Blind maps and blue dots: the blurring of the producer–user divide in the production of visual information

Grootens, J.P.F.

In this chapter I connect cartographic thinking, theories about how a map functions and its relation to the world, to design innovation, that is: to changes in established ideas about the look and functioning of a graphic product. It is my claim that the way a map is conceptually understood will determine if changes in its design are recognized as improvements. Different modes of thinking about cartography, technological advancements in the production of maps and the emergence of new practices are taken into consideration to answer the question: Is it possible to produce fundamentally new maps, and if so, how?

This text is made up of three parts that each deal with a different approach to mapmaking: representational, more-than-representational and post-representational cartography, as described in Chapter 2. These different modes of thinking are used to investigate Google Maps, the most-used map of today. First, I compare French cartographer and theorist Jacques Bertin's ideas with the design of Google Maps. Then, using ideas from critical cartography, I describe how Google Maps produces power, but is also a product of power. I describe how critical thinking informed the ambiguous design strategies developed in my design practice. Finally, taking a post-representational approach, focussing on the processual aspects of the production and use of maps, I investigate the Blue Dot in the Google Maps app. I consider its functionality, its genesis, its technological context, and explore alternative design choices.

Efficiency of Communication

In a 2018 talk entitled 'Is Innovation in Cartography a Mere Illusion?',[1] French geographer Denis Eckert stated that cartography has certain specific restraints that limit the creation of new relevant spatial visualizations.[2] This observation is striking, given the outburst of mapmaking practices that cropped up in the past decades. Since the 1990s, technological advancements have resulted in extended possibilities of combining spatial information with georeferenced databases and maps. Also, digital technologies such as smartphones and various visualization tools gave a general public access to cartography. To Eckert, however, the practices that emerged from these developments use heterogeneous spatialized information in ways that produce 'maps' that are but mere superpositions of non-coordinated graphical signs without any systematic semiology. One such practice, according to Eckert, is Google Maps, the world's most-used map.

Google Earth was launched in June 2005 and came to public prominence during hurricane Katrina in August 2005, as it enabled individuals to see the dramatic changes in the landscape that had occurred. Google Maps is the cartographic overlay of Google Earth. The two programmes merged into a single geospatial application that has more than 1 billion monthly users.[3] More than 1 million websites incorporate data from Google Maps.[4] According to US business news website *The Manifest*, 77 per cent of all smartphone users regularly use navigation apps and of those Google Maps is the most popular by a wide margin.[5] Like most online services, Google's online cartographic platform is regularly renewed to update the information displayed and to optimize its interface. Why then is Google Maps questioned by Eckert?

1 Eckert, 'Is Innovation in Cartography a Mere Illusion?'. Denis Eckert is currently the research director of the Franco-German Research Centre for the Social Sciences Centre Marc Bloch in Berlin.

2 In this text I will use 'visualization' as specified in the Oxford English Dictionary's first definition of the term, a 'representation of an object, situation, or set of information as a chart or other image', and not as the OED's second description, 'the formation of a mental image of something'. For the verb 'to visualize' I use the second definition in OED, to 'make something visible to the eye', rather than the OED's first description, to 'form a mental image of'.

3 Google CEO Sundar Pichai mentions this number in his keynote address at Google's developer conference 'I/O 2017'. Pichai, 'Google Keynote'.

4 'A fresh new look for the Maps API, for all one million sites'.

5 In a survey of 395 navigation app users, 67 per cent preferred Google Maps, 12 per cent Waze (community-driven GPS navigation app launched in 2006, originally from Israel but acquired in 2013 by Google), and 11 per cent Apple Maps (mapping service launched in 2012 by Apple). Panko, 'The Popularity of Google Maps: Trends in Navigation Apps in 2018'.

BOUNDARIES

Equator

ZL00–ZL03

Neighbourhood

ZL07–ZL13
ZL14

Neighbourhood level 1
LABEL ZL07–ZL13

Neighbourhood level 2
LABEL ZL11–ZL13

Neighbourhood level 3
LABEL ZL11–ZL13

Capital city

ZL00–ZL04
LABEL ZL00–ZL09
LABEL ZL10
LABEL ZL11
ZL01–ZL08
ZL09

City/Locality

ZL03–ZL06
LABEL ZL00–ZL09
LABEL ZL10
LABEL ZL11
LABEL ZL12
ZL01–ZL08
ZL09

Region

ZL00–ZL18
LABEL ZL00
LABEL ZL01
LABEL ZL02
LABEL ZL03
ZL02–ZL09
ZL10

Country

LABEL ZL00–ZL06
ZL00–ZL18
ZL00–ZL08
ZL09

Disputed

ZL00–ZL18

BUILT-UP AREA

Built-up area

ZL04–ZL11
ZL12
ZL13
ZL14–ZL18

Ground (non built-up area)

ZL14–ZL18

Areas of interest

ZL09–ZL12
ZL13
ZL14–ZL18

Hospitals

ZL09–ZL18

Services

LABEL ZL12–ZL18
ZL12–ZL18

Health

LABEL ZL10–ZL18
ZL10–ZL18

Place of worship

LABEL ZL10–ZL18
ZL10–ZL18

Civil services

LABEL ZL12–ZL18
ZL12–ZL18

Hotel

LABEL ZL11–ZL18
ZL11–ZL18

Food and drink

LABEL ZL11–ZL18
ZL11–ZL18

Shop

LABEL ZL11–ZL18
ZL11–ZL18

Entertainment/Leisure

LABEL ZL11–ZL18
ZL11–ZL18

Outdoor

LABEL ZL11–ZL18
ZL11–ZL18

TRAFFIC NETWORK

Airport

LABEL ZL11–ZL18
ZL11–ZL18

Public transport

LABEL ZL09–ZL18
ZL09–ZL18

Google does not offer a legend of Google Maps. The legend on this page is based on empirical research, measuring colour values on different zoom levels. Google Maps contains nineteen zoom levels, 00 until 18, each with its own cartographic information, which in some cases also changes slightly in colour per zoom level.

Train station

LABEL ZL09–ZL18
ZL09–ZL18

Railway

ZL08–ZL18

Main highway

LABEL ZL10–ZL18
ZL02–ZL18
ZL13–ZL18

Secondary highway

LABEL ZL13–ZL18
ZL11–ZL18
ZL13–ZL18

Road and street

LABEL ZL10–ZL18
ZL10–ZL18
ZL13–ZL18

Bicycle path

With bicycle lane
ZL12–ZL18

Without bicycle lane
ZL12–ZL18

HYDROGRAPHY

Canal

LABEL ZL09–ZL18
ZL07–ZL18

River

LABEL ZL03–ZL18
ZL03–ZL18

Lake

LABEL ZL06–ZL18
ZL03–ZL18

Ocean

LABEL ZL00–ZL18
ZL00–ZL18

Shipping route

LABEL ZL06–ZL18
ZL05–ZL18

TOPOGRAPHY

Vegetation

Desert, almost no vegetation
ZL00–ZL01
ZL02

Semi-desert, sparse vegetation
ZL00–ZL01
ZL02

Moderate vegetation
ZL00–ZL01

Dense vegetation
ZL00–ZL01

Very dense vegetation
ZL00–ZL01

Woodland, parc and conservation area

LABEL ZL03–ZL18
ZL02
ZL02
ZL02
ZL03–ZL18
ZL03–ZL18
ZL03–ZL18

Ice sheet and polar desert

ZL00
ZL01
ZL02

Production land

ZL03
ZL04–ZL05
ZL06
ZL07
ZL08–ZL09
ZL10
ZL11
ZL12
ZL13

Beach

LABEL ZL12–ZL18
ZL06–ZL18

Mountains

ZL00–ZL10

Mountain peak
LABEL ZL05–ZL18
ZL05–ZL18

PLACE RESULT

Search result

LABEL ZL00–ZL18
ZL00–ZL18

Starred

LABEL ZL00–ZL18
ZL00–ZL18

Favourite

LABEL ZL00–ZL18
ZL00–ZL18

Want to go

LABEL ZL00–ZL18
ZL00–ZL18

My Location (Blue Dot)

ZL00–ZL18

Denis Eckert's objection to Google Maps is that the information it provides is too heterogeneous: it is an 'assemblage without design or reflection'.[6] To him, a map should be an organized construction of graphical signs. According to Eckert, maps should not contain fuzzy, unnecessary information, but instead be built on a rigorously selected set of relevant data. A map then is a combination of selected data rendered in a systematic legend that shows an understandable structure that can be easily reproduced mentally. In his lecture, Eckert showed a screenshot of Google Maps that was difficult to decipher. The map contained many symbols that did not feel like part of a consistent system in terms of shape and colour. Also, there seemed little coherence between the map's symbols in the foreground and the base map in the background. In short, Eckert questions the effectiveness of the communicative aspects of Google Maps.

In an earlier text that Eckert wrote with French geographer Laurent Jégou, the projection method of Google Maps 2008 is criticized.[7] The article also points out errors in the scale bars in the cartographic application. Some of the issues described in the article have since been resolved by Google, but it is interesting to look at the more fundamental critique. According to Eckert and Jégou, in Google Maps technical choices take prevalence over cartographic ones. They suspect that in developing the software the technical constraint of the display speed was more important than the relevance of the geographical representation. Google Maps and other similar applications, according to the article, are developed without prior knowledge of either the codes of mapmaking or any cartographic reflection. The authors conclude that they regret that Google Maps is not as reliable and coherent in a cartographic sense as it is rich and instantaneous in its technical capabilities.

In his 2018 lecture, Eckert defines a map as a visual representation encoded by given, stable rules and made for specific purposes. He considers this conception to be in line with a particular French approach to cartography, referring to the work of French geographer Roger Brunet, particularly his book *La carte, mode d'emploi* (1987) and most notably the work of French cartographer and theorist Jacques Bertin (1918–2010), specifically the book *Semiology of Graphics, original title Sémiologie graphique* (1967).

Using concepts from semiotics, the study of signs and sign processes, Bertin understood the map as a sign system. His approach can be considered structuralist as he focuses on the relationship between the elements of graphics and not on the elements themselves. Bertin's research is in line with that of other thinkers and philosophers who analysed images in the period from the 1950s to the 1970s, most notably the work of French philosopher Roland Barthes (1915–1980) on advertisements, but also the work of French philosopher and sociologist Pierre Bourdieu (1930–2002) on photography. Bertin's goal was to improve the effectiveness of maps. To Bertin, a map is a monosemic system.[8] In such a system the unique meaning of each sign is specified by a legend. By contrast, in a polysemic system the meaning of an individual sign follows the consideration of the collection of signs as a whole. Signification thus becomes subjective and debatable. Abstract imagery represents an extreme form of polysemy. Signs do not signify anything precise and thus the image becomes pansemic. According to Bertin, all participants in the making and reading of a monosemic system, like a map,

agree on certain meanings expressed by certain signs. This system of signs is rational and undebatable.[9]

Bertin makes a distinction between the content of a map, which he calls the information, and the container, the graphic system. The number of components used in the graphic system depends on the number of elements the information constitutes. As an example, Bertin presents a map of the Iberian Peninsula in which three values of population density are used.[10] The information in the map consists of three elements and therefore the graphic system should also show three values. Bertin distinguishes three types of graphic marks—point, line and area—that can vary in terms of position, size, value, texture, colour, orientation and shape. He calls these the 'visual variables'.[11] In the example of the map of Spain and Portugal, a point is used as graphic mark to represent the population density and size is used to express different values in population density. Small dots are used in areas with a low population density and big dots in denser parts. Bertin explores the manipulation of the visual variables with the aim to define rules of construction and legibility in order to improve the efficiency of maps and other visualizations. His methods are aimed at reduction and simplification, based on a rigorous analysis of the components of the information.[12] Bertin wants to create clear and efficient messages.

A Bertinian Reading of Google Maps

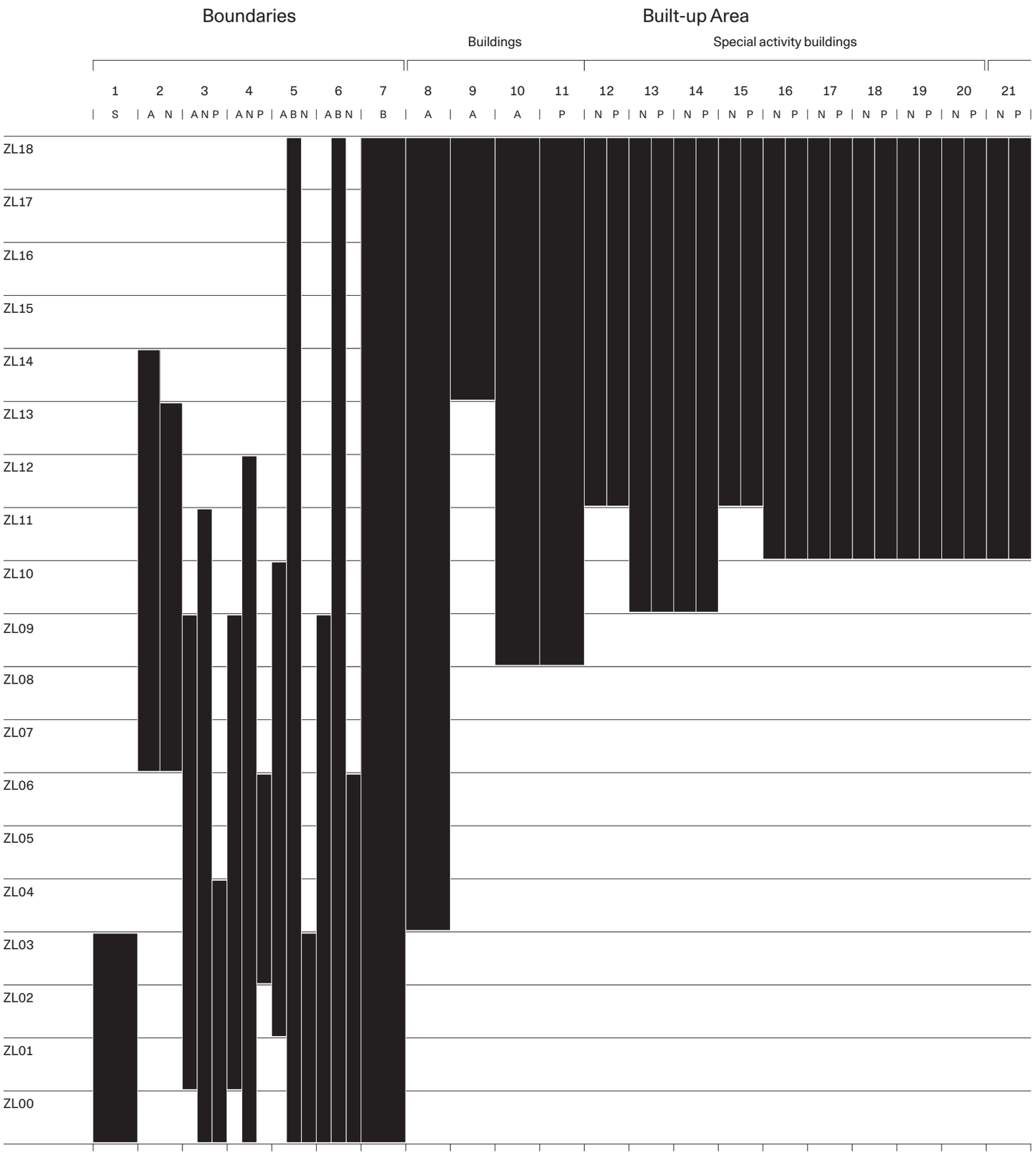
In this section I will take the ideas of Bertin to evaluate Google Maps. In doing so I not only want to better understand and unearth flaws in Google Maps, but also find out if Bertin's theories, developed in a time of paper cartography, are applicable to cartographic apps as well.

Using Bertin's mathematically rational considerations, it is not difficult to find shortcomings in Google Maps. For one, the geospatial application does not provide a legend of its map. It is not possible for a user to have a clear understanding of the meaning of the map's colours and signs. Why is it, for instance, that the Haagse Bos, a landscape park in The Hague, is shown in grey in Google Maps while surrounding parks like Koekamp, Malieveld, Oostduin, Landgoed Clingendael, Oosterbeek and Haagse Hout are shown in green?[13] The Amsterdamse Bos, a landscape park in Amsterdam, on the other hand, is green on Google Maps.[14] The Kralingse Bos, a large landscape park in Rotterdam, is as grey as its counterpart in The Hague, but has some green patches in it.[15] Zooming in, and comparing the map with the satellite view of the same area in Google Earth, it appears that these green patches are sport fields. Strangely, in the map of the Kralingse Bos the football pitches appear green, while the athletics track with a similarly sized grassy centre field for javelin, shot put and other non-track events, is grey.

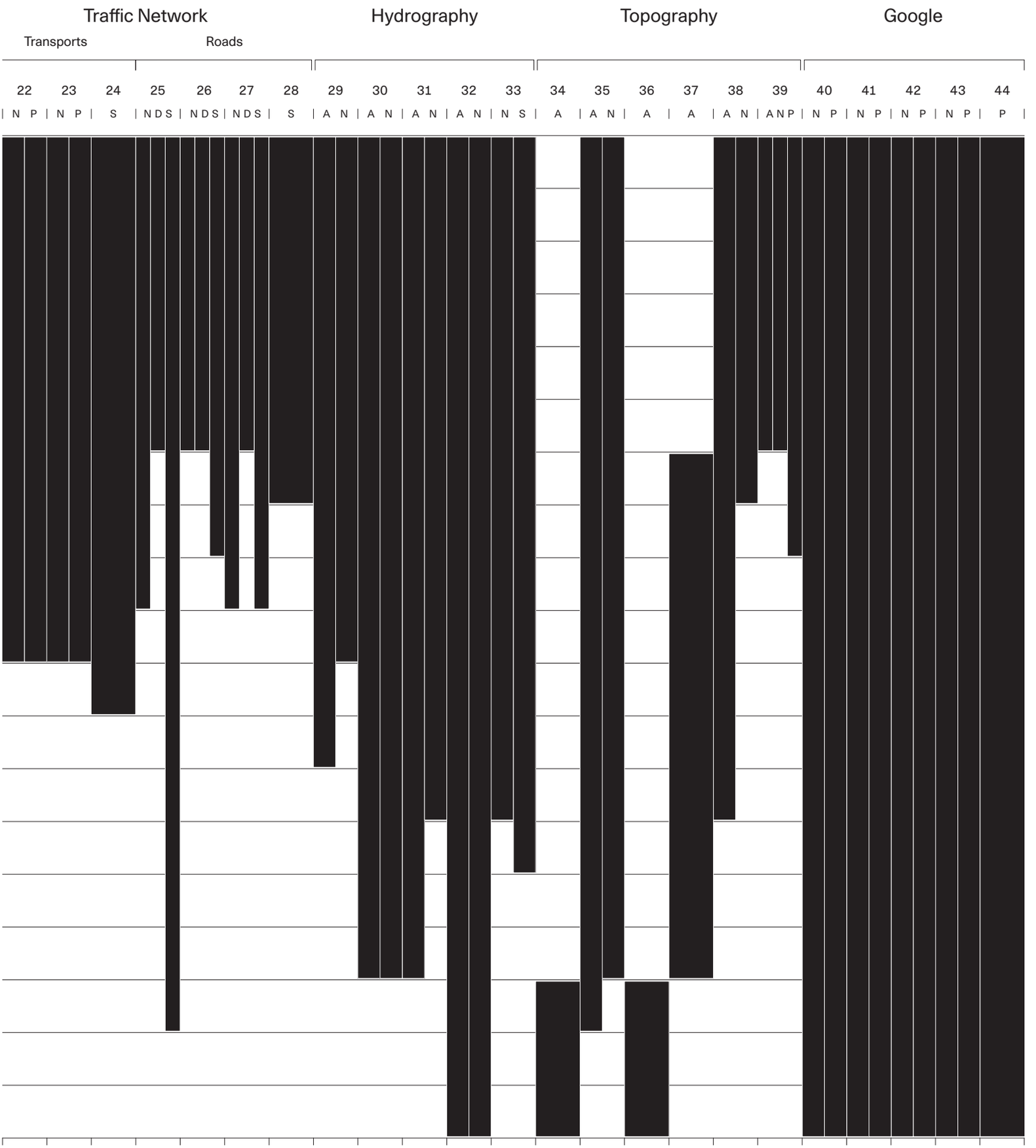
Although Google Maps fails to provide a legend, it does offer users clues by providing more detailed information and alternative representations. The geospatial application is a dynamic platform that lets users zoom in and out and change the map modus to the Google Earth setting, which contains satellite imagery, as well as offering Google Street View, photographic panoramas of stitched images recorded from positions along streets.

6 Eckert, 'Is Innovation in Cartography a Mere Illusion?'.
7 Eckert and Jégou, 'Quel planisphère de références pour Google Maps'.
8 Bertin, *Semiology of Graphics: Diagrams Networks Maps*, 2.
9 Ibid., 3.
10 Ibid., 20.
11 Ibid., 7.
12 Ibid., 171.
13 Google Maps, 'Haagse Bos', accessed 3 May 2019, https://www.google.com/maps/@52.0942603,4.3365666,15z.
14 Google Maps, 'Amsterdamse Bos', accessed 3 May 2019, https://www.google.com/maps/@52.3185022,4.8331301,15z.
15 Google Maps, 'Kralingse Bos', accessed 3 May 2019, https://www.google.com/maps/@51.938218,4.5144516,14.75z.

The Legend of Google Maps: Zoom Levels



This chart shows which information Google Maps contains on each of the nineteen zoom levels. Google Maps contains significantly more information on the closer zooms than on the more remote zooms. The cartographic typology of Google Maps changes per zoom level, from city map to road map to topographic map. This table shows that this is a gradual process.



1 Equator line
2 Neighbourhood
3 Capital city
4 City/Locality
5 Region
6 Country
7 Disputed
8 Built-up area
9 Ground (non built-up area)
10 Areas of interest
11 Hospitals
12 Services
13 Health
14 Place of worship
15 Civil services
16 Hotel
17 Food and drink
18 Shop
19 Entertainment/ Leisure
20 Outdoor
21 Airport
22 Public transport
23 Train station
24 Railway
25 Main highway
26 Secondary highway
27 Road and street
28 Bicycle path
29 Canal
30 River
31 Lake
32 Ocean
33 Shipping route
34 Vegetation
35 Woodland, parc and conservation area
36 Ice sheet and polar desert
37 Production land
38 Beach
39 Mountains
40 Search result
41 Starred
42 Favourite
43 Want to go
44 My Location (Blue Dot)

A Area
B Border
D Direction arrow
N Name
P Pin
S Stroke

In my view, Google does not offer a legend because its focus is on the display of addresses rather than on showing the landscape. The Maps app is a free software tool that up to now does not bring in revenue for Google. The company does not disclose how it intends to monetize the app, but in a 2017 interview Google CEO Sundar Pichai suggested this might be achieved through advertising.[16] Google developed a method of raising revenue by selling advertisements in its search engine. An algorithm analyses every search and determines which advertisements will be shown as 'sponsored links' at the top of the search results.[17] Just as information about what we search is valuable to advertisers, so can be the information about where we search, or what we search in certain locations. The map of Google contains the location information of companies, shops and restaurants that in the future might be willing to pay for users to find their whereabouts easily. So it is in Google's interest to make these locations clearly visible on the map and to only minimally indicate other data, such as information about different types of buildings or green areas. This hierarchy of information becomes apparent in how the map is structured. Google Maps consists of two layers. The background layer, a base map containing topographic information, is a geographic support for a toponymic layer of names of places, companies, shops, restaurants, stations, streets and cities. The hierarchy between the layers is apparent from the visual strategies of the map design. The topographic layer is rendered in pale versions of colours often used in maps: grey for the built environment, green for vegetation and blue for water. Google Maps looks familiar but vague: a mere memory of a map. In contrast, the foreground information, that is the names and pictograms of the information Google might intend to monetize, is shown in bright colours. These fundamentally diverse data sets show up differently at distinct zoom levels.

Here we touch, in my view, on a second difference between Bertin's thinking about maps and Google's geospatial application. Whereas to Bertin a map is an unambiguous stable rendering of the world, Google maps is a dynamic, mutating representation. The plural in the name Google Maps is slightly confusing, as the application contains but a single map that can be scrolled endlessly in either direction. It can also be zoomed in or out and for each of the nineteen zoom levels, a different map is rendered. The map is based on a database with certain elements showing up at particular zoom levels only. Each of the zooms contains different information and is a unique map. Over the course of the zoom levels the digital map changes in typology: from street map to road map to topographic map. To me, this ability to mutate is an aspect never seen before in maps on paper. In that sense the plural in the name Google Maps is correct after all.

A result of showing different kinds of information at different scales is that Google Maps at certain zooms seems to contain hardly any information, while at others too much. This becomes apparent when looking at a shopping street on a small scale—a map in a small scale shows objects closer than a map in a large scale—the map looks too full. Dozens of names and symbols cover the map. Texts are rendered in different directions, horizontal for places like shops, restaurants and institutions, in angles following roads for street names. Furthermore, the texts are set in a small type size to avoid overlapping. The pale colours used for the topographic backdrop do not provide structure to the image.

By contrast, looking at the same location zoomed out, the map feels too empty. With each step up names of buildings, streets, cities, countries appear and disappear. At a certain zoom level no new information appears. What remains is the topographic backdrop that feels quite naked when its pale hues are not covered by texts. Just like the closeup zoom, the map at this larger scale level does not offer overview. It is suspiciously empty.

The necessity for having different zoom levels comes from the poor resolution a screen offers in comparison with printed matter. That was especially the case in the early days of Google Maps when the size and resolution of displays—particularly those of smartphones—was much lower than today's high-resolution screens. Still, even today's devices are lagging behind in resolution compared with ink on paper. On my laptop's 13.3 inch retina display, a screen with an especially high resolution, a map will show the same amount of detail as a printed image of 21.9 × 13.5 cm. A map in a typical atlas, for instance the Dutch *Grote Bosatlas*, is five times bigger in surface area. A large tablet computer has an effective surface area that is seven times smaller than a *Bosatlas* map. And a standard smartphone shows nearly thirty times less information than the printed atlas. The digital map is not able to give its user the same overview as a printed map. Instead, it offers dispersed content through a sequence of zooms.

In my view, a further point of critique of Google Maps from a Bertinian perspective would be its editorial fuzziness. There is no clear relation between the crop of the map, the information displayed and the visual variables employed.

Google Maps is made using large quantities of data that are being updated constantly. To speed up the production of the map and its distribution via the Internet, the geographic plan is divided in smaller segments called map tiles. Each of these tiles in Google Maps measures 256 × 256 pixels. For each zoom level a different map is produced. At the outermost zoom level, level zero, the entire world is rendered in a single map tile. Every zoom level up, one tile is replaced by four tiles. This means that at closer zoom levels, Google Maps contains millions of map tiles. As a consequence and for understandable reasons, the editorial and design processes that Bertin sees as essential in the making of maps have been replaced by a programmed set of instructions.

Even if it would be feasible to carefully craft the map through programming, it would not be possible to anticipate the crop that a Google Maps user will choose. As a result, Google Maps shows a map view that is unbalanced in terms of the quantity, quality and density of information. But Google Maps should not be regarded as a static image; it is a digital platform that offers users the zoom and crop of their choice, and, if they wish, finds them additional information such as directions, opening hours and phone numbers. What Google Maps lacks in informational structure it compensates, I would argue, in offering interactivity and providing additional information.

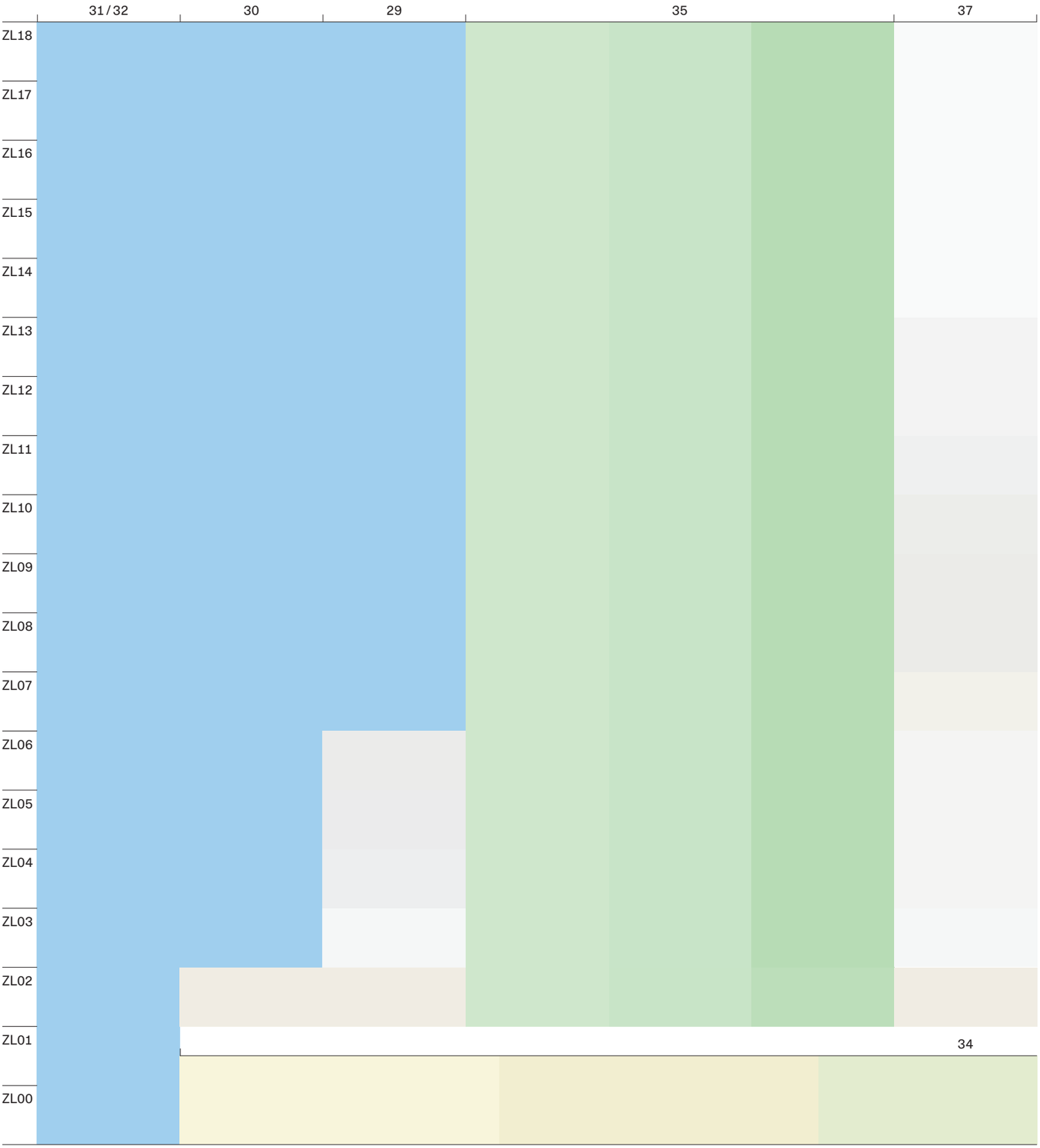
Predigital Practice

Reading Bertin with a computer running Google Maps at hand, switching back and forth between the page and the screen to read and test, it becomes apparent

16 Orerskovic, 'Sundar Pichai Just Hinted at How Google Will Make Money from Maps, and it Sounds Like Lots of Ads'.

17 Brotton, *A History of the World in Twelve Maps*, 428.

The Legend of Google Maps: Base Map



This chart, which is a combination of 3.1 and 3.2, shows the legend of the base map of Google Maps: the colours of the topography, hydrography and built-up areas, organized vertically by zoom level. Note that the colours are pale and soft, this in contrast to the information on specific places and search results as shown in 3.4.

1 Equator line
2 Neighbourhood
3 Capital city
4 City/Locality
5 Region
6 Country
7 Disputed
8 Built-up area
9 Ground (non built-up area)
10 Areas of interest
11 Hospitals
12 Services
13 Health
14 Place of worship
15 Civil services
16 Hotel
17 Food and drink
18 Shop
19 Entertainment/ Leisure
20 Outdoor
21 Airport
22 Public transport
23 Train station
24 Railway
25 Main highway
26 Secondary highway
27 Road and street
28 Bicycle path
29 Canal
30 River
31 Lake
32 Ocean
33 Shipping route
34 Vegetation
35 Woodland, parc and conservation area
36 Ice sheet and polar desert
37 Production land
38 Beach
39 Mountains
40 Search result
41 Starred
42 Favourite
43 Want to go
44 My Location (Blue Dot)

that Bertin's practice is a predigital one grounded in practical experimentation. In his *Semiology of Graphics* many references are made to predigital tools and skills and materials like tracing paper, typewriter and handwriting (all page 308), 'sureness of hand of the professional draftsman' (page 311) and pencil and ink (both page 312). This realization nuances the universality of some of Bertin's claims beyond the predigital period.

Look, for instance, at Bertin's thoughts on colour. Bertin points out that next to not being able to reach the colour-blind, the disadvantages of the use of colour are reprographic problems like additional production time and costs of multicolour documents over monochrome production.[18] This argument might have been valid in 1967 when Bertin wrote *Semiology of Graphics*, but nowadays it is hardly the case in the production of printed matter and completely irrelevant in production for screen use.

Bertin also dwells on the difficulties of creating a colour range of equal value. Certain colours, like yellow, are much lighter than blue and red, for instance.[19] Rather than colours, Bertin prefers the use of monochromatic patterns. Through difference in texture—Bertin uses the French word *grain* to indicate the fineness of the pattern—a variety of shades can be realized. This is a common technique in printing, but patterns do not display well on screen because of the coarse resolution of monitors. It therefore makes sense that as a digital application designed to be looked at on screen, Google Maps uses colour as a visual variable rather than a monochromatic pattern.

Another issue addressed by Bertin that seems to be a bigger challenge in a static print than in a dynamic screen application is map generalization. This is an abstraction method to create a smaller-scale map from a larger-scale map or from map data with a higher level of detail. This can be done manually by a cartographer, or through an algorithm. In *Semiology of Graphics* Bertin spends quite some pages addressing the matter. As a case study he compares nine maps of the Dombes area between Lyon and Bourg-en-Bresse.[20] The region contains more than 1,000 small ponds and lakes that show up as a pattern of small dots on the maps. Bertin notes that the generalization of a cluster of marks, like the pattern of lakes in the Dombes, is the most complex in its kind. The nine maps show a great difference in the number of lakes and their shapes and sizes. The 1:1,000,000 map from the *Times Atlas of the World* contains twenty lakes. The one from *Atlas de France—Geomorphology* shows more than 100. Looking at the same region in Google Maps, the number of lakes displayed depends on the scale of the map. At a certain zoom level only eleven lakes are visible. One zoom level closer the map shows more than 200 patches of blue. Generalization seems less of an urgency in the context of geospatial application when with a touch of the mouse, or pinch on the screen, more detailed information can be accessed. Overview in the case of the digital map is not a singular high-resolution image, but scrolling through a sequence of disparate views.

In summary, it can be said that Google Maps has certain limitations. These are partly related to choices made in favour of technology over cartography. Furthermore, it is clear that Google has developed its map app with a view to future earnings. It puts emphasis on showing (commercial) addresses over topography. This becomes apparent in the colour choices made in the design and probably

also explains why Google Maps withholds certain basic cartographic information such as the legend. On the other hand, Google Maps offers certain functional improvements over paper maps.

By systematically studying the communicative aspects of graphics, Bertin has vastly deepened the understanding of map design. As his studies are rooted in the pragmatics of a predigital practice, the notions and methods Bertin developed mainly apply to printed matter and feel in some instances inadequate to evaluate a cartographic platform like Google Maps.

The work of Bertin is part of a larger set of practices aimed at improving map effectiveness. This approach to mapmaking has been called cognitive cartography[21] and representational cartography.[22] The premise of this method is that the world can be objectively known and truthfully mapped. American geographer and cartographer Arthur Robinson (1915–2004) is another noteworthy representative of this approach to mapmaking. Using ideas of cognitive psychology Robinson aimed to improve map designs by carefully controlled scientific experiments such as how to best represent location, distance and direction.

A Critical Reading of Google Maps

In this section I will look at a critique of cartography that emerged around the time that digital mapping tools became available. In response to some of the notions raised by this critical approach, I will propose a strategy to designing maps developed in my practice.

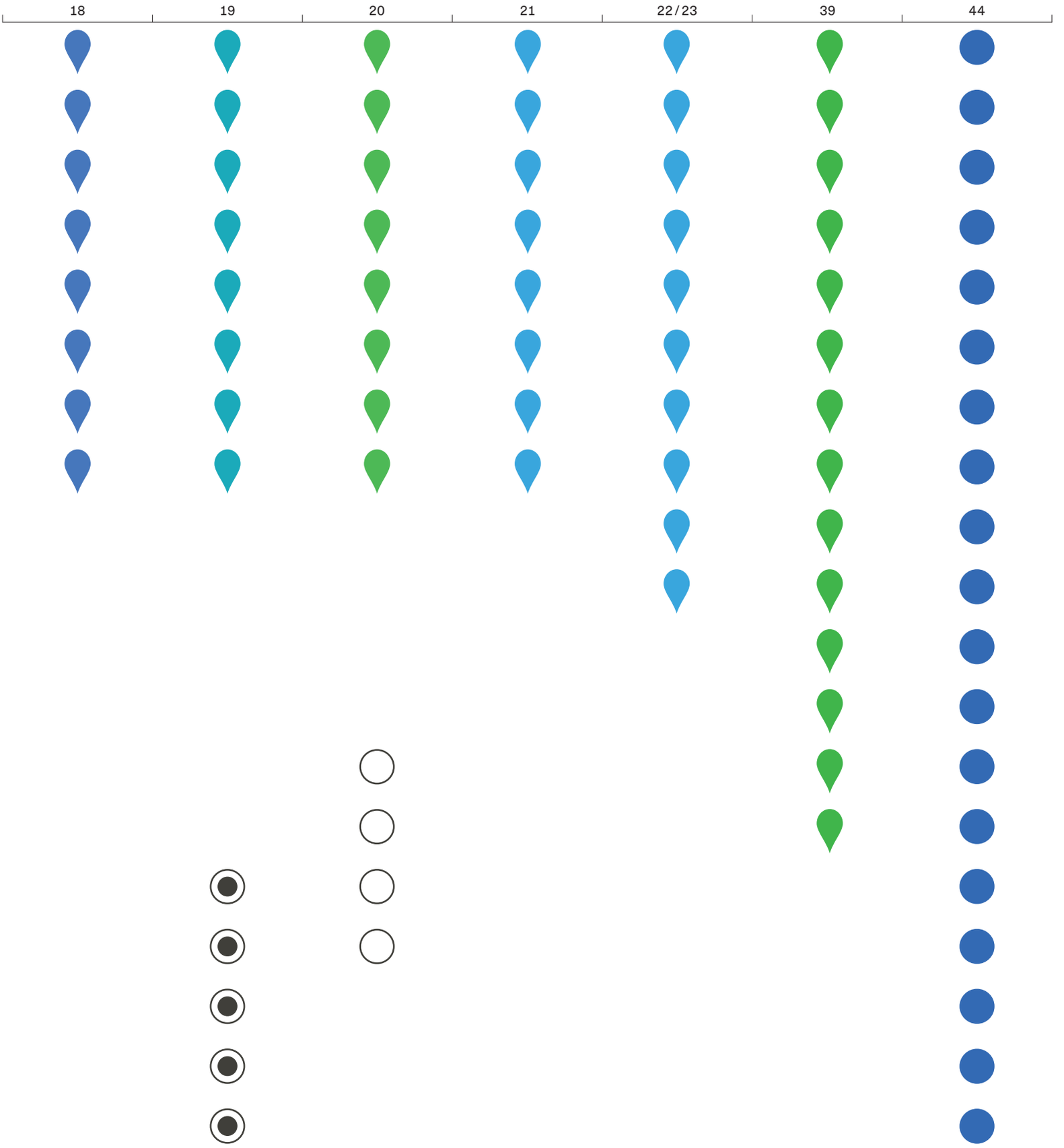
At the end of the 1980s, ideas from poststructuralist thinking, social constructionism and actor-network theory resulted in a shift in the thinking about maps. These new practices have been described as more-than-representational cartography[23] and critical cartography.[24] British geographer, cartographer and map historian Brian Harley (1932–1991) is one of its main representatives. Influenced by the work of Michel Foucault and Jacques Derrida, Harley regarded a map to be a social construction.[25] Building on Foucault's notion about the omnipresence of power in all knowledge, albeit invisible or implied, Harley states that maps are the products of power but also produce power themselves.[26] Derrida's 1967 book *Of Grammatology*, original title *De la grammatologie*, a foundational text of deconstructive criticism, instigated Harley to look at the textuality of maps, particularly their rhetorical dimension. To Harley, mapping is not a neutral, objective pursuit, but one laden with power. It deals with creating knowledge and not with revealing it. In the 1990s, Harley's work initiated the interdisciplinary field of critical cartography. Its objective is to study the full scope of the map, both as the result of a process and as a communicative object.

Geographers Jeremy W. Crampton of Georgia State University, Atlanta, and John B. Krygier of Ohio Wesleyan University, Delaware, connect the development of a critical reading of cartography to the digital mapmaking practices that emerged. They describe two circumstances that resulted in 'cartography slipping from the control of the powerful elites'—such as the great map houses of the West, the state, and to a lesser extent the academic world—that have dominated it for several hundred years.[27] Digital technology, new mapmaking software, open-source

18 Bertin, *Semiology of Graphics: Diagrams Networks Maps*, 91.
19 Ibid., 89.
20 Ibid., 307.
21 Caquard, 'A Post-Representational Perspective on Cognitive Cartography'.
22 Kitchin, 'The Transformation of Cartographic Thought'.
23 Ibid.
24 Crampton and Krygier, 'An Introduction to Critical Cartography', 12.
25 Harley, 'Deconstructing the Map', 57.
26 Ibid.
27 Crampton and John Krygier, 'An Introduction to Critical Cartography', 12.

The Legend of Google Maps: Place Information

This chart, which is a combination of 3.1 and 3.2, shows the legend of the superimposed information in Google Maps: specific places and search results. Note that the colours of this map are much brighter and bolder than that of the base map 3.3.



1 Equator line
2 Neighbourhood
3 Capital city
4 City/Locality
5 Region
6 Country
7 Disputed
8 Built-up area
9 Ground (non built-up area)
10 Areas of interest
11 Hospitals
12 Services
13 Health
14 Place of worship
15 Civil services
16 Hotel
17 Food and drink
18 Shop
19 Entertainment/ Leisure
20 Outdoor
21 Airport
22 Public transport
23 Train station
24 Railway
25 Main highway
26 Secondary highway
27 Road and street
28 Bicycle path
29 Canal
30 River
31 Lake
32 Ocean
33 Shipping route
34 Vegetation
35 Woodland, parc and conservation area
36 Ice sheet and polar desert
37 Production land
38 Beach
39 Mountains
40 Search result
41 Starred
42 Favourite
43 Want to go
44 My Location (Blue Dot)

collaborative tools, mobile mapping applications and geotagging opened up the field of cartography and made it possible for new mapmaking practices to emerge. The second circumstance was the forming of a critique that highlighted the politics of mapping, with the aforementioned Harley as one of its key protagonists. According to Crampton and Krygier, the critical approach to cartography 'undisciplined' the field, freed it from the confines of the academic and opened it up to the people. Until the digital age, maps were produced by those in power, such as the state. In my view however, the new tools created new power centres in companies such as Google that owned and controlled the new technologies. According to Crampton and Krygier, digital technology created new cartographic tools that are easy to access. Technology thus empowered new players to enter the field who, with no prior knowledge of cartography, started mapping different subjects, in novel ways, occasionally resulting in original forms.

Looking at Google Maps from a critical cartography point of view, various power mechanisms and manipulations become apparent, some visible, others hidden. An example of a manipulation that is visible is the map projection, the method of how a spatial object such as Earth is translated into a two-dimensional map. When Google Maps was launched in 2005 it used the Mercator projection, named after Flemish geographer and cartographer Gerardus Mercator (1512–1594), who invented it in 1569. In the Mercator projection all meridians run parallel, creating a rectangular map of the spherical Earth, which results in the distortion of the size of objects on latitudes further away from the equator. Land masses near the poles, such as Greenland, appear much larger than land masses near the equator, such as Central Africa. Projection methods that cause distortions, such as that of Mercator, have been accused of cartographic imperialism, as they depict the richer, powerful countries bigger than less-wealthy countries.[28] In Google Maps the distortion caused by the Mercator projection is mainly visible in the most zoomed-out views. In August 2018, Google Maps dropped the Mercator projection for the most zoomed-out views and instead shows a three dimensional globe.

Depending on the part of the world from where you access Google Maps, the cartographic app will show different, or adapted, information. This is, for instance, the case with contested regions. The Crimean peninsula on Google Maps, when accessed in the Netherlands, is separated from Ukraine by a black, dotted line indicating it as a disputed border.[29] The same graphical representation is used for the borders of the Gaza Strip, the West Bank and between North and South Cyprus. Looking at the Crimean-Ukrainian boundary on a Russian Google Maps, however, the line is a solid, black country border indicating that Crimea is part of Russia.[30]

In a 2016 blog post, Justin O'Beirne, who writes about mapping apps, compares Google Maps from 2010 and 2016.[31] O'Beirne notices that the more recent map contains far fewer city labels and names of cities and more roads in comparison with the same map in 2010. In the period between the releases of the two maps, the usage of Google Maps on mobile devices surpassed that on desktop computers.[32] O'Beirne therefore speculates that the reduction of city names displayed in Google Maps is an optimization for reading the map on mobile devices, the new dominant technology, and that the new roads were added to make the map look less empty. A map with fewer labels can be read faster. The reasons to do so might be understandable, but taking out one kind of information and replacing it with another is manipulation.

From a critical cartography point of view, the examples above—the Mercator projection, the different display of disputed areas depending on the location of the user, and the inclusion of less information to optimize a map for a new dominant technology—are manipulations of a map's content that are visible signs of how a map produces power. There are also imperceptible aspects that highlight that Google Maps is also a product of power. In October 2004, Google took over Keyhole, a geospatial data visualization company. Keyhole was co-owned by the US foreign intelligence service Central Intelligence Agency (CIA) and its major clients were the US military and intelligence agencies. Bearing this in mind, there is a brutal honesty in the name Keyhole that refers to a device to peek through and spy on others. Keyhole's software Earth Viewer formed the basis for Google Earth. Other aspects of Earth Viewer were integrated into Google Maps. In 2003, American news television channel CNN used Earth Viewer software extensively in its reportages of the invasion of Iraq, showing images that simulated flying over Baghdad and dropping down to street level at bombing targets.[33] This was a new form of war reporting financed by the military. Two years later, with the launch of Google Earth, this new form of cartographic imagination would be accessible to everyone.

Other technologies used by Google in its cartographic software were originally developed for military use as well. The satellite imagery used in Google Earth and the Global Positioning System (GPS) used in the Google Maps mobile app were initially developed by the military for surveillance and navigation purposes. There will be more about this subject in the chapter on the Strava Global Heatmap.

Another aspect of how Google Maps produces power is that it is a technology embedded in an economic model based on surveillance. Google maps the users of Google Maps. The technology company records data of the users of its free services like its cartographic app. What users search, on what device, when, where and who they are: it is information that the technology company stores and analyses. Google monetizes the acquired data through targeted advertisements. This economic model has been called surveillance capitalism by Shoshana Zuboff, a professor emirata at Harvard Business School.[34] In that sense the 'maps' in Google Maps not only refers to a noun plural, the variety of maps that make up the cartographic app, but also to 'maps' as a verb, as in Google that actively records the actions of its users.

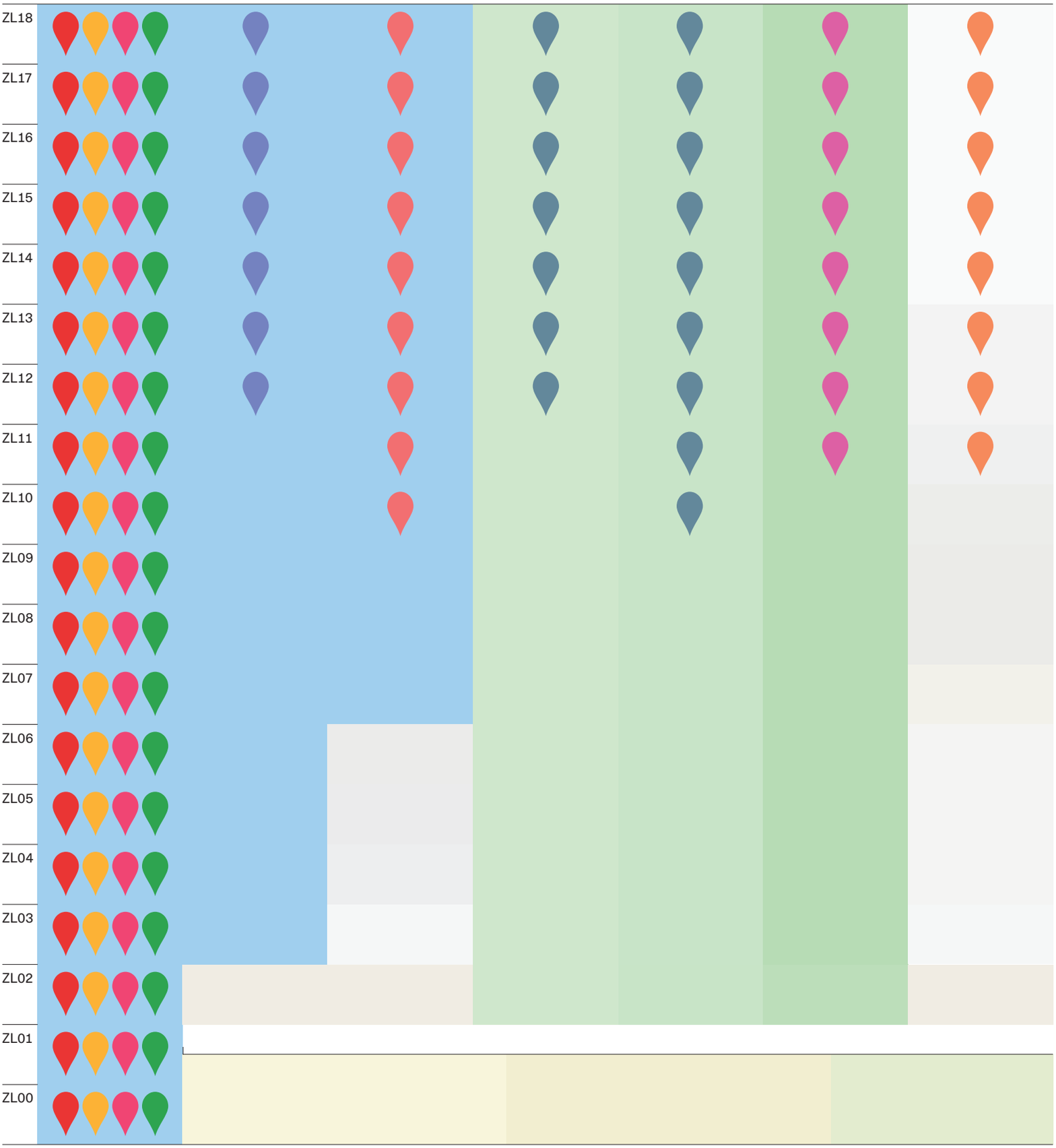
It is not only Google that monitors the users of its Maps app. In 2014, documents leaked by former National Security Agency contractor Edward Snowden reveal that intelligence agencies NSA, the United States National Security Agency and GCHQ, the United Kingdom Government Communications Headquarters, intercept Google Maps searches made on smartphones and store these with the location information of where the query is made. This was so successful that a 2008 document points out that 'it effectively means that anyone using Google Maps on a smartphone is working in support of a GCHQ system'.[35]

Ambiguous Strategies

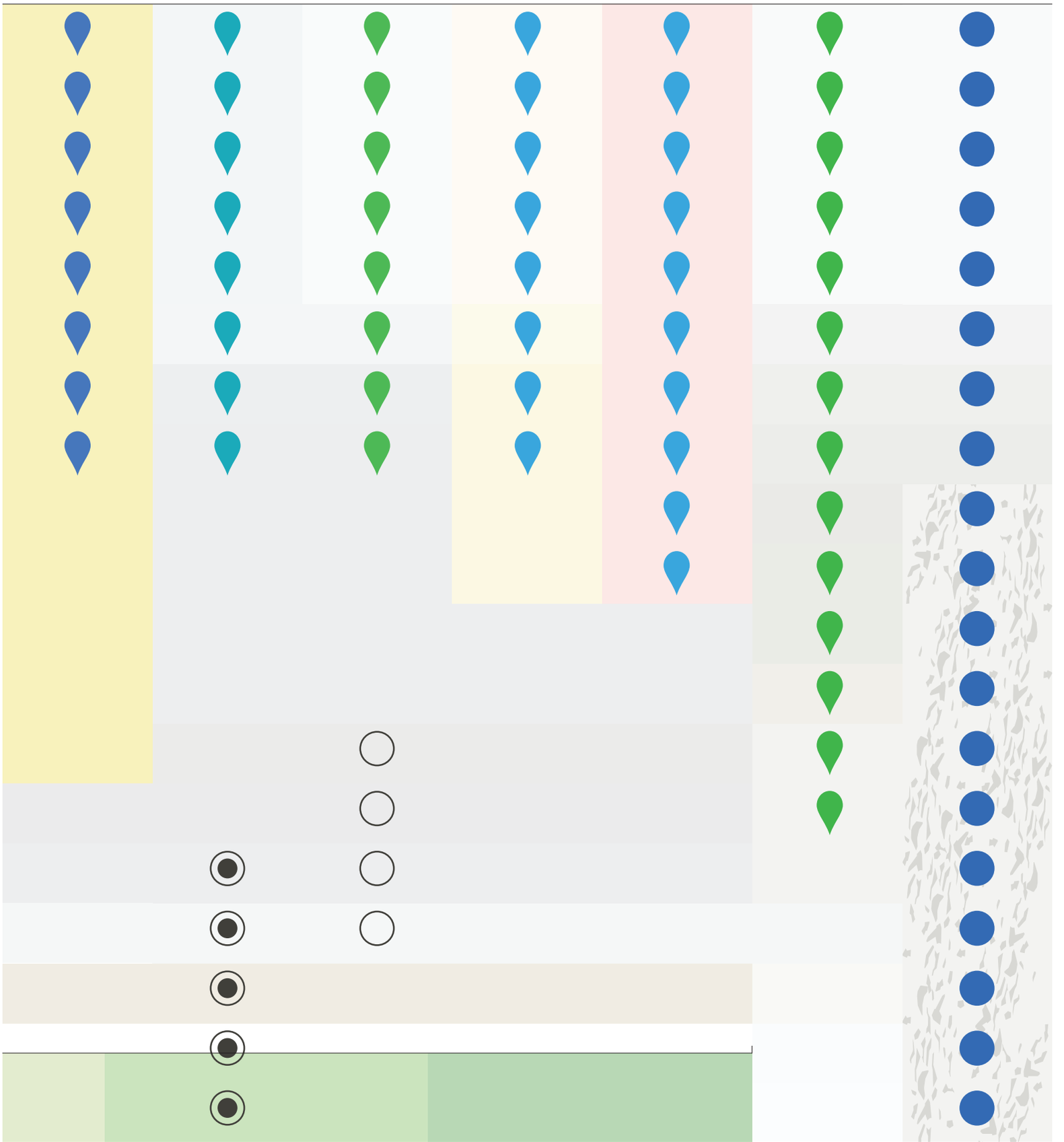
The aforementioned Eckert doubts if it is possibly to produce truly new maps. He may be right, if the map is regarded as functional object alone. From that point of view a map's efficiency can be improved through cognitive scientific experiments.

28 Cartography and imperialism have been linked for centuries. Maps have been instrumental in the overseas expansion of European powers as source of geographic knowledge and as tools for the planning of human settlements.
29 Google Maps, 'Crimean peninsula', accessed 12 May 2019, https://www.google.nl/maps/place/Crimean+Peninsula/@45.6398034,33.246309,7.63z/data=!4m5!3m4!1s0x40eac2a37171b3f7:0x2a6f09e02affbaeb!8m2!3d45.3453029!4d34.4997274.
30 Usborne, 'Disputed Territories: Where Google Maps Draws the Line'.
31 O'Beirne. 'What Happened to Google Maps?'.
32 Siegler, 'Google Maps For Mobile Crosses 200 Million Installs; In June It Will Surpass Desktop Usage'.
33 Maney, 'Tiny Tech Company Awes Viewers'.
34 Zuboff, 'Google as a Fortune Teller. The Secrets of Surveillance Capitalism'.
35 Ball, 'Angry Birds and "Leaky" Phone Apps Targeted by NSA and GCHQ for User Data'.

The Legend of Google Maps: Comparison



This chart, which is a combination of 3.3 and 3.4, shows the bright- and bold-coloured information of specific places and search results superimposed on the pale, soft-coloured base map.



The methods to achieve this by the earlier-mentioned Bertin are impressively thorough and probably unsurpassable in improving this aspect of the paper map. However, if the focus were to shift from the communicative aspect of maps to an approach that incorporates critical insights, then, perhaps, it would be possible to create innovative maps. The aim would be to show users that maps are the product of a process that is not a neutral, objective pursuit, but one laden with power.

What strategies can be used by the map designer to show that a map is not a neutral object? American visual theorist and culture critic Johanna Drucker suggests that this could be achieved through highlighting the ambiguous nature of the map. Drucker regards information visualizations such as maps as 'intellectual Trojan horses' of the empirical sciences that suggest they are observing independently, but are in fact interpretations masquerading as representations.[36] According to Drucker we need to accept the fact that the nature of data is fundamentally constructed and acknowledge that phenomena such as nations, genders, populations and historical periods are not self-evident, stable entities. To rethink our approach to visualization and to the assumptions that underpin it, Drucker proposes that ambiguity and uncertainty ought to be incorporated in the design of information, either by representing ambivalence or by using ambiguity as the basis on which a representation is made.[37] More concretely, Drucker calls for a map with a more nuanced legend or for a non-standard map that shows its constructedness.

In my design practice I have developed a number of strategies to show the ambiguous nature of the map. Some focus on introducing nuance in the legend; others use the means of production to highlight the cartographic construct.

In a recent project my studio worked on for Inrap, the French National Institute for Preventive Archaeological Research, visual strategies were developed for a series of maps that underline the uncertainty of the displayed data.[38] In two maps that show how *Homo sapiens* spread over the world, line pattern transitions are placed between surfaces that display occupation during certain time periods. The same visual transitions are used in timelines placed under the maps. The line patterns create soft outlines around the shapes depicting territories or historical periods. The soft edges are a visual metaphor for doubt that highlights that the information on the map is but a hypothesis. The blurry boundaries also indicate that the informations on the maps and in the timelines are static renderings of dynamic processes.

Primary and secondary colours were avoided in the choice of colours for the archaeologic maps. My problem with yellows, reds and blues is not the difference of their retinal weight (as Bertin would have it), but rather that primary colours constitute a complete model, in which there is no room for a fourth or fifth primary colour. Displaying cartographic information in these three colours therefore suggests completeness, whereas it was our aim to do precisely the opposite, namely to cast doubt on whether the information was complete and unequivocal.

In another project, *Atlas of the Copenhagens*, ambiguity was introduced by using a different map typology for each chapter rather than using a singular cartographic representation throughout the book.[39] One of the qualities I appreciate about Google Maps is that it mutates from zoom level to zoom level. Zooming out, it starts as street map, becomes road map and transform into topographic

map. We aimed to achieve a similar mutation in the Copenhagen atlas: each of the six chapters of the atlas uses a different type of map, from descriptive geographic maps, to data maps, to isometric bird's-eye view drawings, to photographic assemblages. By showing a range of maps that are very different typologically and varied in their visual presence, the territorial and conceptual limits of a city are questioned. This questioning is highlighted by the plural 'Copenhagens' in the book's title. As well as being an atlas that scans a city in different ways, the book is also a catalogue of various representation types.

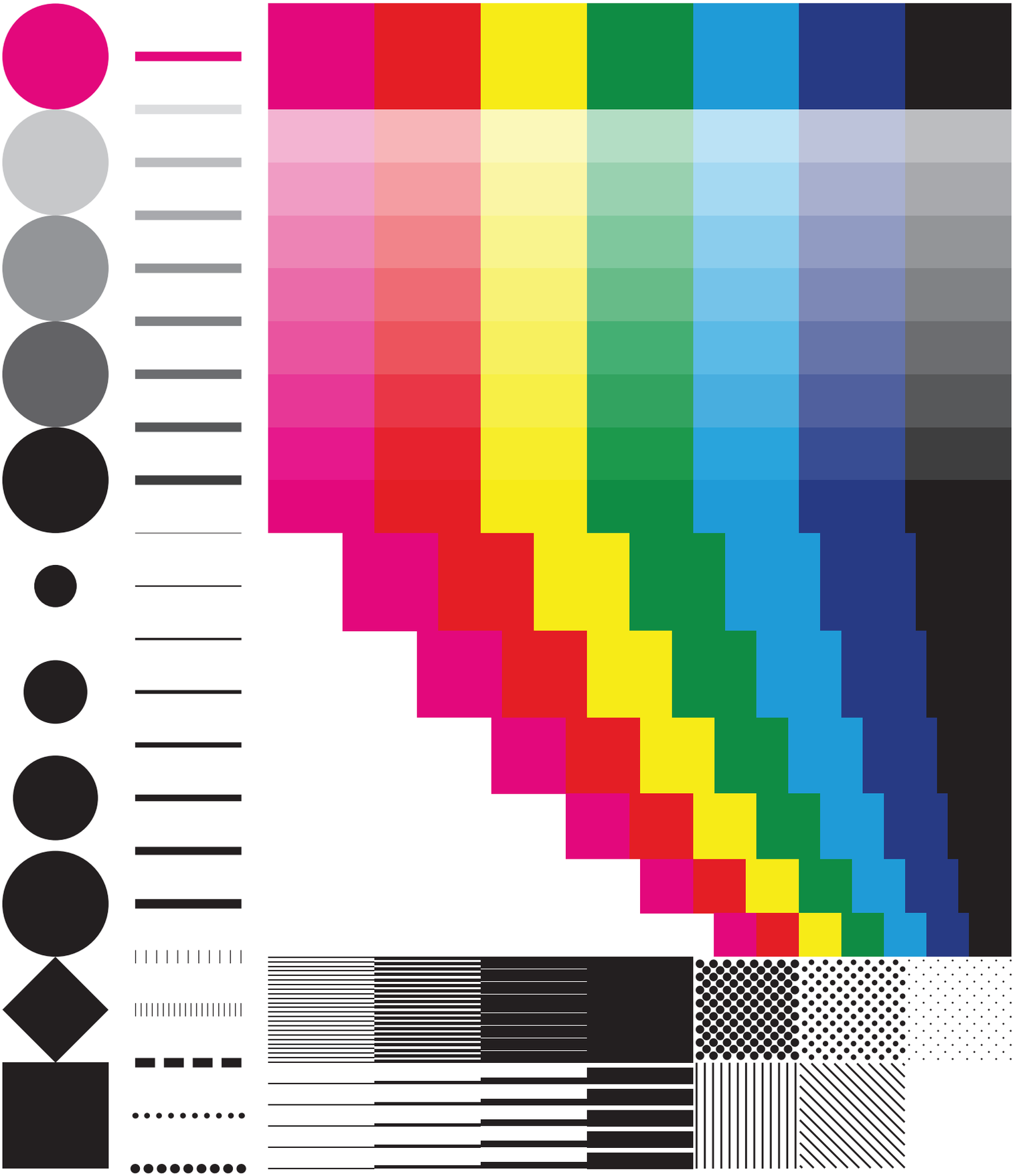
Atlas of the Copenhagens is printed in two fluorescent colours, a very strong blue and a black. The inks emphasize the materiality of the printed object. Fluorescent inks are less transparent than regular inks and lie, literally, more 'on top of' the paper. This gives them a stronger physical presence. This means that a map printed in fluorescent inks has a heightened materiality in comparison to a map printed in regular inks, where paper and inks are physically more one. The effect of the inks emphasizes that a map is both a representation of a physical reality and a material object itself.

Letting maps bleed off the page is a further strategy that uses the means of production to emphasize the manipulation in the process of making maps. A map is a cut-out of reality. This is highlighted by emphasizing the physical nature of the map. The cut of the paper in the production process becomes the crop of the map.

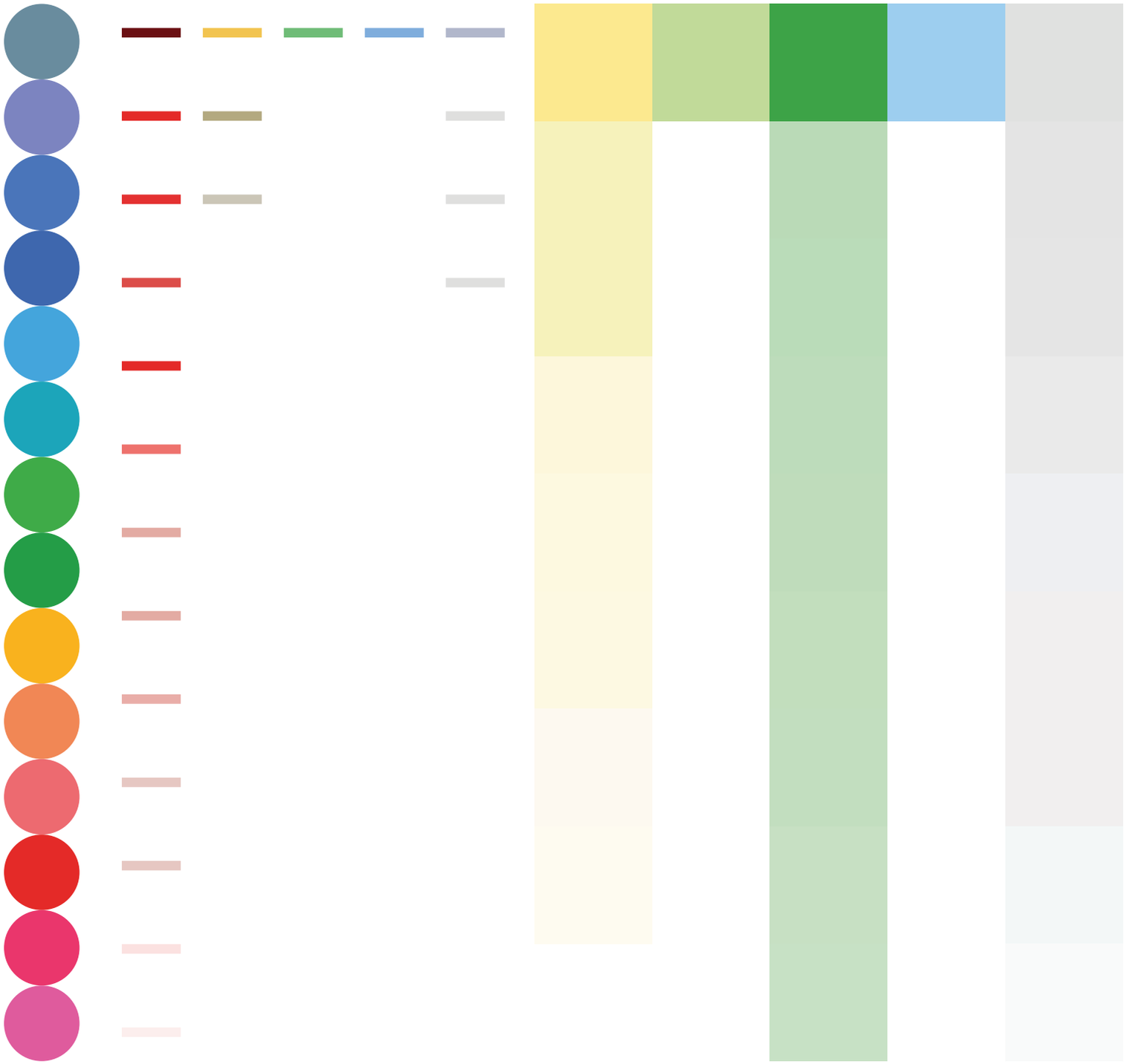
In my work I emphasize and challenge cartographic manipulations by using the means of production to highlight these very manipulations. Making maps is a process of controlling, distorting and altering data. Manipulation takes place in projecting a spatial reality on a two-dimensional plane, in choosing an orientation of a map, in making it a fixed rendering of a situation in flux, in resizing an original site to a smaller representation, in showing a cut-out version of reality, in filtering elements by selecting them or generalizing them, and in adding invisible elements like borders and height lines. A similar transformation occurs in the use of the map. The user is manipulated through the result of the process of reproduction and multiplication. In the choice of medium, the physical qualities, the glow and brightness of a screen or the tactility and translucency of paper. In how a map is placed on a sheet or screen, bleeding out, with a margin, or in a composition with other elements. In the use of typography. In the choice of reproduction technique, the physical qualities of inks on paper, the fact that certain RGB-recipes produce colours that are more intense on the screen. In the effect of grids, line weights, and other characteristics of reproduction.

In November 2017, I presented my work and ideas about an ambiguous cartography as described above at the conference 'Graphic Design and Research in the Social Sciences. Jacques Bertin and the Graphic Laboratory. EHESS 1954–2000' at the École des Hautes Études en Sciences Sociales (EHESS) in Paris.[40] The conference was organized on the occasion of the fiftieth anniversary of Bertin's book *Semiology of Graphics*. My presentation did not get much response from a large part of the audience. It was as if I was addressing an issue that was not a problem to this audience. A year later, I received a more positive response when I presented my work at the 'Mappings as Joint Spatial Display' conference in Berlin.[41] The occasion was very different. Rather than celebrating a theoretical legacy, the symposium in Berlin was aimed at furthering a methodological discourse in mapmaking and

36 Drucker, *Graphesis. Visual Forms of Knowledge Production*, 125.
37 Ibid., 127.
38 Demoule, Garcia and Schnapp, *Une histoire des civilisations. Comment l'archéologie bouleverse nos connaissances*, 34–45.
39 Simpson, Gimmel, Lonka, Jay and Grootens, *Atlas of the Copenhagens*.
40 'Design graphique et recherches en sciences sociales. Jacques Bertin et le Laboratoire de Graphique. EHESS 1954–2000'.
41 'Mappings as Joint Spatial Display'.



French cartographer and theorist Jacques Bertin distinguishes three types of graphic marks—point, line and area—that can vary in terms of position, size, value, texture, colour, orientation and shape. He calls these the 'visual variables'. The overview on the left-hand page shows the variety of visual variables. Bertin included similar overviews in his publications. The right-hand page shows the visual variables of Google Maps, in which only a limited part of the width of the variables is used. Some of Bertin's variables, such as texture, are focused on printed matter and therefore not suitable for screen applications such as Google Maps. Other variables, such as colour, are used only to a limited extent. In Google Maps, the background colours of the base map are pale, to emphasize the brightly coloured location information placed on top of it.



in developing instruments for spatial research. The Berlin conference brought together scholars and students from a variety of fields: sociology of space, architecture, urban studies and geography. I felt that at times my work acted as a bridge in this interdisciplinary debate. The critical concerns of my research resonated with the social scientists, whereas the typologies and tools that I proposed connected with the architects and urban designers. Looking back at the two conferences, I feel that the critical approach to maps may not be a next phase, but rather presents a bifurcation, a parallel trajectory in the thinking about cartography.

A Post-Representational Reading of Google Maps

In this section I will look at how recent cartographic thinking sees maps as processes rather than as products. In this line of thinking, cartography is redefined as a broad set of practices that incorporate both the production and application, the producer and the user, of the map. With this as frame of reference I will investigate the Blue Dot in the Google Maps app, how it functions, how it was introduced and the technological contexts surrounding it. I will also speculate on alternative designs.

After representational cartography, which emphasized the map as object of communication, and more-than-representational cartography, which saw the map as a product of power but also as a producer of power, the early 2000s saw a third shift in the thinking about maps called post-representational cartography. In post-representational cartography the fundamental status of the map is questioned. Maps are seen as never fully formed, their work never complete.

In the previous chapter I introduced the term Blind Map for maps (and other visualizations) that highlights that they are not complete. Every time a user engages with it, a map is completed. Google Maps is the quintessential Blind Map. It has a fundamentally emergent status: it looks empty and its colours are pale as if the map anticipates being filled with a highlighted location or route. Opening the app, the software does not show a map that is complete, but one that is the starting point of a process of searching, scrolling and zooming in and out. In essence, Google Maps is a processual map.

The map that Google's cartographic app shows on mobile devices is different for each user. Naturally, this has to do with the particular device that is used to access the software, the size and proportion of the display and the brightness settings of the screen. But more importantly, it is different because what is shown depends on the location where the software is used: the Google Maps app on mobile devices crops the map in such a way that the location of the user is placed in the centre of the map. The user's position is shown as a small blue dot on the map. For me, this blue dot is a cartographic innovation of unprecedented magnitude, perhaps the biggest change in thinking about maps, mapping and mapmaking since The Blue Marble photo from 1972 made us look at Earth in a different way.[42]

Google has named the feature My Location but I will call it the Blue Dot, because it is much more than just a functionality that indicates one's position. I regard the Blue Dot as a symbol that highlights a shift in the practice and theory of mapmaking in which the role of the user has become more important. The user is not the

recipient of a graphic product at the end of a process, but a co-creator. The Blue Dot literally puts the user on the map. It is both a visual sign indicating the presence of a user in a graphic product and an emblem marking a new phase in the thinking about production and use. The binary division between producer and user no longer applies here. Furthermore, what appeals to me in the name Blue Dot over My Location is that it is a concept that evokes a visual form. Hearing it is seeing it. Other concepts that have a similar quality are The Blue Banana[43] and The Duck.[44]

The Blue Dot is one of two items in Google's mobile cartographic app that remain the same when the map is zoomed in or out. All other elements change in size and colour or appear or disappear when moving from close up to long shot. The other item that is always there is the Google logo; the company name in green, red, yellow and blue letters has a fixed position in the left bottom corner. Google and the user both make the map. Both also use the map. The user to obtain information and Google to obtain data about what is acquired.

The Blue Dot is a cartographic innovation, especially from a post-representational point of view. The blinking circle underlines that Google Maps is processual and that the binary division between producer and user no longer applies. The user is as much the maker as the producer of the cartographic app as her location determines the crop of the map. Through scrolling and zooming she changes what the cartographic app shows, she can demand locations and routes to be displayed and she can add information to the map. The user not only controls it, she is also ever present in the map of Google. The map is always her map, her interpretation. The fact that she has a presence on the map confirms this.

At the same time that the functionality in Google Maps is empowering the user, she is also being used. Google records the user's location and movements. The data thus generated is the company's raw material that it processes and monetizes. The Blue Dot is animated, it expands and contracts in a regular rhythm, the effect of this movement is that it appears to be breathing. This breathing not only confirms the presence of the user, but also the presence of the company that is observing and recording. Blue Dot is watching you.

Another way that Google Maps harms the user is that it provides too little overview. The limited resolution and the small size of the screen of mobile devices does not give overview, which makes orientation difficult on a map scale other than showing the close proximity of the user's location. On larger scales, when more zoomed out, the map contains too little information, both in quantity—how much is shown, and in quality—how it is shown: the colours are too pale to easily distinguish the various cartographic parts.

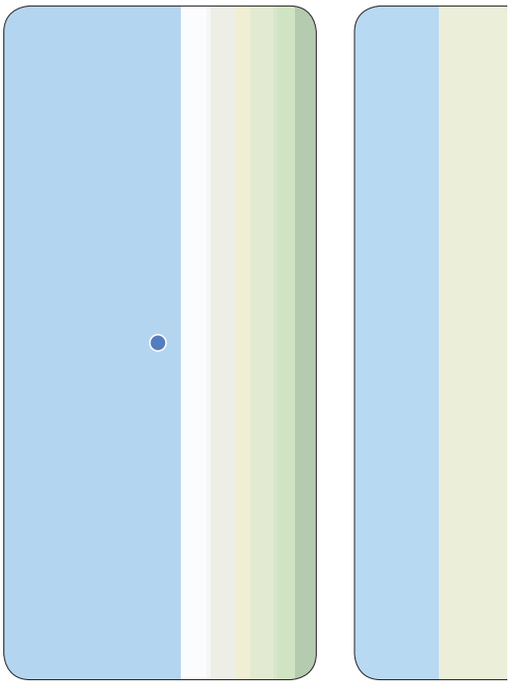
There is a third way in which the Blue Dot user is a victim. Google Maps, in a way, is too complete, it offers a diagrammatic version of reality including the user herself. It does not leave room for additional, alternative versions of that reality. The process of orientation of a map user is comparing reality with an alternative version of that reality, simplified and diagrammatic. Google Maps, however, is not about comparing; the alternative version of reality it provides is complete in that it includes you, the user. Google Maps is the only version of reality. Occasionally you still see someone on the street holding a map. Alternately looking up and down, peering around in a dazed way and then scanning the map to get clarity. Orienting is comparing. More often you see someone in the street fixated

42 Taken on 7 December 1972 by the crew of the Apollo 17 spaceship on its way to the Moon, The Blue Marble image of Earth is one of the most reproduced images in history.

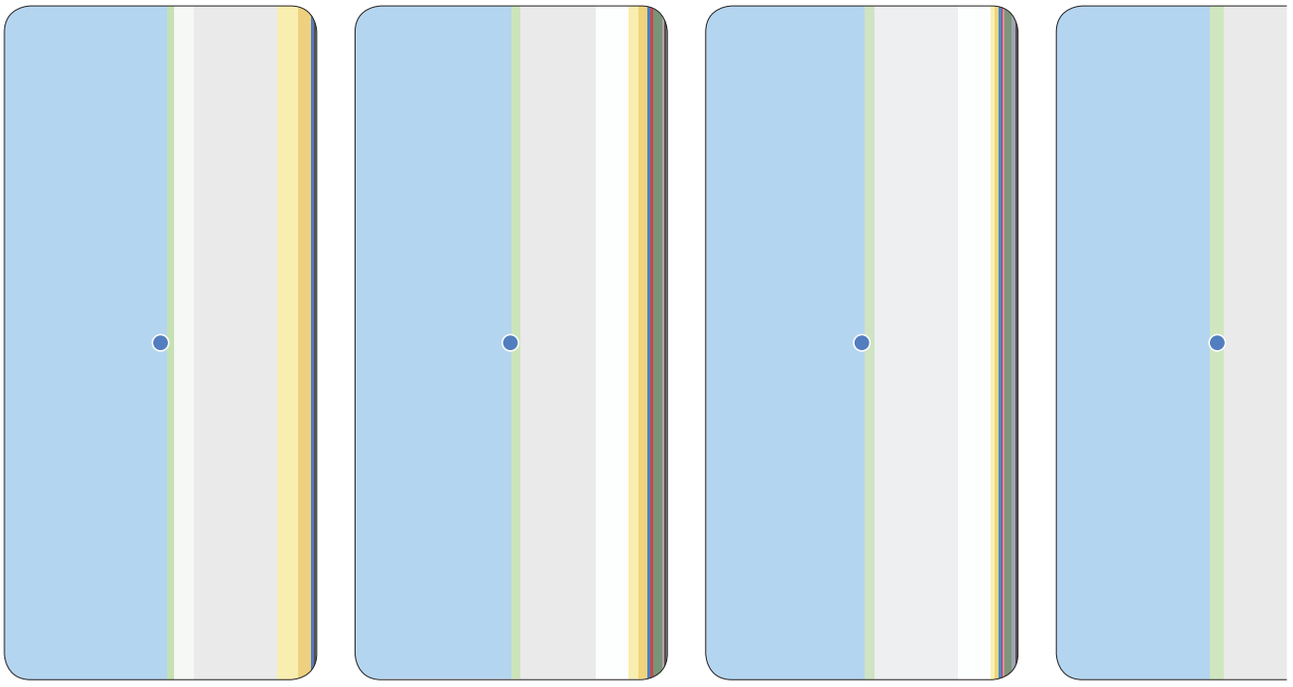
43 The Blue Banana is the name given to a curve shaped corridor of urbanization stretching from North Wales across Greater London to the Benelux and across the German Rhineland via Switzerland to Northern Italy. The colour blue refers both to the colour of the European flag as to the blue collars of the factory workers in the region. The Blue Banana spatial concept was coined in 1989 by RECLUS, a French group of geographers.

44 The Duck is a term to describe certain modern architecture that is expressive in form and volume as opposed to The Decorated Shed which characterizes a particular premodern architecture that relies on imagery and signs. These concepts were introduced in Venturi, Scott Brown and Izenour, *Learning from Las Vegas*.

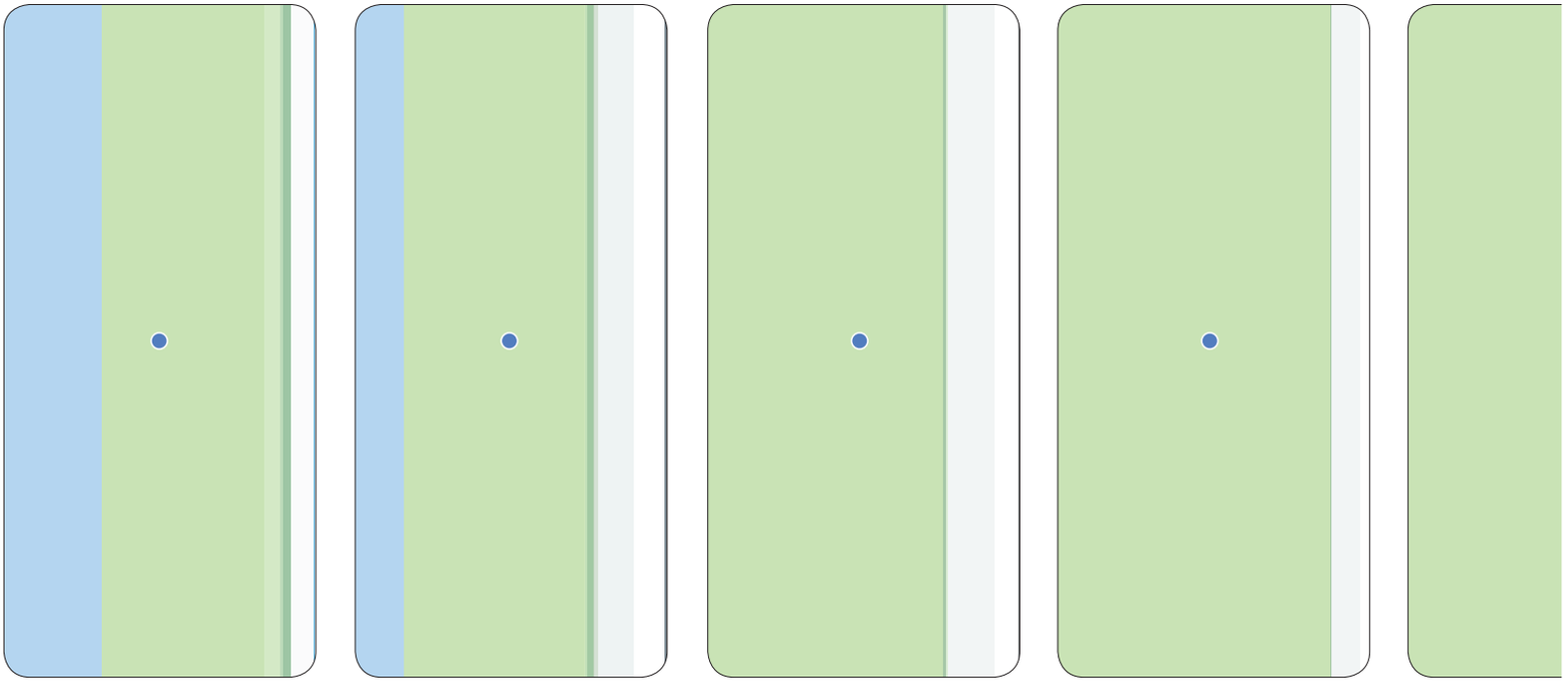
The Blue Dot: Zoom Levels



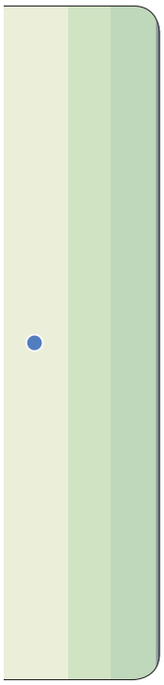
ZL00



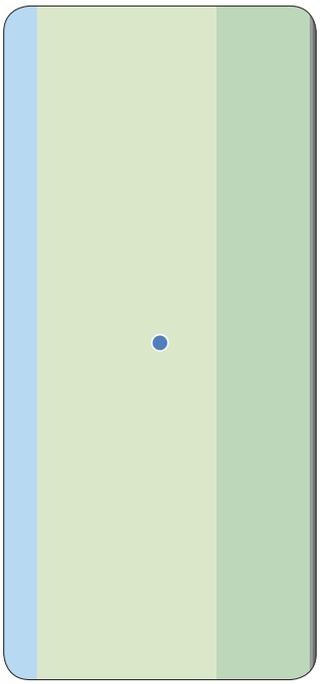
ZL06 ZL07 ZL08 ZL09



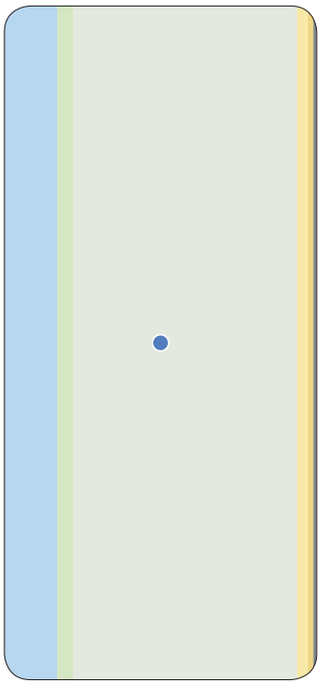
ZL13 ZL14 ZL15 ZL16



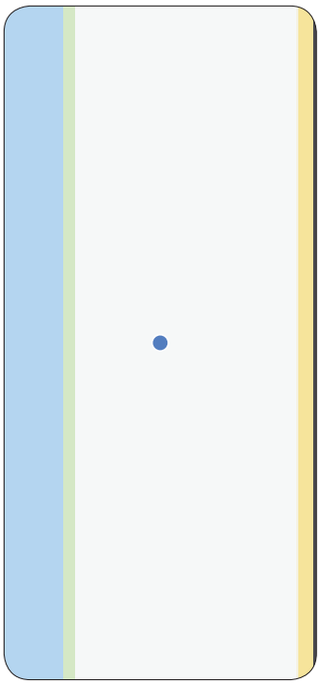
ZL01



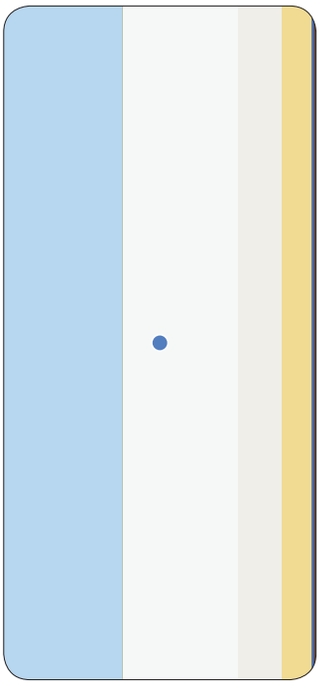
ZL02



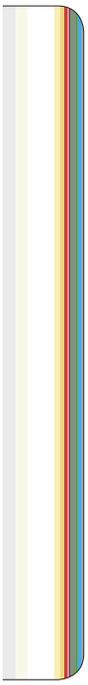
ZL03

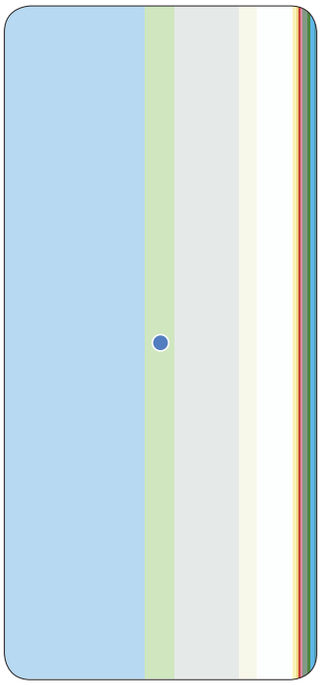


ZL04

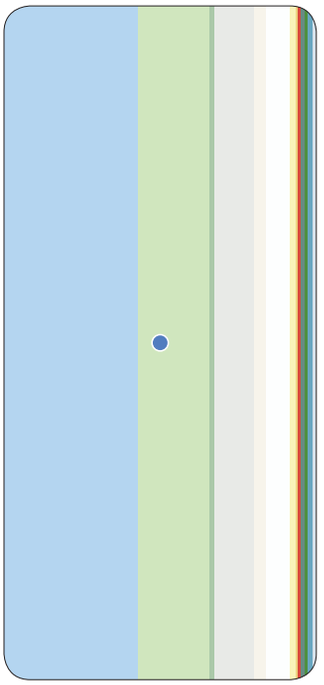


ZL05

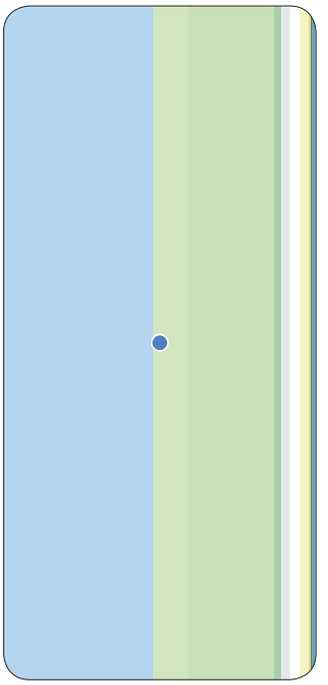




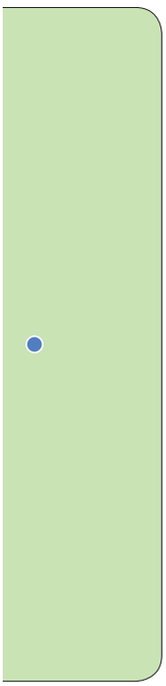
ZL10



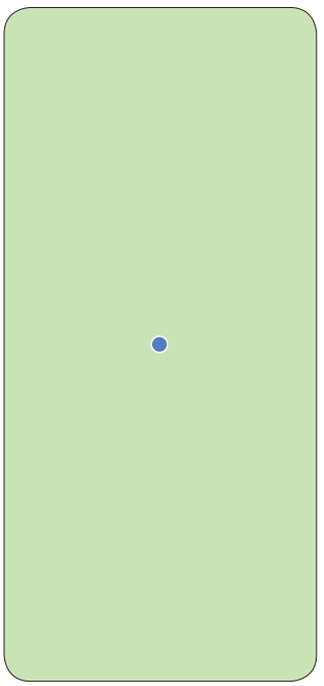
ZL11



ZL12



ZL17



ZL18

Where the cartographic character of Google Maps changes per zoom level, from street map to road map to topographic map, the Blue Dot does not change at all. At each zoom level, this location symbol is the same in terms of colour, shape and size. This overview shows Google Maps screenshots on nineteen zoom levels. The maps are sorted by colour to show the amount of colours per zoom level more clearly. The chosen location for this test is Burnham Park, Chicago, which is also the site of the 1977 film *Powers of Ten* by Charles and Ray Eames.

on the map on her mobile device, like a deer caught in the headlights, focussed on an image that she is part of and looking at the beam of the Blue Dot to know what direction to go. Orienting has become looking at oneself in Google's filtered version of reality. The Blue Dot is a cartographic mirror.

I see the Blue Dot as the conceptual counterpart of the Blind Map that I introduced in the previous chapter. Whereas the Blind Map deals with a graphic product that is essentially unfinished and needs a user to be completed, the Blue Dot involves the different role of the user in the production process of visual information. The Blind Map deals with space, the Blue Dot with position. The Blue Dot gives the user, sometimes literally, a presence in the mapmaking process. But in order to take this role, the user needs to be given room. The Blind Map offers opportunity to the user to take this position. The Blind Map is blind in a metaphorical way as it is centred on the user, the Blue Dot; it does not provide an alternative version of reality, but that of the user.

The Blue Dot

The Blue Dot first appeared as part of the Google Maps app for mobile devices on 28 November 2007.[45] Given the amount of updates, restyling and changes that normally occur on websites and apps, the Blue Dot has remained pretty much the same since its launch. In the current version the Blue Dot looks like a solid blue circular shape with a white outline. The blue circle is not static but an animation and the only animated element in Google Maps. The overall size of the dot remains the same, but the inside blue shape grows and contracts. It looks like it is breathing, as if it is alive.

At the launch of the Blue Dot, Google released a two and a half minute animation explaining the new feature.[46] It is interesting to take a closer look at the video to understand the use Google had in mind and the technological context at the time. The animation starts by showing a clumsily hand drawn figure holding a map, standing on the corner of a street. A voice-over (American, male) says: 'We all need maps and directions when we are on the move. The problem is knowing where you are right now.' The video continues to introduce My Location that lets users know where they are in '1-Click' without the requirement of GPS. Shown is a hand drawn smartphone that resembles the BlackBerry Curve 8300 series.[47] The original 8300 model did not have a GPS antenna that enabled it to receive satellite signals to detect its location, although later BlackBerry Curve models would have GPS functionality. The My Location introduction video explains that Google Maps determines the location either via GPS or by using the positions of cell towers in the phone network. As the latter method is less precise than the GPS method, a larger light blue circle around the blue dot would be displayed to show the approximate location. The larger the light blue circle, the less precise the user's geographic position can be detected. To find out where one is, a user of Google Maps had to press the '0'-key of the keyboard and the animated blue circle would be visible on the map.

The video continues with an example. John (a faceless hand drawn figure) has just arrived in London (a drawing of the Big Ben clock tower of the Palace of

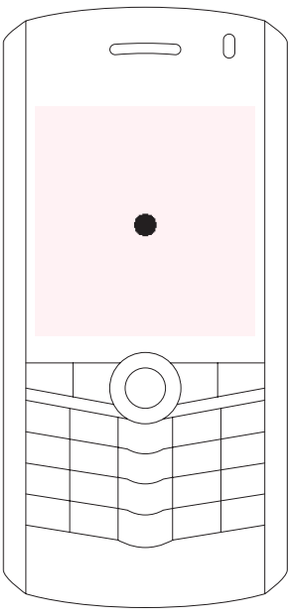
Westminster is shown in the background) and is hungry. 'John wants his first meal to be the London curry he heard so much about.'[48] Rather than typing in the location on phone, 'Tottenham Court Road', John writes 'curry' and presses '0' to find his way to a local restaurant to eat chicken tikka masala. From the example in the animation it becomes clear that the goal of the My Location technology is to connect users and companies who provide goods or services. In that sense it fits in Google's economic model, the abovementioned surveillance capitalism.

After the explanation and example the video addresses the issue of privacy. 'You might ask, does Google know where I am? The answer is No.' The animation goes on to explain that Google uses the same information as telephone companies and that it only knows where a phone is, not who is using it, their phone number or any other information. 'And if you want you can always disable the feature.' Today we know, for example through the leak of Edward Snowden, that location information and Google Maps searches can be traced by others than the users.

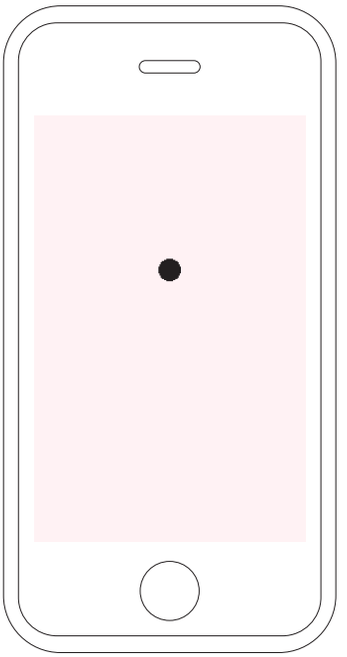
Since its launch in 2007, the Blue Dot format did not fundamentally change. In 2016 a blue beam was added to the Blue Dot to indicate direction.[49] The main look and functionality of the Blue Dot remained the same as first presented in the introduction video. In fact, the Blue Dot has become the standard in several map apps. Apple's cartographic app Apple Maps as well as the Chinese language map app Baidu Maps both have a blue dot to indicate the user's location. And also the functionality—the central position on the map when opening the app, the larger-sized light blue circle to indicate a less precise location indication, the animated contraction and expansion of the circle, the unchanging size of the blue dot when zoomed out or in: all these aspects have been adopted by the cartographic apps of Google's competitors.

The fact that the Blue Dot has not fundamentally changed since its launch in 2007, that it is globally used by billions of users and that its look and functioning have been adopted by others, to me signifies that it has been well designed. I became curious to discover who designed the Blue Dot. I had the opportunity to find out when I met Jonathan Lee, a design manager at Google.[50] Both of us were speaking at AGI Open, a graphic design conference in Biel/Bienne, Switzerland, in 2015. Via e-mail, Lee put me in contact with Sanjay Mavinkurve, the designer of the Blue Dot. In an e-mail exchange I asked Mavinkurve about his motives behind the design. Why is the Blue Dot blue, and why does it remain the same size if the map changes scale? Mavinkurve is not trained as a designer but has a MSc in Computer Science from Harvard University. From 2003 to 2011 he worked for Google as User Experience Design Manager, currently he is Director of User Experience at Google Play.[51] The choice of the dot shape makes sense, according to Mavinkurve, as this is a common symbol on maps to indicate a location. In our exchange, Mavinkurve indicated that the limited capability of the smartphones at the time was the reason for the dot remaining the same size when the map changes in scale. He noted that other elements on the map, like stars and red location markers, also did not scale according to zoom level. 'As for the colour … also no good reason except that, at the time, blue was the one colour I would have most tied with Google.'[52] Mavinkurve continues that blue was the dominant colour in Google's user interfaces.

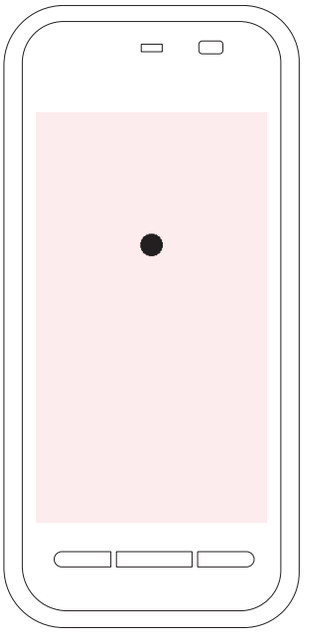
45 Chu, 'New Magical Blue Circle on Your Map'.
46 'Google Maps for Mobile with My Location (beta)'.
47 BlackBerry Curve is a smartphone from the Canadian Research in Motion (RIM) Company first released on 10 May 2007. The BlackBerry Curve was aimed at professional users, had a small 320 × 240 pixel screen, a full Qwerty-keyboard and trackball.
48 Curry is a dish originating in southern India that uses a combination of spices. From the early 19th century curry restaurants were opened in London. The curry houses became increasingly popular in Britain due to the large number of British colonial servants and military personnel who returned from India. After World War II, the popularity increased even more due to the large number of immigrants from South Asia. And although the British Foreign Secretary Robin Cook in 2001 declared the chicken tikka masala to be a true British national dish that reflected the country's multicultural pluralism, I cannot see the 'London curry' remark in the My Location video but in the light of the impact colonialism has on the world of technology today. To name two examples: the basis of the physical infrastructure of the internet is formed by the submarine cable network for telegraph communication between the different parts of the British Empire. Besides, India plays an important role in the tech industry today. Many technology companies are partly based in India and several important employees of those companies are Indian-born, including Sundar Pichai, the current CEO of Google, and Sanjay Mavinkurve, the designer of the Blue Dot.
49 Buczkowski, 'Google Maps Get Redesign of the Blue Dot Showing Your Position'.
50 Jonathan Lee obtained his BFA Communication Design/Graphic Design at Pratt Institute, New York. After working at various graphic design studios, including 2×4, the studio of Michael Rock who was mentioned in the previous chapter, he started working at Google in 2011. At Google he was responsible for, among other things, the creative direction of the Google rebrand in 2015. Since 2017 Lee has been a critic at the graphic design department of the Yale School of Art. 'LinkedIn profile Jonathan Lee'.
51 'LinkedIn profile Sanjay Mavinkurve'.
52 Sanjay Mavinkurve, email message to author, 18 November 2015.



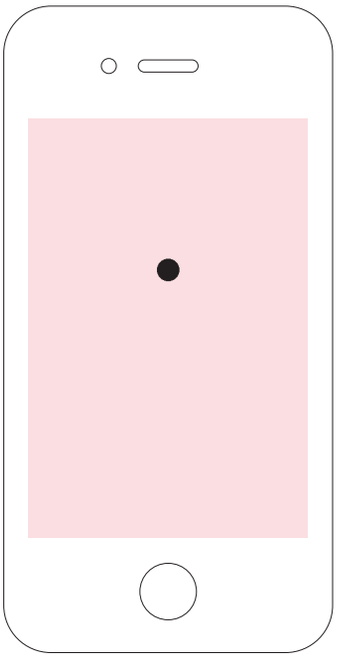
1 09.2006



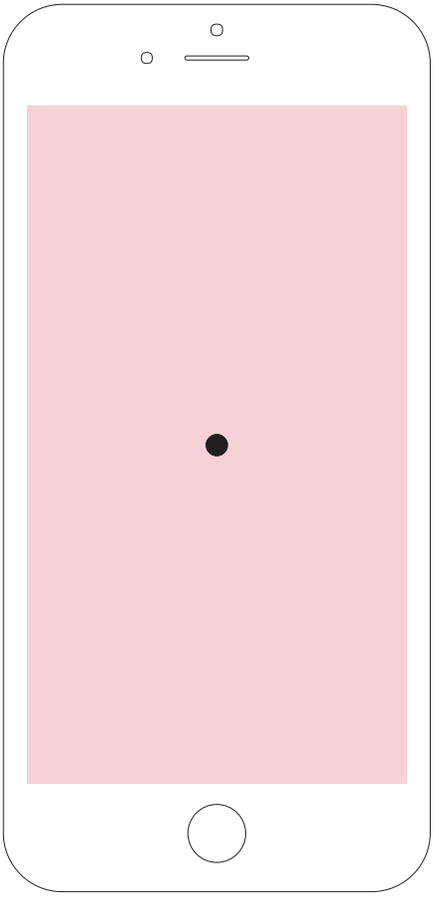
2 07.2008



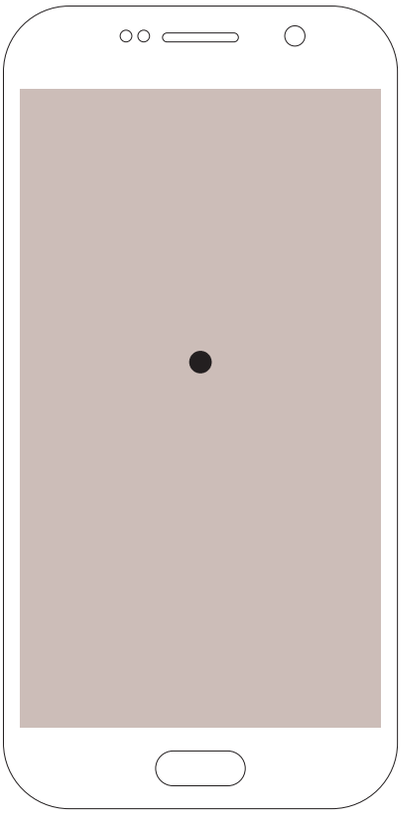
3 09.2009



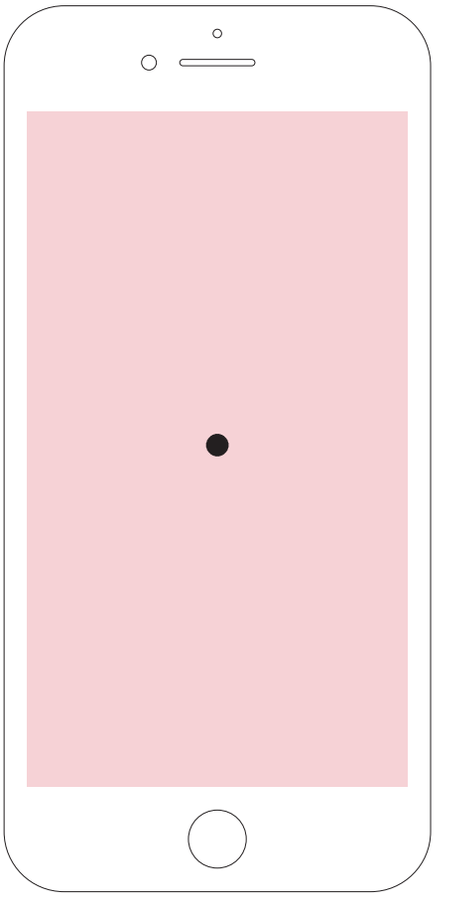
4 06.2010



8 09.2014



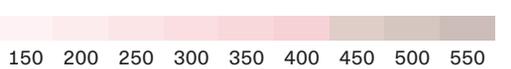
9 04.2015



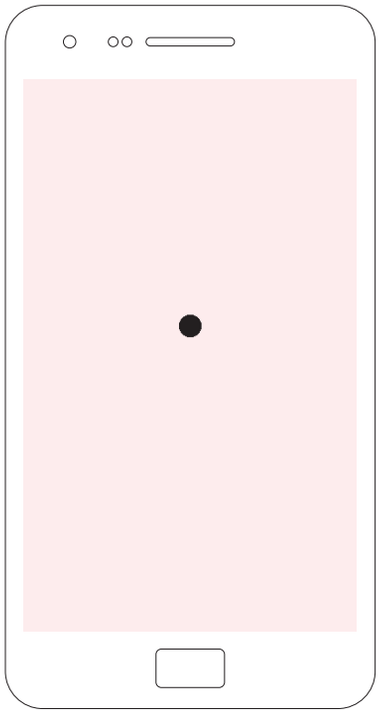
10 09.2016

This chronological overview shows smartphones from 2007, the year the Blue Dot was introduced, to the present day. From every year one of the most sold phones has been chosen. The phones' screens are coloured to indicate the resolution of the screen, the darker the colour, the higher the degree of detail visible on the screen of the phone. In the course of time the screens of smartphones could not only display more information because they became larger, but also because the screen resolution became finer. The dot on each phone indicates the size of the Blue Dot in the Google Maps application.

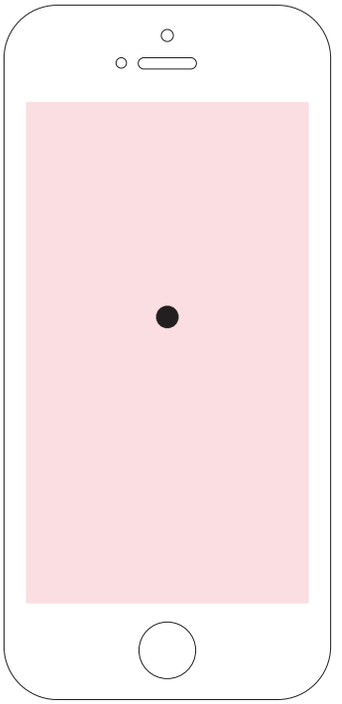
Resolution (ppi)



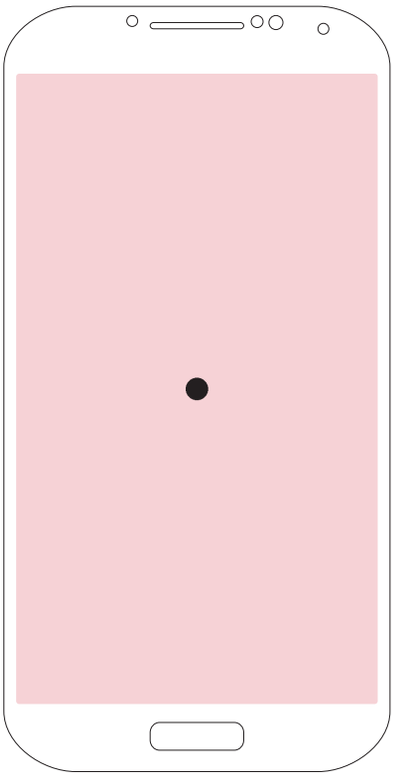
1 cm



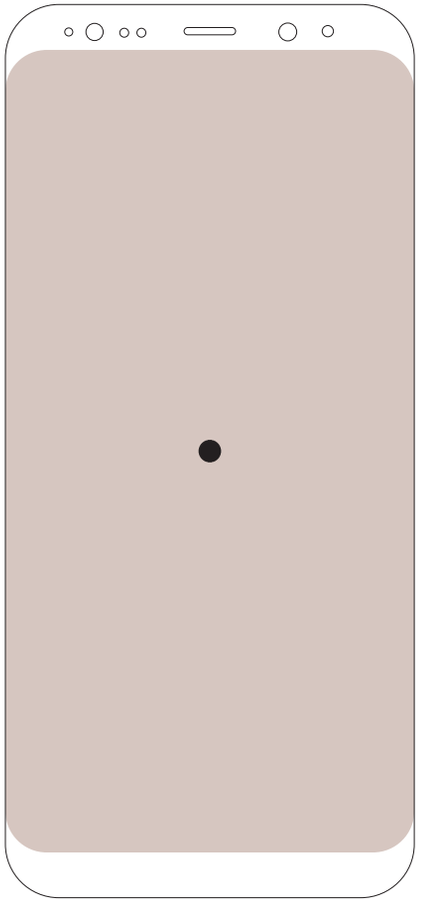
5 05.2011



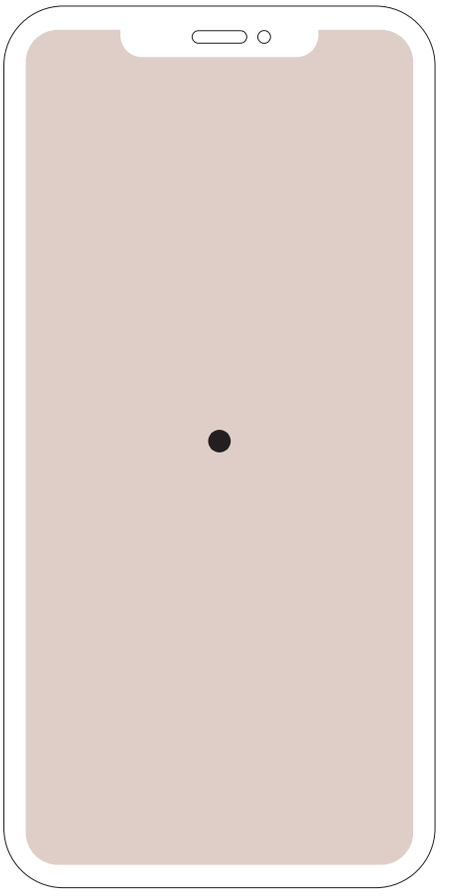
6 09.2012



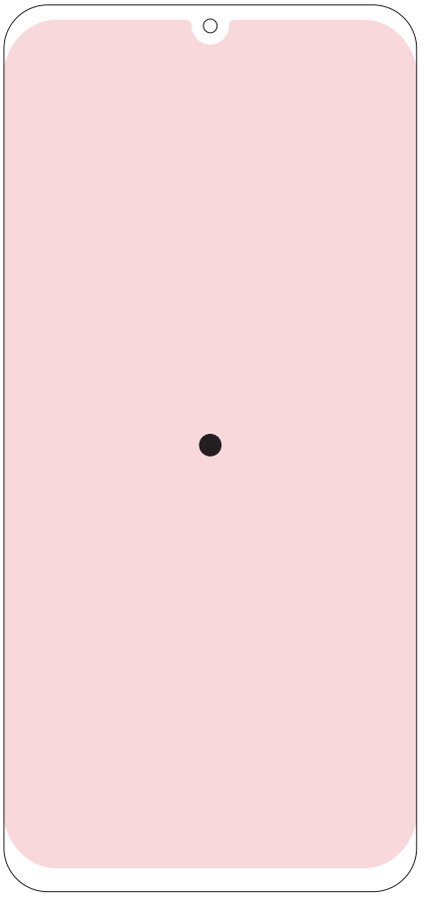
7 04.2013



11 04.2017



12 09.2018



13 03.2019

1	BlackBerry Pearl 8100	157 ppi
2	iPhone 3G	163 ppi
3	Nokia 5230	229 ppi
4	iPhone 4	326 ppi
5	Samsung Galaxy S II	217 ppi
6	iPhone 5	326 ppi
7	Samsung Galaxy S4	441 ppi
8	iPhone 6 Plus	401 ppi
9	Samsung Galaxy S6	577 ppi
10	iPhone 7 Plus	401 ppi
11	Samsung Galaxy S8+	529 ppi
12	iPhone Xs Max	458 ppi
13	Huawei P30 Pro	398 ppi

I understand Mavinkurve's colour choice. Blue is the predominant colour on social media. Nearly all logos of social media companies use the shade.[53] But given the shape I thought that the Blue Dot was referencing 'The Blue Marble' or 'The Pale Blue Dot', respectively: the ubiquitous photograph of Earth taken on 7 December 1972 by the crew of the Apollo 17 spacecraft at a distance of about 45,000 kilometres and a photograph of planet Earth taken on 14 February 1990 by the Voyager 1 space probe from a distance of about 6 billion kilometres. In the latter photograph, earth's apparent size is less than a pixel; the planet appears as a tiny dot against the vastness of space, among bands of sunlight scattered by the camera's optics. But while my thoughts wandered off to remote distances and far away perspectives, the reality of the Blue Dot is that it is about this place at this moment in time. The Blue Dot is a cartography of the here and now. The blue symbol suits a world where through information technology we have more connections with, and knowledge of, the rest of the world. The animated dot that appears to be breathing is a fitting symbol that seems to say: I am the Blue Dot, I am right here right now, I am.

I admire the design of the Blue Dot. But, as with other designs that I respect, I sometimes wonder how I would have designed it myself. In the case of the Blue Dot there are two nagging aspects that I would like to revisit. First it is the shape of the dot. As it is a solid form it covers the area where the user is located. When completely zoomed in this is not a problem. But when zoomed out a bit, the dot is relatively big and can cover complete buildings or side streets. An open or outline shape could solve this. But for this open form to be visible enough it would need to be so big, or the outline so thick, that it would have too big a presence on the map. The other aspect I would like to reconsider is the immutability of the Blue Dot throughout the various scales. With each zoom in or out, the map of Google changes character, from a street map at closer zooms to a road map to a topographic map in views from further distances. In the different scales the relation between the user and the map changes, one would expect the symbol of the user's location to reflect that. In a close view one would almost expect to see oneself, or at least the Blue Dot to have more detail. In views from far away the dot almost becomes ridiculously big and important when it is covering cities or even countries. Why could the Blue Dot at this global scale not be smaller, perhaps reduced to a mere pixel?

Conclusion

In this chapter I looked at different modes of thinking about maps. A cognitive, functional approach built on the premise that the world can be known and truthfully mapped; a critical approach that sees maps as complex and contested, as products and producers of power and a processual approach that questions the ontological foundation of the map and regards the map as mapping, as a process that is never complete. Each of these modes of thinking generates considerations that become criteria to evaluate the look and functioning of a map. Conversely, how the design of a map is perceived is informed by the viewer's conceptual understanding of the cartographic product. From this it follows that a purely functional

reading of the map without it being questioned conceptually does not suffice. Nor does a critical reading of the map solely focussed on understanding the hidden structures suffice, as it does not provide criteria for how a map should function. Building on this idea, it can be said that design invites theory. And theoretical understanding of a product is necessary to understand its design. In mapmaking, theory and design are intertwined.

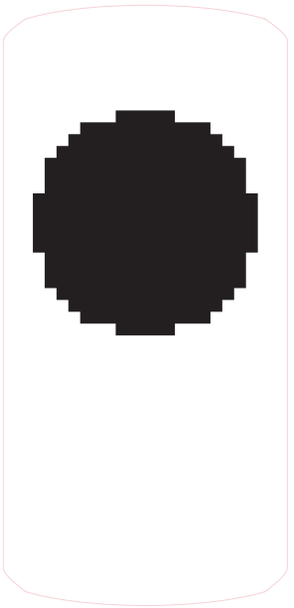
This chapter looked into the question of whether it is possible to produce fundamentally new maps, and if so how. Following the above it can be said that a map that looks and functions differently will only be perceived as innovative if the new design is linked to a different conceptual understanding. A full understanding of the map would need to scrutinize aspects like how the map is produced, by whom, for what reasons, employing what tools and how is it used.

Post-representational cartography perceives the map as a process. Google Maps is the quintessential example of a processual map, because it is in a constant state of becoming. Users search, scroll and zoom to make the map complete. A processual reading of maps questions the producer-user divide and in Google Maps it certainly is the case that the user is as much a producer of the maps the app displays as Google is itself. At the same time, the Google Maps user is a victim as her data is used as raw material exploited by Google. On another level she is prey because orientation using Google Maps is not a process of comparing, but about seeing a single version of that reality that is blind for alternative versions other than that of Google.

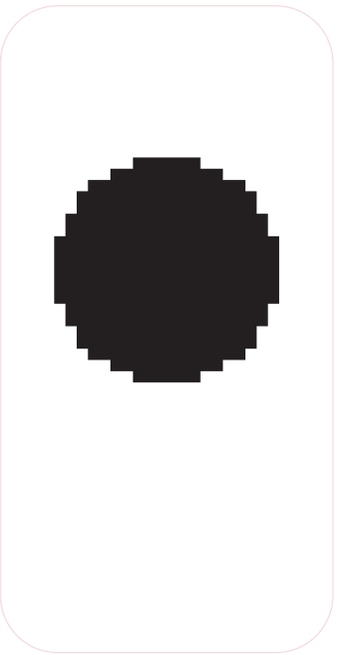
I introduced two concepts for this processual approach to maps and mapmaking. The Blind Map describes the emergent status of maps and other visualizations. Maps are never fully formed but are completed every time a user engages with it. The Blue Dot is both a visual sign indicating the presence of the user on a map and it is an emblem marking a different phase in the thinking about production and use in which the binary division between producer and user no longer applies. The two concepts are interrelated. The Blue Dot gives the user a presence in the mapmaking process. But in order to take this role, she needs to be given the opportunity to do so. The Blind Map offers space for the user to take this position.

53 On 30 April 2019 Facebook CEO Marc Zuckerberg unveiled a redesign of the Facebook mobile app and website discarding the colour blue. The new design marked a shift of direction of the company to focus more on private messaging and less on public communication. The reorientation of Facebook came after accusations that the social network was used as a tool for election interference, that it spread false news, and that it did not properly protect the data of its users. In the 'Fade to White' episode of *The Observatory* podcast, American graphic designer, educator and author Michael Bierut named the elimination of the colour blue a de-branding strategy.

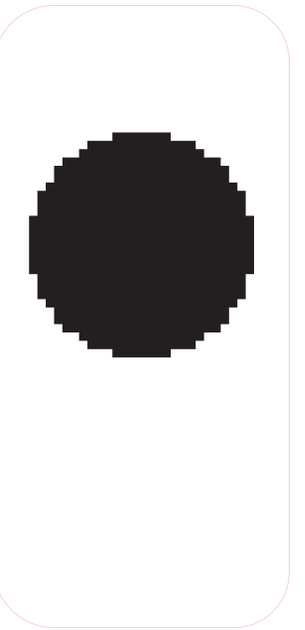
The Blue Dot: Shape



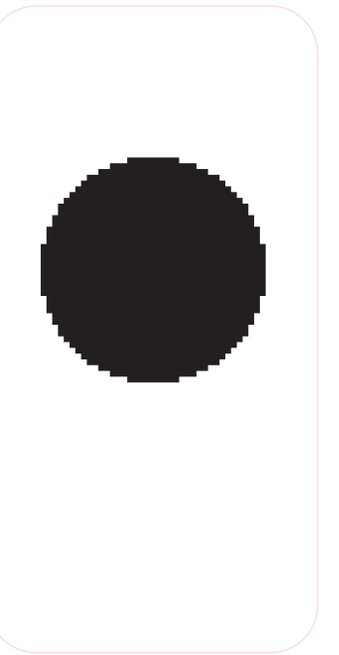
1 09.2006



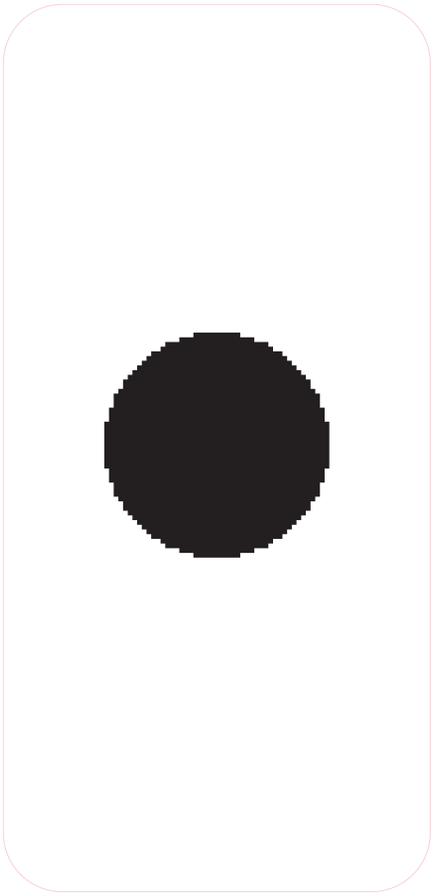
2 07.2008



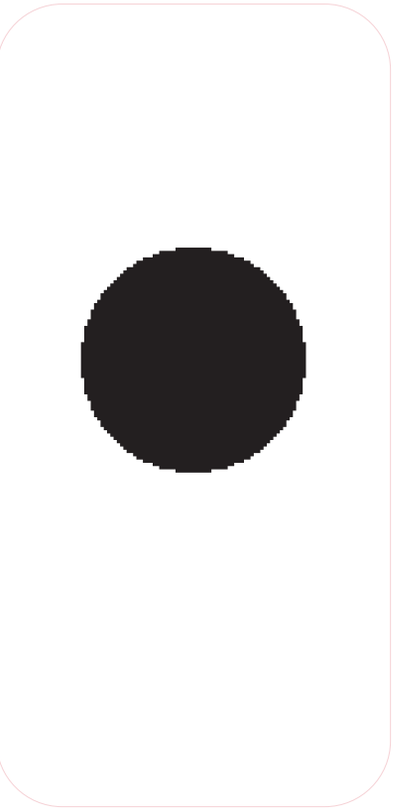
3 09.2009



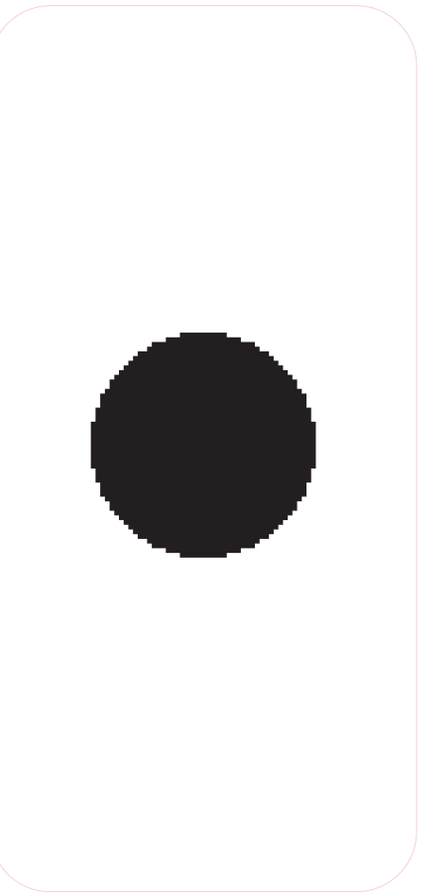
4 06.2010



8 09.2014

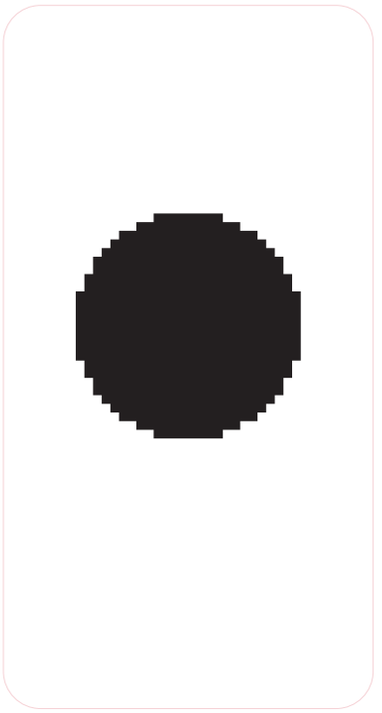


9 04.2015

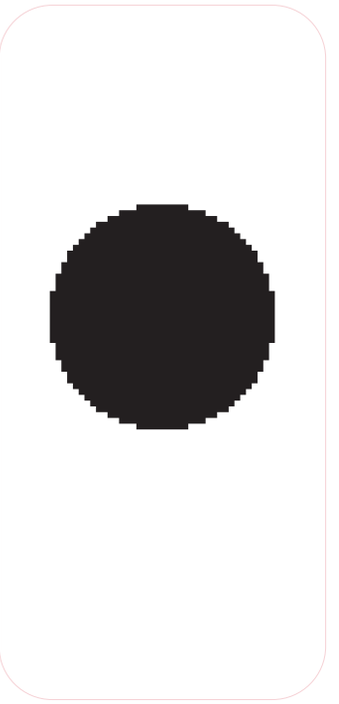


10 09.2016

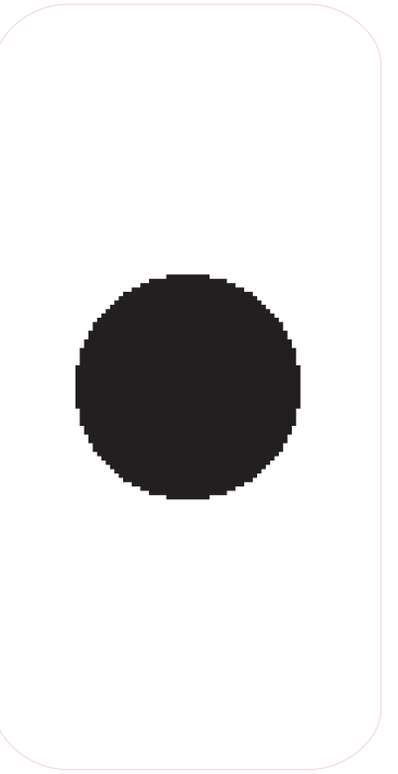
The overview shows how the shape of the Blue Dot changed over time and became rounder due to increasing screen resolutions of smartphones. The size of the Blue Dot has been magnified ten times so that the changes are more clearly visible.



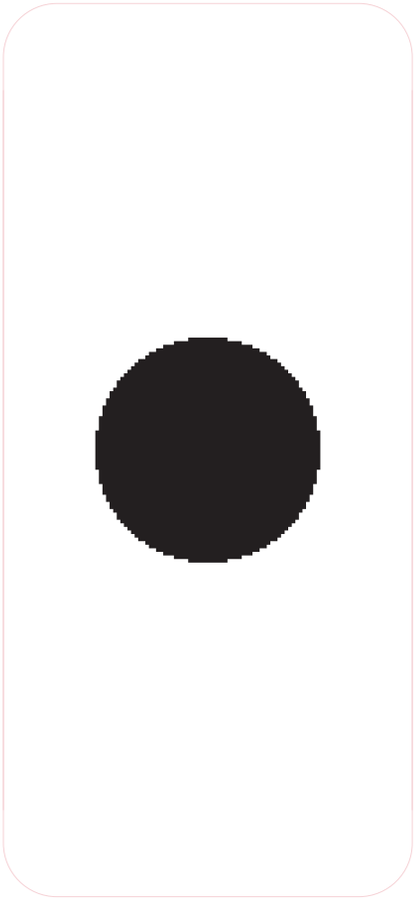
5 05.2011



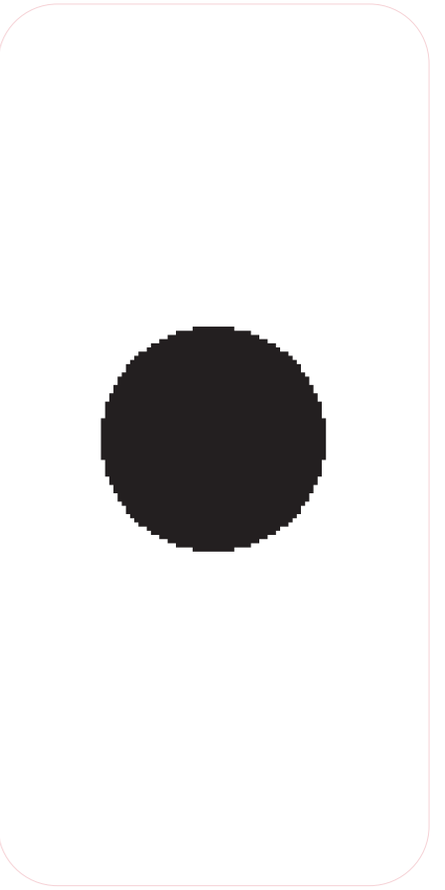
6 09.2012



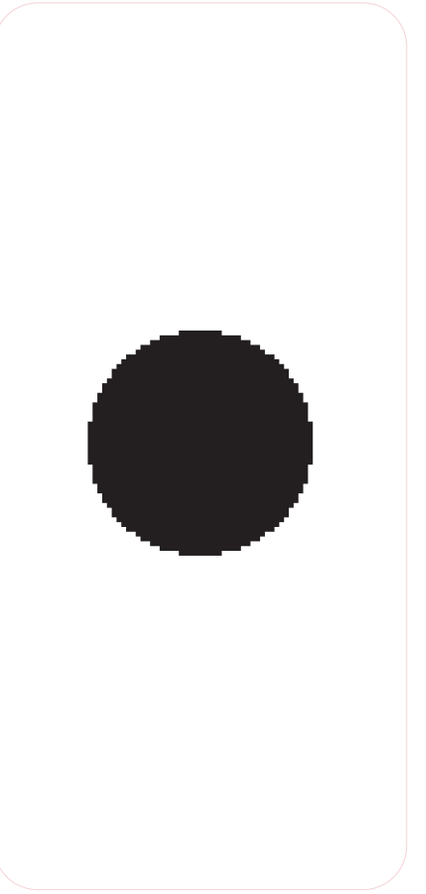
7 04.2013



11 04.2017



12 09.2018



13 03.2019

1	BlackBerry Pearl 8100	157 ppi
2	iPhone 3G	163 ppi
3	Nokia 5230	229 ppi
4	iPhone 4	326 ppi
5	Samsung Galaxy S II	217 ppi
6	iPhone 5	326 ppi
7	Samsung Galaxy S4	441 ppi
8	iPhone 6 Plus	401 ppi
9	Samsung Galaxy S6	577 ppi
10	iPhone 7 Plus	401 ppi
11	Samsung Galaxy S8+	529 ppi
12	iPhone Xs Max	458 ppi
13	Huawei P30 Pro	398 ppi