Reasserting Design Relevance in Cartography: Some Examples

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While concepts and theories about design underpin the work of the professional cartographer, it is unrealistic for most map-makers to be cognisant of the plethora of techniques available to support excellence in design. In the second part of our paper to reassert the relevance of design in cartography, we present the results of a survey of cartographic experts drawn from the academic and professional world. The survey asked participants to present their top ten most expertly designed maps from throughout history. Here, we share the most frequently cited maps that emerged from that survey and describe why they exhibit design excellence. By showing map-makers a range of high-quality cartographic work, we aim to provide exemplars that demonstrate how design affects a map and expertly marries form with function. The techniques on display are well executed and create products that are both well suited to their purpose and have an aesthetic quality that invites people to take notice. They are all, in their own ways, beautiful examples of the art of design in cartography. We have deliberately avoided a ‘top ten’ approach and, instead, offer three examples in a range of map categories. The examples are neither definitive, nor exhaustive and should act as a starting point to explore design in cartography from those who have managed to set the bar high.

Keywords: cartography, design, aesthetics

INTRODUCTION

The first part of this paper outlined the detailed and rich conceptual setting that has, for decades, underpinned cartography and helped shape what it is that we do and how we strive to achieve excellence in design (Field and Demaj, 2012). Cartographers are aware of a multitude of design related debates and have learnt to adopt what works and reject what does not often through innovation but with a focus to communicate something specific to a defined audience. Cartographic language, involving grammar and syntax, enables us to be able to judge when one symbol will work more effectively than another, or where a particular colour has associations that might hinder the message in a map. In short, it is what makes us able to speak graphically to reduce the ambiguity in our maps.

Rather than encouraging map-makers to get to grips with all of this conceptual stuff (though some is always worth learning!), let’s accept that it is the domain of the cartographic profession and for many, they just want to make a map. Understanding concepts is part of what describes professional cartographers as not simply makers of maps. So how do we bridge the gap? There exists a need for cartographers to encourage, cajole and educate the new wave of map-makers to infuse their work with something of what we know to avoid the design vacuum and lack of humanity that Huffman (2011) has identified. One way of doing this is to provide examples that demonstrate excellence in design. Our intention here is not to search for, and disassemble, why a map works in minute detail but to provide a comment of some unique, innovative aspect that simply makes the map work. In essence, the process of design is about problem-solving and continually asking what works, what does not work, what are the alternatives and would they work any better. If we manage to answer the small questions during the design process, then the bigger picture will emerge, richer and more harmonious. This is where the maps we have selected here have succeeded. They each have a particular purpose and the map-maker (they were not all made by cartographers!) has struck upon the magic formula that harmoniously combines form with function, clarity and an aesthetically pleasing result that encourages readers to look at and interact with the map.

The maps we present here are the summary of a survey of some 20 acknowledged cartographic experts from across the globe who were simply asked to provide their top ten maps that exhibit what they consider to be an excellent design ethos. We have summarized the diverse list to show those that were most often cited and which illustrate a clear user-led design principle in tandem with an innovative, engaging, clear and harmonious result. They are all visually engaging

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though the examples illustrate a huge variety in approach and depiction showing how wide the palette of cartographic design extends. While some maps are included based on widespread agreement, the fact that over 100 separate maps were suggested shows that an appreciation of good design is inherently subjective and cannot easily be quantified objectively. The maps herein solve a unique problem or display a very specific dataset. Yes, they are (we hope you agree) aesthetically pleasing as objects, but what they do successfully is take a map-making problem and apply it well to create a coherent product that exhibits clarity for a specific purpose and user group. Clearly, we cannot include every map that exhibits good design and we may have excluded some obvious examples, but we believe that the purpose of displaying extracts acts as a set of exemplars which will provide a starting point for debate about design as well as an end-point for map-makers to look at and appreciate good quality design and to learn from such examples.

Ultimately, even poor maps are designed so design is whatever the designer makes of the task at hand. When it comes to artistic endeavour, differences in opinion begin to appear and objectivity is replaced by a splash of subjectivity and what might be perceived as well designed by one person could equally be criticized by another. But our argument here is that by looking at examples of what we consider to be good cartographic design we might learn something from what has gone before and endeavour to reflect on them as part of our own design process. This list is a ‘highlights of cartography’ as put forward by the cartographic profession and not a definitive model to emulate. They serve as ideas and models of success from which inspiration can be drawn.

The maps we have chosen that reflect our survey are by no means definitive or exhaustive. In listing the maps we have specifically avoided the ‘top ten’ approach (see, for example, Forrest, 2003), because it seems invidious to assess the qualities of one map against another when they vary so much from one another. Instead, we present three examples for each of a series of general map types. This allows us to show maps in a broad context and avoids the inevitable issue with a ‘top ten’ of naming the overall ‘best map’. It also allows us to explore similarities in form relative to function or, how different maps take completely different approaches. We have tried to select maps that display a wide range of styles and purposes as well as including both historical and contemporary examples. There are 39 maps representing 13 separate map type categories. One of the fascinating aspects of the survey is that only 9 of the maps most often cited are actually made by someone whose profession and training classifies them as a cartographer. This is interesting in itself since so many of today’s maps are criticised on the basis that the author has little understanding of cartographic principles. Well, neither did the authors of 30 of the maps presented here, as chosen by our survey of cartographic experts. This shows clearly that great maps do not need a cartographer at the helm. They require someone with passion, insight and a story to tell. They also require someone with a keen eye for telling the story well using a graphical language. Whether they learnt anything of cartography to inform their own map-making process is hard to identify but their results certainly inform professional cartographers and map-makers through their own drive for excellence in communication design.

Finally, it is impossible to present the maps here at their true size so we include only a thumbnail image in most instances that gives a flavour of the map’s appearance. We have included URLs to online resources where they exist and are grateful for the ICA Commission on Map Design for hosting a digital archive of these extracts to encourage people to add their own comments and propose alternatives. See mapdesign.icaci.org for further details. So, in no particular order…

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Figure 1. *Yellowstone National Park* by Heinrich Berann, part of a set published by the US National Parks Service between 1986 and 1995

Heinrich Berann’s work is predominantly in the panoramic style of mapping. As a painter, he used his artistic talent to invent a new way of painting landscapes for the purposes of tourist mapping. Berann’s work is meticulous in its attention to detail, uses highly saturated colours and a unique curved projection that mimics what might be seen (though exaggerated) from an aeroplane. The foreground of the map is almost planimetric which curves across away from the point of view to a horizon depicting the mountains in profile. The map is immediately pleasing to the eye and creates a unique sense of place that, for tourism mapping, is well suited to the need to attract visitors. Berann also developed a trademark way of rendering cloudscapes which again, represent the sky in a way that is unlikely to be seen in the natural environment. This map of Yellowstone national park was one of four he prepared for the United States Park Service and inspired numerous others to work in a similar style (Troyer, 2002).

Figure 2. *The Island* by Stephen Walter published by TAG Fine Arts, 2008

The Island is a satirical map which takes the view of London, UK being an isolated island floating somewhere amidst its various commuter towns (Walter, 2008). It appears independent from the rest of the country, emphasized by the border of Greater London being depicted as a coastline. Walter’s map is entirely hand drawn using pictorial sketches and text and instead of the known landmarks you might find on a traditional topographic map, he fills the space with a vast array of local information based on his personal knowledge, feelings and impressions of a place. He details the interesting and mundane and the map becomes a social commentary that invites others to create an emotional bond with the work through a shared lens. Walter uses a large format (101 × 153 cm) to give himself enough space to contain the intricate detail and builds visual hierarchy in the map through the density of ink. Central London, for instance, contains reverse white type on a black shaded background to emphasize the density of the centre of the city.

Figure 3. *Angling in Troubled Waters: a Serio-Comic map of Europe* by Fred W Rose published by GW Bacon, 1899

Rose’s pictorial illustration depicts the threat posed to British interests by Russian territorial ambitions during the Balkan crisis in late Imperial Europe. The use of maps in this way features heavily in cartoons and other satirical works where familiar shapes of countries are coupled with images of people or events to make a geopolitical point. Rose makes good use of the fishing metaphor to illustrate which countries are fishing and what their catches (colonial possessions) are. It is a highly illustrative and engaging form that draws the eye in to explore the interplay between figures and parts of the map. As a means of stirring debate and controversy, these types of map are a particularly provocative way of capturing the imagination. The use of map shapes and images as a basis for artistic impression is a good approach to communicate such messages since the outlines of countries are familiar shapes and artists such as Rose successfully play on the familiarity to evoke a response (BibliOdyssey, 2009).
Mount Everest has been mapped extensively using a plethora of relief representations. Possibly the most frequently cited example of excellence in design is by Eduard Imhof (1962) for his impressive use of colour. Here, though, Bradford Washburn used Swissair Survey aerial photos and Space Shuttle infrared photos to plot Mount Everest at 1:50 000 (Washburn, 1988). Possibly the last example of hand-drawn Swiss relief representation makes clear the most detailed and accurate map ever made of Mount Everest. The digital age has yet to provide ways of matching such exquisite artistry. The peaks, glaciers, rocks and hydrography are particularly clear with scree slopes depicted in astonishing detail. Blue contours sit well in the overall design and take on the appearance of layers of ice. The typography is beautifully set and the map has a soft, photo-realistic feel that adds visual impact. The border separating China and India is so subtle it looks like it is actually painted on the ridgelines. It is a masterpiece of terrain representation showing natural beauty and scientific information in the most vivid possible way (National Geographic, 2012).

Bradford and Barbara Washburn were mountaineers, explorers and cartographers. During an impressive career, they were strongly supported by the National Geographic Society and many of Bradford Washburn’s maps are unrivalled in the realm of mountain cartography (see Figure 4). It took 7 years and numerous skilled individuals to survey and map the Grand Canyon at 1:24 000 (Garrett, 1978). Washburn’s original maps were combined by Lockwood Mapping, cliff-drawing was by Rudi Dauwalder and Alois Flury in Switzerland and relief-shading crafted by Tibor Toth at National Geographic. Browns bear similarity with natural wood and the textures help immerse readers in the landscape. The colour transition of the landscape from the vivid green plateaus to the ocher red canyon arms to the deep brown-grey valleys and turquoise waters creates a stunning contrast. At such a scale, Washburn was able to represent the Canyon in a way never before seen and as a large format poster the map remains a classic National Geographic product for which the Washburns received the Alexander Graham Bell Medal for ‘unique and notable contributions to geography and cartography’ (National Geographic, 2012).

In 1967, Berann painted the first in a series of plan oblique physiographic maps of the ocean floor for Marie Tharp and Bruce Heezen and their collaboration culminated in the 1977 World Ocean Floor map. The spectacular 1977 map revolutionized the theories of plate tectonics and continental drift as well as demonstrating the plan oblique technique of relief representation effectively. Berann skillfully combined blue-greys to create a topologically accurate, though hugely exaggerated, picture of the ocean floor that leads readers to want to explore. The Mid-Atlantic Ridge and fracture zones appear so life-like with a rippling effect and intricate detail that it draws your eye in and captures your attention. This creates a strong figural component positioned central to the map page that suggests the page (and fracture zone itself) splitting down the middle. The yellow land and deep grey-blue ocean floor provides a strong contrast between land, shoreline and oceans (Troyer, 2002).
Improving the navigability of the Mississippi River has been ongoing for decades due to the constantly changing morphology. In 1941, the Mississippi River Commission appointed Harold Fisk to undertake a geological survey of the Lower Mississippi Valley. His detailed and exhaustive report contained numerous maps that illustrated the historical courses of the river, colour coded for different ages of point bar migration, chute cut-offs and avulsions. As a collection, they succinctly present the complicated story of channel evolution of the river and are archived by the US Army Corps of Engineers (2004). Rather than attempting to fit all detail on one map, Fisk let the geography drive the size and scale necessary to show detail clearly. The maps exhibit a perfect blend of neutral basemap to provide a context for the coloured detail of the river morphology though almost every colour has a percentage of black to allow it to tone harmoniously with the grey background. The organic historical stream flow patterns make an intriguing visual and despite the fluidity of the mapped phenomena the maps appear very structured.

Prepared for the National Aeronautics and Space Administration by US Department of the Interior and US Geological Survey as part of the Geologic Atlas of the Moon, 1: 5 000 000, this map was the first of its kind. It was compiled from NASA Lunar Orbiter and Apollo photographs and Soviet Zond photographs as well as geochemical and geophysical data obtained from orbiting spacecraft to show the detailed geological character of the Moon in glorious detail. The map illustrates the topography as a technicolour mosaic that is almost Jackson Pollock-esque in design. The engaging palette of colours immediately attracts interest in the map which accentuates the strange form of the Lunar landscape. What might appear to be a small design element, the thin black line outlining each feature helps to accentuate the image and delineate one feature from another as distinct forms in contrast to the monotonous appearance of the real landscape. The map is in two versions, one that includes geological notation and grids and a version without (Stuart-Alexander, 1978a, b).

First published in 1856 in a period of great change in the understanding of public health and disease in cities, this was an important map in its day. Robert Mylne was a Civil Engineer and Architect and knew that a detailed geological map was essential for informing major public works such as improved water supply and sewerage systems for London. The original version contained only contours to show differences in elevation and though proposals to modernize the sewage system were neglected at the time due to a lack of funds, the Great Stink of 1858 persuaded Parliament of the urgency of the problem. The map informed the design of an extensive underground sewerage system that drained downstream of the centre of population. By 1871, the engraved map had been hand coloured to show the underlying geological structure and informed the construction of deep artesian wells and bore holes to supply the city with clean water. The combination of plan view and cross-section help to tell the story of London’s topography and geology.
MAPPING THE Z DIMENSION

Figure 10. View and Map of New York City by Herman Bollmann, 1962

Published for the 1964 New York World’s Fair, Bollmann’s map maintains scale equally throughout by an axonometric projection, a technique developed as early as the 15th Century. Bollmann, a woodcarver and engraver, drew this spectacularly detailed map by hand from 50,000 ground and 17,000 aerial photographs to allow readers to view all parts of the map at the same scale (Hodgkiss, 1973). The map exaggerates widths of streets to create a perfect amount of white space in which buildings sit. The dense fabric of the city is represented at the same time as giving clarity to individual buildings. Vertical exaggeration is used to give a sense of the skyscrapers soaring. The street numbering is consistently placed and beautifully letter-spaced. The rich detail invites closer inspection and the colouring, predominantly in pastel shades (to identify building function) with deep grey roof-tops mimics the grey skyline of Manhattan. Other versions exist such as Constantine Anderson’s 1985 map and Tadashi Ishihara’s version from 2000 (Codex99, 2011). Bollman himself went on to create similar ‘Bildkarten’ or picture plans of over 60 European cities.

Figure 11. Ascent from Eskdale in a Pictorial Guide to the Lakeland Fells by Alfred Wainwright, 1957

Alfred Wainwright is probably best known for his seven Pictorial Guides to the Lakeland Fells (Wainwright, 1955–1966). The example here illustrates the hand-drawn style used throughout his 59 walking guides and publications, each one painstakingly detailed using pen and ink based on his own surveys. He drew all the maps, wrote the accompanying text and produced countless illustrations in the hand-lettered publications. The ascent maps are planimetric in the foreground and morph to become perspective in the distance showing natural features and the climb ahead along the route. Contours not only provide useful information but add to the representation of the third dimension (Garland, 1991). The hand-drawn approach lends itself to giving a sense that the maps are somehow more real and match their in situ use perfectly. The maps are not just landscape sketches though. Planimetric detail is marked and pictorial symbols (e.g. trees) are also used to good effect. As a small format book, the publications and the maps they contain are perfectly suited to their purpose.

Figure 12. Here and there: a horizonless projection in Manhattan by Jack Shulze and Matt Webb, 2009

Created as a pair of maps of Manhattan, one looking uptown from third and seventh and one looking downtown from third and thirty-fifth, BERG (2009) explain how the maps are an exploration of the speculative projections of dense cities. Conceptually, they are an inverse of the approach used by Wainwright (Figure 11) and Berann (Figure 3). The map shows the viewer in the third person standing at the base of the map surrounded by large-scale local detail in perspective and bends to reveal the city stretched out ahead in plan view. It is an intriguing and innovative way of representing an environment that would normally be out of sight and Shulze and Webb cleverly take design cues from Google’s map (grey buildings, yellow roads, haloed text) to give the map a sense of familiarity that juxtaposes the unfamiliarity of the view. The gridded streetscape of New York lends itself well to this type of representation, as does the length of the island of Manhattan which creates a tall, narrow, large format poster that emphasizes the approach.
STREET MAPPING

Figure 13. Melway Street Atlas, first published 1966
The first edition of Melway was released in 1966 after 5 years of production and contained 106 original hand drawn maps. Now in its thirty-ninth edition (http://www.melway.com.au/), the map was created in response to shortcomings in available directories at the time. By the 1980s, Melway was the most popular street directory in Melbourne. The maps are designed with a rich and diverse palette of colours, from the blue suburb names to the bright orange secondary streets to the black major roads giving clarity to distinct features. The publication was awarded the International Cartographic Association award in 1982 and the inaugural award for cartographic excellence by the Australian Institute of Cartographers. Street labelling is positioned above the roads, instead of being placed within the road which was against the market trend at the time. Type hierarchy, positioning and colour provided space in which to label a wide range of contextual information. The maps maintain an often imitated ‘house style’ and it has become so ubiquitous that it’s not unusual for people to give a Melway grid reference as directions.

Figure 14. Britannia by John Ogilby, 1675
In 1674, translator and publisher John Ogilby was appointed as His Majesty’s Cosmographer and Geographic Printer and published Britannia, a road atlas of Great Britain, in 1675 which set the standard for many years to come. The atlas contained 100 strip maps accompanied by text at a scale of one inch to one mile (Mullen, 2010). The scale was innovative for the time and later adopted by Ordnance Survey in its first map series. Ogilby’s maps are a linear cartogram and north varies between strips. People can orient themselves in the direction of travel regardless of the true direction. The scroll effect suggests their use for navigation as if they were to be opened and used on the journey itself. Features are artistically represented, but all have a practical value and a great deal of extraneous detail is omitted. The maps, marginalia and cartouches are particularly ornate and typography also includes flowing ascenders and descenders. Ingenious for its time and a style still used today to show the linearity of route networks (e.g. motorway networks) in many street atlases.

Figure 15. Atlas and Guide to London by AtoZ (the Geographer’s Map Company), first published in 1938
The Geographer’s Map Company was started in 1936 and is now the largest independent map publishing company in the UK (http://www.az.co.uk/). It still produces the iconic London A–Z street atlas in addition to over 340 other mapping products. Phyllis Pearsall, a painter and writer, founded the company after discovering that the Ordnance Survey map she was following to get to a party was not up to the task and she became lost. She conceived the idea of mapping London which involved walking over 3000 miles and over 23,000 streets mapping each as she went. Pearsall proofread, designed and drew the map with the help of a single draftsman. Although a map containing hundreds of combinations of type form: bold, italics, spacing of characters, colour, san serif, reversed type, size, rotation, upper and lower case, the design and placement of the typography is meticulous. The use of orange primary routes, yellow secondary and white local was unique and possibly the inspiration for Google Maps at street level. The pocket book size of the original was a perfect form for navigation and despite the atlas being crammed with detail it is extremely well structured in graphical terms.
The Times Atlas of the World (latterly with the addition of Comprehensive Edition) was first published in 1895 and is currently in its thirteenth edition (published in 2011 http://www.timesatlas.com). Originally containing 117 pages and over 130,000 names, it has grown to a 544 page publication with 125 map plates and over 200,000 indexed names and is marketed as The Greatest Book on Earth. The tenth edition, published in 1999, was the first to be produced entirely using computer cartography, but until that time much of the map drawing was by hand. Unsurpassed global coverage of the world’s physical and political features in a single volume, the atlas is both prestigious and authoritative. It has a classic style and traditional appearance and is meticulously presented. Crucially, the intricate design has stood the test of time and the maps are beautifully laid out, easy to read and fascinating. In an age of querying the internet for answers, when questions of authority and accuracy remain, the Times Atlas is unparalleled and remains a reference publication of the highest quality.

First published in 1968, the National Geographic Atlas of the World is now in its 9th Edition (published in 2010 http://www.nationalgeographic.com/atlas/) and contains 300 maps and nearly as many illustrations. The maps are beautiful and engaging and the overall design has become a hallmark of National Geographic publications. One of the most notable design features involves colourfully marking the country boundaries yet keeping the interior of the geographic areas as black text on a white background. This helps establish a clear figure-ground between mapped features and the labels and harks back to the use of hand-painted tint bands on early historical maps. The atlas is also notable for its use of the Winkel Tripel Projection, a standard since 1998, and for its custom proprietary fonts originally designed in the 1930s and named after staff cartographers of the era (Darley, Bumstead, Riddiford, etc.). The fonts and extensive labelling alone sets the atlas apart from others and gives it an unmistakable style. Touches, such as the curved lettering from point features around a coastline, are also a signature national geographic style.

Dorling Kindersley first published their Millennium World Atlas in 1999, inspired by success of their Eyewitness Travel Guide series. The latest version (published in 2008 http://www.dk.co.uk/nf/Book/BookDisplay/0,9781405329859,00.html) contains 528 pages with rich, vibrant cartography, a wide range of cloud-free satellite images, high-quality terrain models and fold-out pages. Dorling Kindersley was one of the first to use satellite imagery linked to maps and as hybrid map/satellite image illustrations. Each page is beautifully presented with many using a unique approach of clipping map areas from their surroundings as opposed to allowing map detail to bleed off the edge of the page. This particular treatment allows the page to be filled with images, facts, illustrations and text which gives supporting information rarely found elsewhere in atlas mapping. Each map features its own legend rather than relying on one in the preliminary pages. Given the amount of content and irregular shapes, the balance, structure and harmony of each page is remarkable and the detail gives readers an opportunity to explore geography as a traveller rather than using the atlas merely as a reference tool.
As Tufte (1990, p. 9) said, ‘The world is complex, dynamic, multi-dimensional; the paper is static, flat. How are we to represent the rich visual world of experience and measurement on mere flatland?’.

This example of a multivariate cartogram by Dorling (1991, 1994) does just that. The Dorling cartogram creates a social landscape so circles are proportional to the population of the area they represent. Here, though, Chernoff Faces (Chernoff, 1973) replace circles to ascribe additional information. Sizes of faces are proportional to the electorate and shape, eyes, nose and mouth each display additional socio-economic variables allowing a theoretical maximum of 625 different faces. In reality, only a fraction of these permutations exist, each coloured in one of 36 trivariate colours. The strength of the image is its overall impact as well as the ability to mine detail. Faces evoke emotional reactions and show social differences we can easily interpret. Sharp local divisions or gradual changes emerge. While such glyphs can often overload a map image, Dorling combines them masterfully and the strong colours on a black background create additional contrast and impact.

Gastner and Newman (2004) outlined the holy grail of population density equalizing cartograms: a method to account for differences between areas of different population sizes while retaining the general shape of individual regions and their contiguity with neighbouring regions. Their method overcomes the stylized cartograms use of geometric shapes to represent areas and produces useful, elegant and easily readable maps which have been widely adopted, particularly to illustrate political differences or socio-economic conditions. The example here is one of a collection of over 700 maps of the world by Worldmapper.org (http://www.worldmapper.org; Dorling et al., 2010). An ambitious project, the maps paint a vivid picture of the world in a way never before seen from transport to poverty, pollution to religion and every conceivable human, social, economic and environmental condition in between. The maps are deliberately stark which emphasizes the single mapped variable. The colours are vivid against a light background and represent 12 geographical regions for visual comparison across different maps. The beauty of the maps lies in their effectiveness at portraying the discomfort of a wholly unequal world.

Successful and elegant display of large multivariate datasets is rarely achieved because many attempt to fit their data into geographical space. Spatial treemaps provide an alternative way of mapping a large number of geographical units by modifying space (Shneiderman, 1992; Wood and Dykes, 2008). Here, Wood et al. (2010a, b) show 1,526,404 postcode units in Great Britain, sized by population and arranged so that geographical relationships and postcode geography hierarchy are maintained. The map is richly coloured according to a socio-economic classification comprising seven super-groups split into 52 sub-groups. The map is beautifully arranged allowing patterns in the vast amount of information to become clear at local, regional and national scales. In a single map, they have managed to effectively display detailed information about 60 million people recorded in 40 census variables in over one million places. The colour gives the appearance of a stain-glassed window inviting you to explore the information at different distances. Sans serif type is a good choice to tie in with the clean regular lines of the map itself and transparency allows large labels to be placed unobtrusively.
ABSTRACT MAPS

Figure 22. Visualizing friendships by Paul Butler, 2010

Butler (2010) suggests that ‘visualizing data is like photography. Instead of starting with a blank canvas, you manipulate the lens to present the data from a certain angle’. His social graph of 500 million Facebook users cleverly demonstrates this philosophy. He asks ‘what might the locality of friendship look like between users of Facebook’ and takes the links between Facebook user’s location and the location of their friends, plots a black-blue-white great circle arc between them and the result is a detailed map of the world. There are no other geographical datasets, yet the shapes of continents, locations of cities and some international boundaries emerge. The map is made entirely out of human relationships. The black background contrasts well with the almost fluorescent lines to create a fibre-optic appearance that lights up the globe. The long distance curves contrast well with the shorter, almost straight, lines of local connections to create an intriguing spider-web pattern. The Facebook logo is so widely known that the map needs no other data or contextual information to enable us to make sense of the theme or patterns.

Figure 23. London’s Kerning by NB Studio, 2006

Maps based entirely on typography are abstract representations of a landscape and have been used effectively as fills for land use and through repetition for linear networks. Type functions literally as well as to locate mapped features. This example, by NB Studio, was one of the first to gain wide attention. Prepared for The London Design Festival in 2006 (NB Studio, 2006) as a commentary on social space, the large format poster went on to win the design week awards in 2007. The map shows only names of locations, streets or places. Larger fonts reflect more important spaces with smaller fonts representing a less celebrated space. Smaller type is used as a replacement for roads and view at a distance, the structure of the city emerges as the form, orientation and positioning combine to create landmarks and shapes that can be easily identified. The map is a great example of the power of typography in map-making and also illustrates how effective a single colour can be. Maps do not always need to be in colour to be visually stunning or effective.

Figure 24. Redrawing the Map of Great Britain from a Network of Human Interactions by Ratti et al., 2010

Regional boundaries defined for the purposes of administration inevitably split a country into arbitrary areas. Ratti et al. (2010) questioned whether these boundaries respect the natural ways in which people interact by delineating space using an analysis of the network of over 12 billion individual telephone calls. What they achieved was a beautifully abstract map of Great Britain that shows people interact inside traditional boundaries. The map base is a grid of squares each comprising 3042 pixels. Each pixel is a node and its connection strength to every other pixel is shown by varying opacity. This creates a strong structural framework for the map with connecting lines showing the strongest 80% of links. Colours identify regions that emerge through analysis with the dark colour for London allowing lines connecting it with elsewhere to be clearly seen across lighter regions. The prudent use of labels to identify major cities is just enough to support interpretation and the leader lines tie them well to the map, clearing the map itself of labelling. The tilted viewing angle allows connections to be seen in a way that a plan view would not allow.
Charles Booth, an English philanthropist and businessman, is renowned for his survey into life and labour in London at the end of the nineteenth century. Critical of the value of census returns as a way of identifying inequality, he set to work investigating poverty for which he was recognized by awards from the Royal Statistical Society and the Royal Society. The Maps Descriptive of London Poverty is an early example of social cartography (LSE, 2002). Using Stanford’s Library 6 inches to 1 mile Map of London and Suburbs, Booth coloured each street to indicate the income and social class of its inhabitants. This choropleth overlay on a light base is an early form of ‘mashup’ and used a rudimentary diverging colour scheme with black for the lowest class (Vicious, semi-criminal) through dark blues and into reds and yellows (upper-middle and upper classes, wealthy). Neighbouring colours were deliberately similar in hue so the map illustrated social transitions across space though strong gradients are easily seen when blacks and reds are in close proximity. The overlay is slightly transparent to allow the underlying basemap detail to be seen for interpretation.

Very few newspapers have a team dedicated to data visualisation and information design. Many (e.g. Data Blog at The Guardian) produce data dumps that are the antithesis of design. The New York Times, however, creates consistently high quality maps and graphics to tell their stories. Small Labs Inc. (2011) provide an excellent repository of over 300 superb examples of their work to date which are a catalogue of best practice in thematic map design. The map of foreclosures (New York Times, 2008) displays multiple variables in a striking 3D graphic giving the map the look of buildings on a city landscape. The map labels do not dominate even though they add important contextual statistics. Subtlety is the key here. The fine san serif shape means it sits further in the background and doesn’t obstruct the foreclosure shapes. The white US country background provides a neutral landscape for the buildings to emerge from. Simple, thin, solid black lines delineate the state lines. The map page is complemented by two traditional but expertly constructed choropleths and the overall page maintains a clean fresh appearance with excellent visual balance.

John Snow was an English physician, the father of modern epidemiology and the inventor of anaesthesia among many successes (Vinten-Johansen, 2006). His famous map, published later as part of his essay on the mode and distribution of deaths from cholera in Soho, London in 1854 (Snow, 1855), is a classic not only in cartography but also analytically. Snow used the map as an exploratory tool to establish that cholera was a water-borne disease. He was the first to propose cholera’s mode of communication in this way and the map helped solve a critical problem of the time. Cartographically, Snow’s map is often cited as the first to use separate thematic layers to determine a spatial relationship between variables. The beauty of the map is in its brilliant simplicity, showing only the detail required to make the link between deaths and water distribution. The mapping of deaths using a single symbol identified individuals for impact with multiple deaths being seen as a density due to their clustering. This is a form of hot spot mapping, but without the commonly employed surface of colours representing generalized data we often see today.
Figure 30. Web trend map 4 by iA Inc., 2009

This fascinating schematic maps the most influential internet domains and people onto the Tokyo Metro map in ways that complement the characters of each (Reichenstein, 2009). Complementary websites are grouped to a line that suits it and the map produces inter-linkages among companies in multiple ways inspiring some intriguing interplay. For instance, Twitter is assigned the station with the biggest ‘buzz’ and Google is mapped at Shinjuku which is the world’s busiest station. Web domains can be evaluated based on their position (proximity to a main line or hub representing importance), height (success measured in traffic, revenue and media attention) and width (stability as a business entity). The axonometric gridlines define street level with all subways positioned below the gridded surface. The Trend Setters are labelled using speech bubbles as if they are saying their name and other labelling works well to support differentiation of major trends. The colour palette is extraordinarily vivid and works well against pure black. Why map the internet in this way? As iA say themselves: because it works.
MAPS IN MASS MEDIA

Figure 31. *Escape the map* by Mercedes Benz, 2011

Escape the map is an online advertisement for Mercedes-Benz (http://www.escapethemap.co.uk/). It offers an immersive, interactive experience for the viewer who becomes a participant in the story. The work has drama, does not overtly force the brand and follows a ‘choose your own adventure’ type plot. It is sophisticated, memorable and unique. The map and map-related objects like the falling map pins and address (locator) are key metaphors in the story. The advert immerses you in the future, how we may use maps in cars and how important location is and will become not just for navigation but as a defining way of living. The heads up display on the electronic paper map works particularly well. The work clearly illustrates how popular maps have become in the mass media and there are numerous references to familiar online web map services, virtual globes and their techniques (such as facial blurring on Google Street View) as well as having a sub-plot that references social media such as Twitter. This familiarity with ubiquitous mapping and social media tools means that the advertisement hooks us into a familiar world to tell its futuristic story.

Figure 32. *OpenStreetMap: a year of edits* by Ito!, 2008

Ito! work with large transport datasets and have been pioneers in the creation of imaginative animations showing temporal activity in transport data (http://www.itoworld.com/static/data_visualisations.html). Their stunning visuals have been used for such diverse projects as displaying road traffic count data and the impact of the Icelandic ash cloud on air traffic in 2010. The first animation they produced displayed, in animated form, the entire year’s worth of edits to the OpenStreetMap database. It paints a fascinating picture as the OpenStreetMap movement captures and publishes new features from single roads to entire countries. The simple temporal legend gives a sense of the speed at which data was acquired and reflects the impact and speed of OpenStreetMap itself in this era of democratized mapping and citizen science. The animation moves rapidly to reflect the equally rapid map changes to create a flickering movie. New edits light up the map across the black backdrop and then disappear as they are added to the core of the map suggesting database integration, an excellent way of showing the quantity and rapidity of change for such a large and important dataset.

Figure 33. *The Wilderness Downtown* by Chris Milk, 2010

The Wilderness Downtown is an interactive music video/movie featuring *We used to wait* by Arcade Fire and built as a way of experimenting with Google Chrome’s interface (http://thewildernessdowntown.com/). Constructed in collaboration with Google, it is without doubt one of the most innovative ways in which maps feature in a short film. Many of the components of the movie are based on the Google Maps suite; the viewer types in an address before launching the movie which then launches multiple inter-related Chrome windows to create a map-based journey through your neighbourhood that accompanies the music. The main hooded and mysterious character is seen running through the neighbourhood the viewer specified, across satellite images and amidst rotating Street Views. Animated components (flying birds, exploding trees) add to each window to use the maps in innovative ways as you become the eyes of the runner. The concept of allowing people to fly through their own neighbourhoods and stop and look at their own house as part of a music video is truly unique.
The Madríd Map of Knowledge (http://www.madrimasd.org/mapa-conocimiento/) allows people to locate strategic information on the activities of companies and networks that form the Community of Madrid. The map acts as a visual network so shared interests, ideas, publications and projects can be seen. It is a striking design with highly saturated colours which become immediately engaging the moment you roll your mouse over the map symbology. The symbols move and reshape/size and interlinkages appear automatically. The application uses sound to emphasis different user interactions, augmenting visuals in interesting and useful ways. Users can switch between a wide range of basemap styles for different purposes. The satellite image has been reclassified to reflect the look and feel of the overlaying symbol and user interface. The floating symbols integrate well with the basemaps and morph at different scales to sizes that better reflect the position of the businesses as the scale increases. A navigable locator map shows you where you at all times and map controls are unobtrusive. The application is in Spanish, yet non-native speakers are able to use it and have a pleasant and engaging experience.

Lars and Jens Rasmussen’s mapping company was acquired by Google in 2004 and the mapping landscape transformed on 8 February 2005 when Google Maps was released as a web-based product (maps.google.com). Google Maps (and numerous complimentary products) has revolutionized the way the people view, use and make maps and how they interact with their surroundings. The Google Maps API underpinned the democratisation of online mapping to allow anyone to create geographically contextualized mash-ups. The design is recognisable and supports a strong, clear brand that is consistent at a local scale, globally. Integration of complementary functionality (e.g. routing, traffic information, overlay of social media and photographs, zooming, panning, querying and measuring) provides an application with a multitude of purposes that goes beyond a general reference map. The design is automatically modified depending on its use. For instance, secondary roads widen at particular scales when you overlay traffic information to show each direction of traffic flow. The appearance of 3D buildings and moving shadows at large scales (in some cities) represent the built environment like never seen before. Quite simply the map is, and continues to be revolutionary.

Examples of good web maps are rare but this map by New York Times is an exception (Bloch and Gebeloff, 2009). Beginning with a clear story, user controls allow effortless mining of layers of information across an unobtrusive colour palette with sensibly deployed pop-ups. The temporal dimension can be explored and the switching between choropleth and proportional symbol maps perfectly marries the map type to the data. Users can select variables and modify their depiction such as changing the relative size of symbols to make the best use of screen size. Using terms like ‘bubbles’, rather than ‘proportional symbols’, simplifies terminology so it makes sense for the average reader. A simple, neutral basemap supports the overlay detail and zooming is enabled but not beyond levels not supported by the data. Symbology is transparent, allowing overlapping symbols and basemap detail to remain visible. Fine white outlines around only those symbols that overlap, subtle haloes and abbreviated labels at small scales which switch to full names at large scale are examples of a high attention to detail. This is a well-crafted web map that perfectly blends form with function using the medium appropriately.
Swiss cartography is renowned for its accuracy, quality and artistry and no collection of the best topographic maps could ignore them. Swisstopo, the official name for the Swiss Federal Office of Topography (http://www.swisstopo.ch), is responsible for the production of topographic maps at a range of scales and while 1 : 25 000 is their most detailed map, this extract of the 1 : 100 000 series represents a range of excellent design principles. The use of colour in particular to vary label meaning, show quantities, represent or imitate reality and to decorate visually enlivens the map (Tufte, 1990). The Swiss style is well structured, maintains uniformity, uses white space effectively, contains beautiful typography and unrivalled depiction of relief on topographic reference maps. The typeface sets a classic tone using primarily ‘antique’ looking serifs that includes a unique combination of thick and thin strokes. Hill shading is in the classic Swiss style based on the work of Eduard Imhof (1982). The maps are rich in content and deliver complex information in a succinct, well-organized manner. Swisstopo topographic maps are truly works of art.

The United States Geological Survey largest (in terms of scale and quantity) and best-known map series is the 7.5-minute or 1 : 24 000 quadrangle series. The scale is unique in national mapping being related to the measurement of 1 inch to 2000 feet. Each of nearly 57,000 maps is bounded by two lines of latitude and longitude covering 64 square miles in southern latitudes but, due to convergence of meridians, only 49 square miles in northern latitudes. The specification has been applied to many other geographies that the US mapped during military operations which demonstrates a high level of flexibility and versatility in the design. As a brand, the series is instantly recognisable and successful. The content serves both civilian and military purposes and supports varied usage. Marginalia is well structured and complex information delivered in a succinct, well organized manner. The series was officially completed in 1992 and while The National Map (http://nationalmap.gov/ustopo/) represents a new generation of digital products, the impact of the originals persists with new maps arranged in the 7.5-minute quadrangle format as well as retaining the same look and feel.

Not so much a map as a digital product that records every single fixed feature of Great Britain in a contiguous database, MasterMap® represents the most detailed, consistent and up-to-date geographical database of any country at a scale of 1 : 1250. Four separate layers contain topographic, transport, address and imagery data to form the full product. Every feature is assigned a Topographical Identifier that gives it a unique reference as well as attribute information to classify it and support mapping tasks. Continuous review means that the database is as current as the latest ground survey data capture and the product is versatile and flexible enough to suit a myriad of mapping purposes at different scales. The schema is robust and currently the database contains over 460 million individual features with extensive metadata. As a product, the release of MasterMap was, and remains, innovative and its scale and level of detail are unsurpassed. The uniqueness of its design is in the construction of a database that supports the mapping needs of a diverse user base.
SUMMARY

We have presented our rationale for reasserting the relevance of design in map-making (Field and Demaj, 2012) and as an alternative to criticising map-makers who are not classically trained in cartography for the plethora of errors, gaffes and sub-par approaches, we, instead, have sought to encourage them to look at examples of good design for inspiration. Of course, encouraging good design is not limited to amateur map-makers for even professionals should continually explore examples of design excellence and learn something new. By studying examples of quality, we encourage map-makers to explore ways of reverse engineering techniques to learn how to apply them in ways that support their own work.

The 39 maps presented here are by no means definitive or exhaustive but represent the broad consensus of 20 cartographers acknowledged in their field. They illuminate the concepts discussed in Field and Demaj (2012) and show how they can be expertly applied. Of course, the list can never be complete and in compiling the examples presented, we have had to reject many which might have equal merit. And what of our own favourites? The work of Beck, Minard, Berann, Bollmann and National Geographic would rise to the top of the cartographic pile at the time of writing though frankly, tomorrow, others might be preferred. As with music or art, where we may express a particular favourite song or painting at one time or another, so it is with maps and that has been a fascinating aspect of this exercise. Debates between the authors and the cartographic experts we surveyed have been interesting and stimulating and served to prove that excellence in cartographic design remains at least in part, in the eye of the beholder.

BIOGRAPHICAL NOTES

Damien Demaj graduated from RMIT (Royal Melbourne Institute of Technology) University in 1998 with a Bachelor of Geomatics (Cartography/GIS). He began his career as a cartographer for Explore Australia Publishing (Penguin), specializing in cartographic map design and road atlas production. He has spent time in London working as a lead cartographer for publishers DK (Dorling Kindersley) and has since created his own cartographic design consultancy company, Demap. Recently, Damien held the position of Chief Cartographer for the Earth Blue Edition atlas, Macmillan Primary Atlas, and the Telegram World Map Project. He has also self-published a number of city maps in his home state of Victoria, Australia. Damien is currently an Online Cartographic Product Engineer at Esri.

DISCLAIMER

The thoughts and ideas expressed in this paper do not necessarily represent the positions, strategies or opinions of Esri.

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The authors wish to thank the cartographic experts who took part in our survey and offered their top 10 well-designed maps. It was a hard job to whittle down the list from over 100 examples cited so apologies if we have missed out one of your favourites!

Small extracts of the maps presented in this paper have been used to display excellence in design. We have sought to contact all copyright holders to gain permission and we thank them for allowing us to reproduce the extracts here. We are also grateful to the International Cartographic Association Commission on Map Design for hosting online extracts of the maps presented here and for providing a mechanism for readers to discuss and debate the relative merits of the maps included, and to propose alternatives. Please visit mapdesign.icaci.org for more details.

REFERENCES


