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# Mapping society: an ingenious but today outdated map

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## Abstract

Today the scientific world shows great interest in visual culture. This is a transversal phenomenon to national disciplines and contexts, given that the same tendency to reorient knowledge and organize it around visual paradigms is to be found in different areas of contemporary western thought.
In this reevaluation of the visual culture is collocated the present rediscovery of the heuristic value of the geographical map, the use of which today has undoubtedly crossed the narrow ambit of geographical studies to find growing use with specialists of other disciplines too, attracted by the capacity of maps to synthetically highlight significant spatial correlations of the phenomena being studied.
Nonetheless, like every scientific instrument it comes up with processes of adaptation to the changing scientific contexts, just as the traditional Cartesian configuration of the map needs to be updated in order to be in line with the new post-modern scientific paradigms and with the reality of the contemporary world.
The analysis of these dynamics of contemporary cartography is here traced back to the case of a specific cartographic method: the choropleth map, or mosaic diagram. This represents one of the most fortunate intuitions in the history of cartography, introduced by Charles Dupin in 1826 and is an exemplary application of positivist scientific thought. Even though the introduction of the choropleth map was the start of a fruitful period for the subject with the ceaseless development of statistical cartography, today it seems inadequate for the understanding of the multi-faceted contemporary reality.
After highlighting the reasons for the success of the choropleth map, this paper makes a number of considerations on its present limitations and the need, as far as cartographical studies are concerned, to press on beyond the frontier of innovation. In particular, stimulating starting points to reason on the future of the geographical map are offered by the recent success of the anamorphic maps.

**Keywords:** Cartography, Visual Culture, Choropleth Maps, Dupin, Anamorphic Maps

## 1. The beginning of an extraordinary scientific intuition

In the history of cartography the most fertile sector for the introduction of new representations of the territory has been the bureaucratic-administrative one. From the medieval cadastres, useful not only for defining property rights but also for allowing the collection of taxes, to the geodetic triangulations for complete mappings of national territories,

 

government bodies have always been the main clients of geographic maps.

In contemporary times it will be statistics, the government discipline par excellence, the branch of sciences from which the main stimuli for cartographic innovation will stem, considering that it will be at the basis of the advent of thematic cartography. This advent must be set in the more general context of the cultural climate inspired by positivism, whose interpretative model foresaw that all phenomena were linked together by connections based on the cause-effect principle and that any explanation based on the notion of "chance" should be excluded.

In this methodological perspective the spatial distribution of phenomena offered important keys to understanding, as pointed out by Charles Dupin, the protagonist of this article, when commenting on the product of his own invention, that is the first choropleth map (in French *carte teintée* and in Italian also called "cartogramma a mosaic") with education in France as its subject: "It is the activity and the spirit of inhabitants the cause of the huge difference that is felt when one glances at the map. You can see the well-defined blackish line going from Geneva to St. Malo, dividing the north from the south of France" (Dupin, 1827, pp. 250-251).

His proposal, which changed the history of cartography as much as statistics, appeared for the first time in 1826 and was then presented in its final format the following year in his major piece of work (Robinson, 1982, p. 232; Palsky, 2008, p. 415; Figure 1).

The importance of the choropleth map derives from the fact that for the first time in the history of cartography we find a differentiation among areas and the hierarchy resulting from it is recorded according to the intensity of a phenomenon[1]. Before then the only forms of differentiation had been between places and not areas, and were extremely elementary and approximate: a town could appear more populous than another if the symbol that represented it was visibly bigger; a decidedly rough and ready graphical solution to relate the hierarchies among the subjects of the map.

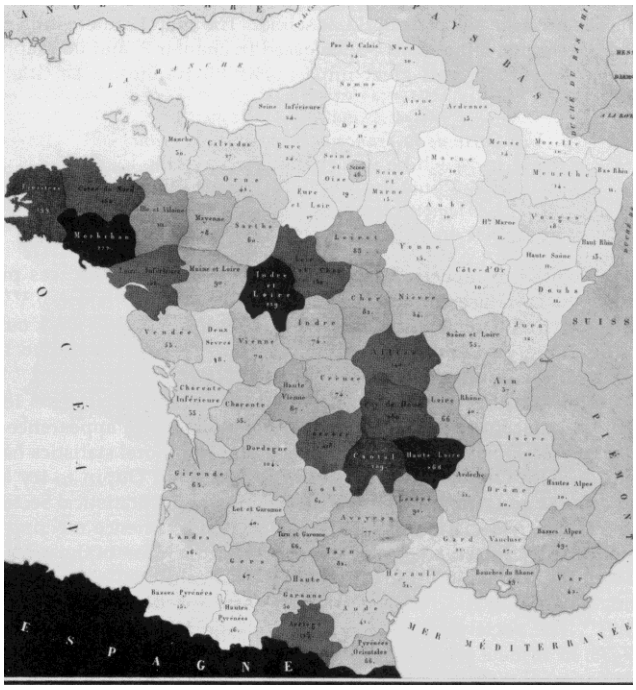


Figure 1. Charles Dupin, *Carte figurative de l'instruction populaire de la France*, 1826.

With Dupin's first choropleth the areas begin to be differentiated on the basis of the intensity with which a given phenomenon is recorded in the area (the "subject" that gives the name to thematic maps). We are therefore before an important turning-point in the way of thinking and representing the territory, which now takes on precise hierarchies. An innovation that in the following years is to open the way for a rich production of scientific theories based on spatial differentiation, like for example the concentric zone model developed by Ernest Burgess in 1925 or the one of central localities proposed by Walter Christaller in 1933.

The advent of Dupin's first choropleth map immediately set off a proliferation of cartographic representations of statistical data (Figures 2-5).

[1] Only later will the aerial diagrams come onto the scene, that is, those representations that with a cartographic background superimpose a symbol of dimensions corresponding to the value of the phenomenon being considered.

 

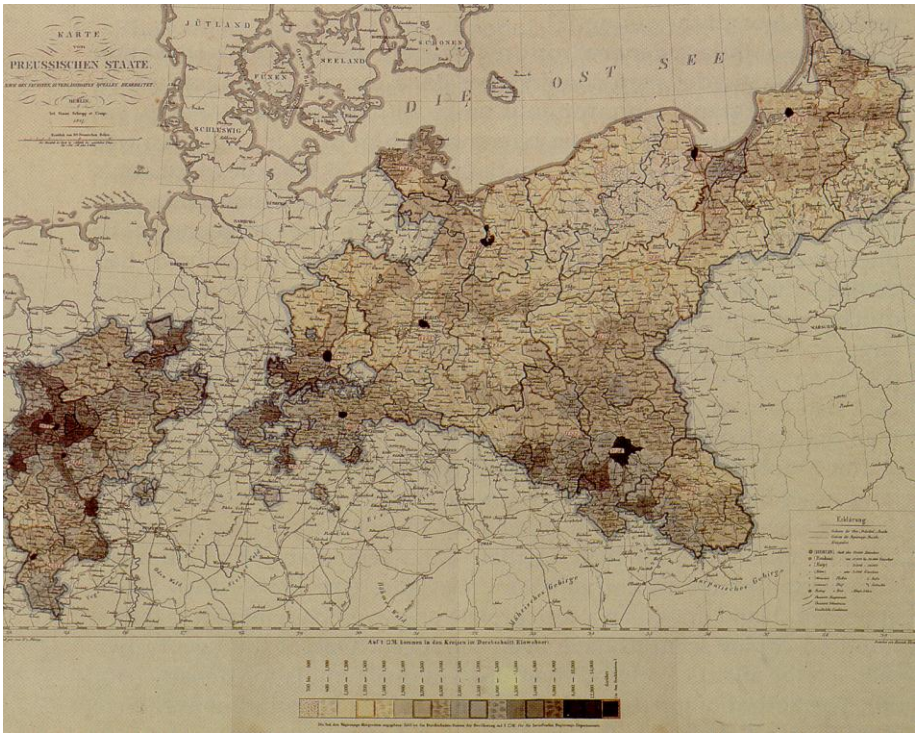


Figure 2. *Administrative-Statistischer Atlas vom Preussischen Staate*, map of population density, 1828.

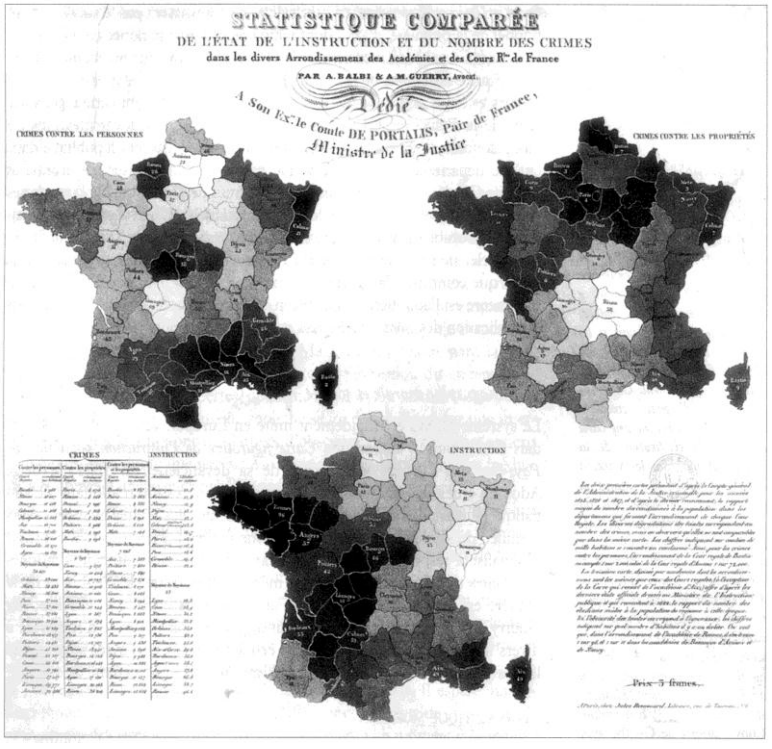


Figure 3. André Michel Guerry e Adriano Balbi, first comparison among choropleths on crime in relation with level of education, 1829.

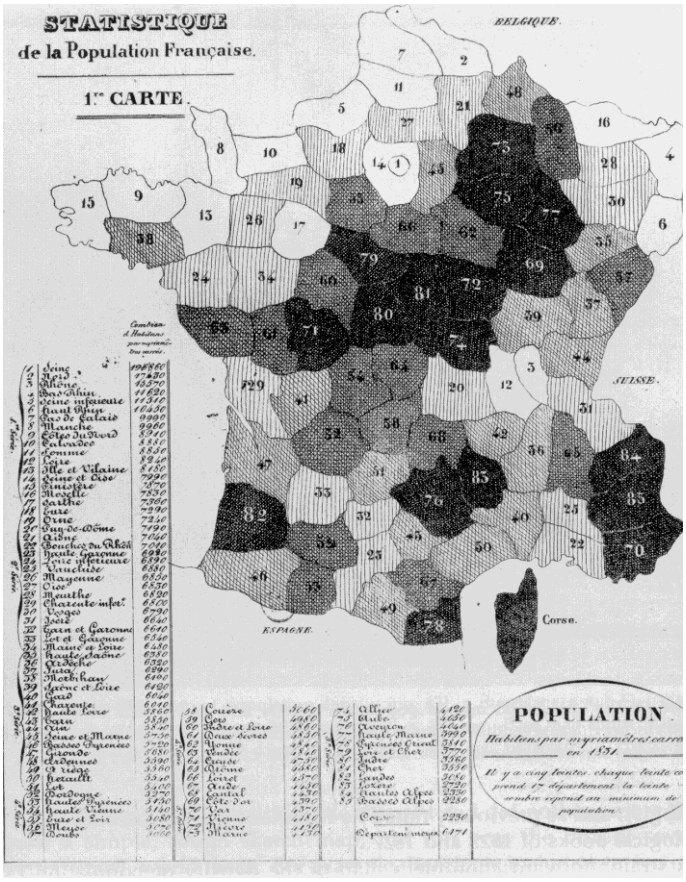


Figure 4. Adolphe d'Angeville, map of population density in France, 1836.

Figure 5. August Petermann, detail of population map of British Isles, 1849.

 

The idea of "speaking to the eye", William Playfair's rather fitting expression (1802, p. XX), another pioneer of thematic cartography who caught the attention of many scholars that ventured into this new genre that was capable of transmitting information in a more immediate and simple way with respect to the tabular form and was considered more suitable to summarise situations, highlight connections and put forward hypotheses.

It must also be remembered that the usefulness of the visual impact by means of maps was accentuated by the fact that in those years instruments of inferential statistics had not yet been invented, such as correlation or regression. Therefore, the observation of spatial differences given by the map created unprecedented possibilities for the scholars of that time.

The fact is however significant that the data that Dupin could count on were hardly reliable (Palsky, 2008, p. 415); his map, which was the beginning of a genre that was to have huge success, was born with a considerable stake: the reliability of the data.

From the point of view of the history of cartography, Dupin's proposal and the consequent affirmation of thematic cartography had an important theoretical outcome, insofar as it put an end once and for all to the illusion of the map as inventory, able to exhaustively represent any information on anything connected with the territory.

Furthermore, it is important to note that thematic cartography, after its beginning dedicated to representing natural phenomena (such as temperatures, the type of plant covering or the geological nature of the ground), soon extended to social ones (income, schooling, health conditions, education, criminality, etc.) giving an abundant and regular cartographic production of man's activities. Until then maps had clearly privileged the natural data to the anthropic data: the elements linked to the human being and his ingenuity (roads, towns and little else) were overwhelmed by representations of mountains, rivers, lakes, planes, letting nature dominate the general picture. From the early nineteenth century the map instead discovers a new function: to show the spatial distribution of social and economic phenomena, presupposed for the study of those same phenomena (Figure 6).

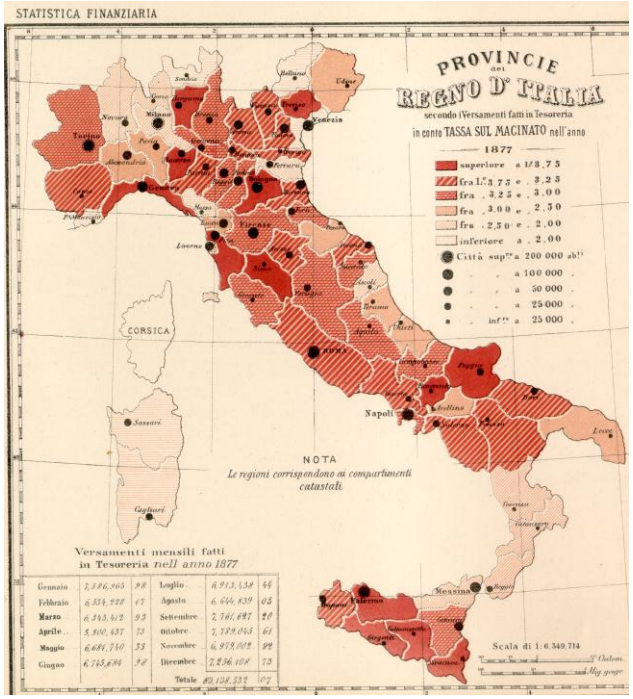


Figure 6. Choropleth regarding taxation from: Regno d'Italia. Prospetti e tavole grafiche, *Atlante Statistico del Regno d'Italia*, 1878, tav. 4a.

The establishment in cartographic practice of the criterion of the intensity of the phenomenon by Dupin triggered other exceptional innovations for the history of cartography: in the maps of the movements of goods produced by Charles-Joseph Minard from the 1840s onwards[2], significantly called "Figurative and approximate maps", not all the places of the area are represented but only those crossed by flows of goods. In fact, something similar had already been the case with the itinerary maps of very old tradition (the Romans' *itineraria picta* were famous) in which, with respect to the area represented, they only showed the places near the major thoroughfares. In Minard's maps,

[2] The first on the subject was "Carte de la circulation des voyageurs par voitures publiques sur les routes de la contree où sera placé le chemin de fer de Dijon á Mulhouse" (1846). The author had already written a contribution that was considered "the best statistical graph ever designed" (Edward Tufte said this about Minard's cartogram relative to Napoleon's Russian campaign of 1812; Tufte, 1983, p. 40).

 

however, a second condition was added to that of proximity: for a place to be shown on the map it also had to be crossed by a flow of goods that was higher than a level considered minimum.

A good example is the map of the goods transported to Paris by rail (Figure 7).

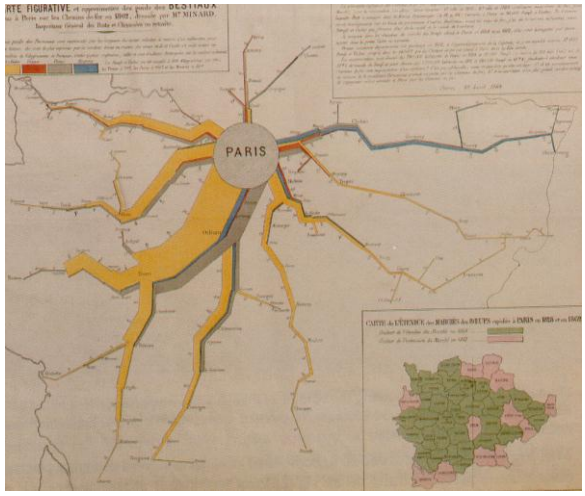


Figure 7. Charles-Joseph Minard, *Carte figurative et approximative des poids des bestiaux venus á Paris sur les chemins de fer en 1862*, 1864.

Not only does it merely show, among all the French places, the more populous ones situated along a railway leading to Paris, but it considers exclusively the important ones with respect to the phenomenon, that is, those moving an amount of goods considered significant. In other words, this means that even the populous towns linked to Paris by a railway line are not recorded on the map if stopovers of a certain commercial importance are not shown. With respect to the classical itinerary maps a new condition was thus introduced: the intensity of the phenomenon.

Moreover Minard developed another fundamental innovation: the dimensioning of the sign according to the intensity of the phenomenon, prior to this limited to few characters and in particular to the one relative to the demographic importance of the towns. In Figures 8 and 9, for example, the different widths of the broken lines indicate respectively, for every place crossed, the volume of wine exports and the number of travelers on the railway network. A graphical solution introduced some years before (1837) by Henry Drury Harness in his work on traffic between Irish towns (Robinson, 1955).

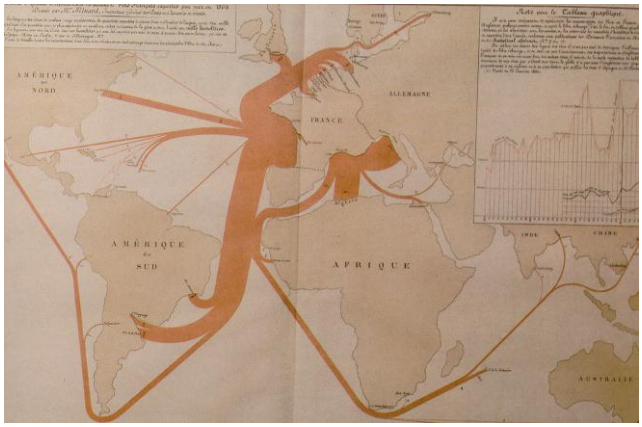


Figure 8. Charles-Joseph Minard, *Carte figurative et approximative des quantités de vin français exportés par mer en 1864*, 1865.

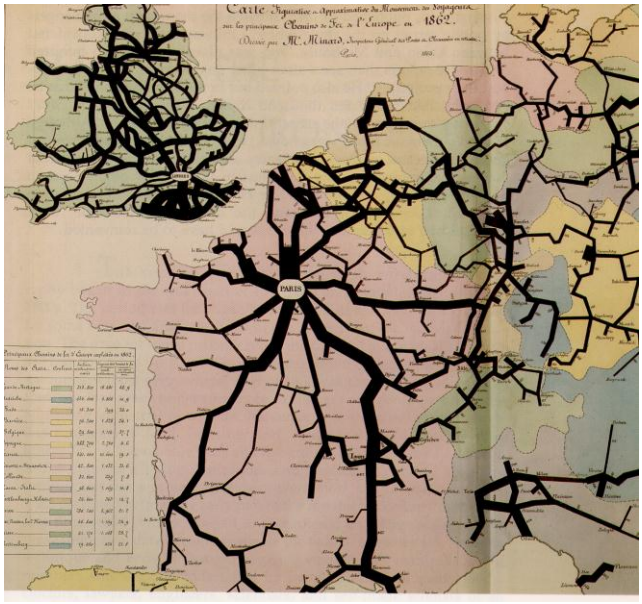


Figure 9. Charles-Joseph Minard, detail of *Carte figurative et approximative du mouvement des voyageurs sur les principaux chemins de fer de l'Europe en 1862*, 1865.

Despite the extraordinary importance of the above innovations, the professional geographers at the end of the nineteenth century were still suspicious of thematic and statistical cartography, and preferred to stay firmly rooted in the traditional cartography of the Major States. It is only in the 1930s that this distrust

 

disappears when, in a climate characterized by an unprecedented and widespread ebullience of ideas on maps, the geographers will develop a keen interest in the new representation techniques developed by the statisticians, ideal to highlight territorial differences, and will apply them in the various contexts of human geography (Robic, 2000, p. 3). In parallel with this, the scholars of other social sciences too will discover and use the new cartographic methods: let us remember, for example, Otto Neurath's visual pedagogy and the above mentioned urban models of Ernest Burgess.

## 2. A less and less adequate instrument for the representation of today's social phenomena

Today, after almost two centuries of life, Charles Dupin's choropleth map is beginning to feel its age. In a globalised world whose main feature is one of flows (of people, things, ideas), the static quality of the territorial mosaic to which the choropleth map gives rise appears increasingly unsatisfactory to understand contemporary economic and social phenomena. In fact it seems an over-approximate and little significant cartographic solution, above all when applied to spatially volatile phenomena of flows (e.g. with regard to finance and communication).

The digital flows, so obviously important in today's world, cannot be represented with the traditional statistical cartography: it suffices to think of the online circulation of information or the chaotic communication flow of the social networks. The bursting onto the scene of internet and the new technologies for distance communication propel the man of today onto a new spatial dimension, unconnected from and independent of the materiality of the land. Moreover, in a world where the historical times quickly change the structures and characteristics of society, the positivist illusion on which the map has speculated for centuries is no longer acceptable, and that is, the claim to show the reader a representation of a time past as if it were relative to the very moment at which the reader observes it. Those same constitutive elements of the choropleth maps that are administrative boundaries (national, regional, etc.) tend to lose the importance that they once had.

A further criticism can be made of the choropleth map. When it was created in 1826 it was totally in line with the times insofar as it satisfied a state concept of cartography, in which the need to define and classify its inhabitants dominated and this objective was reached by using a classical political category: the division of the territory into admintrative units. In this context the choropleth maps reduced the whole population of an entire region to an average value, considering and judging that same population in relation to that average value that was thus raised to the only norm of reference. This expressive modality shows a methodological choice in which the territory prevails over its inhabitants and not vice versa (Crampton, 2004): a bureaucratic concept of the relationship with the citizens typical of nineteenth century Europe. Statistical cartography thus shows a deeply state-centred leaning, or that is, oriented to valorising state data and underestimating the other geographical dimensions of society. This inclination is to be found not only in those products that can be directly ascribable to the activity of the institutions (like cartography for schools or town-planning), but is raised to being an intrinsic feature of cartography production, even the unofficial one. This state-centred vision of the social space blurs the role of non-institutional protagonists of our society, like civil movements, private economic agents, local associations for the defence of the territory and local identity, international companies, NGOs, etc. Instead it is necessary to free oneself of this obsolete state-centred vision that cartography has inherited directly from classical geography, bringing to the forefront the primary agents of our society, until now ignored by maps only because they are not directly linked to the territorial concept of the modern state and basically de-territorialised.

The still widespread use of the choropleth map can be attributed to a basic misunderstanding on the nature of the geographical map, seen as an exclusively technical activity that minimises the moment of the critical interpretation of the phenomenon being observed. This moment can, and rather

 

must, direct the choices in the successive phase of the realisation of the map suggesting adaptations that are specifically suitable to represent the observed phenomenon.

For example, a typical problem of the choropleth map is that the phenomenon being studied is related to the geographical extension of the areas represented even when it would be more opportune for the analysis to relate the phenomenon to different elements (e.g. the demographic importance, education or income level, etc.). Hence the diffusion of the anamorphic maps[3], which have been more and more used in recent years[4]. These representations break a taboo-principle: the surfaces of the areas on the map must correspond to the relative quantitative dimension of the phenomena and not to their surfaces on the ground; at the expense of greatly deforming the usual boundaries, the graphic codes of the anamorphic maps highlight the territorial imbalances (Figure 10).

The diffusion of anamorphic maps, which "adapt the map form no longer to the physical reality but rather to the perceived reality" (Denain and Langlois, 1996), derives from its higher hermeneutical capacity with respect to the traditional methods of statistical graphics (Figures 11 and 12).

Cartography has lived through centuries dominated by topographic metrics[5], the only one foreseen in the rationalist model. The Euclidean space was therefore the only space granted in this model. Today however this monopoly has been overcome, and therefore we come across the use of a multiplicity of metrics.

The success of the anamorphic map gives the measure of the need to develop scientific instruments that are closer to the fluid spatiality of our times and of the popularity that these attempts enjoy among the public too[6]. And yet by admission of its very promoters (Hennig, Pritchard, Ramsden and Dorling, 2010), the anamorphic map presents evident limitations as it is applicable exclusively to quantitative phenomena (like the choropleth maps too on the other hand), while it is difficult to reduce contemporary reality to quantitative analysis.

Furthermore the anamorphic map, relying on the availability of statistical data which are normally supplied according to the usual administrative divisions, forces the analysis to reason by administrative areas at the risk of seriously invalidating explicative capacities. Moreover, the reliance on statistical data brings up the subject of the quality of that very data, which is particularly felt in those contexts without an efficient bureaucratic organisation, autonomous of political interference: to what extent can we trust statistics?

The new topological reality of today's world has not yet found suitable and satisfactory representation instruments to deal with the demanding challenges that the world of research has before it. But undoubtedly innovation has become an obligation if an efficient contribution is to be given to the understanding of the phenomena of our times. Even in cartography.

[3] As well as the version in different languages of the term "anamorphic map" many other terms have been coined to define even scientific maps that present evident spatial distortions: some call them "cartographic transformations" (Griffin, 1980; Cauvin, 1997; Sen, 1976), some "pseudo-cartograms" (Tobler, 1986), "cartographic deformations" (Schneider, 1987), or "meta-maps" (Bunge, 1962; De Vecchis and Staluppi, 1997; Lavagna and Lucarno, 2007). Lastly, some call them simply cartograms (cf. Danny Dorling's site http://www.dannydorling.org/).

[4] The main promoters of this technique are the Englishman Daniel Dorling, the Frenchman Jacques Lévy and the Italian Emanuela Casti, who leads the work of the Laboratorio Cartografico Diathesis of the University of Bergamo.

[5] By metrics is meant, according to Jacques Levy's definition, "le mode de mesure et de traitement de la distance" (Levy and Lussault, 2003, p. 607).

[6] As shown by the unexpected commercial success of Danny Dorling's atlases.

 


Figure10. Anamorphic map. The size of each country correspond to its population.

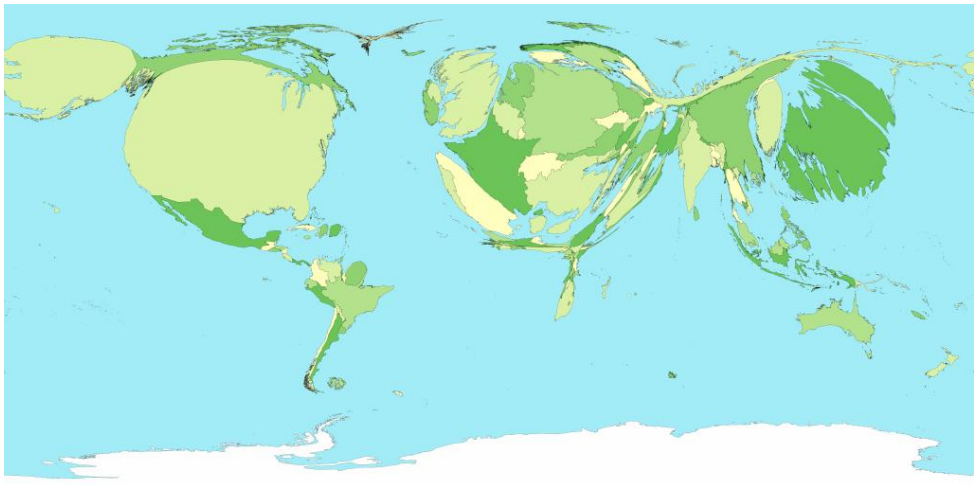

Figure 11. Anamorphic map. The size of each country correspond to its gross domestic product.

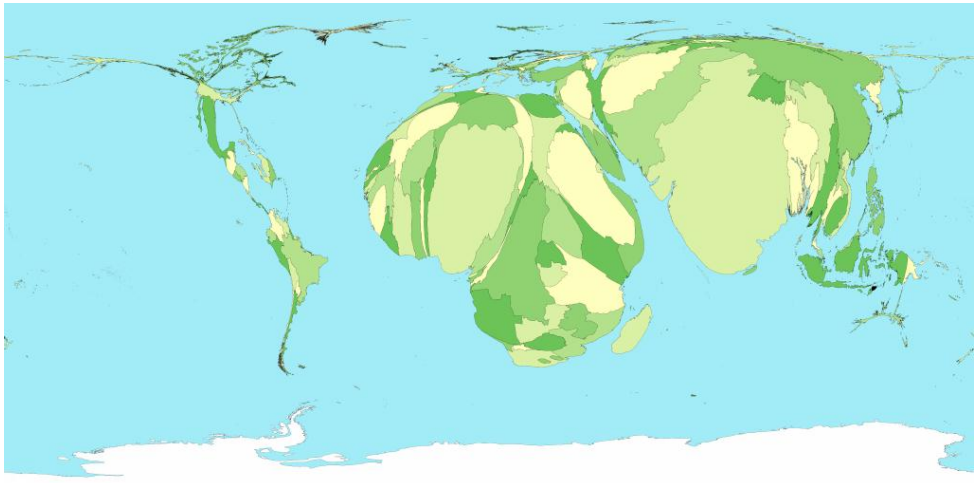

Figure 12. Anamorphic map. The size of each country correspond to its infant mortality rate.

 

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