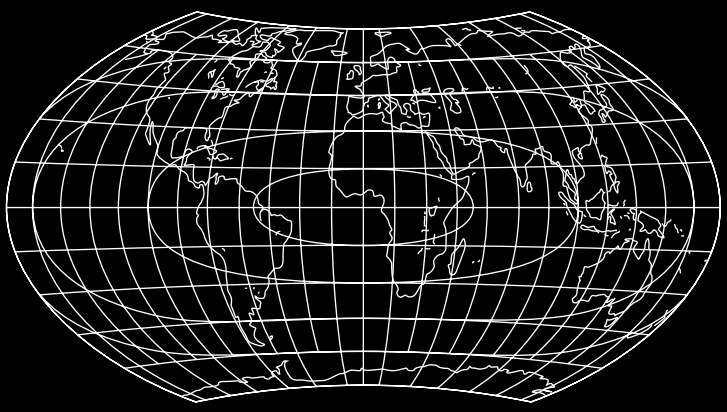
CRITICAL MAP VISUALIZATIONS



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In our chapter, we will discuss a selection of critical visualizations that tackle such diverse topics as the homogeneity of a territory, the representation of minorities, or the juxtaposition of different historical reference frames. These visualizations are closely related to the concept of critical cartography. Critical cartography moves the political and social power of maps to the fore in discussions about cartography. It looks at maps from a poststructuralist and constructivist perspective and defines maps as instruments that proclaim a certain conception of the world (Wood/Fels 2008). Although there has been a recent theoretical shift in mapmaking, most visual practices still come from objectivist cartography. Objectivistic cartography, conversely, believes in a general explanation and a universal order. It seeks design guidelines that should enable cartographers to represent a topic on the earth's surface as faithfully as possible. While objectivist cartography produces

a very formal design approach, as designers and design theorists we wonder how the critical approach is visualized and how objectivity can be questioned by it. Critical cartography has been discussed previously from a theoretical perspective (Harley 1988, 1989; Wood/Fels 1986; Wood 1992a, 1992b); to that end, we would like to draw the reader's attention towards different forms of critical visualizations.

At the center of our investigation is the question of whether the design authors of map visualizations appear critically, and if so, in what way they do so. Interestingly, a number of discrepancies emerge between theoretical aspects of critical cartography and current critical map visualizations. In the maps, the criticism refers primarily to social problems and is not directed at the visual level, that is, at conventions and paradigms within the design discipline. These includes the homogeneity of the surface (Bertin 1974: 52), the continuous grid, and the assumed stability and unambiguity of signs. In contrast, we start from the hypothesis that critique, on a content level, undermines itself when it relies on conventional map design making.

To illustrate our argument, we will discuss two projects on redlining maps by the Digital Scholarship Lab at the University of Richmond and by data artist Josh Begley. These works show that critical reflection on the paradigms of representation arise not only from the subject matter dealt with, but also from the specific visual logic of comparative representation.

INTRODUCTION

Critical cartography originated during the 1980s and 1990s (Harley 1988, 1989; Wood/Fels 1986; Wood 1992a, 1992b). Based on its theory, corresponding critical map visualizations emerged under such names as Counter-, Radical-, Experimental-, Speculative-, and Deep Mapping. They emphasized the fact that maps can serve other interests than hegemonic ones in very different ways. This activity became a medium of resistance, critique, and emancipation by mapping what is left off of, or out of, official maps.

The context of critical map visualization is still relevant today. Small Multiples, a leading data visualization studio from Australia, focuses on cultural diversity in their work.

In *Casino Bus Map*[1], the studio focuses on problems faced by migrant communities. The studio shows how casinos are targeting migrant communities, where gambling is increasingly problematic, by combining cultural demographics with the routes taken by casino buses.

Thematically similar, in the sense that the situation of a minority is made visible, are collaborative data visualizations by the group Critical Cartography. The project *Communal Lands of Mexico City*[2] uses experimental ways of collecting and layering spatial data. It is a reaction to Mexico City's problem of affordable housing and aims to discover new settlement opportunities. The group conceives of maps as a medium of knowledge and organizes workshops to produce them collaboratively.

Other important platforms for subjective and collaborative cartography include *Waend*[3], the *Civic Data Design Lab*[4], the *Spatial Agency Platform*[5] which focus on the relationship between architecture, space, and politics, the Hong Kong-based *Map Office*[6], as well as *bureau d'études*[7] which published a work entitled: Atlas of agendas – mapping the power, mapping the commons.

Critical maps address social and political issues, albeit with a few exceptions. They visualize what is omitted from official maps. In doing so, the critique mostly focuses on the content of level and is seldom transformed onto the visual layer. Having a background in graphic

01 Small Multiples. "Casino Bus Stops". Accessed January 6, 2021. https://smallmultiples.com.au/projects/casino-bus-maps---the-cash-cow-suburbs/.
02 Critical Cartography. "Communal Lands of Mexico City". Accessed January 6, 2021. https://criticalcartography.com/Communal-Lands-of-Mexico-City.
03 Waend. "A platform for subjective and collaborative spatial publication". Accessed January 6, 2021. http://waend.com.
04 Civic Design Data Lab. Accessed January 6, 2021. http://civicdatadesignlab.mit.edu/.
05 Spatial Agency. Accessed January 6, 2021. https://www.spatialagency.net/.
06 Map Office. Accessed January 6, 2021. http://www.map-office.com/.
07 Bureau d'études. Accessed January 6, 2021. https://bureaudetudes.org/.

design, we believe that this undermines the critical stance that the authors express in their mappings. Analyzed from a design point of view, many content-critical maps use a visual language that is highly similar to that promoted by representatives of objectivistic cartography. However, the concept of objectivist cartography contrasts with the critical concept. Wood and Krygier argue that the "Map artists do not reject maps. They reject the authority claimed by normative maps to portray reality as it is, that is, with dispassion and objectivity" (2009: 344).

For us, this results in a tension that is also *visually relevant* to the practice of map-making. If the drawing and representation conventions of objectivist cartography are simply and uncritically adopted for critical representations, then they can come into conflict with the critical attitude that questions this same objectivist claim.

CRITICAL CARTOGRAPHY

Critical cartographers question the paradigm of maps as objective, accurate representations of the world. They see maps as political because they are "products of privileged knowledge" that simultaneously produces and stabilizes power structures (Bittner/Michel 2013 with reference to Harley 1988: 278). But why do we read maps as objective representations of the world in the first place? The fact that maps are regarded as truthful is related to their specific pictorial logic, which is determined by immediacy and in presenting an overview. The accuracy afforded to maps is derived from, on the one hand, the scaling of the map, and on the other, from the coordinate system which precisely defines each position on the map.

Different signs on a map come from sign systems that are different and which were originally independent from each other. But through the spatial arrangement, these signs

are connected to each other through *allocations*. *Allocations* describes how these signs are assigned to positions: "An allocation is an arrangement in unity with two separate systems of structures: a system of spatial relationships between positions and a system of symbolic relationships between signs." (Cancik-Kirschbaum/Mahr 2017: 97).

The constructivist paradigm of maps is based on the fact that isolated sign systems are forced into meaningful connections. It is important to notice that such semantic allocations are *created* in maps. Maps thus produce relationships between signs but also between signs and territories. They force definite relations out of loose information and present them as objective.

A map's simplicity is its strength, or as Michel formulates it, its "highly complexity-reducing coupling of territory and social categories" (Michel 2010: 10). They are powerful because they "fix, unify and delimit spatial, social and temporal categories" (ibid: 10). Visual abstraction takes on a new social and political dimension against this background: They are statements that are only partially factual and that may also be misleading.

Critical cartography tries to deconstruct the illusive truthfulness of maps from a theoretical perspective. Denis Wood (1992b) argues that maps always serve certain interests, and that they become political by doing so. However, we would like to emphasize that this political purpose exists whether the power is claimed for hegemonic or critical-emancipatory interests or not.

To better understand these interests, maps must be understood as "ongoing processes" rather than as stable objects (Dodge et al. 2009: 16). The creation of a map involves several practices, from data collection, to design, to the actual dissemination of the map. The knowledge and the information that maps communicate is realized in ongoing processes of negotiation and transformation. Social structures, discourses, and materiality around

maps constantly change. Maps do not have a constant state; rather, we see them as processual and not as either absolute or objective. Each map represents a snapshot of the knowledge practices that first created the map. Having a background in design, we are keen to discover how this processualism might be transferred into visual means that reveal the frame of reference.

If maps are representing discourses and different practices, they should also look quite different. Of course, there is a significant variety in the design of maps. But it is also striking to us that maps have quite a high degree of unification, regardless of whether they are considered objective or critical.

Critical cartography contributes a very important theoretical point to map-making: Maps are constructed and, therefore, the meaning of the signs is related to the frame of reference. Given that we have been trained as graphic designers, we are responsible for visualizing this point of theoretical criticism, by literally making this construction visible. Our experience with visual means shows us very clearly that criticism, on the level of content, undermines itself when it relies on conventional design principles. Although there has been a theoretical shift in map-making of late, most visual practices still come from a diametral different approach, namely that of objectivistic cartography.

OBJECTIVISTIC CARTOGRAPHY

We understand the notion of objectivistic cartography as related to two things. Firstly, a philosophical belief in a general explanation and a search for universal order. Secondly, the conviction that things and objects that are part of this order can accurately be represented in a cartesian system. Interestingly, standard works of objectivistic cartography (Bertin 1974; Hake 1994) mainly deal with the second point. They

define design guidelines that enable cartographers to represent a topic on the earth's surface as faithfully as possible.

The ultimate goal of cartographers like Jacques Bertin was to make maps effective. Maps are thought to be effective in the sense that they can be understood easily by the reader. Maps must be error-free in order to achieve such effectiveness. The necessity to remain error-free, in turn, called for good design principles. In his *Semiology of Graphics*, Bertin (1974) precisely describes issues such as the representation of the location, the selection of information, the best symbolization of certain data, the combination of symbols, and the type of map to be published.

Bertin considers two things to be indispensable to the creation of effective, error-free maps: Firstly, the simplification of information and graphic elements to a minimum and secondly, fixing them as unambiguous signs. Arguably, simplification is necessary to achieve conciseness in a map. Conversely, though, we know that abstraction, formalization, unambiguity, and visuality are tools that create a certain (subjective) idea of the world (Harley 1989). These ideas, however, come across as objective under the mantle of formalized design.

In his general theory, Bertin compares graphics with mathematics. He argues that graphics, like numbers, are part of a monosemic system. This means that graphics, and in our case symbols on a map, are signs with a unique meaning. What are the conditions that a graphical sign can have one distinct meaning? According to Bertin, all participants must agree on the meaning of the signs, which cannot be either revisited or discussed any further. Doing otherwise means that the map does not represent a stable reference point for a certain knowledge (Bertin 1974: 3). Only this agreement enables a collective reading of the signs and produces 'logical' meaning. The signs can only be fixed if the frame of reference is also stabilized, because the meaning of signs is dependent on the given frame of reference.

Who are these participants that define that meaning? Until the 1980s, only a handful of groups had the privilege to do so: Cartography was an academic field, by and large, and was controlled by land surveying offices run by the state, the military, and the economy. Those groups had the authority to define the meaning of maps. It seems comprehensible that these groups also pursued their interests while doing so. It is important to acknowledge that their definition of the world does not necessarily correspond with that of other groups, minorities within a state for example.

We assume that every representation can be appropriated as evidence for certain statements and interests, regardless of whether it is an act of emancipation or a claim to hegemony. The relativity of the unambiguity and evidence of showing can be made visible and questioned, as Volker Pantenburg writes with regard to the essay film:

> "The photographic image tends towards tautology and operates with a deceptive evidence. However, through contact with a second photograph, by means of which clarity and unambiguity are 'disturbed' in favor of a relation and a relationship, it can advance to become an analytical instrument." (2006: 277)

Relating different visual statements can undermine the evidential power, which is fed by the immediate effect that the image has and can turn it into critical questions. In the following section, we contextualize this assumption with current approaches from the discourse of critical graphic design.

VISUAL REFLECTIVE CARTOGRAPHY

Our considerations tie in with critical and reflective design formats of the 2000s (Bardzell/Bardzell 2013; Blauvelt 2006). These considerations question the role of the designer,

based on discussions around the principles of "designer as author" (Rock 2009) and "the designer as producer" (Lupton 1998). Design is no longer seen solely as a commercial service, but as content design and visual authorship.

This evaluation of graphic design takes place under such different names as "author design", "critical design"[8], and "reflective design" (Felsing 2021). The examples that we will present throughout the following pages represent a growing awareness of the roles played by designers in the definition of what becomes objective. They view their traditional role from a critical point of view. Their position corresponds with a general change within the designer's mindset. Designers have become increasingly aware of the autonomy of their creative statements. (Menne 2018)

How does this critique manifest itself in the designer's practice? Mazé (2009) argues that criticism in design is expressed in three, mostly interacting forms: Firstly, as a self-critical attitude towards one's own design practice. Secondly, as a criticism that focuses on conventions and paradigms within the discipline. Thirdly, this criticism appears as a criticism of social and political issues in general. The following examples refer to the last of these three forms, the content criticism. However, as described previously, we are interested in the visual form that criticism might take. The search for this visual form, and its relation to the content, is particularly characteristic for our consideration of the following examples.

08 This term was popularized by the exhibition "Forms of Inquiry. The Architecture of Critical Graphic Design," which was first shown in 2007. See Laranjo, Francisco Miguel. "Critical Graphic Design. Critical of What?". Accessed January 6, 2021. http://designobserver.com/feature/critical-graphic-design-critical-of-what/38416/.

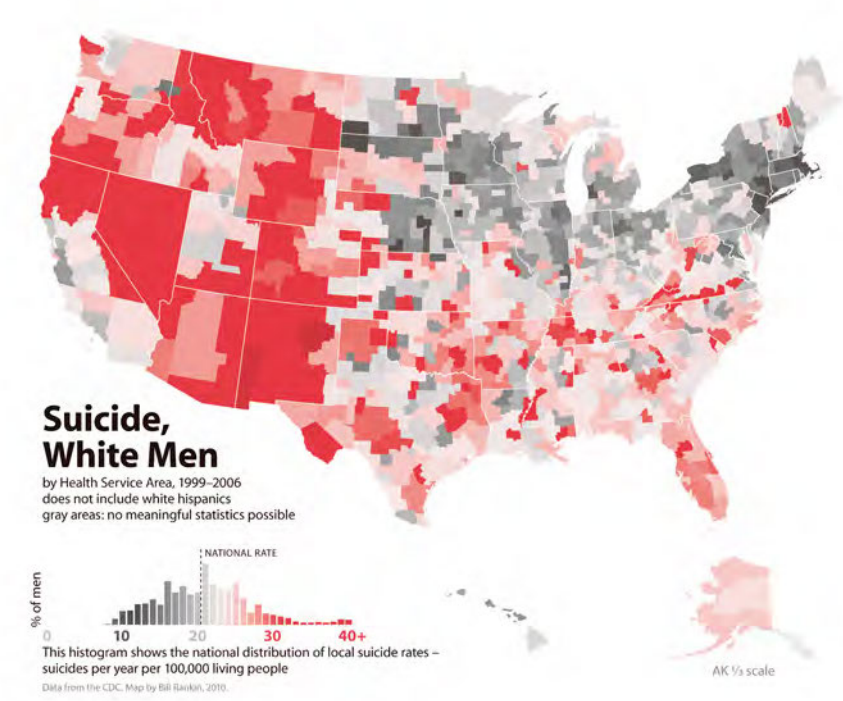
THE SUICIDE MAP

Most of today's maps follow the idea of the unity and homogeneity of a territory as a nation. Both the maps and the principal idea of such territories were defined in the 18th and 19th centuries. They still serve as the basis for most of today's maps, whether they represent geographical, political, or social issues. Therefore, these problems are presented in relation to territories that were defined two centuries ago. Although political and social issues are understood as dynamic and process-oriented, these dynamics are still hardly mapped. This means, in relation to the following example, that the certainty that an individual will live in a particular county for a significant period of time is by no means given today. The closedness of the territories is, therefore, not relevant for the comparison of state counties.

Bill Rankin, a cartographer and researcher from Yale, suggests that instead of large political territories, it would be more appropriate to use small "socio-geographical islands" as the basis for maps. He demonstrates this in his *Suicide* map. ○○○ The map visualizes the problem of suicide across different states throughout the U.S. Rankin argues that "there are huge differences in the suicide rate by race, gender, and geography." (Ranking 2005, 2010). According to Rankin, it makes no sense to talk about a "suicide rate for the United States". These rates differ largely based on the socio-geographical conditions of the people (ibid). If the frame of reference is too large, then a differentiated representation of the relations of race, gender, age, and territory is no longer possible. The visual statement is far too general which, in turn, can lead to the cementation of existing prejudices.

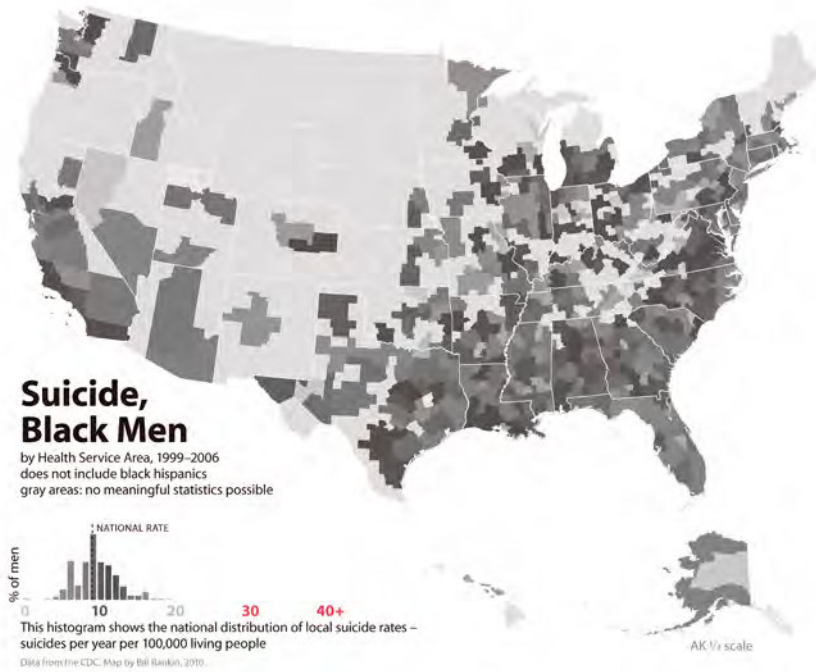
Rankin created three different maps in order to avoid this generalization. One for native Americans, one for afro Americans, and one for white Americans. Each map again is divided by gender.

FIG.1–3



▲ 1

● FIG.1-3 ▶ The distribution of suicide rates across the United States for white, black and indian men. The colors of the map have been changed for this publication. For a view of the original please visit http://www.radicalcartography.net/index.html?suicide. Biill Rankin, 2005, 2010.



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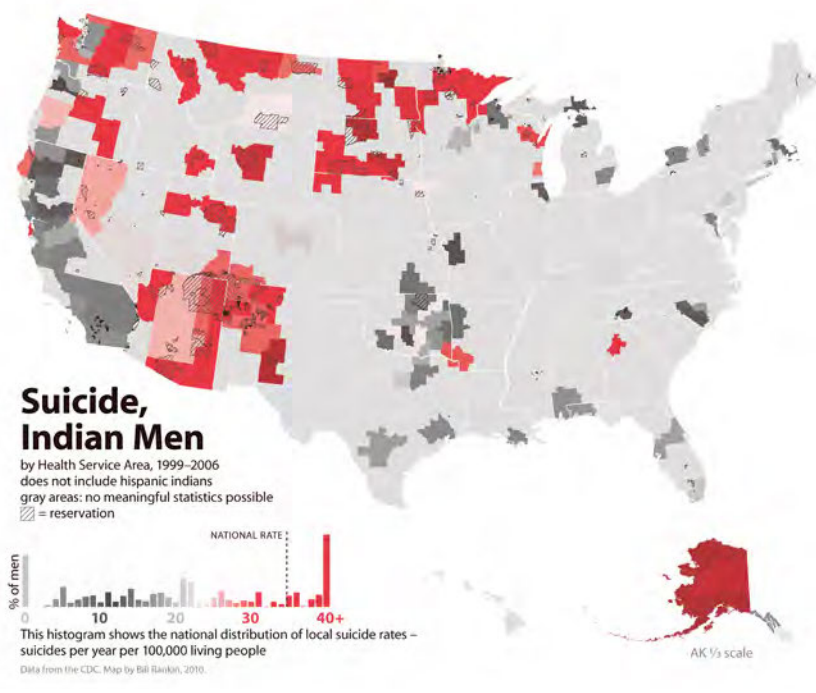


▲ 3

Rankin chose a choropleth map for his visualization. This type of map uses state districts and landmarks to visualize some statistical aggregation (in Rankin's case suicides). Each county is represented as an abstract polygon and filled with a color that indicates the suicide rate. By doing this, Rankin creates a visual argument that there exists a relation between suicide rates and the county in which people live. The problem that the frame of reference of the country is too large is, thus, simply shifted to the county level. Whether this solves the problem of representation of individual population groups is, in our view, questionable. In this visualization, Rankin reveals the problem in all its complexity and encourages us to continue to search for better solutions.

MAP & JERRY

A central theme of critical maps is the visibility or invisibility of minoritarian and majoritarian groups. Such critical maps try to make communities visible that are not represented within the official order, through state maps for example.

It is crucial to consider maps from a critical perspective, not just in the context of their current use. According to Sybille Krämer (2003), they fulfill a constitutional function: as media, they are fundamental for the justification and demarcation of territories. Maps are not neutral tools, but are instead constitutive of the enforcement of rules, laws, and ideologies. For example, by making specific sub maps, the absolute interpretive authority of the map can be critiqued, and an offer can be made for differentiated, omitted, or overlooked contexts. One example of such an invisible area is the Awansouri-Ladji district located in Cotonou, the economic capital in the West African country of Benin. The district is not depicted, neither on any official city maps nor on Google Maps.[9]

Map & Jerry created the first map of the area in 2018 and this was carried out by FabLab[10] Benin and OpenStreetMap[11] Benin. ○ The project included 40 local residents of different ages who collected the basic data of the map, including points of interest, existing infrastructure, and businesses. FIG.4

Most of the street names could be determined by the participants from the "bottom-up", given that the addressing of the buildings and streets has not been carried out by the government agencies. This also made clear the colonial influence that the regular, official maps operated under (Choplin/Lozivit 2019). Viewed from this perspective, the project formulates a clear critique towards the hegemonic claims of official maps.

However, this critique on the content level is undermined at the visual level. Due to a lack of time and budget, the project used the graphical specifications provided by OpenStreetMap. This is a highly codified visual language that is based on Western standards that leave little room for the expression of cultural specifics. These, in turn, we consider to be instrumental in helping communities identify with their maps. This issue became particularly clear while finding an appropriate symbol for places of worship related to local voodoo culture.

09 Awansouri-Ladji appeared on these maps as a "green" area with no roads, houses, or infrastructure by the time the project was carried out. By the time that this article was written, however, the district did appear on Google Maps.

10 The concept of FabLab (a term derived from the contraction 'fabrication laboratory') appeared at MIT in Boston in the late 1990s. A FabLab is a space for digital innovation and technological democratization that ensures the promotion of, and training to use, innovative technologies. A FabLab is generally equipped with open-source software, hardware, such as a 3D printer, to manufacture objects and conduct projects (hence also the term makerspace to designate these spaces in the English-speaking world). Blolab is the first FabLab in Benin.

11 The OpenStreetMap (OSM) project is a mapping project that aims to build a free geographic database of the world. It relies on volunteers organized in groups around the world, as it did in Benin.

The symbol provided by OpenStreetMap, which was ultimately used on the map, shows a person on their knees praying. Choplin and Lozivit (2019) criticize this choice retrospectively, because "the Voodoo cult does not imply prostrating oneself before a god. It values the links with the natural elements (fire, earth, wind, water)." (ibid, 25) They further argue that it would have been desirable to include the community more in the design process of the map.

COLLEGE TOWN

Another example that provides criticism on the content level is the map *College Town* by Bill Rankin. However, this radical map comes very close to extending its critique to the visual level. ○ FIG.5

In his map, Rankin designs a counter-vision to the objectivist concept in which territories are tied together to establish identity. The objectivist map suggests wholeness and the continuity of the territory both internally and externally. Here, too, the 19th-century idea that territories are homogeneous in themselves is predominant.

However, Rankin's critical perspective emphasizes the differences within a territory. These differences, in turn, threaten the territory's recognizability. Rankin's radical cartography depicts Boston as a university town. Rankin defines a different frame of reference, quite unlike the official maps which show only the smallest version of the university campus, including the most important buildings. His map shows all of the land that is owned or leased by the city's 52 colleges and universities.

The map, thus, reveals that far larger areas of the city belong to the universities than is usually shown. Rankin's map emphasizes the university's dispersed presence.

This alternative view provided by Ranking on

Boston as a "student city" would have become even more clear by juxtaposing it with more common maps. Although this is suggested through an offered Google Maps link, the maps differ greatly in their visual means, rendering a direct comparison hard.

In the following section, we would like to examine a project that uses such juxtaposition quite successfully.

REDLINING MAPS: AN EXAMPLE OF VISUAL AND SOCIAL CRITICISM

For us, the examples presented so far show that criticism on the content level can undermine itself if it relies on conventional, objectivist map design principles. At the very least, the visual layer can contradict the critical content, as seen in the example of *Map & Jerry*. We will present two examples in which the critique is applied both in terms of content and visual means.

Redlining is the practice of categorizing residential areas in terms of their investment security. In the U.S. of the 1930s, various banks and other lenders began to grant mortgages on the basis of such maps. This mainly affected minorities living in poorer parts of the city, who were denied credit because of their ethnicity. Since the 1960s, Redlining Maps have been associated with disinvestment, racial discrimination, and neighborhood decline (Harris/Forrester 2003). The practice continues to have an impact on the prosperity of certain minorities even today, such as among African Americans living in poorer neighborhoods for example. Two actors that recently explored *Redlining Maps* are the University of Richmond's Digital Scholarship Lab and data artist Josh Begley.[12]

12 Begley, Josh. "Redlining California: 1936-1939". Accessed January 6, 2021. https://joshbegley.com/redlining/.

FIG.6 **The Digital Scholarship Lab's critical visualization consists of a juxtaposition of historical and current map materials. ○ The project combines nationwide overviews with detailed views that can be enlarged down to the level of individual streets and residential buildings. By zooming in, the user can see the 'mortgage security' categorized from A (highest) to D (lowest) as well as a historical description of each area. The maps were created by agents of the federal government's Home Owners' Loan Corporation (HOLC) in liaison with local real estate professionals (lenders, developers, and real estate appraisers).[13]**

One of the historical descriptions of a D-Zone reveals the discrimination clearly. The area is described as "characterized by detrimental influences in a pronounced degree, undesirable population or an infiltration of it." The recommendation was: "refuse to make loans in these areas [or] only on a conservative basis."

The critical visualization renders the categories visible on each of the zoom levels. Thus, the project provides a general overview of the statistical distribution of categories per territory, on the one hand, while each territory is substantiated and contextualized with very specific facts and official documents on the other.

The interface design also supports the intertwining of history and the present. The user can gradually control the overlay of the historical maps with OpenStreetMap. The interface offers three options: "Full Map", "Graded Areas", and "Polygons". While the historical map effectively *covers* the present in the first option, in the last mode the historical map is completely dissolved and merges into the present. By controlling the degree of overlap between past and present, the user is invited to actively consider these two levels together.

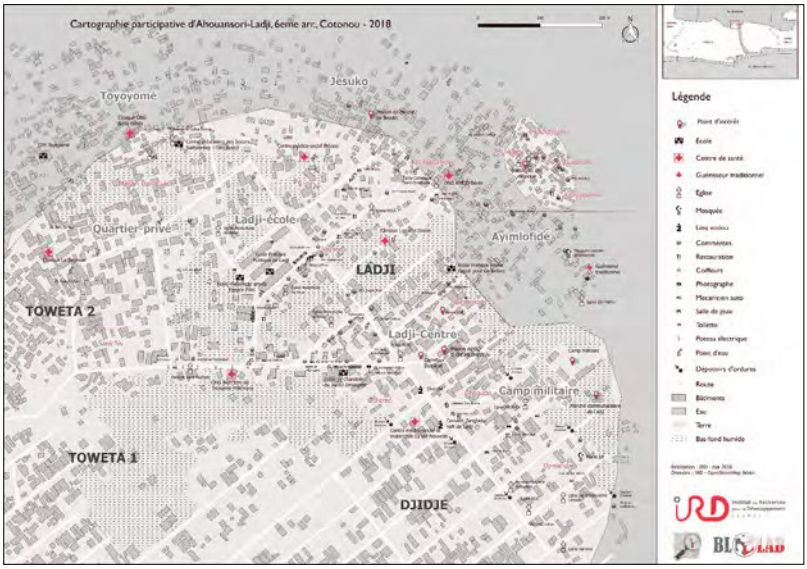
13 In the color-coded maps, the highest grade of 'A' (green) was an area with minimal risks for banks and other mortgage lenders. Areas receiving the lowest grade of 'D', colored red, were considered 'hazardous'.

An associated project *Not Even Past: Social Vulnerability and the Legacy of Redlining* reinforces the actuality of the issue further by juxtaposing the redlining maps with contemporary health disparities. As can be seen in ○ the redlining districts are put in relation to the Center for Disease Control's *Social Vulnerability Index* (SVI). ○ The SVI is a widely used indicator for FIG.7 social and economic resources that enable a community to face human and natural disasters. For example, the index shows that people of color are more exposed to the COVID-19 virus due to their social and economic disadvantage. The project contextualizes current inequalities by combining the index with the historical redlining maps. It becomes clear that the practice of redlining has shaped certain areas for generations.

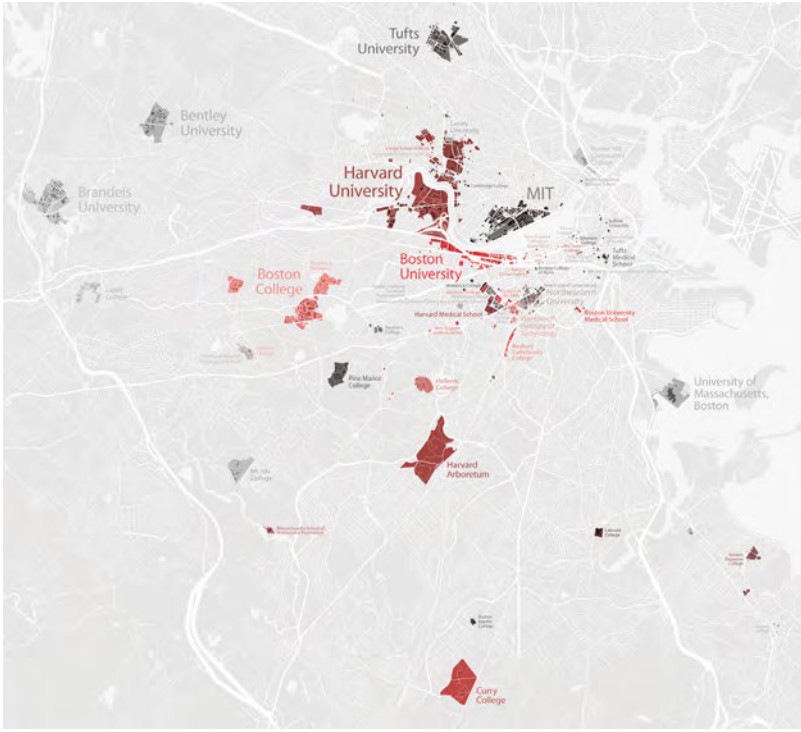
Data artist Josh Begley has also developed a visualization and contextualization of historical redlining maps in parallel with, but independently of, the *Digital Scholarship Lab*. It differs from the Lab's approach essentially in that he uses the popular program Google Earth to overlay the maps. In doing so, he also shifts the historical problem to the present, but possibly allows a broader audience to refer back to a process that is still relevant today. Begley's work also provides deeper insight into the problem in that he provided a historical description of each area.

DISCUSSION

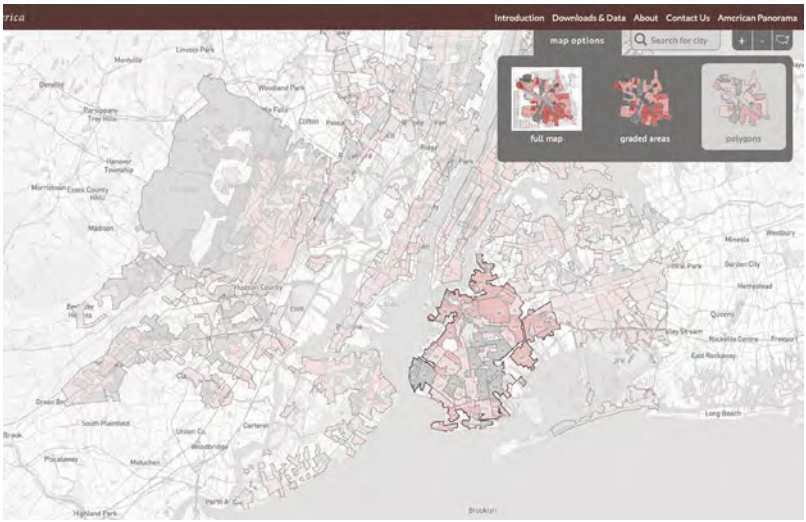
We would like to discuss our initial hypothesis now that we have completed our presentation of different examples from critical cartography: Criticism on the content level undermines itself if it relies on conventional objectivist, map design principles. This thesis is contradicted by Bertin's objectivist concept, with which he intensified the question of the separation of the content (the information) from the form (the means of the graphic system)



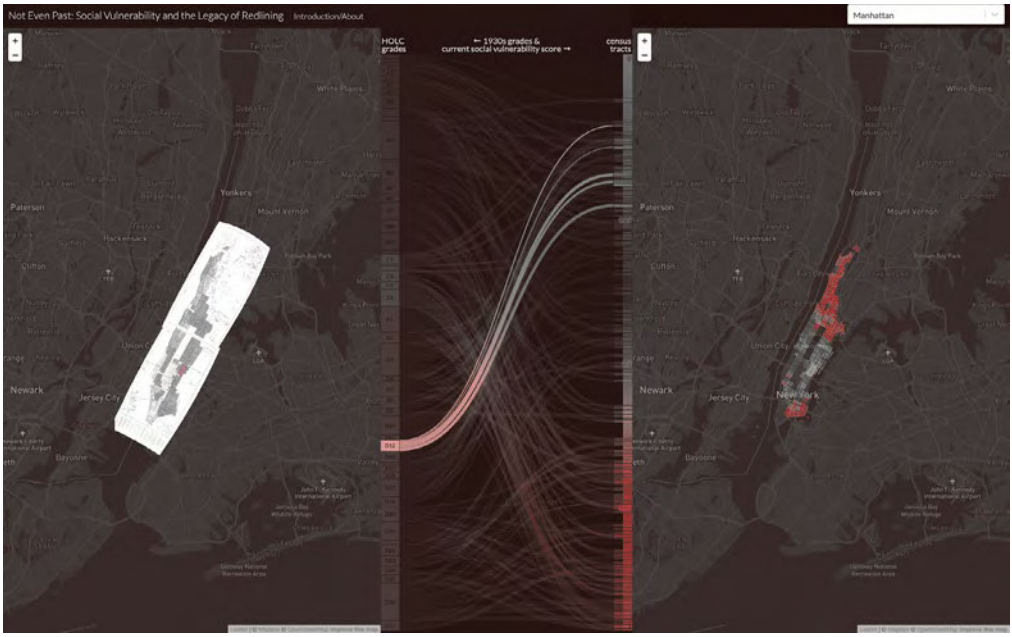
● FIG.4 ▶ The map developed by the Map & Jerry project showing the Awansouri-Ladji district in Benin. Map & Jerry, 2018.



● FIG.5 ▶ Detail from the College Town map showing the distribution of different universities across Boston. For the complete map please visit http://www.radicalcartography.net/index.html?boston_campus. Bill Rankin, 2007, 2009



● FIG.6 ▶ The juxtaposition of historical redlining maps with current OpenStreetMap data. Digital Scholarship Lab.



● FIG.7 ▶ The redlining districts put in relation to the Social Vulnerability Index [SVI]. On the left side, it shows central parts of Manhattan which were classified as 'hazardous' in 1930. On the right side, it shows that the same areas became strongly gentrified. Digital Scholarship Lab.

(1974: 12). From today's perspective, this separation is problematic. Various authors have proven (Ganslandt 2012; Krämer 2003) that the design process is itself content-based; it does not just add 'form' to an already existing content. The visualization is constitutive for the mapped data. Therefore, the medium of the map not only represents data, but it also simultaneously produces data.

From the traditional perspective of the humanities, media are understood as invisible. This is expressed in the metaphor of the Crystal Goblet (Warde 1930) which enables, only limited by the materiality of the media itself, any transmission of information. This understanding is reflected in Bertin's idealistic view that "thoughts remain constant, regardless of the sign system into which they are transmitted" (1974: 12). In contrast, the perspective of cultural studies presumes the "supremacy of the medial" (Krämer 2003: 80). Here, the medium is no longer understood as something transparent and serving, but as an independent, all-determining entity. Viewed from this perspective, the media not only transmits meaning, but also generates it.

Maps are not neutral communication channels; they are involved in the production of meaning. The meaning to be communicated is constituted by the medium; namely through the material map and through immaterial signs. Therefore, we understand maps not only "as an instrument for creating nations and identities" (Michel 2010: 9). Maps are also pictorial acts (Bredekamp 2011) with their own reality-producing force.

If we apply the essential ideas of critical cartography onto adequate visualizations, then these will have to visually reflect the interrelationships of actors, artifacts, and signs.

A counterargument to our thesis might be raised with regard to the examples presented, however. We argue that criticism must be made on the content and the visual levels so as to not contradict each other. However, one could argue that visualizations are already often

quite complex and hard to decode. Visualizations that break with the conventional (objective) stylistic devices could unnecessarily complicate the reading of the content's critique.

We would, therefore, like to advocate that the visualization's frame of reference must be explained in as much detail as possible. Information that enables the temporal and spatial classification of the data facilitates the contextual classification for the recipient. This not only enables them to understand the visualization, but also shares the responsibility for the content (and does not simply demand its affirmation). We argue that the mere demand for simplification (Bertin 1974), in order to achieve efficient representations, patronizes the recipient.

Another difficulty of visual criticism is that the paradigms of graphic visualization have hardly been studied so far. First investigations on the Western convention of the homogeneity of the surface and the continuity of the grid can be found in *Visual Coexistence: Information Design and Typography in the Intercultural Field* (Baur and Felsing 2020). According to Bertin, the surface (of the "information carrier") is homogeneous and the setting of signs is also homogeneous (1974: 52). Within the surface, the presence of a sign signifies the presence of the fact to be represented. Conversely, the absence of the same sign can express that the fact represented are not present in that place.

However, reality is much more complex than "factually present" and "not present", it is much more heterogeneous. The redlining project visualizes this complexity through the diachronic perspective. It shows that the respective social meaning of urban spaces *changes* (over a period of three generations), but also *persists* in certain places. This gives rise to ambiguous references that can completely contradict each other. And this corresponds to the social differences that are continuously renegotiated.

What are the gains associated with critically reflexive map visualization? Reflexive visualizations allow us to question the apparent objectivity of representation and to interrupt the realistic reading of the representation in favor of a questioning. They offer an in-depth look at historical, social, and political contexts and relate them to the now. Playing with the shifts between frames of reference – such as current and historical ones – leads to a different, interrogative way of depicting in which the recipients can be involved. Selected, curated juxtapositions are important because isolated representational logic creates a deceptive weight of evidence. It has been pointed out by various authors that the power position of the speaking subject should not be underestimated, even if representations allow for different interpretations (Muttenthaler/Wonisch 2007). However, by juxtaposing multiple frames of reference in the representation, the power of showing is distributed among different actors.

CONCLUSION

Our chapter has focused on the question of whether the authors of the map visualizations perform criticism and what design means they use to do so. Our hypothesis was that a visual form that is appropriate to critical cartography would also reflect upon, rather than simply adopt, prevailing conventions of representation. Then, we argued that visualization is constitutive for the mapped data. The medium simultaneously produces that which it represents. Using the example of redlining maps, we were able to show that critical and visual reflection results from the juxtaposition of historical redlining maps, which stand for discriminatory practices around housing and current maps. Thus, the interrelationships of actors (such as the inhabitants and investors), artifacts (historical redlining maps and official area descriptions, Google Maps), and

signs (especially boundary lines and colored areas) become clear. The redlining maps projects illustrate that the interpretation of visual map signs depends on the specific frame of reference with which they are placed in relation. This evidence can be broken in favor of an interrogation of the historical and social contexts of showing, whereas an isolated logic of representation generates a deceptive evidential power – regardless of whether this is claimed for hegemonic or critical-emancipatory interests.

FUTURE RESEARCH

The knowledge acquired from forms of critical cartography and map visualization flows into our future research in the field of digital image archives. As part of the Sinergia project *Participatory Knowledge Practices in Analog and Digital Image Archives*, funded by the Swiss National Science Foundation (2021-2025), our interdisciplinary team is developing participatory forms of use on the example of three collections of the Swiss Folklore Society's photo archive. One of these collections is *The Atlas of Swiss Folklore*, which constructs a specific image of Switzerland through the cartographic location of cultural patterns. The pictorial statements will be contextualized by other types of maps to be able to make references back to the diversity of the groupings – for example, with regard to language boundaries, dialects, and religious affiliations. The project is collaboratively led by Walter Leimgruber, Peter Fornaro, and Ulrike Felsing. Max Frischknecht will develop the *New Requirements of Digital-Participatory Knowledge Visualization* as part of his PhD studies.

→VIDEO LINK

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