002 | -0.67 |
| ContrastShadow | 0.28 | (0.08) | 0.37 | (0.12) | -3.52 | .002 | -0.9 |

Table 3

Overall proportion correct reports across all exposure durations for each typeface in Experiment 1. Comparing the Master typeface to the four test-typefaces shows that the Master is perceived significantly better than all four test-typefaces.

| | Overall correct score | SD | Master vs. | | |
|----------------|-----------------------|--------|------------|--------|------|
| | | | t | p | d |
| Master | 0.48 | (0.1) | | | |
| Swash | 0.25 | (0.09) | 17.62 | < .001 | 2.42 |
| Contrast | 0.36 | (0.09) | 13.44 | < .001 | 1.26 |
| SwashShadow | 0.23 | (0.07) | 17.34 | < .001 | 2.94 |
| ContrastShadow | 0.32 | (0.08) | 13.07 | < .001 | 1.78 |

Results: Experiment 1

The results show that, in general, stimuli presented in the right visual field were reported more correctly than stimuli in the left visual field. Multiple t-tests showed significant left/right differences for all typefaces, which is reflected in both overall correct scores (proportion correct across all exposure durations) and perceptual processing speed (see table 2).

In order to test the overall difference between the typefaces, a mean of the left and right score was calculated, and each of the embellished typefaces was compared to the Master typeface. All tests showed that the Master typeface was reported significantly more correct than each of the embellished typefaces. Of the embellished typefaces, the participants scored highest when stimuli were shown with the Contrast typeface. This was followed by the ContrastShadow typeface (mean: .32, SD: 0.08) and the Swash typeface (mean: .25, SD: 0.09). Participants scored lowest on stimuli shown with the SwashShadow typeface (mean: .23, SD: 0.07). Table 3 shows the overall correct score for each typeface and how each of the embellished typefaces compare to the Master typeface. Comparisons of t_0 (the threshold of conscious perception) for each specially designed typeface with the Master typeface as baseline, showed no significant differences (all $ps > .159$). The mean scores of the Swash and SwashShadow typefaces showed that participants scored significantly higher when the Swash typeface was shown

| | Left visual field | | Right visual field | | Statistics | | |
|--|-------------------|--------|--------------------|---------|------------|----------|----------|
| | Mean | SD | Mean | SD | <i>t</i> | <i>p</i> | <i>d</i> |
| v - perceptual processing speed | | | | | | | |
| Master | 28.89 | (9.25) | 32.86 | (13.16) | -1.38 | .184 | -0.35 |
| Swash | 7.02 | (2.14) | 7.66 | (2.56) | -1.44 | .168 | -0.27 |
| Contrast | 13.77 | (2.91) | 16.23 | (4.57) | -2.68 | .015 | -0.66 |
| SwashShadow | 6.42 | (2.30) | 7.52 | (3.27) | -1.71 | .105 | -0.39 |
| ContrastShadow | 8.62 | (2.20) | 10.61 | (3.39) | -2.40 | .028 | -0.71 |
| Overall correct score | | | | | | | |
| Master | 0.64 | (0.06) | 0.66 | (0.07) | -1.34 | .197 | -0.31 |
| Swash | 0.36 | (0.08) | 0.38 | (0.11) | -1.23 | .235 | -0.23 |
| Contrast | 0.51 | (0.05) | 0.55 | (0.08) | -2.40 | .027 | -0.54 |
| SwashShadow | 0.33 | (0.09) | 0.36 | (0.12) | -1.60 | .127 | -0.31 |
| ContrastShadow | 0.42 | (0.08) | 0.46 | (0.10) | -2.20 | .041 | -0.54 |

Table 4

A comparison of visual processing speed (*v*) and overall correct scores between the left and right visual field in Experiment 2.

without shadow: $t(18) = 3.40, p = .003, d = 0.25$. This was also found when comparing the Contrast typeface with the ContrastShadow typeface: $t(18) = 4.31, p < .001, d = 0.47$.

Experiment 2

Due to the low overall correct scores for each typeface in Experiment 1, we set up a new experiment with longer exposure durations, in order to establish whether the results of the previous experiment, showing no left visual field superiority with any of the tested typefaces, could be explained by the difficulty of the experiment.

The setup of the experiment is the same as in experiment 1, however the refresh rate was 100 Hz, and the exposure durations were 20, 40, 60, 90, 120, 150, 180, and 200 ms.

Participants

19 subjects participated in the experiment. (2 males, mean age: 23.95, SD: 2.34, range: 21-30). 9 subjects participated for course credit, and 10 subjects received a gift card of 300 DKK after participation. All participants provided written, informed consent.

Results: Experiment 2

In this experiment, we found a significant difference in the overall correct score and the processing speed between the left and right visual field for the Contrast typeface and the ContrastShadow typeface. As shown in table 4, both typefaces had the highest overall correct score and the highest processing speed when shown in the right visual field, with the highest effect sizes for the processing speed

| | | | Statistics for master vs.: | | |
|---|-------|---------|----------------------------|----------|----------|
| | Mean | SD | <i>t</i> | <i>p</i> | <i>d</i> |
| t0 - threshold of perceptual processing | | | | | |
| Master | 34.8 | (8.33) | - | - | - |
| Swash | 32.11 | (11.27) | 1.27 | .219 | 0.27 |
| Contrast | 34.30 | (9.35) | 0.26 | .801 | 0.06 |
| SwashShadow | 35.24 | (11.37) | -0.25 | .807 | -0.04 |
| ContrastShadow | 31.62 | (9.37) | 2.19 | .042 | 0.36 |
| Overall correct score | | | | | |
| Master | 0.65 | (0.05) | - | - | - |
| Swash | 0.37 | (0.09) | 19.83 | <.001 | 4 |
| Contrast | 0.53 | (0.06) | 16.15 | <.001 | 2.18 |
| SwashShadow | 0.34 | (0.1) | 19.04 | <.001 | 4.13 |
| ContrastShadow | 0.44 | (0.08) | 17.89 | <.001 | 3.23 |
| v - visual processing speed (mean of both visual fields) | | | | | |
| Master | 30.87 | 9.49 | - | - | - |
| Swash | 7.34 | 2.15 | 10.90 | <.001 | 4.04 |
| Contrast | 15.00 | 3.27 | 7.91 | <.001 | 2.49 |
| SwashShadow | 6.97 | 2.46 | 11.01 | <.001 | 4 |
| ContrastShadow | 9.62 | 2.21 | 10.22 | <.001 | 3.63 |

Table 5

Threshold (t_0), visual processing speed (*v*), and overall correct scores for each typeface in Experiment 2. Comparing the Master typeface to the four test-typefaces shows that the Master is perceived significantly better than all four test-typefaces, and that this is reflected in both visual processing speed and overall correct scores.

The only difference between the Master typeface and each of the embellished typefaces for t_0 is found in the ContrastShadow typeface, which is significantly lower than the Master typeface ($t(18) = 2.19, p = .042, d = 0.36$, the rest of the *ps* > .219). The *p*-value for the *t*-statistic is however close to the critical value at .05, and the effect size is small. This may therefore be a random finding, as the ContrastShadow typeface does not stand out in any other way; it does not have an advantage in neither overall correct score nor the mean processing speed compared to the Master typeface. Just like in the first experiment, participants had a significantly lower overall correct score for the embellished typefaces compared to the Master typeface (see table 5).

The *t*-tests between pairwise typefaces showed significant differences in overall correct scores between shadowed and non-shadowed typefaces. Thus, participants performed significantly worse with SwashShadow compared to Swash: $t(18) = 3.43, p = .003, d = 0.32$, and ContrastShadow was worse than Contrast: $t(18) = 9.76, p < .001, d = 1.29$.

Overall, we find that compared to the Master typeface, all the other typefaces degrade the visual perception of each letter. The Swash typeface degrades the visual input more than the Contrast typeface, and the shadow effect degrades the visual input for both SwashShadow and ContrastShadow, compared to no shadow-effect. Furthermore, the only typeface that

shows a lateral difference is the Contrast typeface and the ContrastShadow typeface, which are perceived better in the right visual field compared to the left visual field.

Discussion

If a typographical layout is to communicate certain moods or associations, choosing a headline typeface of a more embellished nature can support this approach (Juni & Gross 2008; Brumberger 2003; Tantillo et al. 1995; Walker et al. 1986). Understanding how the brain processes these embellished typefaces, will provide the designer with usable tools when choosing typefaces for a given assignment.

Within psychophysical research, the theory of feature detection finds that at the initial first steps of identification, letters are not identified as wholes but are identified through the individual features (Pelli et al. 2006; Rayner and Pollatset 1989), and that the relevant features that distinguish one letter from the others are the main features important for visual processing (Fiset et al. 2008). It is generally agreed that word reading is a cascaded, interactive process; feature detection and letter recognition feeds into lexical operations which in turn constrains the interpretation of the input via feedback loops (e.g., Dehaene & Cohen 2005; Coltheart et al. 2001; McClelland & Rumelhart 1981). Following this, when reading a complex typeface of letters that are difficult to decode, the reader will have to draw heavily on top down processes of lexical operations. The feature detection theory hence confirms the findings by others (Thiessen et al. 2015; Pelli et al 2006) that typefaces with features that are difficult to identify are more difficult to process – and hence less legible – than typefaces with easily identifiable features.

Bryden and Allard suggested a two stage perceptual process related to feature detection. The theory is that there is an initial stage of right hemisphere activity of a global focus aiming at identifying relevant features, which is preceded by a second stage of left hemisphere activity of identification and naming of the target. Following this, for successful processing of complex typefaces, the two stages will need to cooperate. However, when processing more unadorned typefaces, the initial stage of identifying relevant features might not be equally essential, as it comes as no surprise where to locate the individual features needed for letter identification.

An interesting finding from Experiment 2 is that there is a significant difference in threshold of perception between the Master typeface and ContrastShadow, whilst there were no significant differences for the rest of the typefaces in threshold of perception. This shows that not only does it take significantly longer to process the ContrastShadow typeface compared to the Master typeface, it also takes a significantly longer time before the

Figure 7

Adrian Frutiger's idea of a basic letter matrix superimposed on the four typefaces that previously have demonstrated right hemisphere advantage (Bryden & Allard 1976; Wagner & Harris 1994).

A B C D E

Murray Hill

A B C D E

Palace Script

A B C D E

Profil

A B C D E

Shotgun

Figure 8

The legibility ranking of the tested typefaces.

- 1 a b e f g j k m o q r s t x y z
NeutralTest Regular (Master)
- 2 a b e f g j k m o q r s t x y z
NeutralTest Contrast
- 3 a b e f g j k m o q r s t x y z
NeutralTest ContrastShadow
- 4 a b e f g j k m o q r s t x y z
NeutralTest Swash
- 5 a b e f g j k m o q r s t x y z
NeutralTest SwashShadow

participants reach the threshold at which they can consciously perceive this typeface.

A closer look at the script typefaces that previously have shown right hemisphere advantages (figure 7, top) demonstrates that the letter skeleton differs more from the basic letter matrix than in the typefaces of the Neutral Test family (figure 4). A further look at the heavy bold typefaces that previously have shown right hemisphere advantages (figure 7, bottom) demonstrates that the boldness produces tiny inner counters that in some letters are almost non existing, a feature also not seen in the typefaces of the Neutral Test family.

The hypothesis that the most embellished typefaces would have an advantage when presented to the left hemifield / right hemisphere was not supported in the present study. Following the observations above, this result indicates that the visibility level of the letter skeleton might be the key to producing either right or left hemisphere advantages. It is possible that the placement of the essential features in the embellished typefaces of the NeutralTest family was both more predictable and visible, and hence the initial process of a global feature identification did not have to draw significantly on right hemisphere processing.

If the shape of the letter skeleton is the reason why the NeutralTest Swash typefaces did not produce right hemisphere advantage, the higher visibility of the skeleton compared to Palace Script and Murray Hill, was however, not sufficient for the NeutralTest Swash typefaces to be highly legible. The hypothesis that the embellished typefaces are less legible than typefaces of unadorned style, was hence confirmed, as the Master typeface was the most legible of them all. What is interesting is the internal legibility ranking between the three features of swashes, reversed stroke contrast and shadow.

The typeface Contrast Shadow turned out more legible than Swash, which does not have a shadow effect (Figure 8), and so it indicates that the swash effect degrades the visual input more than both reversed contrast and shadow effects. Furthermore, the shadow effect generally degrades the visual input.

As the ornamentation of the Swash typefaces have the same stroke thickness as the letter skeleton, skeletons and ornaments could be difficult to separate, and so have a larger negative impact on the letter legibility than typefaces which manage to maintain a common letter skeleton as in the two Contrast typefaces. The negative effect of the Swash typefaces is even stronger than the added drop shadow on ContrastShadow.

In short, the letter skeleton of the NeutralTest Swash typefaces is too visible to induce a right hemisphere advantage, but not sufficiently visible to result in high legibility.

Conclusion

The data suggests that the style of typefaces, which facilitate additional right hemisphere processing, must be highly script like or heavy weight with small counters. This is concluded, as the tested versions in the present investigation were not sufficiently extreme to show an effect.

The findings further indicate that embellished typefaces with script like features are less legible than embellished typefaces of reversed stroke contrast and of embellished typefaces that both have reversed stroke contrast and a drop shadow.

To maximize legibility of embellished typefaces, type designers will benefit from creating typefaces that maintain a more common letter skeleton. Instead the designer can play with the typeface's expression in other ways, such as in the treatment of the letter stroke, or by added additional effects like a drop shadow. As long as the letter skeleton is maintained, typefaces can carry a range of additional features, and still be relatively legible to the reader.

References

- Adamson & Hellige (2006). Hemispheric Differences for Identification of Words and Nonwords in Urdu-English Bilinguals, *Neuropsychology*, 20(2), 232-248.
- Barton, J.J., Fox, C.J., Sekunova, A., & Iaria, G. (2010). Encoding in the Visual Word Form Area: An fMRI Adaptation Study of Words versus Handwriting. *Journal of Cognitive Neuroscience*, 22, 1649-1661.
- Beier, S. (2013) 'Legibility Investigations: Controlling Typeface Variables', *Praxis and Poetics: Research Through Design*, Conference Proceedings, 92-95.
- Beier, S., & Dyson, M. (2014). 'The influence of serifs on 'h' and 'i': useful knowledge from design-led scientific research', *Visible Language*, 47(3), 74-95.
- Beier, S. & Larson, K. (2010). 'Design Improvements for Frequently Misrecognized Letters', *Information Design Journal*, 18(2), 118-137.
- Bernard, J.-B., & Chung, S. T. (2013). The dependence of crowding on flanker complexity and target-flanker similarity. *J Vis*, 11(8), 1-1.
- Bessemans, A. (2016). Matilda: a typeface for children with low vision, *Digital Fonts and Reading*, 19-36.

- Brumberger, E.R. (2003). The Rhetoric of Typography: The persona of typeface and text, *Technical communication*, 50(2), 206-223.
- Bryden, M.P., & Allard, F. (1976). Visual hemifield differences depend on Typeface. *Brain and Language*, 3(2), 191-200.
- Bundesen, C. (1990). A theory of visual attention. *Psychological Review*, 97(4), 523-547.
- Bundesen, C., & Habekost, T. (2008). *Principles of visual attention: Linking mind and brain*. Oxford University Press.
- Bundesen, C., Habekost, T., & Kyllingsbæk, S. (2011). A neural theory of visual attention and short-term memory (NTVA). *Neuropsychologia*, 49, 1446-1457.
- Coltheart, M., Rastle, K., Perry, C., Langdon, R., & Ziegler, J. (2001). DRC: a dual route cascaded model of visual word recognition and reading aloud. *Psychological Review*, 108(1), 204-256.
- Dehaene, S. & Cohen, L. (2011). The unique role of the visual word form area in reading. *Trends in Cognitive Sciences*, 15(6), 254-62.
- Dobres, J., Chahine, N., Reimer, B., Gould, D., Mehler, B. & Coughlin, J.F., (2016). Utilising psychophysical techniques to investigate the effects of age, typeface design, size and display polarity on glance legibility, *Ergonomics*, Mar 4, 1-15.
- Dyrholm, M., Kyllingsbæk, S., Espeseth, T., & Bundesen, C. (2011). Generalizing parametric models by introducing trial-by-trial parameter variability: The case of TVA. *Journal of Mathematical Psychology*, 55(6), 416-429.
- Evictor, Z. & Ibrahim, R. (2004). Morphological and orthographic effects on hemispheric processing of nonwords: A cross-linguistic comparison. *Reading and Writing: An Interdisciplinary Journal*, 17, 691-705.
- Fiset, D., Blais, C., Éthier-Majcher, Arguin, M, Bub, D., & Gosselin, F. (2008) 'Features for Identification of Uppercase and Lowercase Letters', *Psychological Science*, 19(11), 1161-1168
- Frutiger, A. (1998). *Signs and Symbols: Their Design and Meaning*, London: Ebury Press
- Frutiger, A. (2008). *Adrian Frutiger Typefaces: The Complete Works*, H. Osterer & P. Stamm, Basel: Birkhauser.
- Habekost, T. (2015). Clinical TVA-based studies: a general review. *Frontiers in Psychology*, 6, 290.
- Habekost, T., Petersen, A., Behrmann, M., & Starrfelt, R. (2014). From word superiority to word inferiority: visual processing of letters and words in pure alexia. *Cognitive Neuropsychology*, 31(5-6), 413-436.
- Hellige, J.B., & Adamson, M.M. (2007). Hemispheric differences in processing hand-written cursive. *Brain and Language*, 102(3), 215-227.
- Hills, C. S., Pancaroglu, R., Duchaine, B., & Barton, J. J. S. (2015). Word and text processing in acquired prosopagnosia. *Annals of Neurology*, 78(2), 258-271.
- Hunziker, H.J. (1998) 'Typographic work of Adrian Frutiger', *Serif: the magazine of type & typography*, 6, 32-43
- Juni, S. & Gross, J. (2008). Emotional and persuasive perception of fonts. *Perception and Motor skills*, 106, 35-42.
- Larson, K. & Carter, M. (2016). Sitka: a collaboration between type design and science. *Digital Fonts and Reading*. 37-53.
- McClelland, J.L., & Rumelhart, D.E. (1981). An interactive activation model of context effects in letter perception: part 1. An account of basic findings. *Psychological Review*, 88, 375-407.
- Pelli, D.G., Burns, C.W., Farell, B., Moore-Page, D.C. (2006) 'Feature detection and letter identification', *Vision Research*, 46, 4646-4674
- Rayner, K. & Pollatsek, A. (1989). *The Psychology of Reading*. Englewood Cliffs, NJ: Prentice-Hall International.
- Susilo, T., Wright, V., Tree, J. J., & Duchaine, B. (2015). Acquired prosopagnosia without word recognition deficits. *Cognitive Neuropsychology*, 32(6), 321-339.
- Tantillo, J., DiLorenzo-Aiss, J., & Mathisen, R.E. (1995). Quantifying Perceived Differences in Type Styles: An Exploratory Study, *Psychology & Marketing*, 12 (5), 447-57.
- Thiessen, M., Kohler, M., Churches, O., Coussens, S. & Keage, H. (2015) 'Brainy Type: a look at how the brain processes typographic information', *Visible Language*, 49.1-2, 174-189
- Tracy, W. (1986). *Letters of Credit: a view of type Design*, London: Gordon Fraser.
- Vangkilde, S., Coull, J. T., & Bundesen, C. (2012). Great expectations: Temporal expectation modulates perceptual processing speed. *Journal of Experimental Psychology: Human Perception and Performance*, 38(5), 1183-1191.

Wagner, N.M., & Harris, L.J.(1994). Effects of typeface characteristics on visual field asymmetries for letter identification in children and adults. *Brain and Language*, 46(1), 41–58.

Walker, P., Smith, S., & Livingston, A. (1986). Predicting the appropriateness of a typeface on the basis of its multi-modal features. *Information Design Journal*, 5(1), 29-42.

Authors

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Katrine Sand is a master’s student of psychology at the Department of Psychology at University of Copenhagen. Her studies have mainly been focused on neuropsychology and cognitive psychology. She has conducted research within the field of visual word recognition, with particular focus on psychophysical methods for studying letter and word recognition.

Randi Starrfelt is associate professor in neuropsychology at the Department of Psychology at University of Copenhagen. She conducted her Ph.D. and a post doc at the Center for Visual Cognition at this Department. She also has certification as a specialist in clinical neuropsychology. Her research is concerned with visual recognition in various groups of neuropsychological patients, as well as normal subjects. In particular, she has focused on understanding the cognitive and cerebral processes underlying visual word recognition by combining psychophysical methods and traditional experimental (neuro)psychology. Recently she has extended her research to the area of face recognition, in particular focusing on people suffering from developmental prosopagnosia, or “face blindness”.

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embellished?: Universe 86

(by Adrian Frutiger)

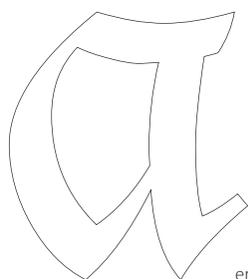
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basic letter skeletons

(by Adrian Frutiger)

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embellished: Lucida Blackletter

(by Chuck Bigelow)

What exactly is the difference between a text and a display typeface?

a 2016 discussion about terminology for text versus display typefaces among
Chuck Bigelow,
Mary Dyson,
Maria dos Santos Lonsdale,
and Kevin Larson.

What exactly is a display typeface?

What is it about a display typeface that makes it unsuitable for reading a lot of text?

These questions were stimulated by the paper in this issue, “Legibility Implications of Expressive Display Typefaces” by Sofie Beier, Katrine Sand, and Randi Starrfelt (see preceding article).

Reviewers of that paper found that various words describe display typefaces in the literature, none of them used consistently or defined precisely. In an effort to clarify, *Visible Language* Editor Mike Zender initiated a discussion among four typographic experts around the letterform features that contribute to or define the informal distinctions of “display” and “text” typeface. The aim was to better define these informal terms and choose more accurate and appropriate words than “display” and “text.”

The experts concluded that a display typeface departs more from the basic letterform skeleton, those most basic stroke distinctions that define an “a” from a “b” (see Sofie Beier’s figure 4). Because typographers intuitively understand that letterforms which embellish or distort the basic skeleton are less legible, they tend to use display typefaces at larger sizes. The discourse that led to these conclusions is summarized below. Note that some of the words discussed are no longer in Sofie Beier’s paper published in this journal, as the authors responded the discussion about terminology.

In this discourse summary, Z. is the voice of Mike Zender (*VL* Editor); B. is Chuck Bigelow, typeface designer; D. is Mary Dyson, typographic faculty and researcher; La. is Kevin Larson, typographic researcher at Microsoft; and Lo. is Maria dos Santos Lonsdale, typographic faculty and researcher.

Z.: 11.29.16

email to B, D, La and Lo

Please to read the manuscript “Legibility Implications of Expressive Display Typefaces” and propose terminology for key terms it uses throughout.

complex, expressive, display typefaces

versus

conservative, text, reader typefaces

_____ These and other available terms do not seem adequate. They're imprecise. They're not descriptive of the features that compromise the distinctions.

_____ I would like to you to propose better words for these concepts. Please suggest some words that are:

more accurate – somehow reflect the conceptual underpinnings behind these terms;

more memorable – memorable in a typographic sense, as related to typography;

still natural – still related to the natural, everyday meanings associated with words.

_____ I'm hoping to avoid jargon or academic language that combines five nouns for each concept. Please propose words and exchange them via email to discuss and select what seems best. I will then suggest to the author that they adopt the proposed language.

NOTE:

The author uses "letter skeleton" on p. 8

This seems to me to be a key concept in play here. Perhaps letter skeleton could be a starting point for your consideration.

.....
B: 11.30.16

The need for definitions raised by this paper are reminiscent of what R. L. Pyke wrote in 1926:

"Four times as many writers have measured legibility as have defined it. ... Three out of every four writers have been attempting to measure something the exact nature of which they have not paused to examine."

Various terms have been used to describe text and display typeface:

- _____ Complex
- _____ Expressive
- _____ Style
- _____ Text
- _____ Display
- _____ Body text
- _____ Conservative

"Complex" can be too subjective. More precise would be "perimetric complexity" in the referenced paper by Pelli et al. (2006), who define complexity

as "perimeter squared over ink area". I suggest a definition of "complex" with reference to Pelli.

_____ That said, we might expect the opposite of "complex" to be "simple". Are there "complex display" typefaces and "simple display" typefaces? Yes, a simple (in terms of perimetric complexity) display face would be Adrian Frutiger's Univers 85 Extra Black Oblique. A complex display face would be Roger Excoffon's Calypso.

_____ "Expressive" is difficult to define. One could argue that all typefaces are collections of abstract shapes that are potentially equally expressive, depending on literate culture and associated connotations, histories, and aesthetics. For example, Imperial Roman inscriptional capitals could be as expressive as Excoffon's "Calypso" typeface.

_____ "Conservative" is also hard to define in typefaces. In the late 19th and early 20th century, the prevailing text types were devolutions of the "Modern" style that had originated a century earlier in types of Bodoni and Didot. When Arts & Crafts printers revived Renaissance types of four centuries earlier, were those Jenson-based and Garamond-based revivals "conservative" because they were much older than the current types, or "radical" (= "progressive") because they sought to supplant the prevailing style?

_____ The old distinction between "display" and "text" functions fairly well and I daresay most typographers understand it.

_____ Concatenations of undefined terms like "complex expressive" or "expressive display" versus "conservative style" or "conservative body text" do not clarify the matter. Is a "complex expressive" typeface the same sort of thing as an "expressive display" typeface? Are they both in opposition to a "conservative style" typeface or to a "conservative body text" typeface?

_____ I am all in favor of finding the right words. As Mark Twain supposedly wrote:

"The difference between the almost right word and the right word is really a large matter. 'tis the difference between the lightning bug and the lightning."

.....
Z: 11.30.16

Chuck, as you note, "display" and "text" are the words I have used too, and I/we "get it."

_____ But "display" and "text" are far from descriptive of what features lead a typeface to be used for those two purposes. Our familiar words are useful for application, to describe the result, but are no help at all for describing (or defining) what (aside from our superior expertise and good taste) led us to use Garamond for text and Shotgun for display.

_____ I am hoping for words that are relevant to features rather than to typical function/use.

La.: 11.30.16

I agree that it would be great if all papers could be either excised of jargon or for all jargon to be defined. Probably neither can happen completely, but we can always aspire to be better.

That said, I wasn't outraged by the jargon used in the paper. For the most part they are words that do resemble their common meaning. Pelli's *parametric complexity* is more rigorously defined, but it does match pretty well to the ordinary meaning of *complexity*. I feel like I know what is meant by expressive, conservative, or display type. Display type and body text type probably have the longest history as terms, though it is still probably difficult to provide an exact definition.

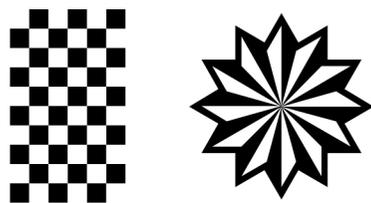
In Sofie Beier's dissertation, she tried to study why something was a body text face. The two hypotheses she looked at were familiarity based on frequency of exposure, and familiarity based on similarity to an idealized letter skeleton. The exposure theory argued that no typeface could start out as a body face, but rather because a body text face through multiple exposures as a body text face. While the skeleton theory argued that there is a Platonic ideal of a letterform and only faces that are very similar to the ideal can be a body text face. For purposes of that work, the ideal skeleton was defined as the eight fonts that Frutiger defined as ideal, and other fonts were measured for strength of correlation with those eight.

Unfortunately the research didn't conclusively show either hypothesis correct.

While I'd be hard pressed to define what makes a font a body text face, "I know it when I see it"

B.: 11.30.16

"I know it when I see it" was Justice Potter Stewart characterizing pornography, but he wasn't writing a research paper. If there were laws against type complexity like against pornography, then some characters might be in trouble, like these from Wingdings 2 and Lucida Console, respectively.



As the former foreman of a jury in a pornography trial, I am pretty sure I know it when I see it, too, but even then, the judge gave us a definition, something about how the work appeals predominantly to the prurient interest in sex, further defined as an itching or longing or unhealthy interest, and so on.

By the time the judge had gone through the whole legal definition and its sub-sections, the jury was pretty thoroughly confused.

That was the most important case I ever served on as a juror, since it involved First Amendment rights, but the most interesting case was a robbery-assault that involved apparent time travel.

A definition would have helped with that case, too.

Z.: 12.1.16

Thanks to you all for your discussion of this. It helps and illustrates why definitions are so desirable yet elusive.

One contrary thought to the "know it when I see it" approach and that comes from my reading today from *Visible Language 2.2* (a.k.a. *Journal of Typographic Research* vol. II no. 2, 1968) "Readership of Advertisements with all display type" where display type was defined as larger than 18 point, in other words,

NOT

TYPEFACE CHARACTERISTICS

but

font size.

Just when Chuck and I thought we knew what we meant by "display" type.

B. 12.1.16

Size is implicit in "text vs. display", but not in "complex" or "conservative", etc..

Bigger size has always been a distinguishing characteristic of display type, even before it was called display type. The transition from text to display occurs around 18 to 20 point in the studies I have made from incunabula through the 18th century. "Great Primer" in English and Parangon in French are the names of the sizes that cross over from text into display, while the styles don't change. Evidence for this separation, and the reasons explaining it, are many, some from the psychophysicist's view.

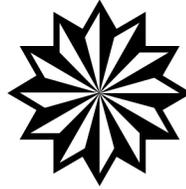
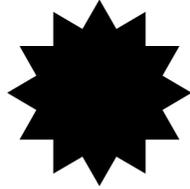
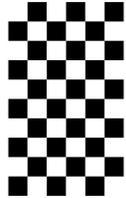
Legge, Gordon E., and Charles A. Bigelow. "Does print size matter for reading? A review of findings from vision science and typography"

Journal of Vision 11.5 (2011): 8-8.

<http://jov.arvojournals.org/article.aspx?articleid=2191906>

A solid rectangle versus a rectangular checkerboard of same size; a solid star versus a shaded star of same size and polygonality.

But, back to perimetric complexity. _____ Maybe there will be some future time in which graphemes are distinguished by degrees of complexity. Here are some geometric figures that are similar in their exterior but differ in perimetric complexity.



.....
D.: 12.02.16

I can understand why you are looking for a description of features but the paper seeks to separate features (swash, shadow and contrast). Any term must therefore be sufficiently generic to cover all of these. We seem to have ruled out perimetric complexity and the paper appears to separate swash style and excessive added detail.

'In this study we will investigate the effect of swash style and the effect of excessive added detail' (p3).

I don't think I got very far with my adjectives, but here they are:

basic/plain/functional/unadorned
vs
decorative/ornamental/embellished/ornate

.....
Lo.: 12.04.16

Inspired by Paul Luna and Alison Black's published work (and other authors), I would suggest: 'Formal Typefaces' versus 'Informal Typefaces'. It is short and neat, and therefore easy to remember. Moreover, since the author is testing legibility, it has the same play on words: legible vs illegible; formal vs informal.

_____ Beyond this, of all the terms used by the author "Expressive Typeface" is the only one I would consider keeping, but without the word 'display' in the middle. That is: "Expressive Typefaces" and not "Expressive Display Typefaces". It's also short and neat, and therefore easy to remember. As the opposite term for "Expressive Typefaces", perhaps Mary's suggestion: 'Functional Typefaces' or 'Plain Typefaces'.

_____ In both cases, what the author then should do at the beginning of

the paper, as already mentioned above, is to explain what is meant by the terms and what falls under their umbrella. That is, what is included: script, handwritten, ornamental, etc.. What are the features: complex letter features, excessive detail, etc.?

.....
B.: 12.04.16

I agree with the goal of Section 2 Terms: the desirability of terms being "short, neat, and...easy." I agree in principle with the need for terms to be clear, defined, consistent, and, where needed, translatable into terminology in cited papers.

_____ I am reminded that in French, "lisible" encompasses the English terms "readable" and "legible". The late Ladislav Mandel once added, rhetorically, "decipherable", when he declared that Helvetica was not "lisible" but merely "déchiffable", while Univers was truly "lisible". Probably there is no perfect and translatable terminology, but if the terms are clear and defined, that should be as much as we can expect.

_____ I'm pretty much in agreement with the other comments as well, although I'm not always sure I know "text" fonts when I see them. Palatino, we are told, was intended to be a display face, not a book face, but it became most popular as a text face in text sizes. Whereas many of the ITC faces of the 1970s, Souvenir as an example, were marketed as "text and display", thus leading credulous designers to make serious books and documents look unserious by composing them in Souvenir.

.....
Z.: 01.31.16

It seems we have some agreement in principles and on parameters and some good proposed terms.

_____ We agree in principle that the terms need definition generally and at the start of the manuscript in question.

_____ We seem to agree that embellishment on the basic letterform skeleton, as measured perhaps by perimetric complexity, is what distinguishes a display typeface. We have not defined a threshold, but the definition proposed could result in such a threshold.

_____ I read no objections to Mary's proposal to use the adjectives:

basic, plain, functional/, unadorned
vs
decorative, ornamental, embellished, ornate
for text versus display typefaces.

_____ I suggest the adjectives that are most related to the definition above are:

unadorned typeface
embellished typeface

In common use, one could just default to “embellished typeface” as the preferred term for “display typeface” and just call everything else a typeface.

Univers 85 Extra Black Oblique is unadorned and unembellished yet a display face.

PS

Z: 11.29.16 clarification

This attempt to clarify language in typography is a bit of an experiment. Typographic terms are defined better than most other areas of graphic / communication design (we don't even have a single universally accepted name for this discipline), so I'm thinking what we do here and how we do it might be used to clarify language in other areas.

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