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EDITORIAL

Research notes: communication design

This second issue of volume three continues to set out potential directions for how we might address communication design research through a range of topics and perspectives offered by our contributors. Their articles provide insights into how designers look, see and represent the world, and demonstrate how research into the 'visual' remains a core component of communication design: for example, the surprisingly complex semiology of children's drawings, the visual messaging strategies of posters, to the multiple ways in which data and information have been visualized at different points in history.

What better way to begin this issue than by exploring the ways in which children's drawings might aid in our understanding of safety signs in public spaces. Kin Wai Michael Siu, Mei Seung Lam and Yi Lin Wong, undertook a study with 65 primary school children (7- to 12-years-old) in different districts in Hong Kong ('Designing signs for children: a study for children's drawings for safety signs'). Through a systematic analysis of the drawings produced by their focus groups, the authors were able to hypothesize different ways in which children read and understand pictograms.

The role of the poster in conveying public health messages historically in the US is the focus of Dori Griffin's insightful article 'Posters for public health: WPA posters and national dialogues about health care in the United States'. Griffin methodically examines the visual messaging found within a selection of posters from the Library of Congress's Work Progress Administration (WPA) Federal Art Project collection procured in the 1940s. Her article shows how a collection might provide a rich resource for an analysis of graphic artefacts, revealing cultural and ideological positons as well as assumptions about the viewing audience. She shows the ways in which the government opted for a graphic simplicity which reduced complex issues down to a set of core American values (e.g. home life, cleanliness, and healthy futures).

Communicating the complexity of data is also addressed through the narratives of information visualization. Leslie Atzmon delves into the 'revolutionary world' of Charles Darwin arguing that his use of the 'tree-of-life' sketches informed his understanding of the complexities of evolution. Atzmon proposes that these sketches, and the diagrams they generated, published in Darwin's *Origin of Species*, reflect a process of 'visual ideation' resulting in an 'infographic' which serves as a way of thinking through ideas, but also a way to communicate those ideas to others.

Jonathan Lukens, argues in his article, 'Fresh paradoxes in food data', that the process of 'traceability' of food items in moving from the 'farm to table', opens up questions around design which promotes an advertising agenda (e.g. packaging) as opposed to design that reveals (e.g. supply chain). Lukens navigates the complexity of wicked problems and draws from Kees Dorst's concepts of design paradoxes to address issues surrounding traceability and the communication designer's role in this process. His conclusion: designers must be made aware of the ambiguity, ephemerality and often contradictory nature of information made possible by food data and tracking systems.

Whilst the visual is key to representing ideas, the journal is also interested in how different senses can be employed in conjunction with the visual as a way to share new insights into a subject. A case in point would be Kate McLean's intriguing method of 'smellwalks' to illicit participants' perspectives on smells in an urban space. She explores the role of olfactory sense in

The role of the visual in communication is exemplified by this platform signage, Flinders Street Railway Station, Melbourne, Australia. Source: Author 2016.

her visual essay, 'Ex-formation: Urban Smellscapes & Mapping', and evidences through her own practice how this might contribute to our understanding of place.

Thereafter, we continue with our series which explores the nature and potential role of archives in shaping history, but also for informing the future of communication design. Wibo Bakker takes as his case study the fascinating inventory of the design agency Total Design, in order to explore the value of Dutch archival practices for designers, researchers as well as a broader public audience. Not surprisingly, this leads Bakker to question archival practices in a digital age; especially where design work is created in software programmes which may or may not be available in the future.

The plethora of recent design exhibitions and conferences provide another indicator of the increased interest in the history and theory of communication design. Yet, it could be argued that such forums have also been central to informing the 'who, what, where, why and how' of communication design research and professional practice more generally. With this in mind, the journal wanted to increase the column inches devoted to reviews in order to explore design education internationally - specifically in Latin America, South Africa, USA and UK, as well as interrogating alternative histories of graphic design through the lens of designers as curators. We also wanted to engage with what policy might bring to our understanding of the profession by featuring an analysis of the recently published 'Diagnostic Review of Design in Brazil'. It is clear that such a broad range of reviews and positions indicate just how far our profession has come.

Our cover for this issue is by the celebrated South Korean designer Ahn Sang-Soo. As founder of the Paju Typography Institute (PaTI) and past Vice-President for Icograda (1997–2001), his contribution to defining the future of design education and the profession continues to inspire.

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Designing signs for children: a study of children's drawings for safety signs

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ABSTRACT

Children's drawings could give new insights into how signs should be designed for children. Safety signs in public places, such as parks and shopping malls, are sometimes not comprehensible to children. In this study we extracted children's comments and opinions on safety sign design through their drawings. Sixty-five primary school children in Hong Kong aged seven to 12 were asked to draw 12 safety signs and their responses and drawings were then analysed. It was found that the children tended to express their ideas by drawing the signs with different human figures, symbols, environments, tangible and real objects and consequences. Some of the children's drawings differed from the registered safety signs, which may be due to the differences between adults' and children's cognitive abilities and the way in which children see the world. Five suggestions are proposed to assist designers in designing safety signs for children. These suggestions serve as a starting point for the research and design of signs that consider and value the needs of end users. It is also hoped that the perspectives provided in this article can optimize the design of existing signs to increase children's understanding.

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Introduction

'Public signs' or 'public symbols' are pictograms which convey specific meanings and messages in the public environment.[1] These pictograms are often iconic or indexical and sometimes arbitrary (i.e. symbolic, as suggested by Charles Sanders Peirce) indicating an object, or a cause of an event or an object based on similarity, contiguity or convention.[2] In this article, instead of understanding the term 'signs' from a semiotic perspectives and examining its semiotic nature, we are using 'signs' to refer to the physical pictograms that appear in public spaces. Figure 1 shows an example of the kind of signs (e.g. pictograms) that are addressed in this article.

Frutiger called these kinds of signs 'signal signs'. These signal signs are meant not only to 'communicate but rather to produce an immediate reaction in the viewer'.[3] According to

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Figure 1. An example of the signs discussed in this article (Photo taken by the authors in a park).

Frutiger's classification, pictograms as signal signs fall into three different groups. The first group is pictures that show the image of a common object in the form of silhouettes. People using different languages or living in different cultures are often able to understand this kind of pictures quickly.[4] The second group is diagrams that convey more complex messages, and people need to take some time to think about the meaning. The third group is indicators of abstract concepts; in this group, pictograms must be learned to be understood.

While designing the signal signs, designers have to concern different issues and take different factors into consideration. Researchers have also generalized some guidelines for designers so that more comprehensible signs can be generated. In the context of signal signs with safety messages, Wogalter et al. summarized from the literature six guidelines specifically for the design of warning signs.[5] Five of these – namely: (1) salience; (2) wording; (3) layout and placement; (4) pictorial symbols; and (5) personal factors – apply to safety sign design. These guidelines, or factors, focus on the representation of pictograms as signs rather than the cognitive aspects of sign designs. This provides another perspective, which is distinct from that of Shinar et al. and McDougall et al.[6] It may provide some clues to sign design and assist in constructing a framework for sign evaluation.

In the search for further guidelines regarding effective sign design, few of these studies address the issue of age and even fewer address the issue of children's comprehension. Lesch addressed comprehension and memory variance in different age groups.[7] However, Ng and Chan found no significant difference between different age groups.[8] Neither Lesch nor Ng and Chan included children in their study.

Children start encountering signs when they are able to access public spaces. According to Piaget's stages of development, seven-year-old children start to be able to form concepts,[9] and thus seek the relationship between a sign and its environment. However, safety signs in public places are sometimes not comprehensible by them,[10] and very few studies have included children in the research of sign design. The studies of Martin and Smith-Jackson and Waterson et al. are two of the few that have investigated sign design using children.[11] Martin and Smith-Jackson investigated how well children can use pictorial instructions for toy assembly using 12 six-year-old and 12 nine-year-old children.[12] They focused on the performance of the children and suggested 10 guidelines for designing pictorial assembly instructions. The guidelines emphasized the format and the arrangement of the instructions rather than the cognitive aspects. Waterson and his colleagues assessed how a group of 210 five- to 10-year-old children evaluated selected safety signs, and a new set of signs, through interactive classroom discussions.[13] Based on their findings, they suggested a set of guidelines as a starting point for designing signs. These guidelines contain four major components and 12 sub-components explaining what should be considered. The major components and sub-components include: (1) design prototyping (preparation, design and evaluation); (2) general format (type of signs); (3) textual aspects (language, number of words, use of terminology and concept and fonts and lettering); and (4) visual aspects (imagery, such as pictograms, examples, symbology, characters/figures and colours).

When we compare the considerations and guidelines for designing for adults[14] and those for children,[15] it would be clear that they are different from each other. The latter have more holistic considerations for sign design that includes not only the visual aspect of a sign but also its design process. The difference is needed to foster good communication with children. In the design of traffic signs, education level was significant in predicting the performance of participants who were asked to comprehend traffic signs.[16] Since children have had less education than adults, children may have been unable to easily understand the signs that they have not encountered before. Education level highlights the importance of catering to children's needs in sign design, as it is likely that children's comprehension level may be lower due to less education than adults.

Since children are one of the major end user groups of the safety signs in parks (Figures 1 and 3) and shopping malls (Figure 2), the consideration of children's comprehension on safety signs is exceptionally important; currently comprehensibility of most signs is relatively low from children's perspectives. Designers need to develop comprehensible signs that are appropriate for children and also usable by other end users. To determine additional insight into how to better design signs for children, our study examined children's drawings that responded to 12 safety concepts found in mandatory action signs (e.g. wash your hands), prohibition signs (e.g. do not push), and warnings signs (e.g. slippery surface). These 12 concepts correspond to 12 signs already registered by the ISO.[17] While similar to other sign design studies using children,[18] in providing some suggestions to enhance the comprehensibility of signs for children, our study method is different in that we looked at the design of signs from the perspective of children's drawings. We collected children's comments and opinions through their sign designs (i.e. their drawings) with the aid of verbal communication. Using drawings to extract children's ideas has been proven to be a common and effective method in the field of psychology and medicine[19] and various disciplines.[20]

Figure 2. A safety sign in a shopping mall (Photo taken by the authors on an escalator).

Figure 3. A safety sign in a park (Photo taken by the authors in a park).

Method

Participants

Sixty-five children aged seven to 12 from primary schools in different districts of Hong Kong were involved in the study. The primary schools were selected based on sampling convenience and the children were chosen randomly by their school teachers. Among the children, 52% were girls and 48% were boys. Their median age was nine years. In a colour vision deficiency test, it was found that a K-1 boy and three K-3 boys were unable to read the numbers on the number plates. These children may have had red–green deficiencies. All other children were able to read the numbers on the plates despite some errors due to

inattentiveness. All the children, with or without deficiencies, were included in the study, as the deficiencies do not affect the analysis and findings in this article.

The children were asked to provide their personal background and answer questions related to their drawing ability. A 5-point Likert scale (1 = totally disagree, 5 = totally agree) was used for the children's self-evaluation. The children reported that they felt it was fairly easy to visualize ideas in their mind (mean = 3.22, SD = 1.10). They were also confident of their drawing skills (mean = 3.49, SD = 1.17). They tended to agree that drawing is a good way to present their ideas and designs (mean = 3. 82, SD = 1.10). These data show that the children generally felt comfortable with drawing.

Tools and materials

A self-design booklet was given to the children to draw in. On each page, the children were given the referent of a sign (i.e. the sign meaning) and asked to design and draw the sign in a 7 × 7 cm square. The children had to draw 12 safety signs in the booklet (Table 1). These signs were chosen from the ISO 7,010:2011(E) Graphical symbols – Safety Colors and Safety Signs – Registered Safety Signs.[21] These signs are more related to children's daily lives; signs such as 'warning: optical radiation' and 'do not extinguish with fire' were not chosen because they were beyond the children's level of cognitive development. For the same reason, only mandatory action, prohibition and warning signs were included and other sign categories (i.e. safe condition and fire equipment signs) were not chosen for this study. Although culture is one of the major concerns in semiotics, the signs chosen in this study are reproductions of real, common experiences that are least likely to be influenced by cultural factors that could affect the comprehensibility (i.e. the first group of the categorization of Frutiger).[22]

Coloured (red, orange, yellow, green and blue) and black felt-tip pens were provided for the children. Thirty-three children were given black pens only and 32 children were given coloured pens. Giving coloured pens to children may more effectively facilitate expression of their emotions and ideas. Several studies have also used coloured pens to allow children to draw and express their emotions and ideas.[23] The separation of the children into two groups using different pens aimed to provide information about how children choose colour when designing safety signs.

Procedures

The children were briefed on the objectives of the study and the task they had to finish in the booklet. The facilitator explained the task to the children using the example shown in the booklet. The facilitator then allowed the children to draw individually. After drawing, the facilitator asked the children in both groups (with black and multicoloured felt-tip pens) 'what is this in your drawing?' and 'why did you draw it in this way?' and guided the children to explain their thoughts. For those who used multicoloured felt-tip pens, the facilitator additionally asked them 'why did you use this colour to draw this part?' These questions were asked to provide an opportunity for children to explain their drawings and hence strengthen their communication with the facilitator. In Kwok's study of young children, the findings illustrate that it is effective and important to ask children further questions based on their drawings, to clarify the meanings in the drawings and prevent misunderstanding by the researchers.[24]

Table 1. The 12 safety signs included in the booklet.

Categories	Sign number	Sign meaning	Sign image (not included in the booklet)
Mandatory action signs	M1	Use footbridge	
	M2	Use handrail	
	M3	Wash your hands	
	M4	Use this walkway	
Prohibition signs	P1	Do not touch	
	P2	No sitting	
	P3	No pushing	
	P4	Not drinking water	
Warning signs	W1	Warning: Slippery surface	
	W2	Warning: Toxic materials	
	W3	Warning: Drop/fall	
	W4	Warning: Floor-level obstacle	

The children's answers were recorded and notes were taken at the same time. At the end of the session, the children were asked to respond to questions related to their drawing experience and abilities on a 5-point Likert scale. All drawing and interview sessions were held at locations with a desk and a chair, where children could draw comfortably. These places were places familiar to the children, such as their school.

Findings

The contents of the children's drawings were extracted and analysed. Each drawing was examined by the facilitator and the research team (with members from different disciplines, e.g. child development, psychology, education, communication design) and the content of the drawings was determined based on: (1) the drawing itself; and (2) the children's explanation. Some drawings were barely comprehensible, in which case the visual qualities are not assessed nor analysed in this article. Instead, the analysis of each of those drawings is based on the child's explanation and description on his or her drawing.

The following discussion of the study, subsections include the three categories of the safety signs and the two major visual elements – 'human figures' and non-human indicating symbols – that appeared in the children's drawings. It is noted that an analysis of specific design choices (e.g. position, placement, and size of the figures or symbols) are not included since that is not the focus of this study.

Use of 'human figures'

Among the 780 drawings of 12 safety signs produced by the children, the image of a human figure was a popular choice. Sixty-five per cent of the drawings (507 drawings) consisted of one or more human figures. The children drew a human figure image in most of the safety

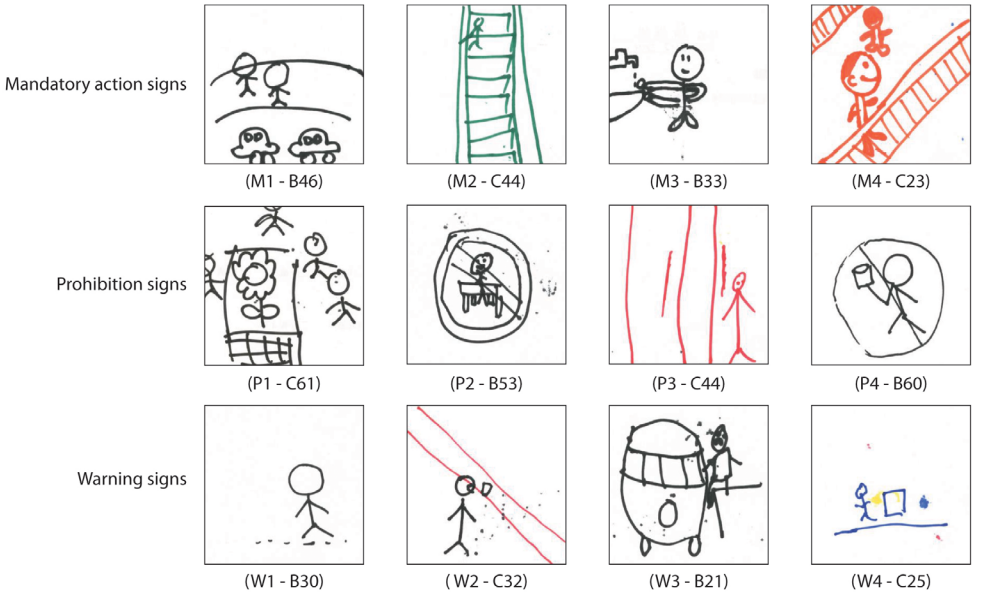

Figure 4. Children's drawings with a 'human figure' in the 12 safety signs. M1 represents the sign number and B46 represents the drawing number.

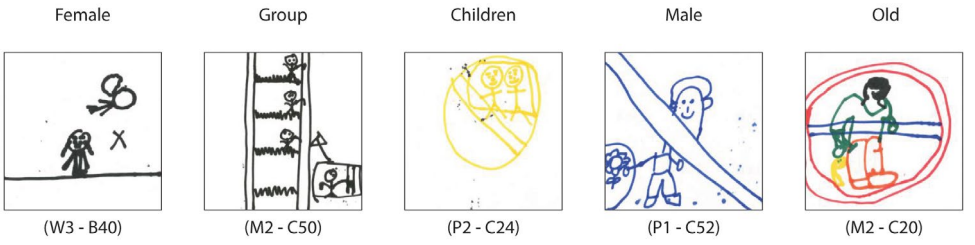

Figure 5. Some drawings of human figures related to 'female', 'group', 'children', 'male' and 'old'.

Table 2. Indicating symbols used by the children and the frequency of usage in each of the safety signs.

Indicating symbols	M1	M2	M3	M4	P1	P2	P3	P4	W1	W2	W3	W4	Total
Cross*	1	2		5	25	30	23	23	2	15	2	6	134
Prohibition sign					16	19	19	24		8	2	2	90
Arrow	9			10					1	2	5	2	29
Tick	2	6	1	8		1			1				19
Exclamation mark									3	3	6	5	17
Movement symbol											7	2	9
Shaking hand					1	1		1		1			4
Sparkle							1			1	1	1	4
Circle/emphasis symbol		1									1	1	3
Question mark											1		1
Emotional symbol												1	1
Total	12	9	1	23	42	51	43	48	7	30	25	20	311

*Note: Symbols with only 1 slash are also included in this category.

signs, except sign M3, wash your hands. Only about 23% of sign M3 drawings (15 drawings) contained an image of a human figure.

The sign with the greatest percentage of human figure images was sign W3, warning: drop-fall. About 98% of the drawings (54 drawings) contained an image of a human figure. The children typically used whole-body matchstick men to represent the human figure. Figure 4 shows some examples of the drawings.

Sometimes the children specifically indicated the gender and the role of the human figures. Most of these specifications could be identified from their drawings, with a few only identified from the children's explanations. Although only about 4% of the drawings (32 out of 780 drawings) had these specifications, it was interesting to see that 'female' figures (as reported by the children's explanations or identified from the drawings) were popular among these children (about 31% of the specified drawings, e.g. W3 - B40 in Figure 5). Other, less popular descriptions of human figures included 'group', 'children', 'male' and 'old'. Figure 5 shows some example of these drawings.

Use of indicating symbols

Sometimes the children used indicating symbols to express meaning, which could not be conveyed by the tangible objects in their drawings. The indicating symbols were used to:

1. emphasize a certain part of the image
2. describe the action taken by the human figure

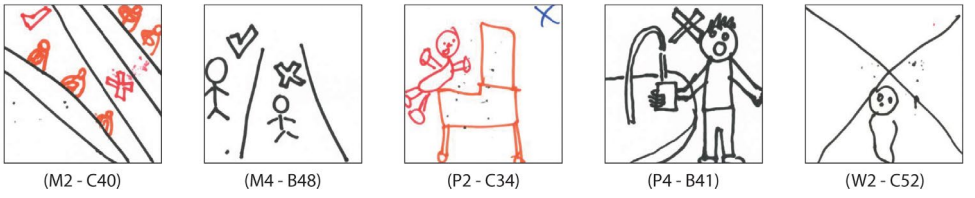

Figure 6. Examples of drawings that used a 'cross'.

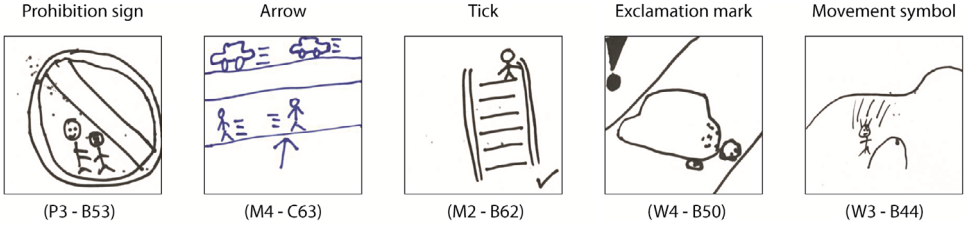

Figure 7. Examples of drawings that used other indicating symbols.

3. state what should or should not be done, or
4. present emotional aspects of the human figure.

Table 2 shows the indicating symbols used by the children and the frequency with which they were used.

Approximately 40% of the 780 drawings had indicating symbols. It is unsurprising to note that signs P1, P2, P3 and P4 had the largest total number of indicating symbols (Table 2). The most used indicating symbols were a 'cross' (to cross-out or X-out something) and the 'prohibition sign' (a circle with a backslash). Interestingly, the 'prohibition sign' was not the most popular symbol that children used to convey the meaning of prohibition, but instead, more children used a 'cross' to represent this idea. It is also interesting to note that the 'cross' was not only used in P1, P2, P3 and P4, but also in other safety signs. The 'cross' in other signs was often used to indicate an incorrect action in the drawings. In other words, some children used a cross to indicate what should not be done and a tick to show what should be done. The contrast of the images in a drawing clearly shows which is correct. Figure 6 shows some examples of drawings that used a 'cross' to express the meaning of prohibition and incorrectness.

Other popular indicating symbols are shown in Figure 7. The movement symbol indicates the direction of movement of the human figure in the drawing and is often used in sign W3, warning: drop/fall (also shown in Figure 7).

Children's mandatory action signs

Mandatory action signs in this study included signs M1, use footbridge, M2, use handrail, M3, wash your hands and M4, use this walkway. The children's drawings show a commonality for these four signs.

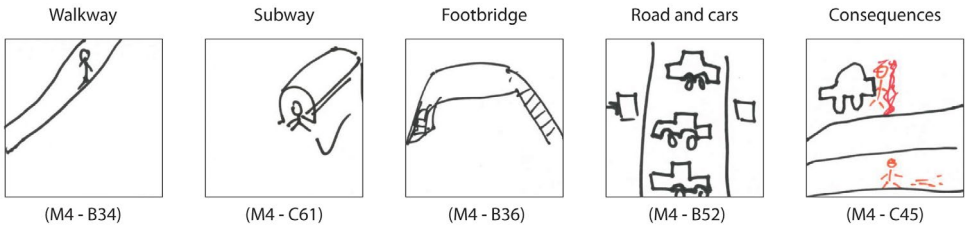

Figure 8. Examples of different scenarios in the children's M4 drawings.

Sign M1, use footbridge. Most children used a 'footbridge' (100%), a 'human figure' (55.4%) and a 'road' (30.1%) to present the message of the sign. A few used objects such as a 'car' (20%), a 'noticeboard' (6.1%) and 'a pool of water' (1.5%) to give more detail to the drawings. It is clear that a 'footbridge' and a 'road' was the scenario given by the children, with the 'road' contrasting with the 'footbridge'.

Sign M2, use handrail. The children's drawings for sign M2 show that most of the children put the emphasis on a 'human figure' (83.1%), a 'handrail' (69.2%) and an 'escalator' (53.8%). Instead of a whole-body human figure, some children (7.7%) only drew 'hands'. In addition, the scenario was not limited to a handrail and an escalator. A 'stair' (10.8%) and a 'footbridge' (3.1%) were also included.

Sign M3, wash your hands. As mentioned above, unlike signs M1 and M2, only some children (23.1%) drew a whole-body human figure for sign M3. Most children emphasized 'hands' (90.8%) as the human-related object, a 'tap' (81.5%) or a 'wash basin' (61.5%) as the scenario and 'water' (75.4%) as the cleansing material. Few children used 'soap' (4.6%) or a 'bubble' (3.1%) to represent cleansing materials and the process of washing.

Sign M4, use this walkway. Although sign M4 also showed some commonalities, it was more complicated than the children's drawings for signs M1, M2 and M3, due to the children's different perceptions of a 'walkway'. Almost half of the children (47.7%) drew a 'walkway'. However, 38.5% of the children used a 'subway' to represent the idea of a 'walkway'. A few children (4.6%) used a 'footbridge'. The children also used contrasting scenarios to enhance the message of 'use this walkway'. Approximately 36.9% of the children drew a 'road' next to the 'walkway' ('subway' or 'footbridge') to show the distinction between a walkway and a 'non-walkway'. A few children (4.6%) drew a 'zebra crossing' on the road to indicate the difference between the 'walkway' and the 'road'. Some children (21.5%) drew cars on the road to clearly illustrate the role of the road. The children also illustrated the consequences of not following the instruction in their drawings. Figure 8 shows some examples of different scenarios depicted in the children's drawings. The use of a human figure was still the most popular option (69.2%) for the human-related object.

Children's prohibition signs

In the prohibition signs category, not all children drew a cross, a circle with a backslash or another similar sign to represent the idea of prohibition (Table 2). Nearly 28% of the drawings (73 drawings) did not emphasize prohibition. Instead, these drawings showed what would happen if the instruction was not followed. The consequences included 'being bitten by a Venus flytrap' (P1, do not touch), 'getting an electric shock' (P2, no sitting), 'falling off' (P3,

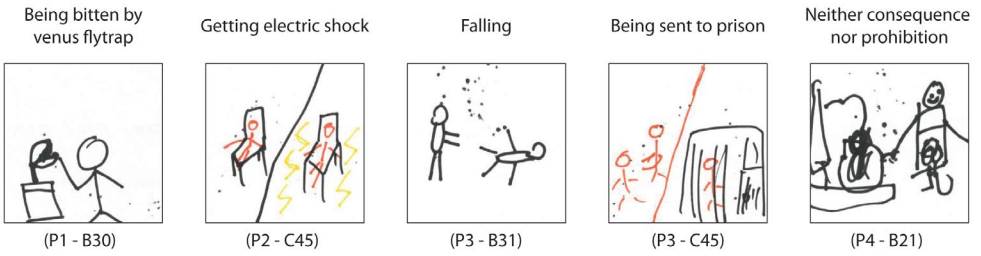

Figure 9. Examples of the children's drawings of prohibition sign.

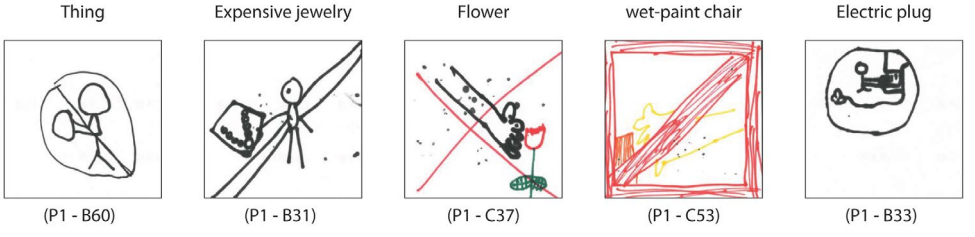

Figure 10. Examples of the children's P1 drawings.

no pushing) and 'being sent to prison' (P3, no pushing). However, some drawings of sign P4, not drinking water, contained neither the idea of prohibition nor the consequences. Figure 9 shows some of these drawings.

The drawings of signs P1, do not touch, P2, no sitting, P3, no pushing and P4, not drinking water, have less in common with each other than those of the mandatory signs. The children had different interpretations of the sign messages and their drawings varied accordingly.

Sign P1, do not touch. The use of a whole-body human figure was the most popular (61.5%) human-related object. Surprisingly, only 27.7% of the children drew hands, rather than a human figure, to represent the message of the sign. The children had different understandings of the objects that cannot be touched with 37 different objects represented in the drawings. The most popular object, which was described as a 'thing' by the children, accounts for 10.8% of the drawings only. Others include 'expensive jewellery', a 'flower', a 'wet paint chair', 'poison', an 'electric plug', 'fire', a 'Venus flytrap', 'glass fragments', etc. Figure 10 shows some examples.

Sign P2, no sitting. About 88% of the children included a 'human figure' in their drawings. Most children (90.7%) did not situate 'no sitting' in a scenario. However, some of them explained the scenarios in their drawings as being on a 'train', on a 'bus', in a 'furniture shop' or 'shop', on a 'balcony', or on a 'toilet'. Most children (72.3%) drew a 'chair' as the place where people should not be seated. Other places included a 'surface', 'boxes', a 'sofa', on 'dirty stuff', etc.

Sign P3, no pushing. A 'human figure' was still the most popular content chosen by the children. Interestingly, children tended to draw two or more 'human figures' (69.2%). Pushing often happened between the two human figures. In some children's drawings, pushing happened between a human figure and an object. The objects included a 'door', 'stuff', a

Figure 11. Examples of the children's warning sign drawings, which included text.

'cart', 'wood stuff', etc. The pushing was happening on a 'train platform', in front of a 'snack counter', on 'stairs', etc.

Sign P4, not drinking water. A 'human figure' was still the most popular content (58.5%) chosen by the children. Most children (64.6%) indicated 'water' as non-drinkable. It is interesting to note that about 3% of the children indicated that a 'soft drink' was non-drinkable. The source of the non-drinkable water varied. About one third of them showed that the water was from a 'tap' (30.8%). Other sources were the 'sea', a 'pool', a 'drinking fountain', etc.

Children's warning signs

Unlike the mandatory and prohibition signs, the children not only drew human-related objects, other tangible objects, scenarios and indicating symbols, but also wrote words for signs W1, warning: slippery surface, W2, warning: toxic material and W4, warning: floor-level obstacle. Children wrote the Chinese (their mother tongue and also the language used in the booklet) of the signs' meanings in their drawings. For example, six drawings of sign W1 had the phrase 'beware of slippery'. Figure 11 shows some of these drawings.

Sign W1, warning: slippery surface. Approximately 70% of the children drew a 'human figure' in their drawings and most of these figures were slipping. About half of the children (52.3%) situated the scenarios, regardless of the presence of human figures, on 'a pool of water'. Others scenarios were a 'wet floor', a 'floor' or a 'slope'.

Sign W2, warning: toxic materials. Approximately 30% of the children drew a 'human figure'. Other than a 'human figure', a 'skull' was also a popular choice (27.7%) for this sign. Most of the children who drew a 'skull' were 10- to 12-years-old. The toxic materials illustrated in the children's drawings varied. The most popular drawing was 'poison' (23.1%). Other toxic materials included 'drugs', 'medicine', a 'drink', a 'correction pen', 'bleach', etc. Most materials were contained in a 'bottle' (24.6%). Others were in a 'bag', a 'can', a 'bucket' or a 'cup'.

Sign W3, warning: drop/fall. As mentioned previously, nearly all of the children drew a 'human figure' for sign W3. In the drawings, the human figure dropped or fell from 'a hill' (20%), on a 'stair' (10.8%), from 'a building' (7.7%), on 'a surface' (6.2%), into a 'hole' (6.2%), etc. A few children (7.7%) also drew some objects to describe the act of falling or to indicate the possibility of falling. They were a 'stone', a 'rock', a 'banana skin' next to the human figure or a 'nearly falling rock'.

Sign W4, warning: floor-level obstacle. A 'human figure' was still the most popular human-related object (46.1%), while 20 different floor-level obstacles were drawn by the children. The most popular was named 'obstacles' by the children (15.4%). Other obstacles, from the

Table 3. The major contents of the 12 registered safety signs and the corresponding children's drawings.

Sign number	Sign message	Registered sign	Children's drawings*
M1	Use footbridge	Human figure, footbridge	Human figure, footbridge, road
M2	Use handrail	Human figure, handrail	Human figure, handrail, escalator
M3	Wash your hands	Hands, tap, water	Hands, tap, wash basin, water
M4	Use this walkway	Human figure	Human figure, walkway/subway, road
P1	Do not touch	Rectangular block, hand	Human figure
P2	No sitting	Human figure, seat	Human figure, chair
P3	No pushing	Human figure, wall, floor	Two or more human figures
P4	Not drinking water	Tap, water	Human figure, tap, water
W1	Warning: Slippery surface	Human figure, floor	Human figure, a pool of water
W2	Warning: Toxic materials	Skull	-
W3	Warning: Drop/fall	Human figure, right angle	Human figure
W4	Warning: Floor-level obstacle	Human figure, rectangular block	Human figure

*Note: Objects that account for more than 30% of the drawings, i.e. 20 drawings, are included in the table. The indicating symbols, except those meaning prohibition, are also included.

children's perspective, were a 'stone', a 'banana skin', a 'rock', a 'hurdle', a 'box', etc. These obstacles were placed on a 'road', an 'uneven surface', the 'floor', 'grassland' or a 'racing lane'.

Comparison between the children's drawings and the registered safety signs

The content of the registered signs and a summary of the children's drawings are compared in Table 3.

The differences between the registered signs and the children's drawings show that children may need additional information to more effectively understand the signage that they encounter. For example, the children's drawings of the four mandatory signs, significantly illustrate that more information, such as a road (M1, M4), an escalator (M2), a wash basin (M3), a walkway/subway (M4) are needed. Although this information may appear to be additional, it represents the environment in which the event takes place. It is important for the children to understand the sign and to be able to situate the event in an appropriate environment. Sign W1 is another example for which children may need additional information. Children need 'a pool of water' (or wet floor) to understand that there is a possibility of slipping. The floor alone may not explicitly indicate the message of warning, despite the action of the slipping human figure.

Sometimes a 'human figure' or other human parts may be essential for children to understand their relationship with the sign's message. From Table 3, it is clear that children tend to use a 'human figure' or other human parts in their drawings. The registered sign P4 has no human parts, while a 'human figure' appeared in most of the children's drawings. This example highlights the importance of a 'human figure' or other human parts in children's perceptions of safety signs.

In addition, from the comparison it is concluded that the children's drawings were often based on their daily life experiences. For example, for sign P3, no pushing, instead of drawing a wall or a block, children drew two human figures pushing each other. Some children even situated the event in front of a train platform or a snack counter. Obviously, they are places where parents or teachers have reminded them not to push each other. This explains why

most children drew two or more human figures instead of drawing other objects, because in their minds pushing each other is forbidden.

From Table 3, the children's drawings for signs P1, W3 and W4 contained human figure as the only major content. No other converging contents can be found among these signs, despite the different meanings and information conveyed by the signs. Similarly, the children's drawings for sign W2 were diverse and thus contained no major contents. This diversity of pictograms used by the children reveals that the children may have understood the signs differently. It can be argued that the sign messages given to them were not specific enough, and thus they drew different objects and pictures to present their ideas.

Suggestions for sign design from children's perspectives

The children's drawings reveal that some elements are key to conveying the messages of the signs, resulting in the following suggestions based on the rationale of the stereotype production method. The stereotype production method makes use of the most common pictorial generated, i.e. the children's drawings in this study, for a referent for sign design.[25] However, it is noted that the authors do not make any recommendations on the design of specific signs. They recognize that sign designers need to additionally respond to environmental and cultural factors to create effective signage. Instead the authors provide the following suggestions that can be used to accommodate children when designing signs.

Include human figure(s). Most of the children's drawings consisted of human figures. It could be argued that children see this as normal, as the purpose of every safety message is to remind *people* to do or not to do some action. Thus, the act or the role of the person in the sign may be important. Including a human figure in the sign may help to increase the conceptual compatibility and the physical representation.[26] Waterson et al. similarly suggested that signs should consist of 'characters'. Children may relate themselves to the 'character' and the 'characters' help children to imitate the behaviour.[27] Waterson et al. also suggested that a picture of actual children could also be used.[28] Although in the findings of this study none of the children drew a 'character', and most of them had drawn whole-body matchstick men, some students described these matchstick men as old, female, etc. This may suggest that including some specific characters that children are in contact with in daily life, such as teachers, may help children to understand and follow the correct behaviour suggested by the signs.

Use indicating symbols. Children use different kinds of symbols to assist message transfer and to emphasize the key content of the sign. These indicating symbols are important in children's signs because the signs are sometimes complicated. The indicating symbols serve to highlight what is important in the content. Therefore, indicating symbols, such as arrows, in a sign may draw children's attention towards the important parts or information. In this study, it was found that crosses and ticks are two of the popular symbols used by children. Waterson et al. also suggested that ticks and crosses help to convey messages effectively.[29] Presenting incorrect behaviour alongside the correct behaviour may help children to avoid being tempted to act in a dangerous manner.

Include environment. In the children's drawings the behaviour of the human figure was often situated in a scenario or a particular environment. For instance, in the children's drawings for sign M4, use this walkway, the 'walkway' was often clearly drawn. A 'road' was sometimes included in the children's drawings to show contrast. Thus, to convey the message of

the sign more effectively, the environment, i.e. other objects that describe where the correct behaviour should be performed, is essential for children to comprehend the sign. Without this kind of indication, children may misunderstand the sign or even imagine or construct a possible environment for the sign. The imagination or construction may not fit well with the meaning and this may affect the comprehensibility of the signs.

Be specific. Sometimes the meanings of abstract signs are difficult for the children to understand. From the children's drawings of P3, no pushing, and W4, warning: floor-level obstacle, it can be observed that instead of drawing an abstract rectangular block to represent the target objects, the children drew specific items to illustrate the sign message. This suggests that using specific objects or objects that are close to reality is more appropriate for sign design for children. Signs need to be specific or concrete so that they do not exceed children's cognitive ability. Being specific and concrete increases the comprehensibility of signs.[30] However, when the object or obstacle is specified, it is more difficult to fulfil the requirement of standardization as suggested by the guidelines of other researchers, as different kinds of objects or obstacles exist in different situations.

Suggest consequences. It is interesting to note that some children illustrated the consequences of violating the safety rules, for instance, in drawings for signs P1, do not touch, P2, no sitting, and P3, no pushing. It may be easy for children to understand what they have to do to be safe if they understand the consequences. As a matter of fact, showing children consequences of their actions is a common strategy used by teachers and educational psychologists.[31] The consequences should be rational and logical so that they are closely related to the associated behaviour. They should also be appropriate in real settings.

Conclusion

The findings of this study show that the content of children's drawings for safety signs was diverse. Since the children in the study were only provided with the verbal meaning of the sign and then asked to draw its meaning, this diversity suggests that the 'meaning' behind the sign may not have been specific enough for children and that most children were unable to draw something abstract. Thus, they drew the signs with different human figures, symbols, environments, tangible and real objects and consequences to express their ideas. Based on the rationale of stereotype production method, the drawings provide the basis for five suggestions about sign design for children: (1) include human figure(s); (2) use indicating symbols; (3) include the environment; (4) be specific; and (5) suggest consequences. However, following these suggestions would make signs less general. For instance, including an image of chair (i.e. an object to illustrate the environment) in the sign P2 no sitting may hinder the sign from being used in other situations which chair is not the prohibited sitting area. Therefore, it is recommended that further studies should be conducted in this area understand how these suggestions could result in better universal signs and determine in which instances it would be better to have less standardization in the design of signs.

In this study, we obtained insights into pictograms using children's drawings that could help the design of effective signs for children. Some of the suggestions recommended in this article are not only compatible with the sign design principles suggested in the literature, but also add insight to the field of signage design. These suggestions serve as a starting point to inspire designers to include children's perspective in the design of signs in public spaces.

This study is limited in that only the objects and human figures in the drawings were analysed. Their actions and behaviour of the objects and figures were not considered in the analysis. Although the combination of the objects and human figures may suggest the behaviour and interaction, more insight may be obtained if these are considered. As indicated earlier, the understanding and the design of a sign are significantly related to the social and cultural background and context of the users.[32] While this study was conducted in Hong Kong, it is intended to add to a more comprehensive understanding of more inclusive and universal signage design.

Notes

1. Ng, Siu, and Chan, "Effects of User Factors."
2. Chandler, *Semiotics: The Basics*; Johansen and Larsen, *Sign in Use*; and Short, *Peirce's Theory of Signs*.
3. Frutiger, *Signs and Symbols*, 345.
4. Ibid.
5. Wogalter et al., "Research-based Guidelines."
6. Shinar et al., "Traffic Sign Symbol Comprehension;" and McDougall et al., "Measuring Symbol and Icon."
7. Lesch, "Comprehension and Memory."
8. Ng and Chan, "The Effects of Driver Factors."
9. Slavin, *Educational Psychology*.
10. Siu et al., "Children's Misinterpretation."
11. Martin and Smith-Jackson, "Evaluation of Pictorial Instructions;" and Waterson et al., "Developing Safety Signs for Children."
12. Martin and Smith-Jackson, "Evaluation of Pictorial Instructions."
13. Waterson et al., "Developing safety Signs for Children."
14. For example, McDougall et al., Measuring Symbol and Icon;" Shinar et al., Traffic Sign Symbol Comprehension;" and Wogalter et al., "Research-based Guidelines."
15. For example, Martin and Smith-Jackson, "Evaluation of Pictorial Instructions;" and Waterson et al., "Developing Safety Signs for Children."
16. Al-Madani and Al-Janahi, "Drivers' Personal Characteristics;" and Ng and Chan, "The Effects of Driver Factors."
17. International Organization for Standardization, Registered Safety Signs.
18. For example, Martin and Smith-Jackson, "Evaluation of Pictorial Instructions;" and Waterson et al., "Developing Safety Signs for Children."
19. Mibrath and Trautner, *Children's Understanding and Production*; and Patterson and Hayne, "Reports of Emotionally Laden Events."
20. Guha et al., "Working with Young Children;" Harpham et al., "Participatory Child Poverty Assessment;" MacDonald and Gustafson, "The Role of Design Drawing;" MacDonald et al., "Enhancing Children's Drawing;" and Kwok, *Participatory Research for Children*.
21. International Organization for Standardization, Registered Safety Signs.
22. Frutiger, *Signs and Symbols*.
23. Burkitt, "Drawing Conclusion;" Ehrlen, "Drawings as Representation;" Harrison et al., "Children's Drawing New Perspective;" Hopperstad, "Relationship between Drawing and Interaction;" Jolley, *Children and Pictures*; Jolley et al., "Development of Expressive Drawing;" and Strauss, *Understanding Children's Drawings*.
24. Kwok, *Participatory Research for Children*.
25. Ng, Siu and Chan, "Perspectives towards Stereotype Production."
26. Shinar et al., "Traffic Sign Symbol Comprehension."
27. Waterson et al., "Developing Safety Signs for Children."
28. Ibid.

29. Ibid.
30. McDougall et al., "Measuring Symbol and Icon;" Shinar et al., "Traffic Sign Symbol Comprehension;" and Waterson et al., "Developing Safety Signs for Children."
31. Slavin, *Educational Psychology*.
32. Siu, "Users' Creative Responses;" and Siu, "User Participation."

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Posters for public health: WPA posters and national dialogues about health care in the United States

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ABSTRACT

During the same years they were designing the now-famous American travel posters, Work Projects Administration (WPA) designers produced an extensive body of public health posters to communicate a variety of health-related messages to the American public. This article explores the role of the WPA's public health posters in Depression-era health care dialogues in the US. Explicitly, this visual dialogue centered around the need for data-driven personal health choices; expert information about health and disease; and the role of government agencies as representatives of reliable data. Implicitly, the posters also re-enforced existing norms associated with race, gender, and class, framing dialogues that had as much to do with social norms as they did with health care messaging. Drawing on the Library of Congress collection of WPA posters as its sample, this article provides both quantitative and qualitative analysis of the visual messaging strategies employed by WPA poster artists when discussing public health.

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Introduction

Politically charged visual messaging around the topic of public health in the twentieth century has a complex and diverse international history.[1] As the US grapples with issues of universal health care access and improved public health care policy, dialogues about national public health have saturated the media landscape. Unsurprisingly, many contemporary conversations escape historical contextualization. Health care has been part of the national conversation in the US at several key points in time prior to the Affordable Care Act of 2010. On an international scale, such conversation has been even more prevalent throughout the twentieth century, with scholars of visual culture documenting the ways in which visual communication participates in the dialogues surrounding national public health.[2] Visual messages have both shaped and reflected the diverse dialogues in which they participated. While such historical dialogues are in many ways specific to their own places and moments, they also have the capacity to illuminate contemporary conversations by providing rhetorical context.

The public health posters of the Work Projects Administration's (WPA) Federal Art Project provide one opportunity to both quantify and engage critically with historical visual messaging around public health in the US. The roughly 2000 surviving poster designs of the

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WPA represent a small part of a much broader program of activity. The WPA (and, more specifically, the Federal Art Project) was part of the Federal Emergency Relief Appropriation Act, which was enacted in 1935 by President Roosevelt and effectively ended when the US entered the Second World War. 1936 was the peak employment year for the WPA's Federal Art Project, with over 5300 artists on payroll. The artists of the Federal Art Project produced about 35,000 unique poster designs and printed about 2 million posters.[3] To investigate the cultural context and ideological messaging strategies of the WPA's public health posters, this article takes as a sample the Library of Congress collection of WPA posters. The Library of Congress collection is the largest in the world, containing 907 posters acquired in the 1940s, shortly after the close of the WPA in 1943. Of the 907 posters in the Library of Congress collection, 92 (10.14%) address themes related to public health, and it is these posters that the following analysis considers.

In comparison to the WPA's travel posters, which are well-known to both popular and scholarly audiences, the other subjects that WPA artists and designers addressed are much less familiar to contemporary viewers. The scholarship surrounding the WPA's travel promotion is well-developed in relationship to both the posters and the written materials, such as the State Guides series. This scholarship suggests two primary ideological goals for the WPA's visual and textual production related to travel. One, the materials sought to build a cohesive and well-defined national landscape that was unique to America and valuable in terms of its cultural context, historical significance, and natural beauty.[4] Two, the materials sought to unify a diverse American public facing a national economic crisis, primarily by contrasting the viewing audience with an array of exotic people groups – such as Native Americans, Latin Americans, African Americans, and recent European immigrants – and their colorful cultural customs.[5] The WPA's public health posters do not fit neatly into either of these narratives, primarily because their pragmatic and ideological goals were so different from those of the travel posters. As the following analysis will reveal, the public health posters addressed a well-defined and largely homogenous audience. They sought to outline clear sources of threat and offer clear methods of resolution within a prescriptive, authoritarian framework predicated on a sense of personal and social responsibility. The representational strategies and visual tropes of the posters supported their ideological and practical messages as they sought to meet these goals.

Addressing homogenous, well-defined audiences

Race, gender, and class are all well-defined variables within the visual messaging of the public health posters. The homogeneity within these categories of representation limits the perceived audience for the posters and assumes a significant level of social conformity within the viewing audience. White, middle-class, nuclear families are the norm (Figure 1), and deviations are pictured as just that – deviant. Broadly speaking, the posters assumed a white viewing audience; supported complementarian gender roles within a nuclear family; and depicted a middle-class standard of living as the norm, with poverty visualized as a situation associated with or even directly caused by negligence, dirtiness, and disorder. The representational strategies used to communicate these messages deserve individual attention.

While the WPA's travel posters often pictured minority populations, the public health posters exclusively pictured white individuals. Of the 92 public health posters in the Library

Figure 1. The normative audience for the WPA's public health posters was the white, middle-class, nuclear family. Posters designed and printed by the Illinois Federal Art Project (left), 1936–39 and the Ohio Federal Art Project for the Cleveland Division of Health (right), 1940. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-USZC2–80 and LC-USZC2-1086.

of Congress (LOC) collection, 64 picture humans, and 42 (45.65%) picture individuals who are clearly identifiable as white. The remainder are either partial representations such as a booted foot or figural icons such as male/female pictographs, in which race is entirely obscured. None of the posters identifiably picture persons of color, and only one even mentions persons of color. A poster made for Ohio WPA employees between 1936 and 1940 asked workers to 'stamp out syphilis' by having a blood test; to illustrate the message, a booted foot stomped on the hand-lettered text beneath. City and county health clinics were listed on the poster, and one of these was 'white only' while two were 'colored only.' This is the only poster in the whole sample that does not assume whiteness as normative and inevitable. Nor did any of the WPA's public health posters communicate in a language other than English. A limited range of Spanish-language posters and brochures could be ordered from the New York Maternity Center Association, a non-profit established in 1918. A set of four congenital syphilis posters was available for public display at a price of fifty cents, for instance.[6] But there are no surviving Spanish (or, indeed, non-English) posters produced by the New York City Federal Art Project, which produced 28.26% of the public health posters in the sample. As a major metropolitan area with a large international population, New York City might be expected to require a linguistically diverse range of public health communications. Illinois, Ohio, and New York state are the other WPA branches that were primary contributors to the sample – all locations in which a lack of linguistic diversity during the 1930s is perhaps less surprising. That the materials for and by New York City communicated

only in English is an exclusionary representational choice, speaking to the normative nature of the English-speaking white person as the intended audience for the posters.

Though the public health posters carefully avoided representing minority populations, other WPA posters reflected the culturally institutionalized environment of racial segregation or used racial minorities as symbols of the exotic or the primitive. Multiple examples from a variety of artists demonstrate the ways in which persons of color indicated the presence of prejudice and/or symbolized 'the Other.' John Wagner's 1936–40 'Learn to Swim' poster for the New York City Department of Parks pictured racially segregated swimming classes, with white children and black children all wearing swimsuits, but lined up separately according to skin color. Though there are ways to complicate the reading of the 'Learn to Swim' poster, its composition does indicate a significantly segregated social environment.[7] While representations of African Americans often pointed toward the segregation of the contemporary environment, representations of Native Americans were more commonly used as symbols of America's primitive past. A series of 1939 posters by Louis Siegriest pictured traditional Native American activities such as hunts and dances, and handicrafts such as weaving and pottery, to advertise the Indian Court exhibit at the Golden Gate International Exposition in San Francisco. By portraying Native Americans as performative actors in spectacles meant for tourists, the series frames Native American culture as the primitive 'Other.' This was a common representational strategy of early to mid-twentieth century tourist imagery depicting indigenous cultures, particularly in the Southwest.[8]

Unlike these examples of WPA posters that pictured persons of color, albeit in stereotypical and limiting ways, the public health posters failed to depict persons of color at all (Figure 2). The public health posters were progressive in some regards, particularly (as a later section will discuss) in relationship to evolving notions of sexual health, but they failed to challenge the racist norms of their time in any way. Indeed, with the one exception that has been noted, they even failed to address the health concerns of non-white viewers *within* a racist, segregated context. Thus the posters imply that public health is a matter of concern only for the white population through their exclusionary representational tactics. They quite literally erase non-white persons from the conversation about health. This visual strategy echoed the racial prejudices of medical practice at the time. Medical research studies that drew conclusions based only on data drawn from largely or exclusively Caucasian male populations were not uncommon, and studies that intentionally, systematically, and deceptively denied treatment to African Americans established patterns of fear and mistrust that continue to impact the medical experiences of minority populations in the twenty-first century US.[9] Framing public health and personal wellness as an exclusively white concern was not a neutral visual practice or a harmless oversight; rather, it was both a reflection and a perpetuation of a dangerously prejudiced system.

In the same way that they failed to address race, the public health posters failed to challenge normative gender roles. Throughout the 92 posters, gender roles are clearly defined, with men as bread-winners and women as keepers of the home (Figure 3). In 12 posters (13.04% of the total), men are pictured in professional contexts: working in factories and hospitals, as drivers and deliver-men, as shop-keepers and manual laborers. Syphilis is a 'menace to industry; don't lose your pay' advises a 1936–40 poster by the Illinois WPA, picturing a man at work in an industrial setting. 'Infection is avoided by immediate first aid on the job!' cautions another poster by the Illinois WPA. The poster shows two workmen, one administering first aid to the other. Only twice are men pictured in a domestic context, and

Figure 2. White patients and white doctors dominate the posters taken at a whole; persons of color are never represented, and languages other than English are never used. Posters designed by Alexander Dux for the New York State Department of Health (left), 1936–39, and the Illinois Federal Art Project, 1936–39. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-USZC2-5371 and LC-USZC2-5184.

both times they appear alongside women as father figures in middle-class, white, nuclear families. In contrast, women are pictured in what might be a professional context twice (2.17% of the total). Both women might be elementary school teachers, depending on how the viewer reads the image. 'John is not really dull; he may only need his eyes examined,' advises a 1936–37 poster sponsored by Health Officer of the New York town of Hempstead. The poster pictures a boy reading a book, and a woman holding a printed page (perhaps a report card) in front of his book. The woman could be either the boy's teacher or his mother; the context is unclear. In the second ambiguous poster, a young woman holds two report cards, one with an 'A' for grades, the other with an 'A' for habits. 'Good grades and good habits go together; get your [tuberculosis] test now,' the copy reads. The young woman might be either a teacher or a secondary school student; again, the context is open to interpretation. The right of women – particularly married women – to work was called into question during the Depression years, when jobs were scarce and public sentiment consigned women firmly to the home.[10] Yet women certainly participated in the workforce, making up 21.9% of the labor force in the US during the 1930s.[11] The absence of professional women in the WPA's public health posters, then, can be read as a choice – a messaging strategy, rather than a factual reflection of the physical environment.

Figure 3. Clearly defined complementarian gender roles depict men as wage-earners and women as keepers of home and family. Posters designed by E. S. Reid for the Cook County Illinois Public Health Unit, 1936–41 (left) and the Illinois Federal Art Project, 1936–41. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-USZC2-5237 and LC-USZC2–806.

Though their role as professionals is ambiguous at best, women appear in unambiguously domestic contexts more frequently – seven times, or 7.61% of the total. In their representations of women, the posters highlighted the role that mothers played in the maintenance of public health. The professional literature of the public health professions delivered the same message. World War Two, which saw women entering the workforce in unprecedented numbers, offered an opportunity to reflect nostalgically on the role of the woman in the home. 'Traditionally, the homemaker does much to protect and maintain the health of her family,' wrote the national Director of Community War Services in 1943. He continued:

> She knows the physical needs of her children and any peculiar tendencies which need special attention. She plans meals which will give her family the foods they need for health. When illness occurs, she will be on the lookout for it and make every effort to obtain adequate medical service at once. With life centered in the home, children are protected against activities and contacts which might jeopardize their health.[12]

This homily might well have been describing the narrative content of the WPA's posters for maternal and child health. A 1936–41 poster by E. S. Reid advised viewers that the 'lifelong job' of the mother is 'the constant protection of [her children's] health.' Other posters illuminated the details of maternal responsibility. Proper prenatal care must include a 'balanced diet for the expectant mother,' instructed a 1936–39 poster by the New York State Federal Art Project. Infants and children must be appropriately nurtured; 'no creature in this world

Figure 4. Poverty is represented through visual cues about urban disease, dirtiness, darkness, and derelict buildings. Posters designed by Anthony Velonis (left) and the New York State Federal Art Project (right) for the New York City Housing Authority, 1936–38. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-USZC2-1132 and LC-USZC2-1019.

[is] so ignorantly nurtured as the average baby,' a 1936–38 poster by Erik Hans Kraus scolds; 'advice at your health bureau.' Mothers are integral to the prevention of disease; 'congenital syphilis is preventable if syphilitic mothers will take adequate treatment,' a 1936–39 poster by Alexander Dux informs expectant mothers. Mothers are key to responsible family meal planning. 'Start the day right with a good breakfast; plan your luncheon wisely; dinner should balance your day's meals,' instructs a 1941–43 poster for the New York City Nutrition Program. The smaller copy on the poster differentiates between the dietary needs of children and adults, and the illustration shows a woman at a dining table. Clearly, the female role is child-care and home maintenance, where gendered health concerns center around pregnancy, child-rearing, and family well-being. Conversely, the male role is employment outside the home, where gendered health concerns center around job-related health and safety.

Class is a somewhat murkier variable, though most posters picture middle-class or working class individuals and families. Modes of dress are the clearest visual cues for class. Manual laborers wear overalls, deliverymen wear uniforms, businessmen wear suits, and clean, tidy children wear gender-appropriate school- or play-clothes. Only the planned housing posters (8.7% of the total) directly address poverty, primarily through visual cues about urban disease, dirtiness, darkness, and derelict buildings (Figure 4). A 1936–38 poster for the New York City Housing Authority portrays the stark contrast between public housing and slums. The left half of the poster has a black background; the words 'rotten living' appear in large white type above an illustration of a barefoot boy playing near a heap of rotting garbage. The right half of the poster is empty and white, with the words 'decent living through planned housing' in large green type near the bottom. The difference is quite literally black and white. 'Planned housing fights disease' claims another poster in the same series. It pictures a black,

amorphous mass awash in microbes being penetrated by the rays of a bright yellow, very geometrical sun. In this poster, the difference between darkness and light is further underscored by the contrast between order and chaos. 'Must we always have this?' asks a third poster in the series, picturing a chaotic urban environment filled with crumbling buildings, cracked windows, empty beer bottles, drunken and disheveled men, stray cats, rotting trash, and what appears to be the corpse of an infant. The appalling illustrations are reversed out of an amorphous black blob, implying both evil and disorder. 'Why not housing?' the poster implores, suggesting that planned public housing will solve the problems being depicted.

The New Deal investment in public housing, epitomized by the United States Housing Act of 1937, emphasized the role that clean, safe, and above all modern housing played in public health. Sympathetic contemporaneous media coverage of the Housing Act highlighted the correlation between substandard housing and poor health:

> [A]reas with high death rates and high sickness rates, especially for diseases dependent on contact infection, approximately coincide with areas of bad housing. General death rates and infant mortality in slums are likely to be twice the city average, tuberculosis and pneumonia rates perhaps four times as high.[13]

The WPA posters devoted to healthy housing communicated much the same message. Urban slums were hotbeds for disease and death, but also for crime, poverty, and filth – both moral and physical. The urban poor were miserable inhabitants of a dirty, dangerous, and disordered wasteland. Planned housing, on the other hand, offered an opportunity for 'decent living.' The visual representation of planned public housing invariably embraced the language of Modernist architecture, curing the chaos of urban poverty through the imposition of uniformity and geometry. The planned housing posters presented viewers with logical, organized, and above all geometric dwellings. These modern structures benefitted from a plentiful supply of natural light and a clean, disease-free environment. By imposing a clean and orderly physical environment, the posters suggest that class differences (and their attendant social ills) can be erased through cleanliness and responsibility.

Distribution, media, and style as strategy

Clearly defining the target audience's race, gender, and class was one strategy to effectively reach the intended audience. Distribution methods, choice of media, and stylistic decisions also played a role in negotiating the relationship between broadcaster and receiver. A quantitative 1939 study revealed that among government agencies, newer agencies were more likely than well-established ones to utilize mass media publicity tools, primarily defined as radio, newspaper, and poster campaigns. In this study, the WPA appeared in the 'most extensively engaged in public media campaigns' category, along with the Rural Electrification Administration, the Farm Security Administration, and the Federal Housing Administration – all New Deal programs.[14] The relative age of the issuing agency influenced how likely that agency was to engage with visual messaging in a broad public context. Thus the WPA, as a young government agency, enthusiastically embraced public media campaigns. Where and how the posters appeared was a topic that received attention, as well. Professional journals advised public health officials as to which messages belonged in which locations. In general, posters were distributed 'primarily to [neighborhood] residents, but also to doctors and dentists, and to schools, welfare and health agencies, stores, industrial plants, banks, motion picture theaters, clubs, and restaurants.'[15] More targeted distribution might be employed

Figure 5. The content of a message influenced its perceived context and audience; thus posters that utilized similar color schemes, design elements, and messaging strategies were deemed 'appropriate' for different venues. Posters designed by the Illinois Federal Art Project for the Chicago Department of Health (left), 1936–41 and the New York City Federal Art Project for the New York City Department of Correction (right), 1936–37. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-USZC2-5171 and LC-USZC2-1006.

depending on the poster's content. Syphilis posters, a 1941 public health publication advised, should be placed 'in public lavatories, lavatories in beer parlours, and other suitable locations,' while infant and child vaccination posters should be placed 'in schools, town halls, community halls, offices, etc.'[16] Public transit vehicles and stations, museums, libraries, and the windows of local merchants were also specified by WPA literature as likely locations for general-interest public service posters.[17] Thus the content of the message influenced its location and perceived role within the public sphere (Figure 5).

While distribution methods primarily addressed context, production methods influenced the visible stylistic characteristics of the posters. Silkscreen was a cheap and relatively easy production method for the posters, more economical than offset lithography or photographic printing and requiring little in the way of specialized equipment and training. The nature of silkscreen as a medium led to the flat, graphic shapes and simplified compositions shared by most of the posters.[18] In turn, these practical concerns led to an aesthetic differentiation between the WPA public health posters and other visual media of the time that addressed the same topics. Some health publications of the day echoed the photo-journalistic strategies of *Life* magazine covers or the realist illustrations of Norman Rockwell for the *Saturday Evening Post*. *Hygeia*, the American Medical Association's periodical for general readers, used both strategies on their covers throughout the 1930s. Journalistic photographs tended to depict clinical situations and environments – for example, the July 1941 cover

Figure 6. Flat, graphic shapes and Isotype-style icons allowed the WPA's poster artists to simplify their pictorial language, a dual strategy that took advantage of silkscreen's economy of production and attempted visual sophistication and stylistic differentiation. Alex Kallenberg for the US Public Health Service and American Society for Control of Cancer (left), 1936–37 and the New York State Federal Art Project for the Health Bureau (right), 1936–39. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-USZC2-1009 and LC-USZC2-5353.

pictured a white male draped in anticipation of a physical exam, attentively examining his own foot, with the copy 'Do you have athlete's foot?' running beneath the photo. Pictorial illustrations often depicted outdoor activities and sports – for example, the August 1936 cover that showed a young white woman playing golf. In contrast to such photographic images and realistic illustrations, the WPA posters were flat, graphic, and relatively abstract, though they did retain their figural specificity. Stylistically, the posters combined pictorial American illustration with the graphic abstraction of avant garde European modernism.[19] In many cases they also utilized or referenced the simplified representational language of the Isotype pictorial language system, developed by Otto Neurath in the early 1930s (Figure 6).

The use of Isotype-style icons and illustrations was generally hailed as an aesthetic advancement for government-sponsored design. Isotype-style posters received favorable reviews because of their graphic simplicity, their ability to intuitively communicate factual information and relationships, and their assumed (though of course not actual) universality. By adopting a similarly abstract and simplified visual style, the WPA's public health posters could trade on the associated visual messages of scientific accuracy and visual neutrality.[20] For some American viewers, Isotype also enjoyed an association with a progressive social and political agenda. *Survey Graphic*, published from 1921 until 1952, was a left-leaning political magazine that made extensive use of Isotype-style charts, graphs, and illustrations.

The magazine's 1936 biographical sketch of Neurath called him a 'social showman,' claiming that Neurath's 'little man,' used to symbolize people in visualizations of social statistics, first appeared in the US on the pages of *Survey Graphic* in 1932.[21] With regard to its editorial content during the Depression years, the magazine was closely aligned with New Deal politics. It frequently addressed New Deal initiatives, often publishing work by artists, authors, and officials within the WPA and its affiliated agencies. 'Under the Federal Emergency Relief Administration the Neurath pictograph technique [i.e., Isotype] was introduced in chart-making, and the Works Progress Administration is now carrying on that work,' wrote the Assistant Director of Information for the Resettlement Administration, a short-lived New Deal agency, in 1937. However, he concluded that despite these advances, '[g]overnment poster work in many respects is inadequate and unimaginative and it is only in recent years that layout and design have made any measurable typographic advance,' pointing toward the work of WPA poster artist Lester Beall as an exemplar of 'excellent poster work.'[22]

Unappealing government-sponsored design was doubly unfortunate because it was 'competing for attention with interesting, high-quality commercial publicity releases.'[23] Poorly-produced public health messages had little hope of rivaling the glossy salesmanship of the packaged food industry and the over-the-counter health tonic industry.[24] Even in educational contexts, commercial publications often edged out their government-sponsored competition. Thus when the educational journal the *Grade Teacher* listed resources for teaching healthy food habits to elementary school children, only 26.09% were published by government offices, while 73.91% were 'produced and distributed by food and kitchen appliance manufacturers or producer[s].' The authors went on to note that most of the commercial material 'is factually accurate as far as it goes and all of it is printed and illustrated much more attractively than the government literature. This is probably one of the reasons why the teachers prefer it.'[25] The graphic stylization of the WPA posters can be seen, then, as a dual strategy – one involving both economy of production and an attempt at visual sophistication and stylistic differentiation.

Syphilis and new strategies for pictorializing sexual health

In addition to responding to market trends and pressures, the WPA's public health posters responded to persistent concerns within the medical and 'social hygiene' communities at the time of their production. The most frequently represented subject among the 92 posters in the sample is syphilis. Almost a third (32.61%) of the total posters address syphilis; just over half (55.55%) of the posters addressing disease are syphilis posters. Syphilis was a pressing public health concern during the early twentieth century and one for which effective treatments were beginning to be developed during the WPA period. Time was of the essence for efficacy of treatment, however. As a poster by the New York state Federal Art Project put it, curing syphilis was possible only if those infected 'did not wait too long' to seek treatment. Thomas Parran, the Surgeon General of the US from 1936 until 1948, was particularly committed to efforts to control syphilis. His 1937 book *Shadow on the Land* was a well-received discussion of how frank and scientifically accurate public conversations about sexual health were necessary to controlling the spread of syphilis, and how recent scientific advances had made treatment more effective.[26] It is important to note that the Tuskegee Syphilis Study, which denied available treatments to poor African American men and their families while claiming to provide free syphilis treatment from the United States Public Health Service,

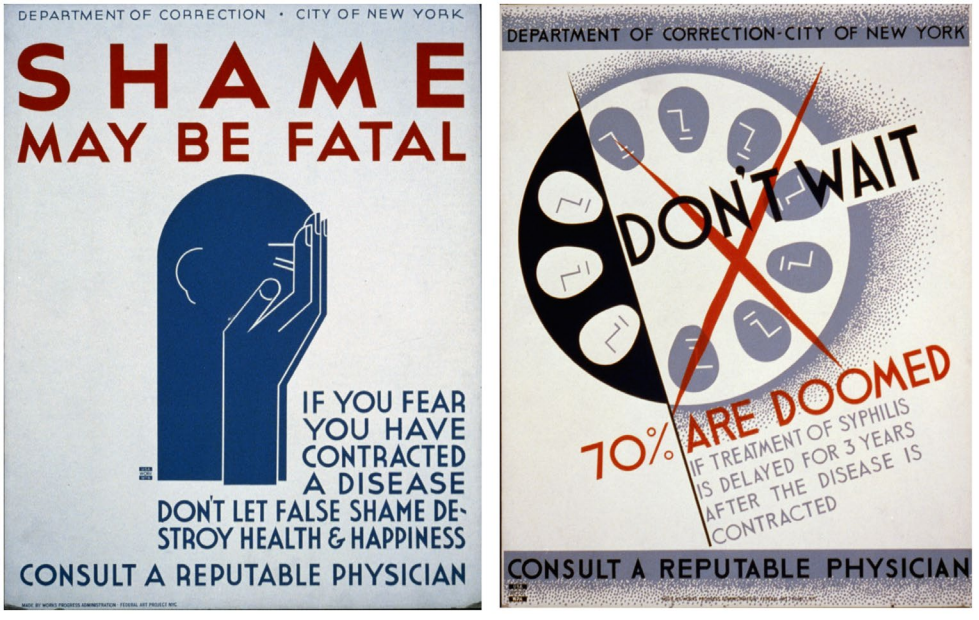

Figure 7. The syphilis posters produced by WPA artists emphasized prompt treatment by medical professionals and encouraged viewers not to let shame or stigma to prevent them from seeking appropriate care administered by trusted medical sources. Posters designed by Foster Humfreville (left) and the New York City Federal Art Project (right) for the New York City Department of Corrections, 1936–37. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-USZC2-1118 and LC-USZC2-1014.

continued to operate during Parran's time as Surgeon General. Scientific advances in effective treatment were not equally available. Regardless, the syphilis posters produced by WPA artists emphasized prompt treatment by medical professionals and encouraged viewers not to let shame or stigma to prevent them from seeking appropriate medical care (Figure 7).

The WPA's general approach to syphilis contrasted with that of the American Social Hygiene Association (ASHA) only a decade earlier. The ASHA was active in the effort to educate public audiences about the dangers of sexually transmitted diseases. However, most of their campaigns exhorted young men and women to embrace what they deemed to be morally appropriate attitudes toward sexuality rather than emphasizing the role medical treatment could play in controlling existing cases and preventing new ones. An ASHA poster series produced during the early 1920s combined photographs and illustrations with brief moralizing texts to promote sexual morality. A poster for young men showed athletes jumping hurdles on a track, with text that read, 'The sex instinct in a boy or man makes him want to act, dare, possess, strive. When controlled and directed, it gives energy, endurance, fitness.' A 1922 poster for a young women showed an illustration of a rosy-cheeked girl carrying school-books. The copy read, 'Sex endows the girl with beauty of body, vivacity, and charm of manner. It is the sex or creative impulse which inspires her warmth of affection, her intensity of purpose, her desire to devote herself to the welfare of humanity.' Another poster from the same year showed an illustration of a young mother serving tea to two small children; the copy advised that 'Home-Making [is] a Science. A real home is no accident. Efficient house-keeping increases home comfort. It requires knowledge and skill.' Smaller text advised girls and young women to 'Learn to care for the house (business efficiency); to spend wisely

(budget system); to feed the family (food values); to care for the baby (child hygiene).' The ASHA posters assumed that sexual health would be achieved through the embrace of traditional gender roles and the re-direction of sexual energy into athletic activity for men and the cultivation of nurturing and home-keeping skills for women.[27] Morality, not medical science, would provide the solution to the developing syphilis crisis – a disease which none of the posters mentioned by name, though they were produced in direct response to it.

In their frank approach to sexuality and sexual health, the WPA posters represented a new direction in visualizing prevention and treatment, particularly for stigmatized conditions like syphilis. By encouraging viewing audiences to overcome feelings of 'false shame and fear' in order to seek care from a 'reputable physician,' the posters echoed the emergent advice of public health officials like Surgeon General Thomas Parran. 'The taboo which until recently surrounded popular discussion has made it difficult for public health authorities in the United States to deal effectively with the problem [of syphilis],' Parran wrote in 1937. 'The lingering association of syphilis with sin has meant that it did not receive from public health officials the same sympathetic consideration that other and presumably more benign diseases have received.'[28] The WPA posters uncoupled syphilis from condemnation of sexual sin, reserving moral judgment for those who continued to expose others to the disease through their refusal to seek treatment. 'You must keep up treatments for at least six months to a year following [syphilis] infection,' a 1936–37 New York Department of Corrections poster instructed. Meanwhile, a 1936–39 New York State Department of Health poster advised that 'Congenital syphilis is preventable if syphilitic mothers will take adequate treatment' and a 1936–39 poster from the same agency implored with viewers to 'Stop the spread of syphilis; tell your physician from whom you got it; treatment will benefit them and prevent its spread.' The posters asked the inverse question, as well. 'Whom have you exposed to syphilis?' another New York State Department of Health poster queried. 'Tell your physician; they should be examined; they may need treatment.' For the WPA poster artists, syphilis was an acknowledged health issue within the family unit and community. Instead of vague moralizing, the posters offered specific instructions, advising socially responsible individuals to take personal, medically-oriented action in preventing the spread of the disease.

Reductivist narratives of threat and resolution

As an indicator of how important syphilis was to the public health dialogues of the day, the 32.61% of WPA public health posters about syphilis stand in stark contrast to the 11.96% of total posters about cancer and 9.78% about tuberculosis. In terms of sheer numbers, syphilis was obviously a large concern. However, the rhetorical strategies and visual messaging of the cancer posters are congruous with those of the syphilis posters. In both cases, the posters picture clear sources of threat and clear strategies for resolution. Both sets of posters stress the importance of timely treatment, the responsibility of the individual to seek treatment, the advances made by medical science, and the difference between appropriate medical care and the commercial remedies of 'quacks.' These strategies echoed the professional literature of the period, which framed a need to educate the public, both about available services and about individual responsibility to seek appropriate treatment. 'Public health has developed to the point where it has become apparent that many diseases cannot be controlled without full citizen understanding and participation,' reported the professional journal *Public Health Reports* in 1945. 'Thus, the principal objective of health education today

Figure 8. Regardless of the health concern at hand, viewers were advised to consult trusted sources of official medical information, such as doctors, health clinics, and health bureau publications. Posters designed by Erik Hans Krause for the New York Health Bureau, 1936–38. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-DIG-ppmsca-38336 and LC-DIG-ppmsca-38341.

is the stimulation of public action and individual participation in preventive health activities.'[29] Like the syphilis posters, the cancer posters proclaimed that 'delay is dangerous' and urged viewers to seek scientifically valid treatment from 'a reputable physician.' Likewise, the TB posters stressed the need for testing to prevent the spread of the disease. They also stressed 'the rules of health' – the individual's personal habits in regard to diet, exercise, rest, and cleanliness – and the need to consult reputable medical professionals for accurate advice.

The emphasis on direct threats and clear sources of resolution remains consistent throughout the sample, regardless of the health topic being addressed (Figure 8). At a historical moment when the relationship between disease and medicine was both firmly entrenched in a model of medical authority and increasingly visually abstracted, this is unsurprising.[30] Of the posters, 43.48% explicitly advise viewers to 'consult a reputable physician,' or get 'advice at your health bureau,' or similar language that directly names a health authority as a trusted method for prevention and/or cure. Though disease and its prevention and/or treatment is the most obvious context in which the threat/resolution dialogue plays out, it is not the only context. The same holds true for posters about road safety, food and nutrition, and physical safety – dog bites, fireworks, protective goggles. Sources of threat are clear, and their prescribed methods of resolution are equally unambiguous.

Figure 9. The WPA posters told a familiar story about public health in the US, one in which patriotic, white, middle-class families were clean, happy, and responsive to positive developments in science and medicine. Posters designed by the Illinois Federal Art Project for the Municipal Tuberculosis Sanatorium and Tuberculosis Institute of Chicago (left), 1936–39 and C. Y. Bienvenu for the WPA War Services of Louisiana (right), 1941–43. Library of Congress, Prints & Photographs Division, WPA Poster Collection, LC-USZC2-5207 and LC-USZC2-5580.

The infallibility of medical science is not the only reductive visual trope at play in the posters, of course. American patriotism figures prominently into the visual language of the sample, a message primarily communicated via color. In all, 30.43% of the posters use a red, white, and blue color scheme. As a whole, the posters also stress the sanctity of home and family. Youth and child welfare and maternal responsibility figure prominently into the cumulative narrative, with 40.22% of the posters addressing one or both of these topics. Cleanliness equals virtue; 15.22% of the posters address cleanliness, often in the context of implying that negative consequences arise from dirtiness. Just over 14% of the posters picture men in work-related contexts and/or dress, emphasizing the traditional masculine gender role and obscuring the national unemployment crisis. From pouring steel to delivering milk, conducting medical exams to selling groceries, the men of the WPA's public health posters are engaged in work. At its peak during the Depression, US unemployment reached above 24%, almost meeting the 25% mark. Yet none of the posters picture unemployment as an explicit health risk, and only 2.17% of the posters show men engaged in the lazy, careless activities of drinking and gambling. Finally, scientific advances and statistical information are portrayed as authoritative sources of knowledge and progress. Of the posters, 19.57% relay statistical information, include symbols of science such as microscopes, germs, and test tubes, or both.

Taken together, these narrative tropes illustrate a familiar story that is indicative of the posters as a whole (Figure 9). According to the posters of the WPA, national public health is a self-evident and uncomplicated story that follows a predictable plotline. Americans love their country and value their home life. Women are keepers of the home while men work professionally to support their families. Cleanliness is next to godliness. And science and medicine point the way to a happier, healthier future. Lived experiences and debates around policy decisions – particularly those surrounding issues of federal funding – reflected a more complicated reality.[31] But the formal and narrative simplicity of the WPA's public health messaging implied a tidy, well-organized scenario of cause and effect. Within this framework, solving socially entrenched health problems was as simple as the uniformly-defined audience following the clearly articulated directions of the appropriate authority figure.

Notes

1. Serlin, *Imagining Illness*; Cartwright, *Screening The Body*.
2. Grant, *Propaganda in Inter-War Britain*; Helfand, *The Picture of Health*; Lewis, *The People's Health*.
3. Carter and DeNoon, *Posters for the People*.
4. Bold, *The WPA Guides*.
5. Pillen, "See America."
6. "Maternal, Infant, and Child Welfare," 601.
7. Gutman, "Race, Place, and Play."
8. Dilworth, *Imagining Indians*.
9. Wasserman, Flannery, and Clair 2007, "Raising the Ivory Tower."
10. Hobbs, "Equality and Difference."
11. US Bureau of Labor Statistics and US Department of Labor, *100 Years of Spending*, 15.
12. Taft, "Public Health and the Family," 145.
13. Wood, "One Third of a Nation," n.p.
14. McCamy, "Variety in Growth," 287–8.
15. Zimand, "Campaign Calendar," 166.
16. Swan, "Public Health Education," 427.
17. O'Connor, *Art for the Millions*, 181.
18. O'Connor, *Art for the Millions*, 180–81.
19. O'Connor, *Art for the Millions*, 177.
20. Lee, "Otto Neurath's Isotype," 167–178; Mitman, "The Color of Money," 40–43."
21. "Social Showman," 618.
22. Mercey, "Modernizing Federal Publicity," 90.
23. Rhodes, "Health Education," 74.
24. Norman and Rorty, "Our 'Civilized' Food Habits"; Dodd, "Conservation of Public Health."
25. Norman and Rorty, "Our 'Civilized' Food Habits," 446–47.
26. Parran, *Shadow on the Land*.
27. Wembridge, "Social Background."
28. Parran, *Shadow on the Land*, 149.
29. Derryberry, "Health Education," 1395.
30. Cooter and Stein, "Visual Imagery and Epidemics," 174–80.
31. Sydenstricker, "Health in the New Deal."

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Intelligible design: the origin and visualization of species

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ABSTRACT

In this article, I argue that visual ideation and design thinking helped Darwin shape his revolutionary ideas about evolution. Visual ideation is a range visual thinking methods that are used to generate, develop, and communicate new ideas. I first discuss how immersion in a richly disordered visual context contributed to Darwin's ideas while sketching. Darwin's 'tree-of-life' sketches are design experiments – hand-on-pencil-on-paper activity that he produced within the context of the disordered visual culture of mid-nineteenth century biological collecting. These sketches helped him to see evolution as an unpredictable, change-driven, time-based set of processes with an indeterminate beginning and end.I next consider Darwin's finished, published tree diagram from his book the *Origin of Species*, which was his attempt to communicate his ideas in visual form to his readers. This diagram is a design artifact, an infographic that was based on the mid-nineteenth century visual vocabulary of tree diagrams. By visual vocabulary, I am referring to visual entities that carry certain content within a culture. I believe this 'tree' visual vocabulary limited how Darwin could give expression to his ideas about evolution. In my conclusion, I underscore how visual ideation is a vital component of both design and science.

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Introduction

> 'When I was a kid growing up in Far Rockaway, I had a friend named Bernie Walker. We both had "labs" at home, and we would do various "experiments." One time, we were discussing something – we must have been 11 or 12 at the time – and I said, "But thinking is nothing but talking to yourself inside."
>
> "Oh yeah?" Bernie said. "Do you know the crazy shape of the crankshaft in a car?"
>
> "Yeah, what of it?"
>
> "Good. Now tell me: how did you describe it when you were talking to yourself?"
>
> So I learned from Bernie that thoughts can be visual as well as verbal.'
>
> Richard Feynman, from *What Do You Care What Other People Think?: Further Adventures of a Curious Character,* as told to Ralph Leighton

In her book *Darwin's Pictures*, Julia Voss states that 'Darwin developed his ideas … by tirelessly creating, reworking, and revising pictures.'[1] Designers know that creating and reworking

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sketches encourages innovative thinking by eliciting unforeseen connections among seemingly unrelated ideas. Darwin's thinking, Voss says, 'can be followed step by step in his sketches.'[2] This leads her to ask a critical question: 'Why are images and evolutionary teachings so closely entwined?'[3] Her partial answer is that Darwin's diagrams – and therefore his thinking – were shaped by the over-collection of biological specimens in the nineteenth century.

Darwin's visual environment

Nineteenth century British scientists, including Darwin, brought back an overwhelming number of biological samples from their expeditions abroad. 'More was collected than could be processed in decades, perhaps even centuries.'[4] It was a 'vast, bewildering array', and for Darwin it called into question commonly accepted species classifications.[5] The disordered and overabundant collecting, in which Darwin was often immersed, made it possible for him to 'recognize the room for variation within species' and 'to ponder evolution'.[6] But precisely *how* did being immersed in these vast disordered collections catalyse Darwin's thinking?

Visual ideation, which is typically part of design thinking is, in fact, fueled by disorder and uncertainty.[7] The massive array of samples that for Darwin shattered species classifications created the perfect environment for visual ideation sketching. In the book *Design Things*, the authors observe that:

> … an immersive mass of material may support intensity in design … creative density means space for odd, surprising, or useless objects in the studio and the chance to find something unexpected in surprising or interesting combinations of those objects … the environment can in some sense be seen as a 'sea' of design material.[8]

And architect and researcher Gabriela Goldschmidt describes how

> Architects like to surround themselves with visual displays that serve, we postulate, not merely as decor for the workplace, but also as potential sources for visual information (shapes, colors, spatial relations) that may be useful in a new design task.[9]

As in design thinking, immersion in a jumbled environment of items helped Darwin to imagine that species variation can move in multiple directions at once, and to ponder the invisible forces behind such a phenomenon. So did sketching.

Darwin's design experiments

A close reading of Darwin's sketches through the lens of design can show that these sketches have more than a didactic meaning; it can show that, in these sketches, we can glimpse the halting and limited but also stunningly creative emergence of a revolutionary idea (Figure 1).

Visual ideation, during which designers think and sketch in order to imagine possibilities for yet-to-be-conceived designed artifacts, requires suspension of preconceived notions about what these artifacts could be.[10] Evolutionary processes likewise require visual imagination to comprehend: we cannot see the processes of natural selection, mutation, or evolution taking place. Darwin had to find ways to 'visualize how one scene modified into another via a mechanism … that could not be directly observed in the present' – which is in essence a design problem, even if he would not have conceived it as such.[11] To visualize

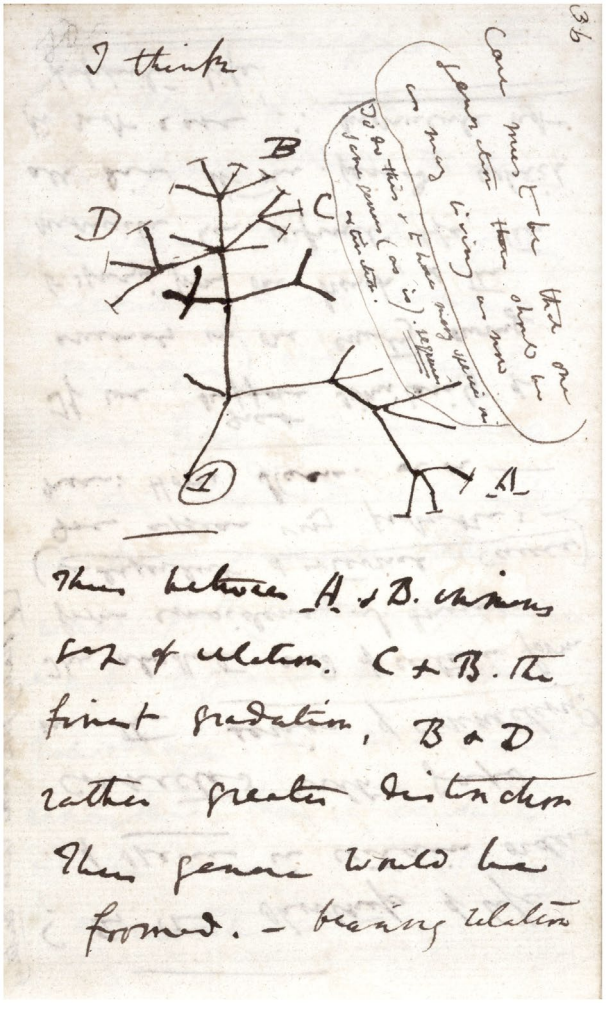

Figure 1. Charles Darwin, Tree-of-Life sketch from Notebook B, 1837. Reproduced by kind permission of the Syndics of Cambridge University Library. MS.DAR.121:p36.

these hidden mechanisms, Darwin used his hand (and pencil or quill) to let his mind roam on the page.

Darwin sketched and wrote in a series of notebooks. Scholar James Costa describes Darwin's Notebook B as the space in which he thinks through species transmutation, a nineteenth century term for the altering of one species into another. Costa explains:

> … we find the first expressions of a genealogical view of species: first a tentative branching 'coral of life', then, a few pages later, a bold ramifying tree-like sketch with species or species groups branching from a common trunk; this beautiful diagram is prefaced with the words 'I think' – a vision that clearly set Darwin's conception of transmutation apart from all earlier attempts.[12]

Researchers have interpreted the didactic scientific content of Darwin's 1837 'Tree-of-Life' sketch from his Notebook B. Voss describes it this way: 'as the lines branch off, they symbolize how species vary over the course of generations. The abrupt end of a line indicates extinction. Lines that end with a cross stroke stand for … those still living'.[13] But critics look past the

content that's suggested by visual or formal aspects of this sketch. The 1837 'Tree-of-Life' from Notebook B is an active thinking sketch, that is, a sketch done while Darwin thinks about how evolution might operate. Its branches go in random directions in a seemingly disorderly manner, 'a fragile, irregular pattern – a sprawling growth with nodes and gaps'.[14] The handwritten '1' in the diagram indicates a starting point for the processes that Darwin is considering; it may represent the origin of species or some random origin, and it suggests an indeterminate beginning.[15] In Darwin's hand, the sketch line moves, morphs, starts and stops, and changes course as he thinks. Darwin's builds his diagram over time, in a sketching action that architect Richard McCormick describes as 'a process of criticism and discovery'.[16] Darwin jotted down his thoughts in handwriting at two different angles on the page. The handwritten notes that surround the diagram are not mere text, however; they are a visual component of his ideation. His written comment 'I think' runs parallel to the edge of the paper at the top of the page, giving it a hierarchical prominence: this page is for *thinking*.

But the right side of this 'I think' text also aligns visually with an angle that runs along right edge of the line drawing – between the sketch and the text in balloon shapes. This formal relationship indicates the importance of the sketch to Darwin's thinking: 'I think' refers first to the processes that are expressed in the diagram, and then to the textual content on the right side of the page. This text reads:

> … case must be that one generation should have as many living as now. To do this and to have as many species in same genus (as is) requires extinction. Thus between A + B the immense gap of relation. C + B the finest gradation. B + D rather greater distinction. Thus genera would be formed. Bearing relation (next page begins) to ancient types with several extinct forms.[17]

On this page of Notebook B, Darwin uses both his sketches and his writings to sort out his ideas about how a group of related species – called a genus – could come into being, and how some species within a genus could end up more closely related than others.

Darwin leaves white space on the left one third of the page next to the sketch, and his sketch pushes into the right two thirds of the page. The sketch part of the page creates an asymmetrical composition, which is very different from the typical tree diagram of the time. And the whole composition angles up to the right, adding to the dynamic quality of the information contained therein. The text that begins with 'Case must be that one generation …' extends from the drawing and thus becomes part of the visual. As noted above, in this text Darwin is sorting out some theoretical insights into how a genus that includes a group of related species might originate by divergence from a starting point and how some species may go extinct. The written idea of extinction balloons from Darwin's tree sketch and practically extends off the right side of the page. In my opinion, this composition suggests how immense these ideas must have seemed to Darwin, reaffirming an indeterminate timeframe – right off the edge of the page – for both the origin and extinction of species. Darwin's visual ideation process itself shared striking similarities with the evolutionary processes he sought to pin down. Like evolution by natural selection, visual ideation is a trial-and-error process in which abundant ideas or series of ideas come to fruition, morph, or die off in response to internal and external factors.

Visual ideation and design

Simultaneous sketching and thinking – as Darwin did in this tree-of-life sketch – are keys to visual ideation. Indeed, design researcher Nigel Cross writes that it is inadequate to design

by relying on thinking alone. Sketching, he writes, 'provides some of the circumstances in which a designer puts him- or herself into the design situation and engages with the exploration of both the problem and its solution'.[18] Putting pen or pencil to paper while thinking seems to stimulate both creative thinking processes and unexpected outcomes.

Darwin did not make any notes about the function of his visual ideation process. My own design practice, though, suggests that what Darwin experienced while sketching may be extrapolated from design processes. Although designers may perform different sorts of sketching processes, I would like to argue that the process Goldschmidt describes below maps onto Darwin's sketching while thinking processes. In the essay *The Backtalk of Self-Generated Sketches*, Goldschmidt presents a designer's description of the simultaneity of thinking and drawing:

> I can't get very far with just thinking about it without drawing something. … I like fuzzy stuff. I can see things in it more than I can in harder-lined things. So, sometimes I just get a lot of lines out and then I start to see things in it. A lot of times, I pick up things I think are important. I put down potentials.[19]

The messiness of Darwin's 'Tree-of-Life' diagram, the uneven line widths, the fuzzy ink blobs, the sprawling, irregular pattern, suggest that this diagram was drawn fairly quickly, while Darwin imagined the processes that he was trying to represent. Goldschmidt explains that visual ideation is 'rapid and direct … the sketcher can enter into conversation with his or her materials'.[20] Although most designer sketches are quick and messy, the messiness of the 'Tree-of-Life' sketch also suggests the untidiness, unevenness, and unpredictability of the organic natural processes that it delineates. Darwin, in fact, felt that the character of evolutionary processes that he struggled so hard to pin down got lost in translation in what I will talk about shortly – the tidy tree-of-life diagram that was printed in the *Origin of Species*. His dissatisfaction with the *Origin* diagram is a testament to his sense that evolutionary processes such as the multiplication of species were organic and plastic rather than clean and orderly.

Darwin attempts to depict time

Darwin struggled to find ways simultaneously to depict time and species variation and divergence in his diagrams. Including information about the passage of time and the relationships among species in a succinct diagram, along with the other abstract information that Darwin needed to incorporate, is difficult to accomplish in two-dimensional still media. Critic Heather Brink-Roby points out that although 'Darwin emphasizes the superiority of two-dimensional diagrams', over text for showing species relations, Darwin writes that even diagrams are 'unable to capture adequately both the complexity of natural relations and the element of time'.[21] Yet Darwin persisted (Figure 2).

Designers often need to render a series of sketches in order to work out particularly complicated or vexing content. Darwin did not fully resolve the time/species relationships depiction dilemma for his published diagrams. But he did design a series of sketches using tree diagrams between his 1837 Tree-of-Life and the publication of the *Origin of Species* in 1859. Psychologist Rudolf Arnheim describes such sketches as 'stop-motion glimpses of the flow of creation'.[22] In these sketches Darwin attempted to sort out ways to depict both time and evolutionary processes together.

In 1840, American geologist Edward Hitchcock superimposed 'geological time on a branching diagram of plant and animal relationships'. And in 1848, Swiss geologists Louis

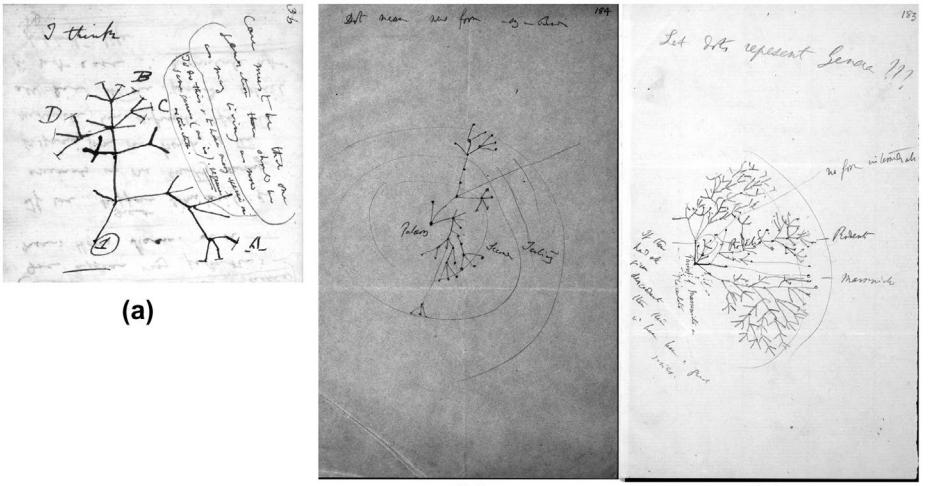

Figure 2a, 2b and 2c. Charles Darwin, Tree-of-Life sketch from Notebook B, 1837; MS.DAR.121:p36; 1850s tree sketch showing geological time, MS.DAR.205.5:f183r; 1857 sketch showing geological time, MS.DAR.205.5:f183r. Reproduced by kind permission of the Syndics of Cambridge University Library.

Agassiz and Augustus Gould produced a circular diagram that showed the distribution of animals over time in the 'order of their successive appearance in the layers of the earth's crust'.[23] Darwin appears to have borrowed the Hitchcock/Agassiz/Gould models in his 1850s sketches in which he used concentric semi-circular shapes to designate the boundaries of geological time. The concentric circles that represent geological periods, which worked in the previous scientific diagrams, did not work as well with Darwin's complicated ideas. In their classification diagrams, Hitchcock and Agassiz/Gould layered structure (classification) upon structure (deep time), while Darwin's evolution sketches instead attempted to layer complex process (evolution) upon complex structure (deep time). Depicting diagrams superimposed over a structure using concentric circles kept Darwin's infographic sketches from coming together as a unified form, in effect mixing visual metaphors.

Darwin's attempt to utilize time as a circular form, though, foreshadowed contemporary radial tree diagrams, one of several sorts of diagrams that are used today to portray the relationships among groups of organisms, called phylogenetic relationships (Figure 3(a) and (b)).

In radial tree diagrams species relationships and time both build from the center outward. These radial trees unify time and aspects of species evolution: time is depicted as a series of concentric circles into which a number of complex interrelated tree diagrams are mapped.

Darwin's infographic

Darwin used 'infographic' sketches to make complicated ideas clearer for his own purposes, as described above; he also worked with printers to produce finished infographics. His sketches helped him think, but he also needed to communicate his ideas to others. Darwin used the ideas in and visual forms of his sketches to design a finished diagram for *Origin of Species*, an infographic that helped to make his complicated ideas available to readers (Figure 4).

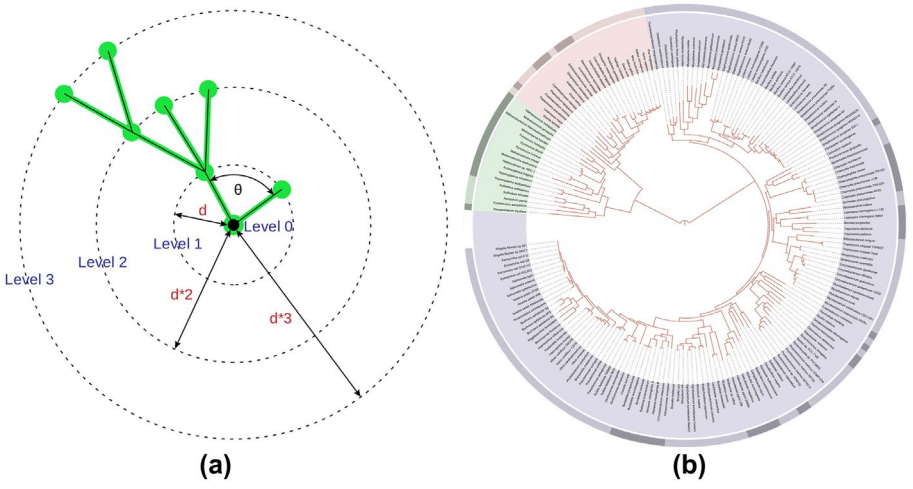

Figure 3. (a) General structure of radial tree diagrams; Wikimedia https://commons.wikimedia.org/wiki/File:Radial-graph-schmatic.gif; (b) David Hillis plot of the 'Tree-of-Life', based on completely sequenced genomes. The very center represents the last universal ancestor of all life on earth. The different shades of gray represent the three domains of life: eukaryota (animals, plants and fungi); bacteria; and archaea. Note *Homo sapiens* (humans) second from the rightmost edge eukaryote section. Wikimedia http://en.wikipedia.org/wiki/File:TreeoflifeSVG.svg

Darwin says of a diagram from his manuscript for *Natural Selection* (which was not published until 1975) that led to his *Origin* diagram:

> The complex action of these several principles, namely, natural selection, divergence & extinction, may be best, yet very imperfectly, illustrated by the following Diagram, printed on a folded sheet for convenience of reference. This diagram will show the manner, in which I believe species descend from each other & therefore shall be explained in detail …[24]

In the *Origin* diagram Darwin made a design decision not to use the semi-circular representations for time that he had been exploring. He instead chose to show time on the vertical axis; species (labeled A–L) within a hypothetical genus are on the horizontal axis. This arrangement works well because time is not rendered as a graphic that underlies a simple branching tree diagram, but instead is incorporated into the infrastructure of the diagram. The *Origin* 'Tree-of-Life' rendering indicates how distinct one species is from another by varying the amount of space between them on the horizontal axis. The dotted lines below the letters effectively show that the species have diverged from one or more common ancestors in an indeterminate timeframe as indicated on the vertical axis. The branching lines communicate the idea that species give rise to other species that may either continue to exist or go extinct.

Darwin's 'Tree-of-Life' in *Origin*, however, required eight pages of accompanying text to communicate fully his dynamically networked rendition of unpredictable genesis, change, and eradication over an expanse of time with no clear beginning or end. Voss writes that Darwin's ideas about 'competition, effort, and struggle' were delivered through his text, and his concepts of 'chance, variation, disorder, and incompleteness' were expressed in his diagram. But I would argue that the *Origin* diagram – with its tidy minimalist geometric two-dimensional representation of Darwin's ideas – fell far short in its attempt to show disorder.

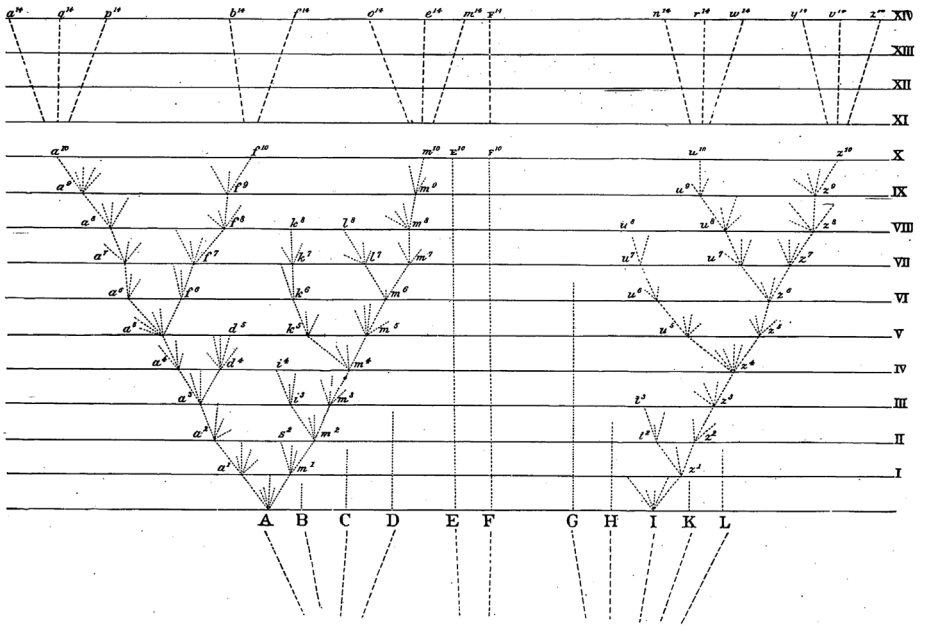

Figure 4. Charles Darwin, 'Tree-of-Life' diagram from *The Origin of Species*, 1859. Reproduced by kind permission of the Syndics of Cambridge University Library. Syn.7.85.6.

Darwin understood that the visual vocabulary of this diagram was missing a fundamental quality of his ideas. He writes:

> I must here remark that I do not suppose that the process[es of species divergence, natural selection, and extinction] never [go] on so regularly as is represented in the diagram, though in itself made somewhat irregular. I am far from thinking that the most divergent varieties will invariably prevail and multiply: a medium form may often long endure, and may or may not produce more than one modified descendant; for natural selection will always act according to the nature of the places which are either unoccupied or not perfectly occupied by other beings; and this will depend on infinitely complex relations.[25]

Although Darwin could not capture all of the complexity of his ideas in one diagram, his thinking sketches communicated disorder better than the *Origin* diagram precisely because they conveyed 'a fragile, irregular pattern – a sprawling growth with nodes and gaps'.[26]

The visualization of information typically requires a balance between clarity and complexity. Because an infographic is a succinct presentation of information in one unified artifact, designers must use each and every part of it to make meaning – this includes the infographic's formal, material, and aesthetic qualities. 'Information-visualization designers do not only aim for efficiency and clarity' according to Lev Manovich. He points out that they choose:

> … visualization techniques and graphic styles in order to communicate an idea about the data and to evoke particular emotions in the viewer. For example, a network visualization may emphasize the density of the network, present it as a result of organic growth, focus on its instability and dynamism, or show the same network as a logically arranged, symmetrical, top-down, and stable structure.[27]

In other words, information-visualization designers use every means available to balance clarity and complexity in one unified artifact, always being aware of what its visual and material qualities contribute to the content. Although Darwin's *Origin* Tree-of-Life communicated didactic information well – species divergence and emergence, and continuation and extinction – it was far too orderly to show the disorder, unpredictability, and randomness that are so vital to Darwin's ideas.

Despite the shortcomings of his *Origin* diagram, though, Darwin clearly managed to communicate his complex theories. Biologist Theodore Pietsch explains that 'It was largely his diagram and carefully worded step-by-step explanation that sold his revolutionary ideas to an initially skeptical audience.'[28] Darwin conveyed the sense of disorder, randomness, and indeterminate time that his ideas embodied using both the tree infographic and his descriptive text.

Limitations of the tree diagram and contemporary evolutionary infographics

I would like to argue that it was not just the multiple factors that he needed to embed in one graphic, or the tidy visual vocabulary of his *Origin* diagram that hindered a more capacious visual representation of evolution by natural selection. Darwin's ability to express his ideas using tree-of-life diagrams was inevitably colored by the design limitations of these popular tree diagrams. Although the branching tree diagram was good for showing organizational relationships and classification systems, it was hardly adequate for representing Darwin's complex impressions and comprehensive concepts. Darwin's novel approach to biology – which underscored the interrelationships among Deep Time, organisms, and hidden dynamic biological processes – didn't yet have a visual language on which to hang its hat in the mid-nineteenth century. While using the simple tree diagram to undergird his thinking enabled the depiction of some aspects of his theories, it foreclosed on other aspects.

Pietsch writes that mid-nineteenth century tree diagrams were 'meant to demonstrate perceived affinities or similarities between plants and animals' and to 'bring order into the chaos of names and kinds of living things'.[29] Even early 'networked' diagrams, such as the Table of Affinity of the Vegetable Kingdom, published by in 1802 by August Johann George Carl Batsch, showed only an interrelated *classification* of species. According to information designer Manuel Lima, most nineteenth-century scientists sought to understand '"the influence of one variable over another', and Voss points out that most English naturalists still drew 'circles, lines, and parallels' or reduced the animal kingdom 'to dialectical equations'.[30]

Darwin understood that the phenotypical traits – that is, the visible traits of genes that are expressed by organisms, such as eye color or height – that individuals express are infinitely varied. He knew that natural selection and extinction are slow moving, random processes that act upon these varied traits in conjunction with a whole host of environmental factors. But Darwin was mystified by the mechanisms behind variation and natural selection, what he calls 'the infinite complexity of the coadaptations between all organic beings …'[31] In other words, his ideas about evolution went far beyond just the structure of the relationships among certain species (Figure 5).

Figure 6 shows visual representations of three natural systems. In the early twentieth century scientists began to apply what Darwin had already observed: the idea that natural systems had multiple variables that interacted randomly and sometimes chaotically.[32] The

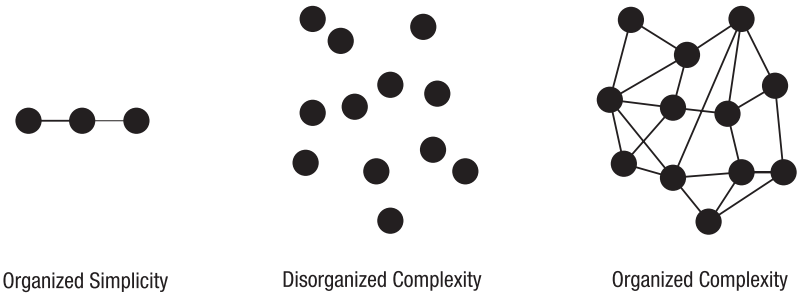

Figure 5. Schematic of three different ways of visualising natural systems.

study of these complex linkages at various scales is the main goal of complex systems theory. The scientific application of complex systems is often called 'complexity science' which is defined as 'the study of the phenomena which emerge from a collection of interacting objects'.

The random traits and unpredictable forces that Darwin describes in *Origin*, and an earlier version of *Origin of Species* entitled *Natural Selection*, fit what mid-twentieth century American scientist Warren Weaver called 'disorganized complexity'. In disorganized complexity, natural systems have variables that are random.[33] Systems of disorganized complexity typically have a large number of elements, with no correlation among these elements. The large number of possible variations among members of a species, for example, and the large number of possible environmental forces that can act upon these variations are systems of disorganized complexity. But Darwin's ideas also have characteristics of what Weaver called systems of 'organized complexity'.[34]

Organized complexity, which took hold in the middle of the twentieth century, still characterizes contemporary thinking about natural systems. Contemporary natural systems are understood as networks, complex systems with multiple interconnected variables. Systems of organized complexity are characterized by non-random or coordinated interaction among its elements – these systems are typically complex networks with multiple interconnected variables. The interrelationships among forces and traits in Darwin's theories are systems of organized complexity: the forces of natural selection, for example, act upon the random variations within a species to precipitate evolution, divergence, and extinction of species.

Darwin understood that evolution was a complex system. He presciently points out in his massive tome *Natural Selection*, that 'The relation of all past & all present beings may be loosely compared with the growth of a few gigantic trees.'[35] A group of trees, however, is not a unified representation of all species relationships. 'Perhaps realizing this,' Costa suggests, 'Darwin opted to represent the profusion of life with the single-tree metaphor.'[36] His metaphorical few gigantic trees, though, are elements of a nascent system of organized complexity.

Darwin had to use text and image together to try to depict the systems he intended to communicate to his audience. His *Natural Selection* passage about a group of trees suggests again that at some level he understood that his single tree image – even with his textual descriptions – was too simplistic to properly represent his ideas, although he may not have fully figured out why. The evolutionary mechanisms that Darwin intuited are explained by DNA, but DNA and the idea of random genetic mutations were not known yet. And Darwin certainly had not figured out how to best represent this complexity in an infographic.

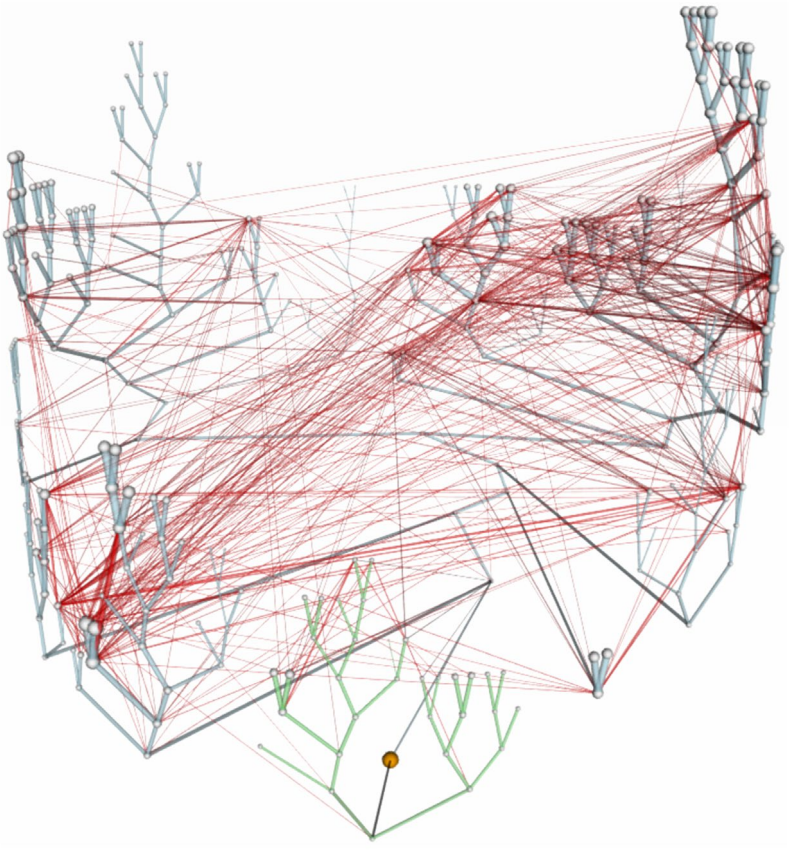

Figure 6. The Net of Life, 2005, From V. Kunin, L. Goldovsky, N. Darzentas, and C.A. Ouzounis. Microbial phylogenetic network, with the dominant vertical gene flows represented by tree-like branches (cyan for bacteria, green for archaea in colour version), and horizontal gene flows represented by horizontal vines (red in colour version). Note that certain species (represented by nodes) are hubs connecting horizontal gene flows across certain areas of the network. The groundbreaking nature of this work is that these vertical and horizontal gene flows were not drawn manually or for visual purposes only, but they were computed using exact algorithmic models across multiple genome sequences and their evolutionary patterns, thus quantifying the relative contributions of vertical and horizontal inheritance. http://www.ncbi.nlm.nih.gov/pubmed/15965028. Used with kind permission of Dr Christos Ouzounis.

Darwin's speculation about multiple trees, however, foreshadowed a kind of contemporary phylogenetic infographic – a diagram depicting historical evolutionary relationships among organisms – that uses interrelated multiple trees in webs or nets. 'Net-of-life' diagrams developed out of research on DNA and RNA sequencing in the late twentieth century. Again, DNA and how it functioned were unknown in Darwin's time. The information that's encoded into DNA and RNA, and how that information responds to environmental forces, provides the missing explanation Darwin sought for species variation. DNA and RNA are the unknown mysterious stuff – that perplexed Darwin – upon which natural selection acts.

Called molecular evolution, this contemporary field developed techniques to read DNA and RNA sequences and those of other biomolecules such as proteins. Scientists first sequenced bacterial RNA from ribosomes – organelles that are found in cells – which bore

out Darwin's evolutionary tree structure. According to Graham Lawton of *New Science* magazine, the pioneers of molecular evolution believed that DNA sequencing would likewise validate the accuracy of Darwin's 'Tree-of-Life'. In fact, DNA sequencing called into question the very premises behind Darwin's tree.

DNA sequencing in bacteria, plants, and animals indicates that they crossbreed or have crossbred at times, 'meaning that instead of genes simply being passed down individual branches of the tree of life, they are also transferred between species on different evolutionary paths'[37] The diagram in Figure 6, for example, depicts a 'three-dimensional representation of the net of life – an updated version of the 'Tree-of-Life'. Red lines depict horizontal gene transfer. These lines tie together individual bacteria and archaea (another group of microscopic life forms), all of which originate from a common root shown in orange'.[38]

Scholars DeVarco and Clegg argue that phylogenetic tree-of-life infographics evolved from Darwin's limited flat hierarchical phylogenetic tree to two-dimensional radial as well as three-dimensional spherical configurations in response to the new ideas in molecular evolution.[39] Yet, in *Origin* Darwin paints for the reader a version of a net of life, an image of a spatial thicket of interrelatedness in a passage that has sometimes been called his 'entangled bank' text. He writes:

> It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us.[40]

In the entangled bank text Darwin describes a dynamic three-dimensional web of life, a prescient image of evolutionary nature that evokes contemporary net-of-life diagrams, such as the net-of-life diagram shown in Figure 6. Although Darwin renders this in text rather than as an image, the reader comes away with a mental picture of the 'richness of the variety of life', its 'complex interdependency', and its 'weaving together an aesthetic fullness'.[41]

This text would be a challenge to depict as an infographic, but it suggests sites of tension between clarity and fluidity in Darwin's infographics. Entanglement is a design problem that Darwin only partially solved. Without a knowledge of genetics, he couldn't have known how fully entangled that bank was. Yet Darwin presents a remarkable netlike version of variation, natural selection, and extinction in his diagrams and text – it was as complex as his inherited visual vocabulary would allow.

Science and visual thinking

Although it's not always obvious, science and design have rich areas of overlap, and they both utilize visual thinking. Physicist Richard Feynman described his own visual ideation as bringing:

> … birth to clarity, which is really a half-assedly thought-out-pictorial semi-vision thing. … I take this turn – like as if there was a big bag of stuff – and try to collect it in a way and to push it. It's all visual. It's hard to explain.[42]

And Einstein explained his visual ideation in ways that suggest the absolute importance of visual thinking to the production of new ideas. He writes:

> The words or the language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in thought are

> certain signs and more or less clear images which can be 'voluntarily' reproduced and combined. … This combinatory play seems to be the essential feature in productive thought before there is any connection with logical construction in words or other kinds of signs which can be communicated to others.[43]

When asked if information visualization is science or design, Lev Manovich responds that they exist in the same space.[44] Design and science are both rooted in culture. Both are characterized by cultural paradigms that falsify some ideas and reveal others. And they are constructive partners in the evolution of our ideas about evolution.

Conclusion

In this article, I consider how immersion in a richly disordered visual context contributed to Darwin's ideas while sketching. Architect Kyna Leski calls this element of the creative process 'gathering', in which the creator is submerged in ideas and things. She argues that that creative gathering starts to 'structure or hold together content, and begins to structure or give form to an idea. This gathering … is the genetic code of form … how we take information in, process it, and project it back out'.[45] Darwin's gathering helped to shape the 'tree-of-life' design experiments in which he could see evolution as complex: an unpredictable, change-driven, time-based set of processes with an indeterminate beginning and end.

Yet, Darwin's tidy tree diagram from the *Origin of Species*, which was delimited by his nineteenth century visual vocabulary of tree diagrams, failed to show this complexity. Darwin did attempt to assimilate visual renditions of Deep Time and evolutionary processes in a series of thinking sketches in which time is depicted as a series of concentric circles. These visual experiments were never resolved, but they presaged contemporary circular phylogenetic tree diagrams. Darwin's description of evolution as an interrelated group of trees likewise foreshadowed contemporary phylogenetic net-of-life diagrams, and his notion of evolution as an entangled process anticipated twentieth century scientific complex systems.

Leski writes: 'When the arc of your own life intersects with an arc of the creative work in which you are engaged, it establishes a … noncausally related occurrence that leaps your work forward into a new realm.'[46] A vital component of much creative thought in both design and science, visual ideation was instrumental in precipitating Darwin's visionary work. It allowed him to visualize a process whose gradual changes over long periods of time he could never actually see, and to theorize a process whose implications we are still absorbing.

Notes

1. Voss 2010, 7.
2. Voss 2010, 7–8.
3. Voss 2010, 7.
4. Voss 2010, 8–9.
5. Voss 2010 88.
6. Voss 2010, 8–9.
7. Leski 2015, 1–8.
8. (Binder *et al*. 2011, 33–34)
9. Goldschmidt 2003, 85.
10. Leski 11–34.
11. Smith 2009, 10.
12. Costa 2009, xiv.
13. Voss 2010, 63

14. Voss 2010, 62.
15. Grosz 2004, 21.
16. McCormick as quoted in Cross 2011, 71.
17. Darwin 1837, Notebook B.
18. Cross 2011, 12.
19. Goldschmidt 2004, 86.
20. Goldschmidt 2004, 87.
21. Brink-Roby 2009, 249.
22. Arnheim 19.
23. Pietch 2012, 70, 82.
24. Darwin 1987, 238.
25. Darwin 1987, 238.
26. Voss 2010, 62.
27. Manovich 2013, 12–13.
28. Pietsch 2012, 87.
29. Pietch 2012, 7.
30. Lima 2013; 96; Voss 2010, 96.
31. Darwin 2009, 109.
32. Lima 2013, 45.
33. Lima 2013, 45.
34. Lima 2013, 45.
35. Darwin, 1987, 249.
36. Costa 2009, 129.
37. Sample 2009.
38. Lima 2013, caption Figure 24, 68.
39. DeVarco and Clegg, 2010.
40. Darwin 2009, 489.
41. Beer 2000, 159.
42. Gleick 1992, 244.
43. Ghiselin 1952, 32.
44. Manovich, 2013, 12.
45. Leski 2015, 56.
46. Leski 2015, 137.

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Leslie Atzmon is Professor of Graphic Design and Design History at Eastern Michigan University in the US. She is both a graphic design practitioner and design historian. Atzmon edited the collection *Visual Rhetoric and the Eloquence of Design* (Parlor Press 2011), and is currently co-editing *The Graphic Design Reader* (forthcoming from Bloomsbury in 2017) with Professor Teal Triggs of The Royal College of Art, and the collection *Encountering Things: Design and Theories of Things* with industrial design professor Prasad Boradkar of Arizona State University (forthcoming from Bloomsbury in 2017). Atzmon and colleague Ryan Molloy were awarded a National Endowment for the Arts ArtWorks grant from 2012-2014 to run experimental book design workshops, and to edit, design, and produce the book *The Open Book Project*, which explores the history and future of the book through scholarly essays and an exhibition catalogue. Atzmon was in the UK through June 2016 on a Fulbright fellowship supported by Central Saint Martins, University of the Arts London. Atzmon's Fulbright research is on Darwin and design thinking.

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Fresh paradoxes in food data

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ABSTRACT

This article frames some of the implications of consumer-facing 'fresh food traceability systems' for designers. These infrastructures, which support the production and transportation of perishable food, enable the tracking, or 'traceback' of different items as they move from farm to table. Food traceability presents a unique paradox: communicating new information about the provenance of food contradicts a longstanding history of obfuscation in the design of its packaging and advertising. In this article I analyze this paradoxical nature of food as a data object, and present designers with a series of contradictory positions they have to navigate when working with fresh food traceability systems. These include ambiguity regarding stakeholders, issues of schematization, and third order effects of ubiquitous food data.

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Introduction

The infrastructures that support the production and transportation of perishable food are becoming more robust and more ubiquitous, affording the tracking, or 'traceback' of different items as they move from farm to table. For example, services like HarvestMark (http://www.harvestmark.com/) allow consumers to receive limited information about the origin and quality of some fresh fruits and vegetables by entering a 16-digit code into a website.

Traceability is a term for means of recording, recalling, and displaying the path of a perishable food item from farm to table. Traceability is often established to address the problem of locating and destroying hazardous products, but as other issues involving the provenance of food become matters of public concern, the potential scope of traceability expands. It is this potential scope of traceability that has to be negotiated by the public and articulated through design.

While the work of some critical designers, such as The Center for Genomic Gastronomy, has focused on issues within food systems, there has not been a focus on food traceability within communication design. Much of this is because food traceability is a new area of research and practice. Furthermore, as food data exists at an almost infrastructural level – there to facilitate inquiry without being too overt in advertising an ability to inquire – the role of the communication designer may be muddled by contradictory objectives. This is

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unfortunate, because formal communication design input can change both the structure and effects of food traceability systems. As designers begin working in the space of food traceability they will have to contend with the ways that communicating new information about the provenance of food contradicts a longstanding history of obfuscation in the design of its packaging and advertising. In this article I analyze this paradoxical nature of food as a data object, and I argue that food traceability is contesting the longstanding relationship between the presentation and performance of the idea 'freshness,' and the obfuscation of food supply chains (Vileisis 2008:97–160[22]; Freidberg 2010[9]: *passim*.) This reveals a disconnect between the structural and aesthetic components of food packaging and promotion that communication designers have traditionally engaged with, and highlights a new, disembodied stream of information accompanying food products.

At the same time, I have titled this article 'Fresh Paradoxes in Food Data' to reference Dorst's conception of design paradoxes. Bennett has argued that issues arising from the global food system constitute a wicked problem (Buchanan, 1992[3]; Rowe, 1991; Rittel & Weber, 1973[16]), one that is 'hard to solve because one solution may disrupt the system, lead to other problems, or only address a small part of the whole problem' (Bennett, 2013[2]: 6.) In calling upon Dorst's ideas of design paradoxes, which involve a designer repeatedly cycling between problem formation and potential solutions, I attempt to accept the wickedness of the problems that arise from and are exposed by fresh food traceability. Dorst argues that designers have to bridge different discourses while avoiding their potential contradictions (Dorst 2006[7]: 10, 16.) Without dismissing the possibility of food traceability addressing problems within food infrastructures, I present traceability as a set of four issues which require the designer to navigate contradictory positions:

I. Users may not be clients, and eaters may not be producers. There is ambiguity regarding stakeholders, and it may be difficult to determine who the designer is working for, and who traceability is intended to benefit. For example, a designer tasked with improving the consumer's ability to access food safety recall information will be walking a fine line between improving and promoting a food traceability service and increasing consumer awareness of the possibility of contaminated food. When viewed from the consumer's perspective, maximizing awareness of access to food safety information is more important. When viewed from the perspective of producers, transporters, and retailers, raising the specter of contamination may have negative economic consequences.
II. Designers will need to contend with the formats in which traceability information is recorded, stored and presented. This extends beyond the typical constraints and affordances provided by governmental and other standards. In designing for and with fresh food traceability data, questions arise concerning the categorization of different food production and distribution activities. That categorization can have a reciprocal relationship to design: the presentation of food traceability data may force a reconsideration of its categorization, forcing its re-presentation, and so on.
III. The digital infrastructures of food production point to a future/present in which food 'objects' possess digital footprints that designers will have to contend with. Drawing from II (above), designers and consumers will be confronted not just with the ubiquity of food data, but by its becoming ephemeral. After all, we are concerned with data on perishable commodities, and while the systems that route those commodities may remain relatively constant, the units moving through them are in a constant process of literal degradation.

Figure 1. Harvestmark label from a package of raspberries. Note that while these labels might be offered as points of access to the histories, life cycles, and contested agencies of food production, they tell us little on their own. They seem designed for a world in which a human operator exists as an interface between UPC or QR codes and machine readers.

IV. The designer working with food traceability systems will need to navigate the relationship between the data footprints of humans, and those of their food. As a matter of concern, food traceability data overlaps with other issues involving data, tracking, and human health, ranging from the level of the single meal of a single individual to the diet and health of large groups.

In the second half of this article, I analyze all of these issues in detail. First, it is necessary to explain traceability processes in greater detail, stopping to point out issues for communication designers.

Traceability for consumers

I first encountered traceability through a sticker next to the label on a package of raspberries. It read, '[s]ee where and when I was grown. Enter the code at harvestmark.com.' An arrow on the sticker pointed at a sixteen-digit alphanumeric code on the label. I entered that number into the harvestmark website. The results were underwhelming. I noted that the raspberries' 'safety status' read 'no issues reported.' Then I felt naive for assuming that the food I bought was determined to be free of 'issues' *before* it was put on the shelf. Was food safety now the responsibility of the consumer? What happened to the USDA and the FDA?

I realized I'd seen the same type of code before, remembering a package of mushrooms I'd bought a few days earlier. I entered that code into Harvestmark too. Again, no 'issues' were reported, but this time I was given some additional information – their country of origin,

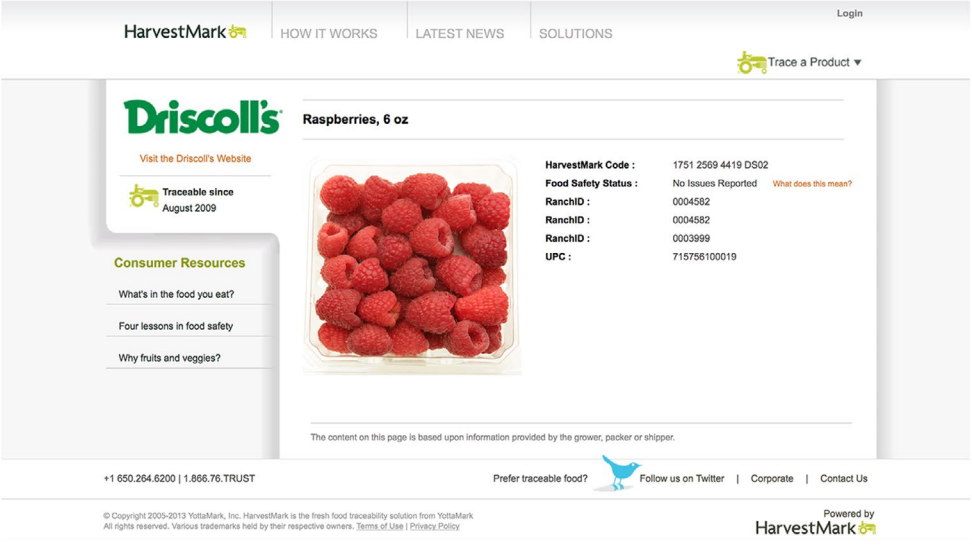

Figure 2. Harvestmark traceability report. Source: my.harvestmark.com/ResponsePage.aspx?Code=1751 2569 4419 ds02#. Accessed 01.20.15 The results of entering a 16-digit code from a package of raspberries into the Harvestmark website: 'No Issues Reported,' and uninformative boilerplate.

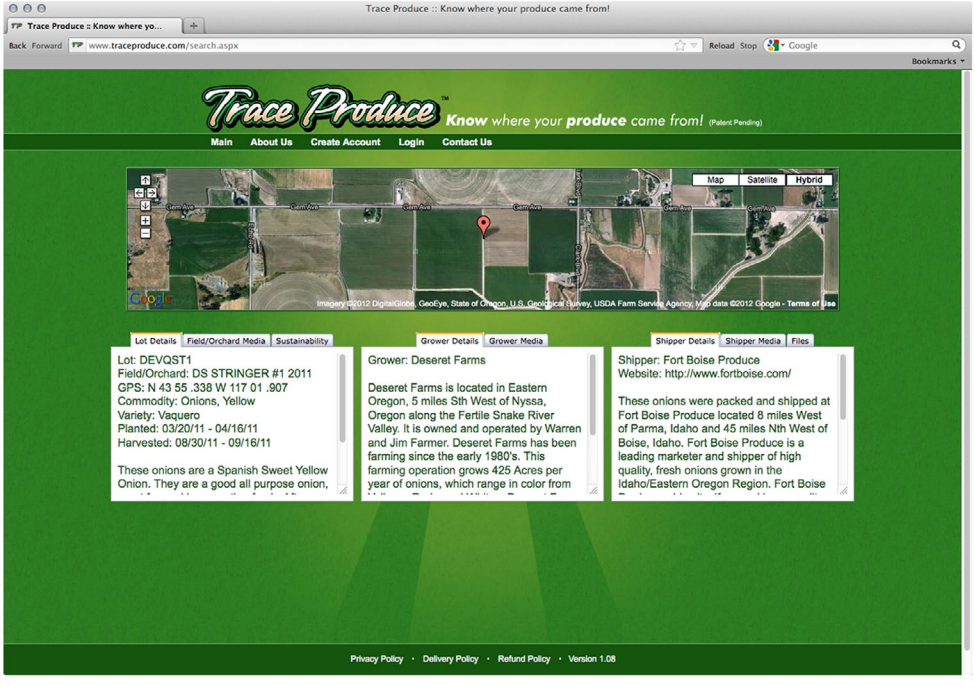

Figure 3. Trace produce.com report on yellow onions. Source: http://www.traceproduce.com/search.aspx. Accessed 01.20.15 Information on Trace Produce was more substantial than that on HarvestMark, but fills a fragment of the space of possible consumer-facing systems. The area is ripe for design research and the creation of new prototypes.

state of origin, and packing location. Next, the code from a package of spinach let me know that it had been grown in either Imperaial [*sic*] County, California or in Yuma or Maricopa counties, Arizona.

I wondered how was I supposed to interpret that information, and what my experience as a customer was designed to be. I realized that the dissonance I was experiencing arose from the expectations advertising and design had already instilled in me. The industrial food supply has long relied on the communication designer to cultivate consumer assumptions of safe, 'fresh' food. Because of this, revealing even a part of the circumstances of food production can be a contradiction, one that exposes the ways that trust is created and maintained through design. Traceability forces a renegotiation of the arrangements upon which trust is based, and the communication designer will have a key role in that renegotiation.

As Kjaaernes and Torjusen explain, when '[b]uying a hamburger for lunch, we have to take its safety for granted. We cannot check directly but must rely on farmers, slaughterers, processors, bakers, outlet services, more indirectly on food technologies, nutritional scientists and public regulatory systems. Generalized institutional trust is a basic feature of well-functioning modern food systems.' (Kjærnes and Torjusen. 2012[12]: 88–89) That trust is engendered through the work of communication designers, who ply their craft to make food packaging appealing on an emotional level, and create and abide by mandated standards of information design in food labeling.

In informing me that 'no issues [had been] reported,' Harvestmark was making me aware of the possibility of issues – something I typically (naively?) didn't consider when buying fruit. It was a declaration prompting questions that would not have been asked otherwise – like someone selling me a well-designed car with a sticker on the dashboard telling me that no other owners have had the brakes fail yet. In letting me know where and when my food was grown, Harvestmark was inverting the longstanding relationship between food producers their presentation of the idea 'freshness,' a presentation which has often relied on obscuring the details in order to present an ideal (Friedberg, 2010[9]: *passim*.) Products may be 'farm fresh,' only after a refrigerated journey from a site thousands of miles away.

As digital traceability initiatives are new, there are few similar systems, including websites and smartphone apps such as FreshQC (http://www.freshqc.com), Find The Farmer (http://www.findthefarmer.com), Nature's Nest (link) and Trace Produce (http://www.trace-produce.com.) FreshQC turned out to be a market research dupe: After I entered an alphanumeric code, the website rewarded me with a series of unsolicited multiple choice questions about the quality of my produce, but no information about its quality or origin. Find the Farmer presented more information than other systems, but was limited to producers of grain used in a particular brand of flour.

Beyond my own investigation of traceability systems, the existence of public concerns about the provenance of food has been empirically established. For example, in a European survey of 2002, respondents ranked the possibility of food poisoning between the 84th and 92nd percentile, while the impression that food safety conditions had become worse over the previous twenty years was ranked between 13% and 39%. (Kjærnes and Torjusen. 2012[12]: 91,92) Moreover, as Torjusen and others have argued, the growth of both organic food production and Community-Supported Agriculture (CSA) can be seen as an indicator of public distrust in the safety of conventional food production methods. (Torjusen et al. 2001[19]; Torjusen et al. 2004[20])

Data about 'food objects' is recorded and analyzed within meat, dairy and produce supply chains to assist with product recalls. This can make it easier, for example, to trace E. coli

infested meat back to its point of contamination. Current consumer-facing food traceability services are an attempt to repackage that data and present it in a way that contradicts the existing obfuscatory food marketing practices communication designers are familiar with.

Traceability addresses a problem of modernity: the invisibility of food infrastructure and its effects. In a small farming village, a family may know where all of their food comes from because the possibilities are small: they either produced it themselves, or traded it with other townspeople. Only after refrigeration, new modes of transportation, and new agricultural processes were developed did the origins of our food become opaque. Even then, many transactions occurred without any records, as people relied on handshakes and interpersonal relationships.

Vileisis details the relationship between changes in food production and transportation infrastructure and the presentation of food. Anxiety about the expansion of food infrastructure was in many ways assuaged through communication design:

> As paths of food distribution changed, the ways that information about food was shared changed, too. In the old system, shoppers had learned about food choices by talking with their butchers and grocers. In the new system, manufacturers informed customers directly about the advantages of their products with increasing numbers of ads, and homemakers began to rely on these ads to fill the gaps in their knowledge about new types of foods as paths of distribution changed, the ways that information was shared changed, now as IT is changing distribution, it is causing change in information sharing.]. (Vileisis 2008[22]: 116)

The availability of traceability information via services like Harvestmark inverts our long-standing relationship to the idea of freshness. Traceability can expose the distance that food objects travel, and the circumstances of their production. While shoppers at a supermarket in New Jersey probably know that their mangos are not local, exposing the transportation infrastructure's role in food delivery and instilling the consumer with the idea of freshness are not exactly well aligned goals. With meat, dairy, and produce, provenance – whether bona fide, or implied by a picture of rolling fields on the side of a package of butter – is, in many ways, the brand. As such, consumer access to traceability data may constitute a fundamental change in the way we think about (or mythologize) agricultural production. This is an issue that communication designers will be tasked with addressing, one that goes beyond presenting a potentially data-rich chain of custody and intercedes in a complex web of social and material infrastructures and relationships.

As things stand, the role of the communication designer in the traceability system is limited. Communication designers current work with food traceability data is neither mandated nor regulated. However, we can see precedents in existing food labeling practices. In the US, for example, food labeling is controlled by federal law, and communication designers must abide by requirements to list ingredients, manufacturer information, nutrition facts, and allergen labeling while adhering to typographic specifications. In the case of perishable commodities like fresh fruits and vegetables, much of this information is not required. A potato does not need an ingredients label, and this reminds us that many perishable agricultural items have little or no packaging at the point of purchase. Since traceability is concerned with 'fresh' or perishable food, the consumer facing package is often minimal or non-existent. As such, a communication designer may have little or no surface upon which to ply their craft, and so traceability information is often associated with meat and produce through links, identification numbers, QR codes, or other information printed on oddly spaced stickers on the bottoms of packages (see Figure 1) or applied directly to food items.

These issues of placement descend from developing and established proscriptions regarding the presentation of food data. They are important to the consumer because they articulate the ways that design modulates their experience with food products. They are important to other stakeholders because they present the potentially contradictory ends of public access to food data. They are important to the designer because they present constraints and represent areas where the designer might interact with food data to modulate public engagement with food production processes.

What is traceability?

Put simply, traceability is the capacity to track a food item through various stages of the supply chain so that we can evaluate things we deem important about its production and transportation. This is usually a means to the end of locating and destroying hazardous products. Most mass-produced fresh food items progress through a variety of steps between farm and table. Opara describes this in a 2003 overview of traceability:

> Agriculture is inherently a fragmented industry, involving a diverse range of distinct enterprises (farmers, processors, marketers and distributors), and relies on inputs from various sources, often at distinct geographical locations. For instance, although some food products such as chicken and pork, have been subject to extensive vertical integration within the production and marketing chain, cattle on the other, may be produced on one farm, grown on another, finished on another, and between each stage, transported and sold through open markets, sometimes several times, before being purchased either in the open market or direct, deadweight, for slaughter. With respect to grains and fresh fruit and vegetables, most marketers and processors obtain their supply from diverse sources (farmers, retailers, brokers) in order to meet marketing and production targets. (Opara 2003[14]: 101–106)

So, different food items may have to move through different steps before being sold and eaten, and many of these steps are significant because they may affect a food's quality. Traceability attempts to make all of the steps between farm and table searchable, to aid in identifying and addressing problems *after* they happen.

For example, the way that some spinach was processed led to an outbreak of fatal E.coli bacteria in 2006 (Centers for Disease Control and Prevention 2006.[4]) It takes time to become ill and develop symptoms after exposure to E.coli bacteria. Adding this time to the time it takes to grow, process and deliver fresh foods shows us both a motivation for traceability and traceability's potential scope. In some cases, food may become contaminated during processing. In others, it may become contaminated during production or preparation. Traceability is an attempt to turn all of the steps from farm to table into something searchable so that identifying and correcting fresh food supply chain problems can be automated.

The international standards organization defines traceability as identifying history, application or location. This can include 'the origin of the materials and parts, the processing history, and the distribution and location of the product after delivery' (Golan, et al. 2004[10]: 3.) This definition is not particularly specific, as any overarching definition of traceability has to apply to dissimilar goods. For example, information pertinent to the traceability of ground beef is not going to be the same as information pertinent to the traceability of peaches.

The following passage from the report *Traceability in the US Food Supply: Economic Theory and Industry Studies* by the USDA Economic Research Service raises a number of other issues with the International Standard's Organization's definition:

> It does not specify a standard measurement […] (a grain of wheat or a truckload), a standard location size (field, farm, or county), a list of processes that must be identified (pesticide applications or animal welfare), where the information is recorded (paper or electronic record, box, container or product itself), or a bookkeeping technology (pen and paper or computer.) It does not specify that a hamburger be traceable to the cow or that the wheat in a loaf of bread be traceable to the field. It does not specify which type of system is necessary for identity preservation of tofu-quality soybeans, for quality control of cereal grains, or for guaranteeing correct payments to farmers for different grades of apples. (3)

This list of omissions can be used as a rough list of things that traceability *could* include: standards of measurement including standards of geographic measurement, key processes to be identified, and where and how information is recorded.

Writing in the *Journal of Supply Chain Management*, T.P. Wilson, a researcher at a traceability services company, suggests the following definition: 'that information necessary to describe the production history of a food crop, and any subsequent transformations or processes that the crop might be subject to on its journey from the grower to the consumer's plate.'

How does traceability work?

In the simplest terms, traceability is just record keeping. Let's look at the example of eggs: each individual henhouse on a farm is assigned a unique number. When eggs from different henhouses arrive at an egg processing facility to be washed, labeled and packaged, those numbers are recorded. As the eggs are packaged and sorted into different boxes and those boxes are placed in different pallets, the numbers identifying henhouses are associated with those packages. Later, when a wholesaler receives different pallets of eggs from different producers, they will record the appropriate information when they are received and assign appropriate information when they are shipped out. This process of assigning and recording data continues at each step along the path from farm to table.

Of course, traceability can be far more sophisticated. Digital tools such as barcodes, scanners, and computer databases can help automate these processes and make them more efficient. Traceability does for food what FedEx or UPS package tracking software does for freight: using a unique tracking number, you are able to determine where something has been, what conditions it has encountered, and where it is going next. Precision and scope vary significantly within existing food traceability systems.

There is significant variation of precision and scope within existing food traceability systems. While the USDA characterizes the capacity of US food producers as 'enormous,' they add that 'Some traceability systems are deep, tracking food from the retailer back to the farm, while others extend back only to a key point in the production process' (Golan, et al. 2004[10]: 3.) Of course, there will be significant variation in traceability because the types of foods produced and their production processes vary. Bacon is produced and processed differently than apples.

Beyond such product specific variability, some systems are very precise, tracking food products to the minute of production or the exact area of a field where they were grown. Others are less precise, tracking products to farms in a large geographical area, such as the area served by a single grain elevator. Some traceability systems collect and track information on a broad range of attributes, while others track only a few.

For example, some coffee producers may market and track attributes such as fair trade, fair wage, and shade grown. This last example, that of the attributes of different coffees,

raises another issue: Different attributes are associated with different transformative points in the supply chain. For instance, whether or not coffee is decaffeinated is dependent on processing, but whether or not it is fair trade is dependent on the relationships between growers, wholesalers, and retailers (Ibid.: 4.) Coffee is an example of the correspondence of different areas of interest and different levels of granularity within traceability.

Traceability can be extended into other issues arising from the arrangement and operation of food systems. For example, Tuters and Kera argue that potential traceability systems may 'provide us tools through which to become sensitized to the ecological impacts of eating choices. […] for instance, to bolster the claims of LOHAS [lifestyles of health and sustainability] certification schemas like Fairtrade.' (Tuters and Kera 2014[21]) Light's work with user-generated food production information begins with the premise that 'by allowing those at the bottom of the pyramid to tell their own stories and present information about how things are made' provides 'a platform for ethical information' which might 'potentially drive more ethical production and purchasing practices' (Light 2014.[13]) The artist Kate Rich's Feral Trade Courier project involves an ad hoc freight system operating over social networks which involves user-generated documentation of the transportation of food items.

It would be incorrect, however, to identify traceability as a completely new phenomenon. The Perishable Agricultural Commodities Act (PACA) of 1930 mandated record keeping that included 'produce lot identity and all transfers and transactions between shipping point and destination receiver' (Suslow 2009[18].) Recent initiatives add computation to the picture. So, traceability today is more than the recording of information about 'fresh' food – that recorded information can be searched, shared, and put to use in automated decisions or processes. For example, if an E.coli outbreak in one part of the country is determined to result from tainted spinach, the spinach could be traced back to determine if other tainted batches had been shipped elsewhere.

This should provide some insight into the underlying process and infrastructure of traceability. Communication design is always a key consideration in the mediation of such services. Where it was once a means to the end of communicating 'freshness' through packaging and advertising, it is now tasked with presenting information which opens the black box of food transportation and production instead. It is here that conflicts between the longstanding practices of food presentation and the affordances of traceability become entangled.

The matrix above (Figure 4) conceptualizes the problem space of food traceability as defined by two axes. As we move from left to right, we move from less information to more information. As we move from bottom to top, we move from the interests of producer to those of consumer. Of course, consumer and producer are loosely defined, and may include subsets with different agendas. Furthermore, this matrix is not intended to imply judgement – that is it is not intended to suggest that more information is superior to less, or vice versa.

We can use this diagram of the problem space of food data to help us consider some scenarios we have already mentioned. For example, where a consumer might want access to as much information as possible about the provenance of a food product, the producer may want to provide less. To offer a more detailed scenario, consumers and producers may each desire more or less information to be collected and or presented depending on specific criteria such as production processes (e.g. pesticide use), or food safety (e.g. product recalls.) This matrix can be helpful in examining the issues I raise below.

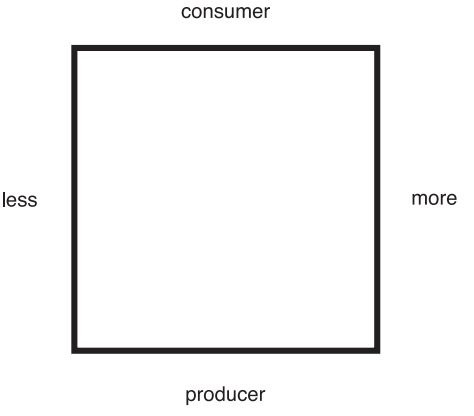

Figure 4. Diagram of food traceability problem space.

Key issues for designers

I. Cui bono?

Regarding traceability, there is ambiguity regarding stakeholders, and it can be difficult to determine who the communication designer is working for, and who traceability is intended to benefit. Most existing food traceability initiatives have been put in place to facilitate product recalls. They have been designed to make it easier to locate contaminated produce and animal products when those products have been found to transmit disease. Currently, traceability may not assist in *producing* safer food as much as *locating and removing* unsafe food from the market. Thus, the communication designer may be working to pierce the veil of 'freshness' as discretely as possible – facilitating the ability of a food-buyer to access information about a product, without reminding them that the product might be dangerous to them.

Websites, apps, and other consumer-facing presentations of food data further complicate this. Are they empowering consumers by allowing them better access to information? While my experience interacting with these services paints them as primitive at best and distracting at worst, communication designers may improve consumer experience in a number of ways: clarifying when and how and why data was collected, explaining the reasoning behind its collection at those points in the supply chain and their significance to the food production process, and, more generally, making the food supply chain more transparent. Of course, that transparency can be of greater benefit to consumers than it is to producers. For some designers working to develop or refine traceability services on behalf of producers or retailers, conflicts may arise between the interests of their users (the consumers) and of their clients. The user a communication designer is designing for may not have the same goals or interests as the clients who are signing their checks.

As Allaire and Wolf recall, '[a]ccording to Farmland Industries president, Harry Cleberg, "In the future, before a farmer plants a kernel of corn, he will know on whose dinner plate and in what form that corn will be served". Although Cleberg's belief that the farmer will be the "knower" of consequence is questionable, the strategic logic here is quite clear' (Allaire, G., & Wolf, S. A. 2009[1]: 438.) But these questions of agency also extend beyond the presentation of and interaction with traceability data. They penetrate down into design of traceability

processes themselves. What information should producers and consumers be able to access? How should it be collected, stored and processed? The designer should be involved in making these determinations. For both the consumer and producer, it is important to note the possibility of unanticipated effects of these design decisions. Designers will need to consider ways in which the widespread availability of traceability information will interact with market forces. For example, it can lead to safer food or obscure unsafe food production; it can enable new types of market speculation in which food as a commodity becomes further separated from food as a necessity. Communication designers will have to probe these possibilities and bridge their constituent discourses.

Ultimately, this may require some analysis of stakeholders on the part of the designer. In investigating these questions of power and agency, we can look at the make-up of standards organizations, both governmental and private, and the role they play in shaping traceability practices. For example, there is only one USDA representative on the board that oversees MPXML, the xml schema used for meat processing data. All of the other board members are managers from meat retailers or producers. Consumers and their advocates, as well as Service, Interaction and Communication Designers and Design researchers may find that important decisions regarding standards and procedures have already been made without their input. Of course, this raises the possibility of regulatory capture, moral hazard, and the efficacy of self-regulation.

Furthermore, 'producer' is an ambiguous term. It may refer to a large multinational agribusiness as much as a small, unaffiliated rancher or farmer. These questions and examples are illustrative broader shifts in the landscape of power within the food industry. Spaargaren, Oosterveer and Loeber describe these shifts as including: 'A significant loss of power from the side of farmers producing food,' accompanied by a 'gain of power from the side of the citizen-consumers buying and using food.' They add that 'consumer empowerment' has 'only recently [become] used for promoting and safeguarding […] non-economic values in food' (Spaargaren, Oosterveer and Loeber. 2012[17]: 1–2.) For example, '[s]ensitivity among the public has heightened with respect to animal well-being and with respect to the huge impacts of food production and consumption on nature, climate and environment' (Ibid.). Of course, the origin of food relative to its destination, is significant to the fossil fuel cost of its transportation, raising the possibility of market externalities, and raising the issue of local food production. As Allaire and Wolf put it, '[t]he popular and academic literature presents the contemporary situation as a fork in the road; one pathway leads to a seamlessly integrated global agrofood system in which transnational firms produce "food from nowhere." The other pathway leads to a reembedding of agriculture in the specificities of local ecologies' (2009[1]: 435).

So, technologies of traceability and the role designers will play in shaping them enter the design space at the same time that publics are forming around issues of sustainability, globalization, and the treatment of animals and farm laborers. Designers will need to identify stakeholders and their allegiances in order to determine their own goals and the success criteria of their designs.

II. Between the lines of the barcode: designing for hungry users

Usability of traceability services is another set of issues designers have to contend with. Designers may need to question the formats in which traceability information is recorded,

stored and presented, and determine what information is important to the consumer and what is irrelevant. How much does the consumer need to know; what is vital information, and what is a distraction?

A great deal of traceability processes are organized according to the 'one step up-one step down model,' in which 'some traceability information is kept in each stage of the supply chain while other follows the product at the next stage of the chain' (Folinas, et al. 2006[8]: 625.) According to this model:

> The final consumer receives only the necessary information that allows the identification of some of the product's basic features concerning its origin and quality. Although the consumer does not have direct access to all the information, since he/she does not follow the product along the supply chain to the point of sale, it is feasible to recover it by accessing each stage of the supply chain downwards. (Ibid.)

So, while the *type* of information being recorded (e.g. location grown, location packaged) is one concern, the *accessibility* of that information is another. In the case of the myriad possible transactions and processes between origin and plate, limiting consumer access to to information could be interpreted in at least two ways: as obfuscating production processes that are not in keeping with consumer expectations or the narratives of food marketers (not showing me how the sausage is made), or as shielding consumers from those processes (I don't care how it was made – I barely have time to make it to the grocer).

When dealing with food data, the designer is contending not just with what *should* or *should not* be presented and how, but with the incredible variance in human needs and preferences: allergies to nuts and dairy products, phenylketonuriacs, dietary decisions to avoid animal products, or to eat animal protein almost exclusively. Those needs and preferences may align differently with the normative, as diets and their constituent concerns with the mechanisms of food production may be rooted in moral or religious beliefs.

For designers working with food data, traditional questions of usability and legibility become even more complex. Regardless of the client or stakeholder, the task of identifying the user or consumer and determining their particular needs is daunting because of the varied patterns of human interaction with food. While interface design outside of research and development was long limited to the recent history of windows, mice, and command lines, the interface between people and food extends backward for all of human history.

As interface and brand become increasingly synonymous (Reichenstein: 2006[15]), the presentation of food may extend beyond its own appearance, into the massaging and shaping of its data to form a sort of virtual pedigree. As Vileisis argues:

> Good advertising cleverly imitates one of nature's very own strategies. In nature, a ripe red berry attracts an eater, who, by consuming the sweet crimson flesh, will serve to disperse seeds. In advertising, a boldly promoted, colorfully packaged product similarly attracts the attention of an eater, who by purchasing it, will contribute to the profits of the manufacturer. In both cases, the eater's hunger is satisfied, but the intent of the attractor may be hidden.' (2008[22]:115)

The recording of food data adds a new layer of possibilities and limitations for designers: the possibility of the Interface *as* a sort of food packaging. Of course, my previous point regarding stakeholders may come into play here as well. The designer may now have to consider the presentation of food data independently of the food's appearance, as well as considering the ways that the presentation of data may augment or compliment the food product itself. Would a consumer be more willing to purchase a bright red apple with a less appealing data pedigree or a less colorful apple with a simpler, less circumspect history?

III. Food and people as data objects

The existence of food traceability data as a new area of design descends from the application of existing properties of digital media to new subjects. If we want to consider what it means for organisms to possess a digital footprint, we can start by examining ourselves. The digital infrastructures of food producers point to a future/present in which food 'objects' possess digital shadows akin to the data-bodies of their human eaters (Critical Art Ensemble 1998[5]: 145), and the representation of these digital shadows presents new problems for design.

The phrase data-body was coined by art and cultural theory collective Critical Art Ensemble, and refers to:

> [T]he total collection of files connected to an individual. […] What brought the data body to maturity is the technological apparatus. With its immense storage capacity and its mechanisms for quickly ordering and retrieving information, no detail of social life is too insignificant to record and to scrutinize. (Critical Art Ensemble 1998[5]: 145)

So, the phrase refers to the agglomeration of digital records that a person accumulates. Credit histories and social security numbers are obvious examples. Just as the traceability of data of food products is often location-significant, so is the relationship between data-body and place. This is what geographer Stephen Graham has called the dyadic relationship between software and geography. According to Graham, this relationship increasingly allows the affluent to:

> Further their secession from the wider space-times of the city, as they seek to locate in, and consume, the privileged, best serviced and highest amenity neighborhoods. The algorithms that support such choices, simulations, orderings, and classifications […] remain completely opaque and utterly unscrutinized. (Graham. 2005[11]: 571)

Databases full of consumer data such as credit history and spending habits are associated with spatial data; the locations of consumers and their purchases are mapped. This confluence of data and location is typically invisible to consumers themselves.

This points to the possibility of using of food data to reinforce existing patterns of consumption. How might a consumers' relationship to food data be contingent upon their lifestyle? Do current traceability initiatives require too much of an investment in time, digital literacy, and technology? Are they only going to be used by retail purchasers who are educated, affluent smart phone owners? Will the developing ties between food and digital media further exacerbate nutritional differences between rich and poor?

Traceability surpasses the simple recording of information about fresh food– recorded information could be searched, shared, and involved in automated decisions or processes. Of course, no change in method comes without some friction. In order for these goals to be achieved, standards need to be implemented, and these may contradict or complement existing practices and norms. This negotiation of technologies and practices makes food traceability an important area for investigation and design, a place where possible futures need to be prototyped an considered.

This data-bodies of foodstuff raise a variety of other issues. They bring traceability into the realm of ubiquitous computing and the so-called 'internet of things,' raising questions about procedurality and ownership. Who owns the data associated with your food? Does using that data in sorting and tracking processes constitute a fundamental change in the way we think about (or mythologize) agricultural production? Traceability raises questions about the fallibility and security of digital systems and the possibility of their exploitation.

If someone hacks into a database and makes the record of five pallets of bananas disappear, then what is the status of those bananas? Food as a data object creates the possibility for new types of speculation and disruption, further decoupling food's nutritional value from its commercial value. While traceability may solve some of the problems of our food supply, we may see unexpected consequences from the intermingling of critical issues from information systems and agriculture.

IV. Eating alone? Social ties and digital traces

The designer working with food traceability systems will need to navigate the relationship between the data bodies of humans, and those of their food. How might their intermingling change their relationship? Are the relationships between human social networks and human food preferences a site of new forms of marketing and exploitation, a new means of encouraging better eating habits, or both?

As Kjærnes and Torjusen argue, '[t]rust is produced in social networks, constituting a "social capital" that can help solve social problems and represents a resource for the individual. Social capital is not only unevenly distributed, it is also assumed to be in decline' (Kjærnes and Torjusen. 2012[12]: 88.) Here, they refer to the trust between food producers and consumers, something that has become increasingly opaque outside of farmer's markets, CSAs, and 'Know Your Farmer' campaigns, which may run counter to the mediation of contemporary food production.

Of course, these efforts raise a difficult possibility for the communication designer: that the absence of digital mediation might be the ultimate solution to the problem of convincing someone of the quality of fresh food, as the very presence of digital mediation can be indicative of the lack of sociality that is the earmark or communicator of quality. Is the degree to which food is mediated inversely proportional to the degree to which it is perceived to be fresh? If the visual communication of quality is contingent upon the idea of a shared social relationship, designers working on food traceability apps and services may feel they are simply decorating the conduits of asociality. Alternatively, some communication designers taking an activist perspective may view the exposure of that asociality as a tactic, while others might view it as a constraint. In all of these hypothetical cases, designing a world in which the genie of food traceability is put back in its bottle is the least likely.

Conclusion

In a summer 2006 article in *Design Issues*, Kees Dorst argued that:

> Creative design seems more to be a matter of developing and refining together both the formulation of a problem and ideas for a solution, with constant iteration of analysis, synthesis, and evaluation processes between the two notional design 'spaces' – problem space and solution space. In creative design, the designer is seeking to generate a matching problem-solution pair, through a coevolution of the problem and the solution. (Dorst 2006[7]: 10, 16)

This conception of design, that of a designer making iterative loops through the spaces of problem formation and solutions, is a good place to begin considering the design space presented by food data and the issues it stems from and gives rise to. Dorst dispenses with the idea of design problems and offers the concept of design paradoxes in its stead. He argues that the designer has to transcend or connect different discourses, and that that

process requires a designer to understand but avoid the potentially contradictory ways of thinking embodied in those discourses. He proposes that 'the central notions that make up the paradoxes the designers are dealing with indeed are meant to shift in the course of creating a solution.' This idea of design paradoxes gets us out of problem space, the identification of design with problem solving, and moves us into a space that is better able to accept the complex problems presented in designing for and with food data. Let's end this survey of food traceability and the issues it presents for designers by looking at each of the areas I presented in the previous section in terms of Dorst's model.

First, in terms of stakeholders, communication designers may find themselves negotiating the 'problem solution pair' (Ibid.) of competing interests. Different stakeholders within the fresh food supply chain may have incompatible goals or needs. Second, we find that acquiring and processing data from the material world, and – conversely – translating data to users in the material world, presents a second design paradox. For example, a designer tasked with considering the legibility of data to both humans *and* software through communication design, APIs, and data structures, is designing a window into an opaque chain of evidentiary data. This prompts the consideration of norms and practices of people's relationships with food that are often unquestioned. Third, a designer will have to consider food and people as trails of data, as entities that cast digital shadows. In deciding how to present that data, designers negotiate the space between those digital shadows and their casters, as well as their relationships with each other. Finally, humans as social animals, and food practices as social practices have to be considered, both in terms of our effects on the eating and purchasing habits of our peers and in terms of the reciprocal influence of our collective eating habits and our social environment.

The informed work of communication designers is vital at this stage in the development of food traceability systems. Taken together, the issues outlined above constitute some key concerns for communication designers working with food traceability. My hope is that this accounting of the design paradoxes they embody will inform future practice and criticism.

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Ex-formation as a method for mapping smellscapes

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KEYWORDS: • *ex-formation* • *map* • *smell* • *smelldata* • *smellscape* • *unknow* • *urban*

'...Every city, let me teach you, has its own smell.'

This quote, from an early chapter of E.M. Forster's 'A Room With a View'[1], points to a humanistic understanding of global urban smellscapes with the potential therein for shared understanding. Exploring options for the communication of Singapore's 'own smell' this visual essay uses the design communication method of 'ex-formation' – a method which awakens the viewer to just how little we 'know' about both the city and cartography – as it probes one ontological view of the map...

'What moves people's hearts, in every case, is the unknown.'[2]

'Wouldn't it be a good thing to *unknow* the world?'[3]

'Maps seek to be truth documents; they represent the world as it really is with a known degree of precision.'[4]

*fig. 1 | **Singapore** © 2015 OpenStreetMap*

16 WALKS over 9 DAYS in 9 NEIGHBOURHOODS *were selected by locals as representative of the multicultural dimension of the city. Participants registered for their preferred walk destination and time of day using web sign-up. This solicited a total of over 200 smellwalkers.*

ITINERARY June 2015:
3rd Katong, 4th Kampong Glam, 5th Chinatown, 6th Sentosa, 7th East Coast Parkway, 8th Gardens by the Bay, 9th Little India, 10th Orchard Road, 12th Toa Payoh

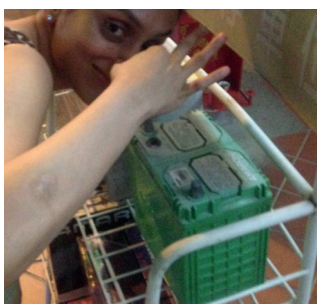
SMELLS OF FOOD. Char siew at ABC... durian at Tao Payoh... charcoal-grilled satay skewers at Lau-Pa-Sat... kopitiam for pandan-scented kaya toast... roti prata in Katong... both raw ingredients and cooking methods impact the city's smellscape[56]...

EXPERIENCES WHEN WALKING. Shrines of fruit and burning incense sticks. Musty A/C, oils and creams of massage parlours. Custom-scented shopping malls. Sweet shisha cafés. Agar wood as a medicinal conduit for herbal remedies.

figs. 3–15 | ***Smell explorations in Singapore***
Photographs © 2015 Kate McLean

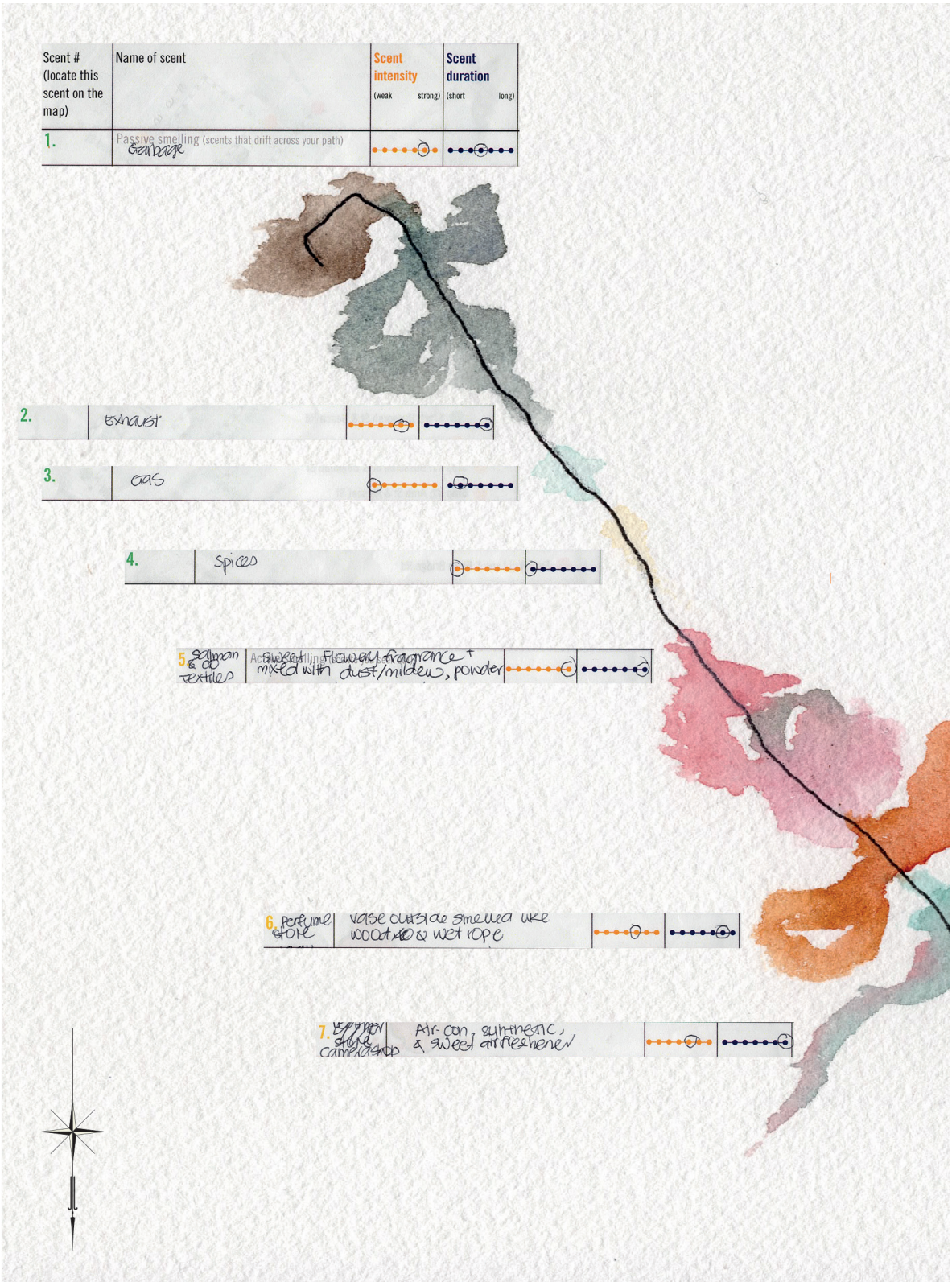
WEATHER. TODAY. June x, 2015: sun and clouds with a thunderstorm. Humidity 85%. Max. temp. 33, min 24. Wind 7mph – 20mph. TOMORROW. June (x+1), 2015: Repeat TODAY.

NEW EYES. Alternate sensory modalities reveal the unknown in the well-known; smellwalking creates olfactory perspectives on consumer goods as the everyday intersects with perfomed tourist[8] experience.



SPACES OF SMELL. Social spaces incorporating commerce and communal restauration form a part of the HDB[7] complexes. The HDB was a Singaporean solution to the 1960s housing crisis that now results in iconic and distinctive, architectures and affordable housing in the city. Cross-cultural smells of foodstuffs mingle as scents of drying laundry drift down.

RESTORATIVE[9] ENVIRONMENTS. Natural and imported sand beaches, rainforests with ancient cinnamon and nutmeg trees, curated botanical garden experiences, a river walk...


Scent # (locate this scent on the map)
Name of scent
Scent intensity (weak strong)
Scent duration (short long)
1. Passive smelling (scents that drift across your path) Garbage
2. Exhaust
3. Gas
4. Spices
5. Salmon & co textiles Sweet, flowery fragrance + mixed with dust/mildew, powder
6. Perfume store Nose outside smelled like wood and wet rope
7. Air-con, synthetic, & sweet air freshener

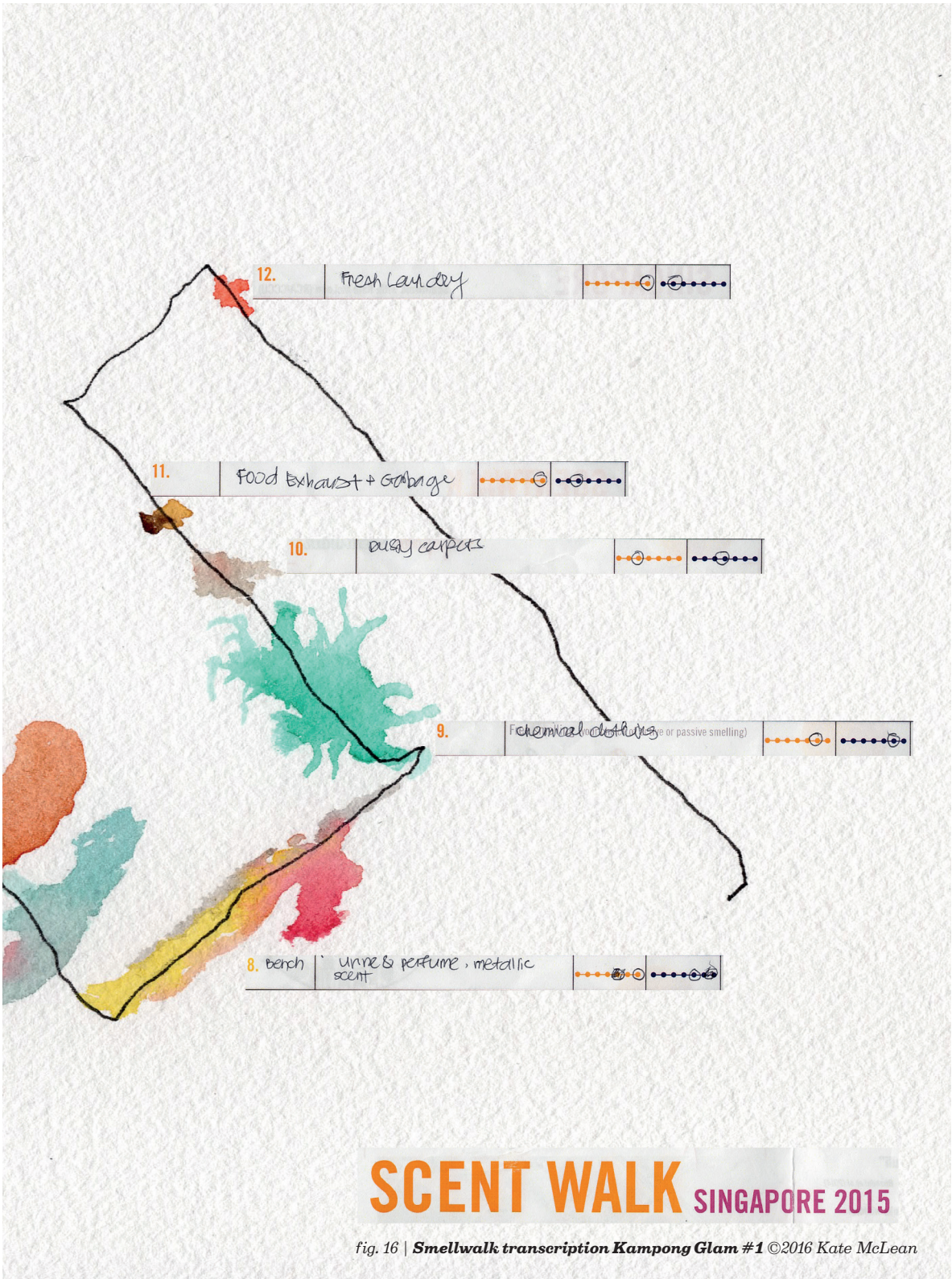
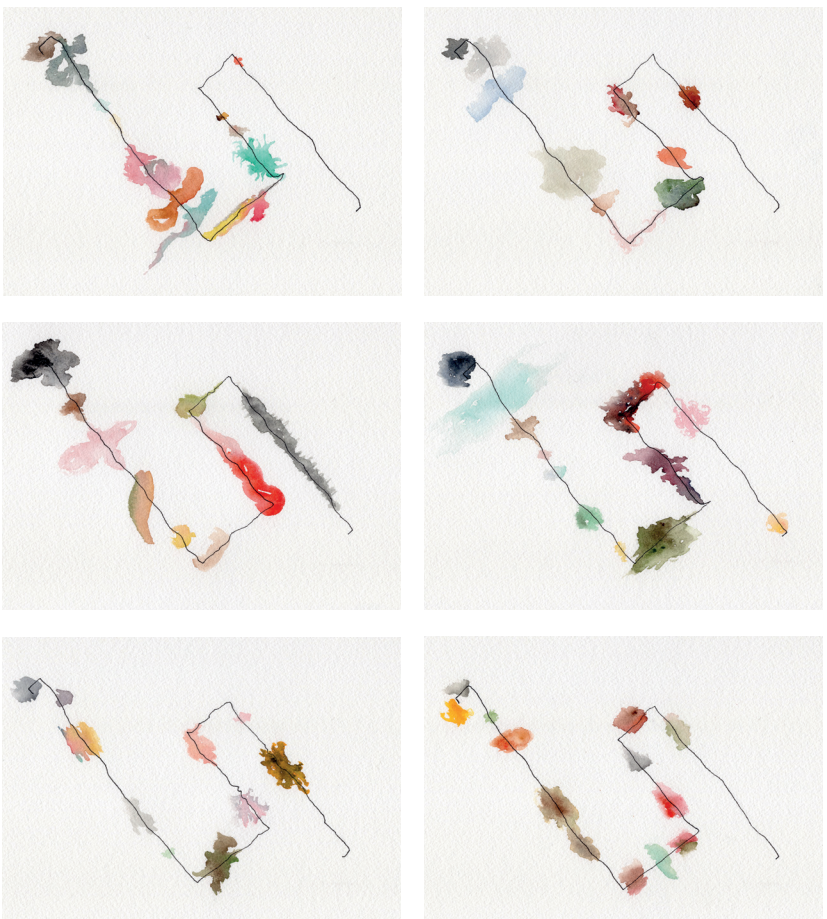


fig. 16 | ***Smellwalk transcription Kampong Glam #1*** *©2016 Kate McLean*

Smell transcribed as watercolour; comparison of individual perceptions of AM and PM smellwalks[10]

My choice of watercolour as a medium for transcribing individually-perceived smelldata into visual records is based on its spontaneity, immediacy and facility to emulate some of the properties of embodied smell. Wet-on-wet techniques enable fluid intermingling of colours and diffusion similar to how odours swirl and disappear in the air. Dry-brush visualises an on-off intensity as smells disappear only to reappear. Urban smells frequently layer, forming complex combinations as do colour pigments in a multi-layered glaze. The subjectivity of the original perception is retained through a method that is tolerant of imprecision. My **GUIDELINES** morph dependent on artistic response to each hand-written smellnote, reinforcing the qualitative element of smell perception.

GUIDELINES. Hue is dependent on smell descriptors (fast food = buttery yellow, perfume = pink, cut grass = vibrant yellow-green, exhaust = grey/black. Saturation



Kampong Glam AM The soft forms suggest ephemeral, light and subtle smells drifting across the route. The possibility of missed sniff opportunity, should you not be in place at a particular moment time, is palpable. Traffic exhaust odours are a common perception at the smellwalk meeting point.

figs. 17 – 22 | ***Smellwalk transcription Kampong Glam #1 – 6*** *©2016 Kate McLean*

reflects the perceived intensity of the odours. Size of the mark indicates smell duration (the shape itself is arbitrary, inspired by the description and association). Position on the walk route is sequential, only itemised in a particular place if indicated by the original smellwalker.

FINDINGS/CONCLUSIONS. *As the eyes lose their supremacy the nose makes gains in our sensory perception of the world. Smellscape perceptions are highly nuanced, however city patterns may be revealed through data aggregation. From individual interpretations I moved on to interrogate the smell database and determined the most frequently-mentioned smell in each of the neighbourhoods and itemised which other city neighbourhoods each of these episodic smells[11] also appeared. Background[12] and curiosity smells[13] were also identified to generate a humanistic smellscape.*

Kampong Glam PM Vibrancy of colour and larger forms suggest night odours are perceived as more intense and longer lasting.

figs. 23 – 28 | ***Smellwalk transcription Kampong Glam #7 – 12*** *©2016 Kate McLean*

Scentscape 06 . 2015 City of Singapore

Scent selections from database for inclusion

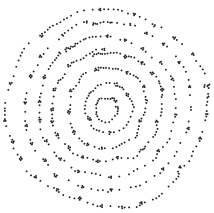
Scent category	Description	Colour	Neighbourhood	Intensity	Duration
Background (Base notes)	Humidity		Off-shore Brani Island	7	7 (+ 1)
			Marina Bay	7	7 (+ 1)
			Off-shore ECPz	7	7 (+ 1)
	Spicy, smokey, hot		Chinatown	7	5
			Katong	7	5
			Toa Payoh	7	5
Episodic (Middle notes)	Roti prata + curry		* Katong	6	6
			Kampong Glam	4	3
			ECP	4	3
			Chinatown	7	5
			Little India	6	5
	Shisha		* Kampong Glam	7	5
	Herby, minty, bitter, dried		* Chinatown	6	5
			Sentosa	2	2
			ECP	5	4
			Katong	3	3
			Kampong Glam	4	3
			Gardens by the Bay	5	4
	Salt, seawater & salty air		* Sentosa	5	6
			ECP	5	4
			Katong	3	3
			Kampong Glam	4	3
			Gardens by the Bay	5	4
	Manila Rope		* ECP	4	4
			Kampong Glam	5	6
	Unpolished wood		* Gardens by the Bay	2	3
			Chinatown	4	2
			Sentosa	2	6
			ECP	2	3
			Katong	7	6
			Kampong Glam	6	6
	Jasmine		* Little India	3	4
			Chinatown	6	3
			Gardens by the Bay	5	4
			Katong	3	6
			Kampong Glam	1	4
			Sentosa	7	7
	Perfume, floral		* Orchard Road	5	2
			Gardens by the Bay	6	4
			Sentosa	4	1
			Chinatown	3	3
			Katong	5	2
			Kampong Glam	6	6
	Durian		* Toa Payoh	7	7
			Chinatown	4	3
			Little India	5	5
Curiosity (Top notes)	Dinosaur		Marina East	7	7
	A hard life		Orchard Road	6	5
	Broccoli / deep dark secrets		Gardens by the Bay	1	1

* Representative smell of the neighbourhood

Smell icons for creative mappings

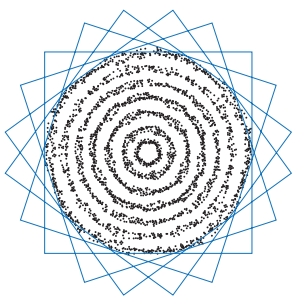
Desimini and Waldheim[14] argue that as design re-engages with cartography we should consider revisiting representational techniques to reconnect with the ground portrayed in the map. One technique employed by cartographers, to visualise a constant value, is the isoline (contour line). I suggest that this familiar visual language can also be used to indicate the perceived intensity of a smell. And in representing an invisible, volatile cloud extant visualisation might be repurposed to reveal the immersive potential in mapping invisible and ephemeral sensory percepts.

Intensity



Average intensity of 1 = 1 single ring of tiny dots
Average intensity of 7 = 7 concentric rings of tiny dots

Duration



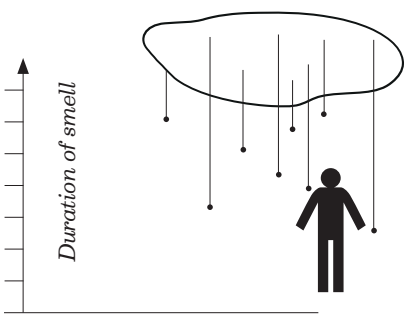
Average duration of 1 = 1 single set of (concentric) rings
Average duration of 7 = 7 sets of (concentric) rings

$$\textit{Angle of rotation} = \frac{360^\circ}{\textit{No. of layers}}$$

Movement

Concentric 'smell isolines' are manipulated according to wind direction and speed recorded over the period of the research, creating clouds of smelldata.

3-D Model



The north-east section of Scentscape 06 . 2015 Singapore was isolated and explored in detail. The smelldata in the form of individual dots was represented by beads hung in dimensional space. Height (z-axis) repesents smell duration.

figs. 29 – 32 | ***Smellscape map symbol creation*** *©2016 Kate McLean*

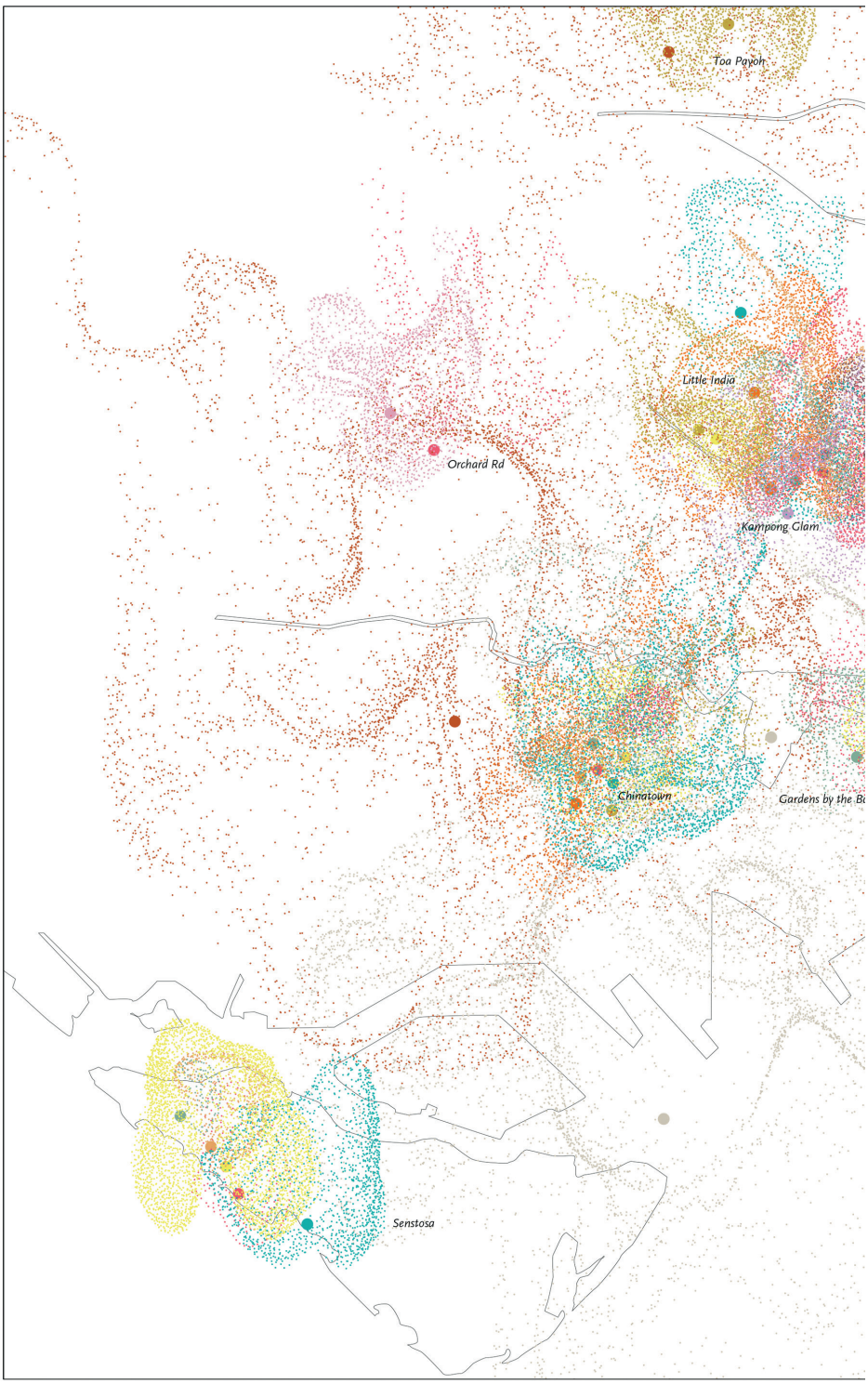
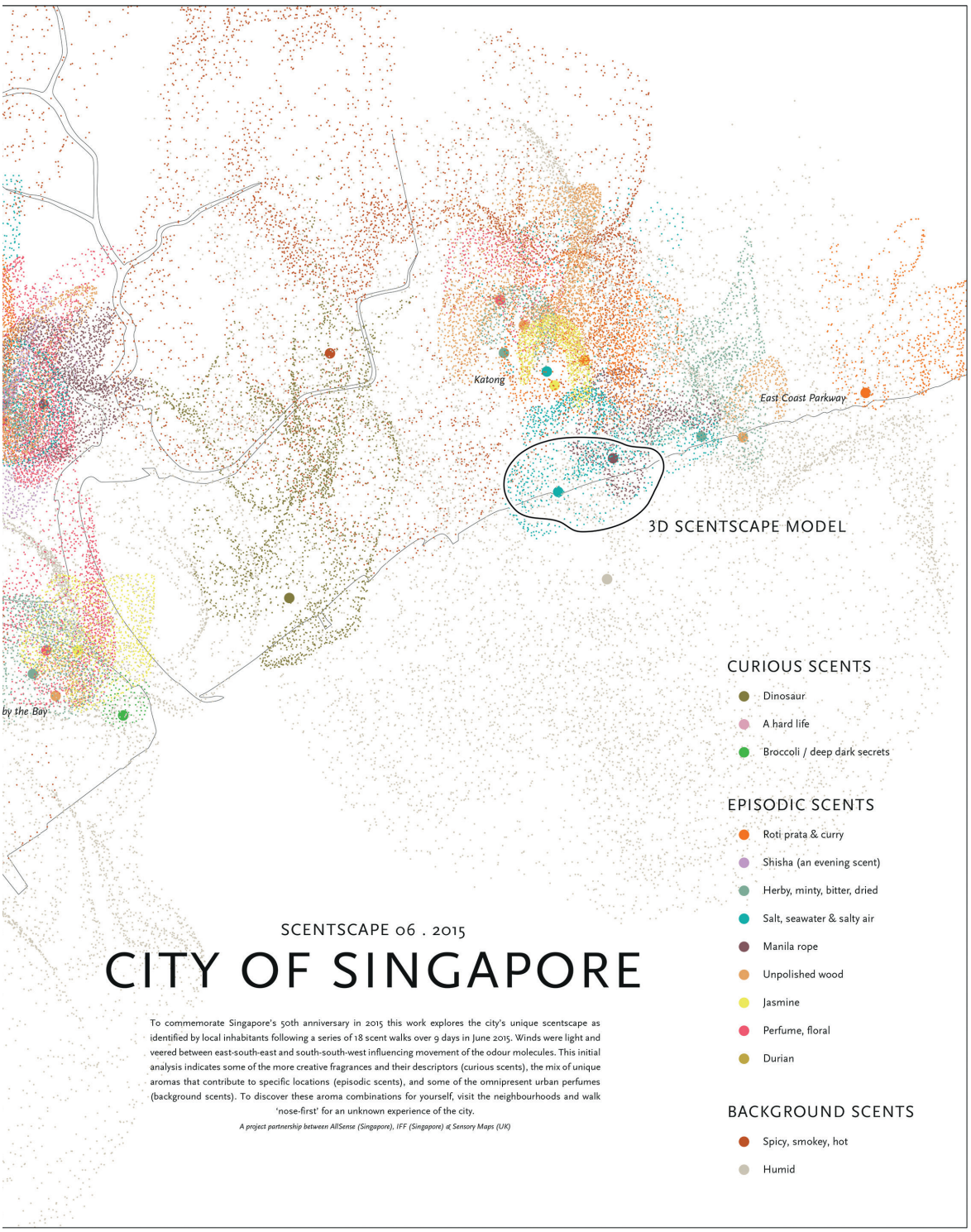


fig. 33 | ***Scentscape 06 . 2015 City of Singapore*** © *2015 Kate McLean*

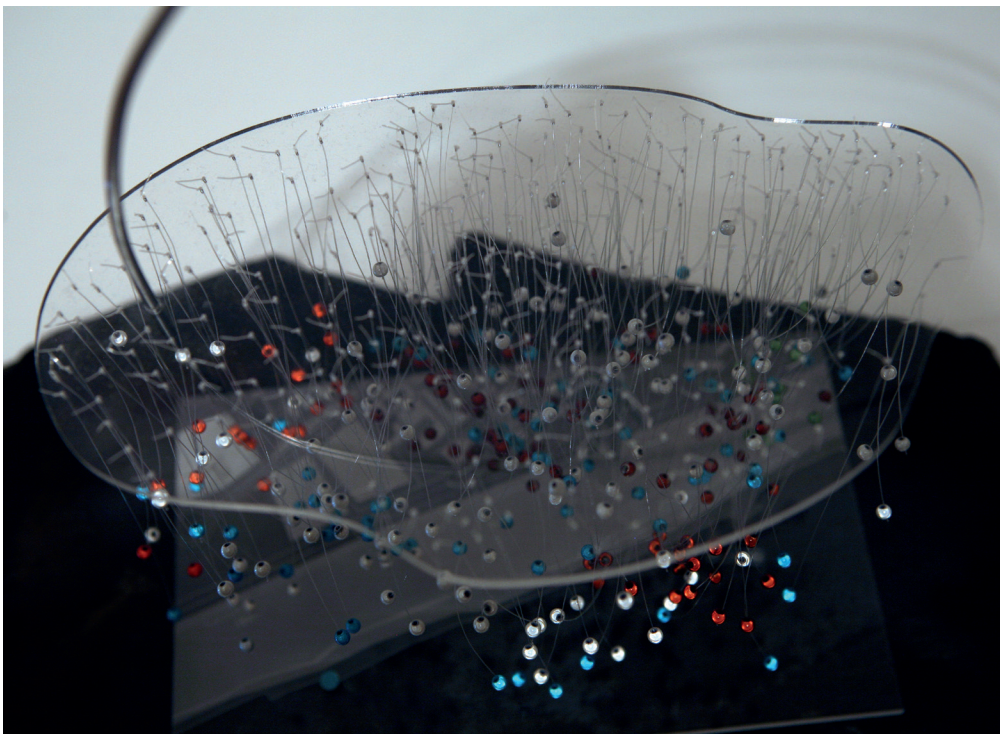


SCENTSCAPE 06 . 2015

CITY OF SINGAPORE

To commemorate Singapore's 50th anniversary in 2015 this work explores the city's unique scentscape as identified by local inhabitants following a series of 18 scent walks over 9 days in June 2015. Winds were light and veered between east-south-east and south-south-west influencing movement of the odour molecules. This initial analysis indicates some of the more creative fragrances and their descriptors (curious scents), the mix of unique aromas that contribute to specific locations (episodic scents), and some of the omnipresent urban perfumes (background scents). To discover these aroma combinations for yourself, visit the neighbourhoods and walk 'nose-first' for an unknown experience of the city.

A project partnership between AllSense (Singapore), IFF (Singapore) & Sensory Maps (UK)



Free smells 'rise' from the basemap proportionate to their perceived duration.

Walking through the Scentscape (a model for a future installation)

figs. 34–36 | ***Scentscape Singapore 3D model (section)*** *© 2016 Kate McLean*

OVERALL REFLECTIONS. A smellscape map exists only in so far it is an indication of possibility; temporally based it is a record of multiple moments of subjective experience tethered to a place through the construct of the map. As an imaginary representation of olfactory space, the security of map as artefact is put to one side and instead it becomes a pointer to the more evanescent aspects of our lived environment, a cue to walk, a call to sniff, making visible the presence of smell in urban life. A smellscape map is performative, and without personal experience and physical engagement, I suggest that it can only ex-form.

NOTES.

1. Forster, *A Room with a View.*
2. Hara, *Ex-Formation.*
3. Ibid.
4. Perkins, Dodge, and Kitchin, *Rethinking Maps: New Frontiers in Cartographic Theory.*
5. Porteous, 'Smellscape'.
6. Henshaw, *Urban Smellscapes.*
7. Housing Dvelopment Board, 'History | HDB InfoWEB'.
8. Larsen, 'Deexoticizing Tourist Travel: Everyday Life and Sociality on the Move'.
9. Henshaw and Nuttman, 'Henshaw_Favourite Places in the City and Their Restorative Qualities_ A Greater Manchester Pilot Study _ Victoria Henshaw - Academia.pdf'.
10. Henshaw and M Cox, 'Researching Urban Olfactory Environments and Place through Sensewalking'.
11. Porteous, 'Smellscape'.
12. Ibid.
13. McLean, 'Smellmap: Amsterdam — Olfactory Art & Smell Visualisation'.
14. Waldheim and Desimini, Cartographic Grounds.

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Henshaw, V. Adams, and T. J. M Cox. 'Researching Urban Olfactory Environments and Place through Sensewalking', 2009. http://www.manchester.ac.uk/escholar/uk-ac-man-scw:122854.

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Porteous, J. Douglas. 'Smellscape'. *Progress in Physical Geography* 9, no. 3 (9 January 1985): 356–78.

Waldheim, Charles, and Jill Desimini, eds. *Cartographic Grounds: Projecting the Landscape Imaginary.* New York: Princeton Architectural Press, 2016.

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NOTES ON CONTRIBUTOR.

Kate McLean is a British artist and designer and mapper of urban smellscapes who is currently Senior Lecturer in Graphic Design at Canterbury Christ Church University, UK. She is a PhD candidate at the Royal College of Art, UK researching fine-grained, human-centred olfactory perceptions of cities worldwide and the methods by which this information can be explored and shared. She runs workshops and leads smellwalks with non-profit organisations, arts and humanities festivals, urban planners and education. She is co-editing a book, 'Designing with Smell' (fc 2017), and as an early career researcher has written for the Guardian newspaper and published in Leonardo. *sensorymaps.com* | *@katemclean*

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Routledge
Taylor & Francis Group

Total design: the archive of a Dutch design agency

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Total Design was the most famous design agency in the Netherlands from the 1960s to the 1980s. The agency's archive became publicly accessible in 2009 and notable as one of the largest archives of its kind in the Netherlands. During the last few decades a number of key books have been published about Total Design and its people. Whilst this suggests that the archive has been well referenced in the past, does this still remain the case today? And, if so, in what ways might the Total Design archive still offer unique pearls of wisdom for design professionals, academics and even users from a broader general public?

Total Design was established in 1963 and is widely regarded as the first Dutch design agency. The agency's partners were experienced designers and included Wim Crouwel, Benno Wissing, and Friso Kramer together with Paul and Dick Schwarz; the latter being the agency's account manager and financier, respectively. Responding to similar developments in the Anglo-Saxon world where consultant-designers where on the rise, Total Design strove to 'realise a unity of thought in everything that a client shows to the outside world, as in their letterhead, logo, packaging, product, advertising and publicity, exhibition stands, but also the internal arrangement of a factory'.[1]

In the following decade the agency developed a strong reputation with its Swiss Style inspired graphic design approach. (See Figures 1 and 2). Typical examples of their work are the visual identity for the Steenkolen-Handelsvereeniging (SHV) and the signage system for Amsterdam's Schiphol Airport. From the 1970s onwards the agency's attitude towards design was increasingly appreciated by government bodies, the most famous being the Dutch national post, communications and banking services (PTT). At the same time, the design profession and press became divided in their appreciation for Total Design's austere and controlled 'design solutions'. Total Design's reign came to an end in the 1980s when younger agencies such as BRS Premsela Vonk and Studio Dumbar came to the fore. Nowadays Total Design is known as Total Identity and promotes itself as a communication consultancy.

Interestingly, Ben Bos, one of the most prominent designers of Total Design, enabled the salvation of Dutch graphic design archives, and the archive of Total Design, by including it on the agenda of the Dutch Graphic Designers Association (BNO) in the early 1990s. This action resulted in the establishment of the Dutch Graphic Designers Archives Foundation (NAGO) in 1992. This organization initially safeguarded and inventoried a number of smaller archives such as those established by designers Dick Elffers (1910–1990) and Otto Treumann (1919–2001). In 2001 the NAGO started to make a rough inventory of the Total Design

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Figure 1. Instructions for the application of SHV's new PAM-identity on gas stations, design Total Design (Benno Wissing & team), ca. 1964. *Courtesy of the Stadsarchief Amsterdam*.

Archive, of which a small part was already available at the Stadsarchief Amsterdam. The total amount of materials covered over 300 meters of shelf space. When a budget was released in 2007 for a detailed inventory, NAGO hired a complete floor in an empty office building to

Figure 2. Slide with DeGruyter new visual identity applied to packaging, design: Total Design (Ben Bos & team), ca. 1972. Slide holders often carry numbers referring to the projects and the presentations they were part of. This potentially enables the reconstruction of (client) presentations, enabling insight into the visual arguments made by designers. *Courtesy of Total Identity*.

sort out the archive, a process which resulted in the archiving of an impressive 2,334 files and 322 objects.

The documenting of the Total Design archive made Dutch graphic design archives more broadly accessible. The standard that NAGO used for describing archive material was initially based upon the museum standard for describing art objects. However, the size and diverse nature of the Total Design archive necessitated the development of a new standard combining the museum standard with one used by archives for describing documents. As part of the same project a web interface was developed that made the NAGO database – currently consisting of 25 archives – widely accessible and integrally searchable. This is probably one of the largest and most detailed databases of graphic design objects and documents in the world.

Some of the designers who worked at Total Design are among the most celebrated in the Netherlands and had their archives inventoried by the NAGO as well, such as Wim Crouwel (1928-), Benno Wissing (1923–2008), Ben Bos (1930-), Anthon Beeke (1940-), and Jurriaan Schrofer (1926–1990). These days the NAGO database is integrated in the website of the Wim Crouwel Institute for Heritage, Graphic Design and Typography, which was established in 2013.[2] The Institute is closely cooperating with the Special Collections of the Library of the University of Amsterdam that administers the NAGO collections since the latter was dissolved in 2014.[3]

The Total Design archive material mainly covers the period of operation between 1963–1990. It can be divided in two parts; the 'archive', which is accessible at the Stadsarchief Amsterdam[4] and the objects, which can be found at the MOTI (Museum of the Image) in Breda. Of these two, the archive is the most interesting part because of its breadth and uniqueness. Additional but not publicly available materials are still housed at Total Identity including Total Design's slide collection and visual identity manuals. The quickest way to get

an impression of the objects is to search online for Total Design in 'Het geheugen van Nederland', a website maintained by the National Library of the Netherlands (KB) who integrates Dutch socio-cultural image databases.[5]

The Total Design archive is rich in its diversity. (See Figures 3a and 3b). All kinds of visual and especially textual minutia are available, such as incoming and outgoing bills and letters. The archive's holdings question the sometimes mythologized stature of designers from this period of history by providing insight into their daily thoughts and activities. This is evident for example in a chart proposing which designer should be responsible for certain agency responsibilities, including basic things such as watering the plants or taking care of the 'social wellbeing' of employees. Or, what to think of Benno Wissing lamenting the demise of the Hochschule für Gestaltung Ulm – '(by whatever hand?) stabbed and dying' – in a recommendation letter for one of his designers (See Figure 4). Here, Wissing remarks: 'Quite recently he told me he wanted to further and more scientific design education [*sic*!] and asked me where to go. Holland does not provide much […] so I advised him to try and go to the U.S.' Later Wissing would leave for the US himself, never to return. More key business documents show Total Design's internal struggles and deliberations concerning questions around how their design should relate to society, even to the detriment of income generation. It is these kinds of documents, in their common appeal that can transport readers back to the time in which the design works of TD were made.

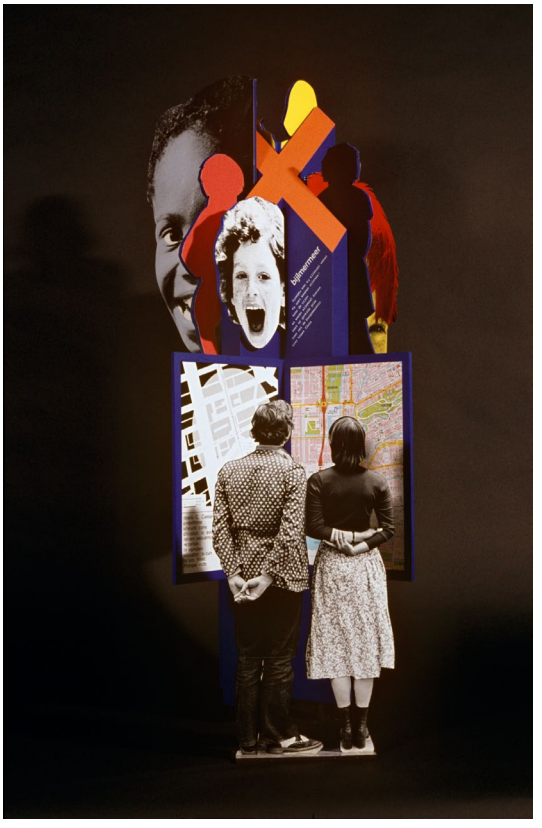
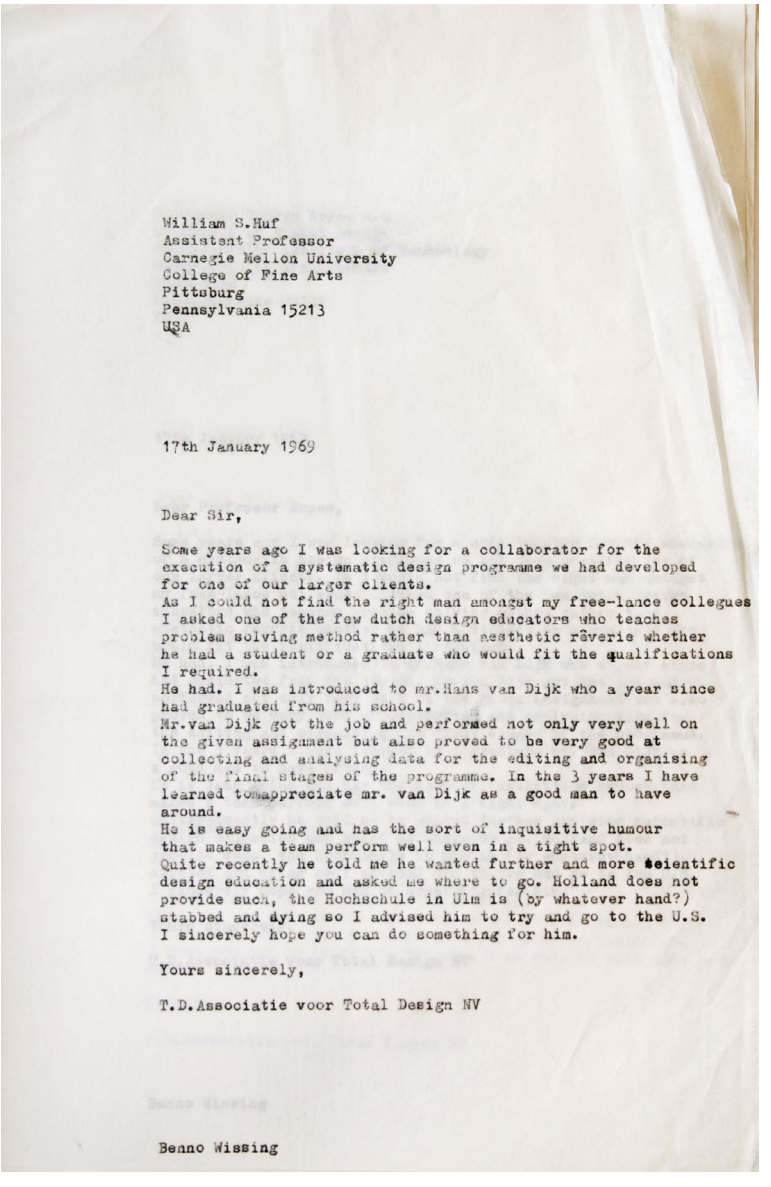


Figure 3. Proposal Amsterdam Metro Identification, design: Total Design, ca. 1972. *Courtesy of Total Identity*.



William S.Huf
Assistent Professor
Carnegie Mellon University
College of Fine Arts
Pittsburg
Pennsylvania 15213
USA

17th January 1969

Dear Sir,

Some years ago I was looking for a collaborator for the execution of a systematic design programme we had developed for one of our larger clients.
As I could not find the right man amongst my free-lance collegues I asked one of the few dutch design educators who teaches problem solving method rather than aesthetic rêveris whether he had a student or a graduate who would fit the qualifications I required.
He had. I was introduced to mr.Hans van Dijk who a year since had graduated from his school.
Mr.van Dijk got the job and performed not only very well on the given assignment but also proved to be very good at collecting and analysing data for the editing and organising of the final stages of the programme. In the 3 years I have learned toappreciate mr. van Dijk as a good man to have around.
He is easy going and has the sort of inquisitive humour that makes a team perform well even in a tight spot.
Quite recently he told me he wanted further and more scientific design education and asked me where to go. Holland does not provide such, the Hochschule in Ulm is (by whatever hand?) stabbed and dying so I advised him to try and go to the U.S.
I sincerely hope you can do something for him.

Yours sincerely,

T.D.Associatie voor Total Design NV

Benno Wissing

Figure 4. Recommendation letter by Benno Wissing (Total Design), 1969. *Courtesy of the Stadsarchief Amsterdam*.

Nevertheless, one does wonder whether the inventorying and storage of the Total Design archive arrived in time, as far as writing an extensive historical study of the agency is concerned. The first study on Total Design already appeared in 1997 as an essay written by Frederike Huygen in the celebrated monograph *Wim Crouwel: Mode en Module*. Huygen used a small part of the Total Design archive that was already available at the Stadsarchief Amsterdam before the whole archive was acquired. As a design historian myself, I also was interested in using the archive: in 2011 the trade edition of my PhD dissertation appeared – *Droom van helderheid: Huisstijlen, ontwerpbureaus en modernisme in Nederland: 1960–1975*

– which had as its subject the development of Dutch visual identities by three design agencies, Total Design, Tel Design and Allied International Designers. Unfortunately, the lengthy inventorying process made the Total Design archive unavailable at the time of writing. The most popular book on the history of Total Design was published in 2011 by Unit Editions and is called *TD 63–73*. An expanded edition of this book was published in 2015. Rather than using material of the Total Design archive it is based on the memories of Ben Bos – an important draw – and much space is dedicated to Total Design's finished graphic design products. The latest book to appear was *Wim Crouwel Modernist* in 2015, written by Huygen, which elaborated on her earlier essays for *Wim Crouwel: Mode en Module*. Seeing the amount of publications about not only Total Design but also its designers – Wim Crouwel taking center stage – that have appeared during the last two decades it might well be that the market for Total Design books is saturated, at least from a commercial point of view.

However, from an academic viewpoint, the Total Design archive still offers many opportunities for researchers. One interesting theme might be, for example, the socio-economical positioning of design: 'how was design rewarded and what can this tell us about the development of the design profession?' Even more interesting is perhaps what the archive can tell us about the rise of the use of the computer in visual communication. From its inception onwards, Total Design had a great interest in the standardization of design work and the organization of information, with an eye towards digital applications. Besides Crouwel and his ideas about digital typefaces, Benno Wissing theorized extensively about the use of computers and multimedia in graphic design. In 1970, for example, he wrote a fascinating document on cybernetics arguing that this aspect should be developed for the Dutch post office, which was famous for its good design policy. He argued convincingly that its new visual identity should be supported by machines that with ample instruction would turn out standardized brochures and posters, thus freeing up valuable time for designers to spent on truly challenging problems. Such production platforms are now in common use by organisations for producing visual identity utterances. Later on, Total Design was the first design agency in the Netherlands to use a computer for graphic design work.

The Total Design archive, as well as the other archives inventoried by the NAGO, might also be suitable for quantitative research into the material qualities of historical objects. The NAGO database notes for example measurements, fabric, amounts of pages, and printing and binding techniques of objects. However, a potential problem is that the applied categorisation is not always clear. If one tries to make a selection, for example, in a 'Techniques' search field of the database, only one selection can be made, where you might have to choose between 'concept' – not really a technique – and 'pencil drawing', both are not mutually exclusive. Measurements in the database are precise for some archives and seem rounded of for others. Smaller archives are described in detail, larger ones in lots. These issues are understandable knowing the changing registrars and funding opportunities at the NAGO, as well as the learning curve in dealing with designer archives. Nevertheless, this does makes quantitative research challenging. Research into the usefulness of this database for such research might offer valuable insights in regard to good and bad practices.

The recent graphic design archiving surge in the Netherlands that resulted in the NAGO database has long since come to an end. The popularity of Dutch archives rested on two fleeting developments. The first being the retirement of the first generation of designers who made graphic design into a respected profession in the Netherlands in the 1960s – including most of the partners of Total Design. This caused a desire to look back and to

evaluate, thus repeating a similar pattern as in the 1960s-1970s, when retired Dutch modernist designers from the 1920s such as Piet Zwart and Paul Schuitema, found their work re-appreciated and collected. The second development was the growing interest of the Dutch government in cultural heritage in the two decades surrounding the turn of the century, coupled with a wide availability of funds for digitization and heritage development, funds which have now been significantly reduced. Although archives from individual Dutch designers who work predominantly in an artistic and cultural realm are still being acquired – a good example is that of book designer Irma Boom at the Special Collections of the University of Amsterdam – it begs the question whether in the future Dutch graphic design archives from larger companies such as Total Design can, and will be inventoried and made publicly available with the same zeal.

An important reason for this, I would propose, is the changing nature of the graphic design profession. With the increasing proliferation and importance of the digital appliances more and more agencies have turned to cross-media work and communication design. This results in an increasing dependency on software applications that make these designs 'work', which is a hindrance to archiving these designs. Who knows whether the technology these designs' use is still available in the near future? And what if the design is dependent on social media? And how might archivists deal with all the digital correspondence? Also the materials inherent abstractness when stored as data on digital media does not necessarily help to make the work more accessible. In addition, there is the more flexible nature of the design profession to consider. As a result of the popping of the internet bubble in 2001 and the financial crisis of 2008, agencies have become more flexible in nature, working with a core team and using more external contractors and collaborators, thus having a less clearly defined identity. Taking everything together these developments do not seem to make the extensive formation, inventorying, and storing of design archives easier for heritage institutions and designers.

With Total Design the movement towards communication design was symbolically indicated by their name change around 2000 to Total Identity. It is no coincidence that at the same time its archive materials were transferred to NAGO. Historically, Total Design's archive had provided a unique resource from which a history of the company and its successes could be readily identified and promoted. Throughout the 1970s for example, Total Design produced promotional posters showing a selection of their work up to that point as well as photos of their employees, all done in a rather neutral way (See Figure 5). In the 1980s Total Design produced two agency books, both titled *Ontwerp: Total Design,* published in 1983 and 1989. The first book also served as a companion for an exhibition about Total Design's 20 year history, the second book concentrated on the agency's 1980s work. In the later books – such as *Total Identity* published in 2003, followed by *Identity 2*.0 from 2008 – the emphasis is not only on current but also on future developments. Although still very visual in nature, these books take on an appearance akin to cookbooks – promoting the business of management consultancy rather than a classic portfolio of well designed artefacts. It remains to be seen how Total Identity's new more digital oriented archive will develop in the future.

Interestingly NAGO already anticipated the potential problematic nature of digital archives at an early stage, and started educating designers in the proper archiving of their (digital) work. However, it is unclear how design professionals and heritage institutions in the future will deal with digital archives in practice. We cannot dismiss what lessons have been learned from the inventorying of the Total Design archive. And, to celebrate the fact that the archive

Figure 5. Promotional poster, design: total design, 1973. *Courtesy of the Ben Bos Archive*.

may still contain many beautiful pearls of wisdom and design which are waiting for researchers discover.

Notes

1. Meeting minutes 10 May 1962, archive of Dick Schwarz cited by Frederike Huygen, 'Total Design' in: Frederike Huygen, Hugues Boekraad, *Wim Crouwel: Mode en Module,* 010 Uitgeverij, Rotterdam 1997, p. 129.
2. http://www.wimcrouwelinstituut.nl/nago/
3. http://wimcrouwelinstituut.nl/en/home
4. Inventory number 1,019: 'Associatie voor Total Design B.V.', Stadsarchief Amsterdam.
5. http://www.geheugenvannederland.nl/?/nl/collecties/TotalDesign

Notes on contributor

Wibo Bakker (1974) works as assistant professor at the Industrial Design department of the Xi'an Jiaotong-Liverpool University (Suzhou, China). He specializes in design history, graphic design and creativity theory. Lately he has become interested in information design and pictograms, carrying out research in the Netherlands, England, Germany and Japan. Bakker started his career studying graphic design at the ArtEZ Institute of the Arts in Arnhem (1991–1996). An internship at Pentagram Design (San Francisco), as well as jobs at several other design agencies, made him aware of national differences in design cultures. In 2009 he obtained a PhD at Utrecht University for his study on the development of visual identity in the Netherlands, titled 'Droom van Helderheid: huisstijlen, ontwerpbureaus en modernisme in Nederland : 1960–1975' (A Clear Dream : Visual Identity, Design Agencies and Modernism in The Netherlands : 1960–1975).

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BOOK AND EXHIBITION REVIEW

Royal College of Art's 'GraphicsRCA: Fifty'

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GraphicsRCA: Fifty Years and Beyond, 5 November–22 December 2014, Royal College of Art Gulbenkian Gallery, Accompanying book 'GraphicsRCA: Fifty Years and Beyond' (ISBN 978-1-91064-200-9)

The winter of 1962–63 in London brought the coldest weather in 200 years. So spring 1963's 'Graphics RCA: Fifteen years' of work of the School of Graphic Design' at the Royal College of Art Gallery was a warming boost, with its luminous 'prints, illustrations, books, publicity, television and films'. Forward half a century: the RCA provided respite from the weather again with the 5 November 2014 launch of 'GraphicsRCA: Fifty'. It too featured graphic paraphernalia from the intervening years of graphic design at the institution, enriched by the stories of its more illustrious students and educators. And, with an accompanying publication and series of seminars brightening the days up to Christmas, it provided much more than an escape from the UK weather.

Of those students and educators: The Royal College of Art (RCA) has a staff and alumni widely regarded to have significantly contributed to UK design from the latter half of the twentieth century onwards. The College is unique in its solely postgraduate offering in art and design, and was ranked top of the QS World University Rankings 2015 in the subject area. This institution has a reputation to live up to, and it assertively flexed its credentials with 'GraphicsRCA: Fifty'.

The original call for alumni work for the exhibition read:

> As a student at the RCA some of your college work is already housed in the RCA's 'Special Collections and Graphic Design Archives'. Yet, after initial conversations with graduates, we know there is more to consider than what these archives currently hold.

That quieter ambition of 'more to consider' and the implicit cross-references to RCA's archives and its current graduates was particularly well explored through the series of accompanying events, and most emphatically within the accompanying publication.

The 'GraphicsRCA: Fifty' publication has a chapter by Senior Tutor Adrian Shaughnessy titled 'A cloud-nine academic monastery'. This is apt since the RCA's Gulbenkian Gallery did indeed feel like a place of worship for the exhibition opening. That was because it was easy to feel reverence for the cultural icons like the bright red lips and tongue of the Rolling Stones logo by John Pasche; or alumni including Margaret Calvert and Jock Kinneir, whose 1957–1967 designs for typography and signage adorn every significant carriageway in the UK; and contemporary contributors to graphic design and its education including the likes of Neville Brody, Teal Triggs, and Adrian Shaughnessy. The sense of pilgrimage was heightened even further by the quietly intimidating presence of many of those on the roll call.

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These big-hitting names and images are the media-magnets that attracted the focus of most previews and reviews. But it was the other half of the exhibition in the gallery entrance that helped to transition the exposition from mere retrospective visual epithet to deeper meaning and resonance. The exhibition was most colourful for me in this more monotone space. Here, it quietly focused on reflections of the RCA by some of the people behind the productions. It is where the purpose of the exhibition resounded – dodging accusations of navel-gazing by its implicit posing of more satiating open-ended questions. For instance, how does the cultural reputation of an iconic school affect the individual within it? To what extent do students and staff even experience an 'RCA-ness' within these walls? How does an individual experience and resolve the tension between commercial and artistic aspects of their work in a world of employability-focus and commoditization of learning? Being the smaller area of the whole, there was really only space to infer more questions than answers, but there were some whispers of riposte. For instance, the most touching piece on display for me was a freshly-researched and produced simple scroll of the names of all the people who have passed through RCA Graphics over its lifetime. It touched by its allusion to the memorial roll call of honour, containing the names of the well-known and well-regarded 'generals' of British graphic design, but it also contained the names of those who have quietly and assiduously contributed to the profession and its education. It hinted at the symbiosis between the art and design institution and its alumni – each party iteratively nurturing individual but aligned reputations through their joint-achievements over years and decades. In this metaphor to the roll call of battle, is the 'unknown soldier', then, represented by the majority alumni (even at the RCA) whose skilful graphic work may cast significant cultural, social or educational influence but whose names remain relatively anonymous or subsumed amongst commercial studios, practices and institutions?

The accompanying book takes up this theme too in its cleverly-folded cover that wraps its contents in the names of past and present RCA students and staff chronologically and alphabetically. It details this more fully in a beautifully delicate four-page spread: '1963/2013 Graphic Design at the RCA – RCA Staff and Students', which is even more redolent of a remembrance roll call with its ghostly monotone of silver on black. Again, rather touching – simultaneously a demonstration by its numbers but also a retort in its simple humanity to the accusation that higher education institutions (even at postgraduate level) have become academic 'sausage factories'. The book is also where the questions implied by the exhibition are explored much more fully. The research has been painstaking, with extensive interviews with alumni and staff. Richard Guyatt (previous Chair of Graphic Design at RCA) features with his 1950 'Head, Heart and Hand' essay, which themes are threaded throughout the book by a series of visual essays. These scaffold the thorough interviews and other short essays. Each interview probes the interviewees about their practice and experiences, with the strong commonality being their notions of the Royal College of Art. This all sounds as though it could be a mutual love-in, but the insights are genuine and thoughtful. The late actor Alan Rickman (student 1968–69) concludes his interview with a hardly gushing (but nevertheless significant): 'In retrospect, being at the RCA was like walking across a necessary bridge to the rest of my working life.' Alex Maranzano says of his time (1965–68): 'For me it was excellent, so different to everything I had previously experienced.' That exciting appraisal appears to contrast with the experience of Richard Doust (1962–65): 'We were basically left to ourselves. So actual teaching was very limited.' But Doust goes

Photograph Copyright: Tim Bowditch

on: 'What was created, however, was a dynamic working environment where a core of the students all fed off each other.' But more recent graduates Emma Thomas and Kirsty Carter (2003–5) are pragmatic in pointing out that: 'The RCA has high fees, and London is an expensive place to study, so it can have a major impact on the demographic of students, at postgraduate level in particular.' In other words, one needs to be able to afford to study in London at the RCA.

Current Dean of the School, Professor Neville Brody, has said that the RCA 'has produced many of the leading and most innovative practitioners of the modern era'. The contribution to British culture and way-of-life of some of the work and people within the exhibition lends weight to his assertion. And yet, Thomas and Carter indicate more of a coming together of talent than the production of it in the conclusion to their interview: 'The College brought together some amazing students from all over the world – we met some very talented and interesting people. And we met each other!' So is that the crux of what the RCA provides – bringing together excellent students and showcasing interesting talent and practices? Is RCA-ness that simple? Then why, apart from my own innate insecurities, have I a slight sense of intimidation amongst the prolific outputs of the RCA and its creators at the exhibition opening? Despite the invite, a nagging feeling of having accidentally stumbled in from the rain to a close-knit party? It is perhaps explained by another privilege that Thomas and Carter earned during their time at the College a decade ago: 'If you look at both of our lives now the RCA is still very present, most of our closest friends and collaborators went there – the opportunities we still get are often linked to the College.' I *am* an outsider.

That enduring presence of the RCA in one's being as an alumnus, the self-assuredness and foresight to hold its own special collections and archives, to so emphatically mark the significant anniversaries of one of its schools, and in doing so to yet again challenge notions of graphic design and graphic design education: is this the College's uniqueness? Perhaps: the extensive exhibition, seminar series and book are not just about RCA-ness, but are RCA-ness.

Notes

'GraphicsRCA: Fifty' was held from 5 November–22 December 2014 at the Royal College of Art Gulbenkian Gallery. The curators were: Teal Triggs, Jeff Willis, Richard Doust, and Adrian Shaughnessy. Curatorial associates were Abbie Vickress and Natasha Trotman. The external alumni adviser was Michele Jannuzzi. The book 'GraphicsRCA: Fifty Years and Beyond' is a revealing and engaging addition to the bookshelf of those with an interest in graphic design education. It stands as a comprehensive volume of a single influential institution in its own right, rather than merely a catalogue of the exhibition. It is published by the Royal College of Art, ISBN 978-1-91064-200-9.

GraphicsRCA: Fifty Years is travelling and recently showed at the Museu Nacional de Repûblica in Brasilia, Brazil (4 September – 27 September 2015).

Notes on contributor

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CONFERENCE REVIEW

AIGA New Ventures: intersections in design education

September 11–13, 2014
Portland, Oregon

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The current landscape of design education is filled with new ventures for both students and educators. These new ventures are sparked by design's intersections with technology, collaboration, and communities. The AIGA Design Educator's Conference*, New Ventures*, immersed attendees into presentations and discussions related to these intersections, 'propelling design educators and students to re-think how, where, and what types of experiences best serve a design education in the 21st century'. (1)

New Ventures took place in Portland, Oregon at the Sentinel Hotel on September 11–13 and drew in participants from inside and outside of the US. Several themes were presented across 20 different panel discussions related to collaboration, critical thinking, and social design. The thread that tied all the discussions together is the need to prepare students for a lifetime career as an empathetic designer – one that is able to engage and work with people at various levels of the design process. The presentations and discussion offered multiple ways to prepare students for such a career – through educational collaborations, social design experiences, and 'real world' activities.

Educational collaborations

Several of the panel sessions focused on sharing examples and ways to implement 'educational collaborations' – from interdisciplinary to cross-disciplinary, within programs, coursework, or projects. Presentations covered rationale for collaboration as well as ways to go about creating these types of experiences for graphic design students. Two distinctly different ways of collaboration were revealed throughout the various panel sessions. One approach is to facilitate collaborative projects where graphic design students work with peers, those in other disciplines, or campus organizations. Another is to provide an educational collaborative experience for design students.

Barbara Martinson, of University of Minnesota, shared her project outcomes from a collaborative project between her graphic design students and nursing students from within the same university. Additionally, she shared a project in which graphic design students worked with computer science students in a color course as a means to test out how their varying approaches work together.

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For a different example, Kelly Murdoch-Kitt of RIT and Denielle Emans of Virginia Commonwealth University of Qatar, have been testing out the numerous ways in which their design students can work collaboratively across cultures. In a poster remix project students from RIT and VCU worked together on a unifying topic, the learning outcomes from students offer the global collaboration. In this experience students learn to build trust and a sense of community that isn't reliant on proximity and location to each other.

Some panel sessions highlighted other ways to provide an educational collaborative experience for design students. These ways involve situating students from various disciplines into common courses by creating a new curriculum offering. In the panel session mentioned previously, 'Intersections in Interdisciplinary', Jessica Jacobs of Columbia College of Chicago is working to create a Business of Design degree that would provide a curriculum of business courses and design courses for undergraduates, creating a graduate that is a 'designer with business skills'.

Social design experiences

No AIGA Design Educators Conference would be complete without the topic of Social Design. Facets of social design were sprinkled throughout most of the presentations. 'Design for the greater good' is a common theme amongst most graphic design programs. These experiences are often highly collaborative but all vary in location and level of immersion into the community or place in which they intervene. If there was a spectrum for 'design for social good' that is structured on the level of engagement, one end of the spectrum would have 'designing *for* the community' and the other would have 'designing *with* the community'.

In the 'Intersections in Communities' panel, Brian Wiley and Eric Benson shared their student work from the University of Illinois Urbana-Champaign. Graphic design students participated collaboratively with each other in the planning and production for a campaign focused on creating awareness for a local garden community.

Natacha Poggio, from the University of Hartford, presented work from the creative think-tank, 'Design Global Change' – an experience where students do design work with global communities. Ryan Clifford formerly from MICA's Design Center for Practice, presented 'Thinking Wrong' through the popular program for students, Project M. In this program, a group of students frequent Greensboro, AL every summer to create community-immersive experiences.

'Real world' activities

Design education's connection to professional practice, the industry, aka the 'real world' was another common topic at the conference. The phrase 'real world projects' was used as a reference for opportunities that offered students a chance to build their skills as a practicing designer. The nature of these projects relied heavily on client-like interactions that have a small monetary value for the design services of the students. The use of this phrase by academics is highly problematic as it implies that the 'real' design projects can only take place in a monetary, client-based scenario. Natalie Davis, educator and founder of Canoe Goods in Austin, TX, offered a different perspective of what should be considered a 'real world project'. In her classes and workshops, Natalie empowers her students to extend their craft and design skills in ways that open up possibilities for them to create their own brand

and businesses. Amy Fidler and Jenn Stucker, of Bowling Green State University, shared a truly thoughtful and authentic experience they have created for themselves, their families, and their students. Since 2007, Jenn and Amy have opened up their homes (and schedules) every summer to students, engaging them in a different learning experience outside of the academic structure. They work together to identify ways in which design can change established patterns and empower the students to be active in defining the areas of this research. Both of these examples offer up a different model for practicing design other than through client-driven or money-driven projects – these are the 'real world projects'.

Conclusion

In conclusion, *The New Ventures* conference provided several presentations related to familiar topics that continue to be discussed at design education conferences. What this conference brought forward was the notion that the topics are at various intersecting points as proven throughout the disparate but related presentations. Design education is moving forward in multiple directions and when those directions converge, the possibilities are endless. Conversations in the near the future will perhaps discuss the impact of these intersections and new ventures on the education and practice of graphic design.

Notes

1. http://newventures.aiga.org/ (accessed: 11th May 2014).
2. http://educators.aiga.org/about-2/ (accessed: 11th May 2014).

Notes on contributor

Rebecca Tegtmeyer is an Assistant Professor in the Department of Art, Art History, and Design at Michigan State University—contributing to both the Graphic Design curriculum and the new Experience Architecture (XA) degree program. She holds a BFA in Visual Communication from the University of Kansas and a Master of Graphic Design (MGD) from NC State University College of Design. Through her active research, writing, making, and teaching agenda she investigates the role of a designer and the design process through a variety of forms — from static to dynamic, time-based to print.

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EXHIBITION REVIEW

Two beadwork exhibitions in Johannesburg, South Africa

'Beadwork, Art and the Body: Dilo Tše Dintši/Abundance' 'eye hand mind; seeing making and understanding'

Deirdre Pretorius

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In 2015 Johannesburg's two public universities both staged beadwork exhibitions. The first 'eye hand mind; seeing making and understanding' was hosted by the University of Johannesburg's Faculty of Art Design and Architecture (FADA) Gallery in association with the independent educational non-profit company 'Africa Meets Africa' and opened on Monday 20 July 2015. 'Beadwork, Art and the Body: Dilo Tše Dintši/Abundance' followed shortly thereafter opening at the Wits Art Gallery (WAM) on 29 July and remained open until October 2015.

The curators had very specific intentions in mind for their respective exhibitions. Helene Smuts established 'Africa Meets Africa' to develop teaching resources for South African educators in subject areas such as Mathematics, History, Language and Arts and Culture by drawing on objects of cultural expression. 'Eye hand mind' showcased how the work of South African weavers, beadwork makers, potters and painters can be used as a tool to teach mathematics to rural children. The exhibition was beautifully curated by Helene Smuts and FADA's Eugene Hön and explanatory wall texts and other information design ensured that the intent of the exhibition was made accessible to all visitors. The didactic approach of the exhibition was unsurprising given the aim of the exhibition and Smuts's background as an arts education consultant with an involvement in teacher training and Hön's many years of experience as a ceramics lecturer at FADA.

In contrast, Anitra Nettleton emphatically positioned the beadwork at the WAM exhibition as 'art' choosing to exhibit items according to their position on the body, such as ankles, arms, waist and neck, and deliberately avoided ethnographic practices of categorizing items according to ethnic affiliation. Similarly, photographic representations of items in use were circumvented and items were exhibited on transparent Perspex structures giving the impression that they were floating in the air. Currently Nettleton is the Chair and Director of the Centre for Creative Arts of Africa at WAM. She took up this position in 2012 after serving for many years as History of Art Professor in the Wits School of Arts. The meticulously curated exhibition, quality of the beadwork, sophisticated exhibition methods used and gallery environment all supported the aim to elevate the beadwork items to the status of 'art'. This

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elevated status of art was literally expressed on the top floor of the exhibition where the work of a number of contemporary artists working with beadwork was showcased alongside the work of beadwork collectives and contemporary examples of beadwork.

Ostensibly these two approaches, one in favour of beadwork as an expression of mathematical thinking, the other as art, seem to be widely divergent. However, both these positionalities speak of attempts at elevating beadwork from a history in which it was seen as 'other', the work of African women which was devalued as 'craft'. As such the exhibitions offer a critical cultural review of beadwork and raises questions around cultural value and inequality, asking of the viewer to reconsider their conceptions of the roles objects can play and how we assign value to things. Each exhibition emphasizes a specific function for beadwork, thereby concomitantly positioning the makers of the beadwork as 'artists' and 'mathematicians' respectively, positions which are valued within Western epistemology but were denied to South African woman under colonialism and apartheid. These two positions are argued for persuasively and eloquently in both exhibitions, as well as the accompanying catalogue, in the case of the WAM exhibition, and the educator's resource books developed for math teaching and learning by Helene Smuts.

As such the exhibitions demonstrate how the meaning of objects are fluid and can shift given different contexts and positioning and ultimately how what objects communicate is entirely dependent on the structures in which they are given meaning. Beadwork therefore can be viewed in diverse ways, for example as adornment, craft, women's work, ethnographic object, art, a mathematical formula, or as I would like to argue, communication design. However, this is a view with which Nettleton disagrees. She does not consider beadwork to be a language and views beadwork as 'markers' rather than messages. Although she concedes that beadwork communicates non-verbally she does not view it as a language and therefore 'deliberately avoided suggesting anything like this in our exhibition'.

For me the most obvious manifestation of beadwork as communication design is the inclusion of words and letters within the beadwork itself. This is seen in examples such as a bride's wedding apron (Figure 1), or a married woman's cape which includes letters from car registration numbers, thereby indicating aspiration towards owning such an object (Figure 2). The shapes and other formal qualities of the beadwork also communicate messages relating to status, gender and language group. This is clearly seen in the various shapes of the aprons worn by woman at different life stages (Figure 3). To make meaning of these messages relies on a groups' shared understandings of codes and in this way beadwork is no different from any other language.

Figure 1. Bride's wedding apron. Photographer Deirdre Pretorius, copyright courtesy Wits Art Museum.

Figure 2. Married women's cape artist unrecorded Zulu (Ngwane) Marriage Cape. Cloth, glass beads, thread. Mid-20th Century. Standard Bank Collection of African Art, Wits Art Museum.

Figure 3. Aprons worn by woman at different life stages artist unrecorded Nedebele irari (Beaded Blanket). Cloth, glass beads, thread. Mid-20th Century. Standard Bank Collection of African Art, Wits Art Museum: artist unrecorded Xhosa Beaded blanket. Cloth, glass beads, thread. Early 20th Century. Standard Bank Collection of African Art, Wits Art Museum.

Notes on Contributor

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CONFERENECE REVIEW

Envisioning futures: design education in Latin America

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X Encuentro Latinoamericano de Diseño + VI Congreso Latinoamericano de Enseñanza del Diseño, Universidad de Palermo, 28–29 July 2015, <www.palermo.edu/encuentro>

BDSÑ (Bienal Nacional de Diseño) + II DiSur (Congreso Latinoamericano de Diseño), FADU UBA, Buenos Aires (Argentina), 10–15 August 2015, <www.bienal.fadu.uba.ar>

July and August 2015 were golden months for the field of design in Argentina, with the two most important academic and professional events in the country being held. The agenda began with the double *Encuentro Latinoamericano de Diseño* and *Congreso Latinoamericano de Enseñanza del Diseño* (Latin American Design Meeting and Design Education Conference), both organized by the University of Palermo (UP), the private university with the largest number of design students in Argentina. With a yearly-sustained ability to summon, this double edition has turned into an important Latin American gathering, with staggering numbers: more than 350 papers presented in the academic part of the Conference – selected from a call for papers through a peer-review process – more than 2000 presentations in the professional Meeting – with unrestricted enrolment, unlike the previous edition – and close to 5000 participants in total. Over a period of 10 years, UP has remarkably set up one of the most relevant spaces of exchange and debate on Design in Latin America, and is now regarded as the main Latin American conference on Design with a focus on education.

In August, the University of Buenos Aires School of Architecture, Design and Urbanism (FADU UBA), where six design university courses are taught alongside architecture, organized the second edition of the National Design Biennale (BDSÑ). The success of this event surpassed the expectations and it closed with a master conference by Pedro Gadanho (architect and curator of MOMA, NYC). In workshops alone there were over 9800 participants in the Biennale six venues. The numbers are impressive: 30 professional awards, 50 roundtables and over 130 workshops. One of the particularities of this issue of BDSÑ is that it also hosted the Second Latin American Design Conference (DiSur), organized by a network of design courses from Latin American public universities. The guiding themes of the DiSur Conference were the performance of design in emerging economies, design in the creation of citizenship and design in regional economies.

Both conferences put in evidence the main areas of interest and research in the region. The double Latin American Design Meeting and Design Education Conference is supported by a network that includes some of the most important private universities offering design

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courses in Latin America. Education is the main focus of those events, and research is presented to support it. In the case of FADU UBA National Design Biennale, the research presented focused on the universality of access to design and the way it is inserted in industrialization and import substitution programs, as well as on programs for the development of small and family businesses which generate the greatest quantity of jobs. This second conference accounts for the relationship between design and citizenship, and also the relationship between design and social inclusion – given that a growth in employment leads to an improvement in social rights. These themes are important since social inequality is common ground in Latin America. In particular, the papers on design and visual communication presented in the conference, were developed within the framework of programs of primary education oriented towards universal access to digital culture.

The reader might be wondering how it is possible to come to have such a large number of activities, speakers and attendees. The reasons are varied and they account for the way in which the field of design education was built in Argentina and Brazil. Both countries were pioneers in Latin America in the creation of design university courses in the mid-twentieth century. More than 60 years of teaching have contributed to developing a clear and early awareness of the profession and the discipline. Furthermore, university courses in Argentina are massive, with over 300 new students a year in each of them. Cities like São Paulo and Buenos Aires offer clear signs of design in their urban culture, surely product of an early presence of designers in this environment. Another explanation for the scale of participation in these conferences and meetings is that, in both cases, it offers free attendance. How is it financed, then? It is financed by the universities. In the case of UP, a significant amount of their revenue is used to support this activity, and in the case of the University of Buenos Aires, it is funded by the national government's budget aimed at helping the dissemination of design in its professional and academic aspects.

This funding cannot be fully understood unless the long history of free higher education in Argentina is taken into account. It began with the first public universities in the

seventeenth century, and continues to this day. This precedent brought about a culture of free higher education that is seen as a universal right. Private universities, then, even if they charge fees, incorporate this concept and understand that the university must have activities that are free of charge for all. This proves expensive, but, undoubtedly, one of the best investments a nation can make.

Notes on contributor

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CONFERENCE REVIEW

AIGA National Design Conference 2015

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ABSTRACT

AIGA's biannual conference was held in New Orleans, October 8–10 2015. This year's theme, Revival, nodded to both the resurgence of New Orleans after Katrina and AIGA's desire to inspire its membership. The main conference was prefaced by a Design Educator pre-conference, professional development workshops, the Emerging Designers Symposium, and other special events. This review focuses on the main stage presentations as key indicators of event trends and themes.

In the face of exponential technological growth – a civilization barreling toward pervasive, embedded technology fed by big data, that will, perhaps, ultimately be orchestrated by forms of artificial intelligence – 2015 AIGA conference speakers urged humanity to investigate, appreciate, and celebrate the wonders of the living world. And what better place to do just that than New Orleans, a location steeped in ritual, music and hot sauce. The ghost of Katrina left an air of fragility throughout the city, encouraging attendees to pay close attention to their surroundings. This ambiance of observation and revelation infused all of the subsequent events. This conference was not about aesthetic eye candy, design truisms and the adoration of design heroes. Presentations and conversations at the 2015 conference generally suggested a larger realignment of design practice: practitioners less as communicators of content and more as facilitators of curiosity.

Roman Mars advocated storytelling as a potent force for these new facilitators of curiosity. Host of the popular podcast 99% Invisible, Mars acted as MC, introducing speakers and leading Q&As – but the true magic surfaced as he live-mixed podcast-like performances on stage. He reeled in attendees and left them straining to find out more about topics as disparate as noisy escalators and municipal flag designs. Mars deftly wove meaningful narratives around tiny details to reveal truths of human experience. 'Once you know the story,' he explained, 'you can love almost anything.'

Noteworthy presentations included one by intergalactic experience designer, Nelly Ben Hayoun. Her high energy chaotic performance – a 'total bombardment' of the senses – exploded with the same passion that drives her subversive projects for organizations like NASA and the Search for Extraterrestrial Intelligence (SETI) Institute. She exemplifies a bold

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generation of designers who are attempting to shape the future by creating experiences that flood our senses and demand our engagement.

Later that day David Delgado, creative director of the NASA Jet Propulsion Laboratory (JPL), and Dan Goods, Visual Strategist for JPL, brought to the main stage their drive to make visible the invisible, to curate curiosity. At JPL, Goods and Delgado transform complex scientific data into accessible experiences so that the public might better comprehend our solar system. Delgado described the participatory nature of his practice as 'sneaking up on learning.' Much to the mystification of the crowd, his presentation of Project Juno, a large-scale effort to say 'hi' to NASA's Juno Spacecraft using crowd-generated code, brought tears to the attendees' eyes. Turning dry data into compelling interactions led many discussions, playing out on the main stage and in affinity sessions. Attendees were eager to explore design as a mediator between big data and humanity – a need that grows daily as ubiquitous computing enables our environment to respond to us.

Noteworthy Saturday speakers included Wolff Olins CEO Ije Nwokorie and designer Keetra Dean Dixon. Both celebrated the inquisitive nature of human creativity. Nwokorie acknowledged the unsettling nature of smart machines when he predicted: 'In a world that is becoming more automated, creativity will be the one thing humans still do themselves.' He urged designers to invite participation and by doing so garner the creativity that lies in everyone. Dixon, a designer who recently relocated to rural Alaska, encouraged attendees to seek 'the beginner's mind.' Her keen sense of making, breaking, and remaking both technology and tools produces work that forces the viewer to either revel in an experience or reflect upon an arduous but exquisite production process – her opulent wax letterform geodes provide the perfect example of the latter. Nwokorie's inclusive spirit and Dixon's hacker-like disregard for technical barriers models the kind of creative inquiry that could triumph despite exponential change.

Designers should embrace these kinds of models. The recurring theme of wonder and curiosity at Revival reacted beautifully against all the recent press suggesting a future of autonomous weapons and job-stealing robots. Overall, the crowd seemed more inspired than at any national AIGA Conference in years. Yet, more critical, reasoned dialogue examining the impact of technology upon our communities would have further enriched this experience. In the age of Technology, Entertainment, Design talks, easy exposure to meaty ideas has raised attendees' expectations and they expect no less from conference presentations. Stronger, more critical main stage analyses of technology – not just as a tool, but also as a cultural force – could lead to strategies not just for responding to change but for shaping the change.

AIGA is moving to an annual cycle for its national conference. This year, attendance was higher than at any in the last 10 years. This sudden resurgence suggests something: time to reflect upon our discipline is a necessity, now more than ever. To do so, we need someone like Roman Mars to pull us into a room every once in a while, forcing us briefly to put aside the harried every day. We need to come together and scrutinize the moment. Whether this happens through a conference or another approach, we need time not just to revitalize our spirits, but to think critically how we got here and where we want to go.

Note on contributor

Helen Armstrong views design from across the spectrum as a practicing designer, college professor, and published author. She is an associate professor of graphic design at North Carolina State University. In addition to teaching, she wrote *Graphic Design Theory: Readings from the Field* (Princeton Architectural Press, 2009) and co-wrote, with Zvezdana Stojmirovic, *Participate: Designing with User-Generated Content* (Princeton Architectural Press, 2011). Her new book, *Digital Design Theory* (2016) bridges the gap between print and interactive experience by examining the impact of computation upon the field of design. Armstrong has an MA in English Literature from the University of Mississippi, an MA in Publication Design from the University of Baltimore, and an MFA in Graphic Design from the Maryland Institute College of Art.

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EXHIBITION REVIEW

Do we need an alternative history of graphic design, or would an alternative future be more useful?

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Graphic design has always been hard to place into an historical context. Is it a craft, a trade, a practice or an industry? Are we, as graphic designers, imagineers of new visions for the world or simply facilitators for industry and commerce? Or is this now a moot point given that outsiders, cultural mavens without formal training, are increasingly part of the field of visual communication?

Adrian Shaughnessy proposed in his 2006 essay *The Cult of Graphic Design*[1] a distinct split in our practice. He stated 'Graphic design used to be homogeneous: everyone agreed about the fundamental principles, even if they disagreed about what was good design and what was bad design'. He continued to divide the practice of graphic design into two discrete camps: one led by industry; graphic designers responding to consumer needs and wants. The second, and arguably more interesting section of design practice, pursuing a more culturally enriching experience, being the engineers of their own destiny.

But arguably there is a third, and equally valid group that will in time come to form part of an overall history of graphic design: the non-graphic designers, the outsiders and DIY creatives, people interested in culture who 'use' graphic design purely as a mechanic, a means to communicate without seeing themselves within an industry, practice or trade. This third alternative, rather than being driven by design is driven by culture. In this third definition graphic design is less important than the act of trying to explain, question and understand the world. The mechanics of graphic design become insignificant; it is no longer a practice of secrecy and professionalism where a rich technical language separates those on the inside from the masses, as it moves to a more embracing condition where amateurs and professionals alike communicate to the world through the visual medium, albeit some better than others.

Fraser Muggeridge's 2015 exhibition 'Towards an Alternative History of Graphic Design: Schmuck, POP, bRIAN, Assembling' (De La Warr Pavilion, Bexhill, UK from August to October 2015) sought to explore the work of some of these outsiders and cultural commentators. Muggeridge is right to be cautious about proposing such a rethink in how we contextualize graphic design, and his caveat 'towards' is telling, stating that we are not there yet. William Addison Dwiggins, the American type designer and calligrapher, coined the phrase 'graphic design' in 1922, not as a positive statement of activity, but more as a means of collecting a

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wide range of often unrelated tasks that he performed as a newspaper designer, from cutting out to laying up, and from drawing to specifying type.

So arguably our 'history' of graphic design is one born of trying to compartmentalize and summarize a set of activities that have always been fractious. The ebb and flow of time at one point coagulated this disparate set of activities under the helmsmanship of the graphic designer and now is again dispersing them through generalists and specialists, professional designers and cultural enthusiasts. Increasingly, it is non-design professionals leading the way. The collection of works in Muggeridge's exhibition exemplify four manifestations of this outsider approach, each of whom used the form of a publication.

In this exhibition, we see four published works laid out around a gallery wall providing an overview of sequence, colour range and density, presenting the publications in a way that we usually don't see them. We see Beau Geste – beautiful Gestetner[2] – Press' Schmuck (1972–1978) by Mexican artists Martha Hellion and Felipe Ehrenberg together with David Mayor who produced eight issues focusing on Fluxus and Mail art, with a wanton abandon of conventions and boundaries of disciplines. Heinz Ohff's 'Pop-Art und die Folgen!!!' (Pop Art and the Consequences, 1968), with visuals by Wolf Vostell. Hansjorg Mayer's bRIAN, a student-led publication that was the result of experimental teaching by Mayer at the Watford School of Art in the UK that actively sought to embrace chance and the happy-accident. Finally, we see Richard Kostelanetz and Henry Korn's Assembling that produced 13 anthologies of supposedly 'unpublishable material' from 1970 to 1982, each invited contributor submitting 1000 copies of a single page of their work that was then 'assembled' into a single publication.

Within the exhibition original pages from the four publications are pasted directly onto the wall, with little contextualization referencing a Fluxus stream of consciousness. As one publication is placed directly next to another juxtapositions of type and image are formed, a series of relationships created that were never intended by the various authors, but that are in keeping with the spirit of the disparate artefacts. Retrospectively, looking at this body of work collated into a gallery setting it was never intended for (these were low-fi outputs, often by non-professionals), they seem uncannily appropriate at this current junction of graphic design lineage and history.

Technology is a liberator and an enabler. Muggeridge recalls that the development of the golf ball typewriter in the 1960s and 1970s made it possible for people to change typefaces, liberating typefaces from the monopoly of the print shop. Technological changes continue to come and the rate of change seems to increase. We are entering an unprecedented era of democratization of both technology and skills, and these works seem a profoundly pertinent reflection on the nature of outsider publications. With this liberation of technology and content perhaps there is less of a barrier between the professional and the amateur, those on the inside and those considered outsiders.

To return to Muggeridge's statement of intent, 'Towards an alternative history of graphic design', perhaps this was never possible and never intended to be. What the exhibition does very successfully however is propose an alternative future for graphic design. A non-exclusive, democratized future, one where the protagonists of these seminal 1960s and 1970s publications would feel welcome. A future where wishing to express opinions or thoughts isn't hindered by professional barriers to entry or technological restrictions.

ENDS

Images credit: Images courtesy of De La Warr Pavilion. Photography by Nigel Green, 2015.

Notes

1. Adrian Shaughnessy's 'The Cult of Graphic Design' published in *Looking Closer Five, Critical Writings on Graphic Design* (2006).
2. The Gestetner machine, stencil duplicator or mimeograph, was embraced by artists and fanzine producers as this technology allowed for the cheap reproduction and publication of documents.

Notes on contributor

Gavin Ambrose is a Senior Lecturer on the Graphic Design BA at the University of Brighton. Since 2004 he has published with Bloomsbury Press, and his latest book, *Design Genius* was nominated for best Scholarly, Academic and Reference book at the 2015 British Book Design and Production Awards. His current practice-based work focuses on book publishing and design, including work for the late seminal photographer Raghubir Singh. Ambrose is currently the Design Director of the 2016 Design Research Society conference, to be held in Brighton next summer and is researching and compiling a book on the late Malcolm Mclaren's sketchbooks.

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POLICY REVIEW

Brazilian design – a diagnosis

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ABSTRACT
The Brazilian Ministry of Development launched the Diagnostic Review of Design in Brazil in June 2014. It is the most comprehensive study ever made on the design sector in Brazil, and should support future actions of central and regional governments in the country. This review discusses its historical precedents, as well as its references, breadth, importance and consequences.

KEYWORDS
Design policies; Brazil; design management; design sector diagnostics

The Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) launched in June 2014 the *Diagnostic Review of Design in Brazil,*[1] a study commissioned by the Brazilian Trade and Exports Agency (APEX-Brazil), and developed by the Brazilian Design Centre (CBD). A study with such breadth and depth on Brazilian design has never been done, and the team at CBD was certainly the most qualified Brazilian institution to perform this task. Their ability and commitment resulted in a historical reference work for Brazilian design, which will set the ground for other studies to come. Notwithstanding its merits, a review in such scale of a virtually untouched sector will always be limited. It is virtually impossible to achieve 100% comprehensiveness in such fragmented and diffuse sector, not to mention the territorial extension of the country. The study is partial because the metrics to assess design are still being developed. It is partial also because it dared to be the first, and to introduce and experiment new metrics to seek to understand the sector.

What is the content of the study?

Structured in four sections, the study initially makes an assessment on how Brazilian companies understand and use design, followed by an overview of the design sector in the country, continuing with an examination of international benchmarks for the sector, and it closes discussing a set of possible future scenarios.

Starting with a simple and clear methodology, the study uses advanced tools for analysis and management of design and innovation to draw a portrait of design in Brazilian industry, from a standpoint of nine selected segments. This allows establishing an initial understanding of the use of design for such diverse sectors, and by extension, reveals a lot about the use design in Brazilian companies. Data analysis allows to compare the situation with other

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Latin American (Uruguay and Colombia) and a few other countries in the world, allowing a preliminary assessment of Brazilian design competitiveness.

By analyzing the Brazilian design market, it points out weaknesses as the 'low formalization and lack of organization of the sector'. It also points out an insufficiency of studies on how design acts on the market, resulting in an acute shortage of data to allow proper reflection. However, the study provides an excellent overview of the design insertion in the country, the growth experienced by the sector in recent years, and government actions that seek to support this growth. Business models adopted by design market, the relationship between design and new technologies, and the components of design's supply chain are also detailed in the study. Analyzing patent deposits, the study raises troubling data regarding the low number of applications by Brazilian companies in face of those by foreign companies – among the 10 largest industrial design patent applicants of in the country, only two are local companies.

Another major contribution of the study is the profile of design professionals, their education and the skills demanded by current and future markets. Some of the topics covered are education, publications, relations between academia and market, production of knowledge, and an analysis of regional distribution.

Along the report different design segments are usually considered as a whole, and not very often is possible to pinpoint specific information regarding communication design fields – even though it mentions graphic, digital, web and game design, packaging, and others. While dealing with the specialty fields covered by Brazilian design companies, it is evinced that the highest concentration occurs in graphic and communication design, which, together with digital design and multimedia, are responsible for 60% of design activity in the country.

Also demands reflection the theme of existing structures to finance design in the country – which will undoubtedly exceed the expectations of readers. Perhaps the design industry should be better prepared to make use of the resources being mobilized, and demand greater clearness and adequacy of such programs to national or regional realities. To compare market demands, professional offer, and availability of resources is an exercise that needs to be done, and the study widely provides data for this purpose. Another issue of current debate in the country, the study also highlights the importance of regulating the professional activity of designers within the Brazilian context, where the majority of professions are regulated by law.

At the end of the study, three hypothetical scenarios for design in Brazil are drawn: conservative, moderate and optimistic. The first is actually very pessimistic, as the study establishes a clear evolution of the Brazilian design industry over the past few years – it is highly implausible to move backwards after so many achievements. The hope expressed in the optimistic scenario is to reach a sustainable growth where Brazilian design achieves better positions internally, in the context of international competitiveness and in the development of the country.

How should this study be used?

Design researchers, students, institutions interested in Brazil and Latin America should benefit from the data, knowledge, tools and outcomes of this study. It should also be considered as a driver to set a more frequent use of design as tool for economic, political and social transformation. A good start would be to promote discussions on its content and on how

it relates to other realities. What do designers want? How far should design go? What role design intends to play in society? Are designers prepared to exercise this role? What are they missing?

There seems to be a lot missing. Bonsiepe[2] says, since the 1970s, that designers should learn to communicate properly with government, while Heskett[3] states designers should learn to deliver in political terms – and politics is a completely different world from design projects. Learn to deliver in political terms means learn to give in, to seek consensus, to make it possible, without having to give up ideals. Finally, one should understand that, in political terms, you cannot reject everything that does not perfectly fits the ideals. Even because one's ideal may not be every other's.

Finally, it is fair to say that the *Diagnostic Review of Design in Brazil* starts a new era of understanding design as a tool for development and innovation in Brazil. Designers should learn to use these new management tools to establish collaborative processes with the government, the market and society. Designers cannot expect only the government to do its part – they also need to understand very well their responsibility in this process, and proactively engage in to promote the changes that they believe design can bring to society.

Notes

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