The Atlas of Cartography:
An Attempt to Spatialize Map Conceptions

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Abstract:

What is a Map? Often, the answer to this question seems quite simple.

Commonly held, the map is conceived as an objective representation of reality. It is akin to a diagram or a model of reality. Such a map helps us to document, communicate, visualize, analyse, manage, and navigate the space of reality. Thus, maps can generalize reality for the empirical measurement of its space through a set of limited variables. Such variables are often referred to as geodata. In recent times, the invention of high-speed computing, remote access, and the internet have fostered revolutionary ways to crowdsource, disseminate, share, and improve the processing of high-volume geodata for mapping. Such a utility of maps is the foundation for many cartographic operations in GIS, GPS, LBS, RS, and VGI among others. This has proven to be useful in the fields of city planning, transport, navigation, resource/disaster management, weather forecasting, epidemiology, social media, and military just to name a few. Ethical considerations in map-making have also seen a rise in participatory mapping to ensure geodata transparency which improves user feedback and builds public trust in map publishers. Such is the technological research agenda of cartography wherein the conception of maps is secure in the fact they remain trustworthy, and objective representations of reality. Today, artificial intelligence is forcing novel applications wherein cartographers are developing programs for generative AI maps or identifying deep-fake maps rendered by AI.

However, maps need not be fake just because they are AI-generated. Manipulating geodata, its censorship, forgery, and secrecy makes maps susceptible to many risks and liabilities. Maps can be used for propagandist rhetoric and unbridled surveillance. A map can also mislead its audience as it may be difficult to ascertain its truthfulness. Thus, the objective status of maps can be easily questioned when their methods of production and delivery are opaque. However, maps may not be objective representations even when the cartographic mode of production is ethical and sound. Cartography seems to have an inherent ability to redefine the characteristics of reality. A cartographer can select, name, categorize, classify, simplify, exclude, and order the geodata to suit subjective biases in the form of a map application. Thus, new realities can be modelled out of subjective map applications. This means that reality is not objectively represented but rather subjectively constructed by a map. This conception of the map as a subjective construction is quite uncommon. It sees cartography as a practice of constructing links between reality and models of reality. If the link is detected, a map will never be confused with reality. If the link is undetected, maps may gain the power to standardize the model of reality as reality itself. The conception of maps as subjective constructions is useful for galvanizing ethical considerations in cartography. Often, cartographers have used this conception to liberate mapping practices from objective empiricism by problematizing the simplification or omission of sociological geodata in technological applications. They have challenged power relations in academic forums by organizing ideological research agendas under Critical, Feminist, Queer, and Decolonial Cartography. Thus, the conception of maps as subjective constructions shapes the ideological research agenda for cartography.

In recent times, maps have been conceived as neither objective representations nor subjective constructions of reality. They are seen simply as practices or processes within reality. It does not matter whether the practices and processes are technological or ideological. Thus, maps can be movements or operations within reality. They can be producers, propositions, interventions, replacements, or transgressions of reality. Surprisingly, maps can also be conversations, memories, or dreams of reality. Such map conceptions have modified the research agenda of cartography to include practice-process oriented studies. Cartographers use methods in participation observation, observant participation, genealogy, and ethnography to find novel applications for maps and expand their conceptions within technological or ideological research agendas.

Coming back to the question of what a map is, it seems that the answer is not simple and it is never-ending. This can be attributed to the following observation: A novel map conception is like a beacon that illuminates a novel research agenda

for cartography. This implies that a map will always be anything one conceives it to be, unfolding a multitude of research agendas for cartography. Examining this situation means navigating the space of infinite map conceptions in a systematic manner. Such a systemic navigation can be embodied within the traditional framework of an atlas. Theoretically, an atlas should have the potential to spatialize any measurable entity. Thus, to spatialize map conceptions would mean to measure, weigh, and locate them conceptually. This implies that the conception of a map must be expressed qualitatively and quantitatively. On the quantitative side, methods in citation analysis and N-grams shall be used to weigh the influence of map conceptions in cartographic literature. On the qualitative side, methods in literary deconstruction shall be used to mark overlaps, contradictions, and tensions that distance map conceptions from each other. Thus, by weighing and distancing map conceptions, the multitude of spaces in between them can be measured and expressed as an atlas.
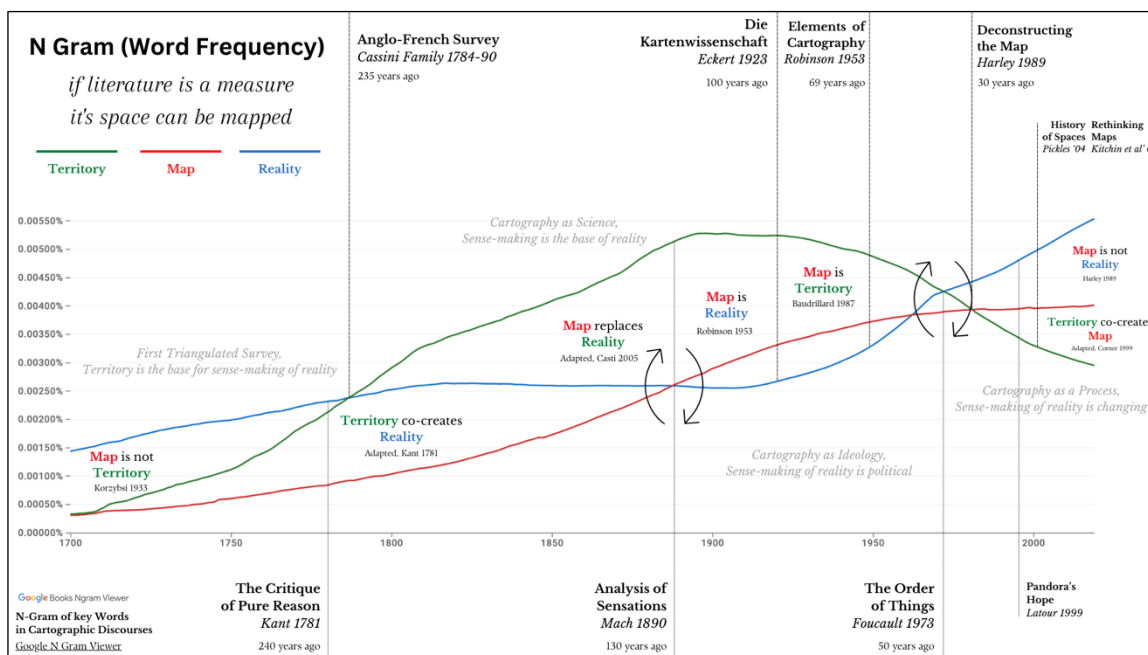

Figure 1. Quantitative Analysis: An N-Gram of keywords (Map, Territory, and Reality) used to express map conceptions.

Sr. No.	1	2	3	n
Map Conception	**Objective Representation**	**Subjective Construction**	**Practice-Process**	**XYZ**
A map is like a...	Mirror Model Chart Diagram	Text Rhetoric Forgery Illusion	Proposition Intervention Movement Conversation	? ? ? ? ....
Research Agenda	**Technological - Scientific**	**Ideological - Sociological**	**Practice - Processual**	**?**
Map Authority **Author's Interpretation** **Emprirical Objectivity**	Traditional Unquestionable Neutral Possible	Always Questionable Biased Impossible	Contextual Variable Possible	? ? ? ....
Cartographers	Bertin (1999) Brunner et al (2017) Eckret (1923) Goodchild (2007) Kang et al (2023) Kraak and Ormeling (2020) M.Eachren (2004) Robinson & Petchenik (1976) Robinson (1955) Tobler (1970)	Brown & Knopp (2008) Cosgrove (2001) Crampton (2010) Crampton-Krygier (2006) Eades (2011) Edney (2005) Harley (1989) Jacob (1992) Monmonier (1996) Wood (1992)	Berque (2013) Brown and Laurier (2005) Casti (2005) Corner (2011) Del Casino & Hanna (2005) Della Dora (2009) Kitchin and Dodge (2007) Losifescu Enescu et al (2015) Picker et al (2013) Wood and Fels (2008)	? ? ? ? ? ? ? ? ? ? ....

Table 1. A summary of map conceptions and their corresponding research agendas.

Acknowledgments

References

Azócar Fernández, P. I., & Buchroithner, M. F. (2014). *Paradigms in Cartography: An Epistemological Review of the 20th and 21st Centuries*. Springer Berlin HeidelbergSpringer.

Berque, A. (2013). Die Transgression der Karten. In M. Picker, V. Maleval, & F. Gabaude (Eds.), *Die Zukunft der Kartographie* (pp. 241–256). transcript Verlag. https://doi.org/10.1515/transcript.9783839417959.241

Bertin, J. (1999). *Sémiologie graphique: Les diagrammes, les réseaux, les cartes* (3. ed., reimpr). EHESS.

Boggs, S. W. (1947). Cartohypnosis. *The Scientific Monthly*, *64*, 469–476.

Brown, B., & Laurier, E. (2005). Maps and Journeys: An Ethno-methodological Investigation. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *40*(3), 17–33. https://doi.org/10.3138/6QPX-0V10-24R0-0621

Brown, M., & Knopp, L. (2011). Queering the Map: The Productive Tensions of Colliding Epistemologies. In M. Dodge, R. Kitchin, & C. Perkins (Eds.), *The Map Reader* (1st ed., pp. 456–463). Wiley. https://doi.org/10.1002/9780470979587.ch59

Brunner, G., Richter, O., Wang, Y., & Wattenhofer, R. (2017). *Teaching a Machine to Read Maps with Deep Reinforcement Learning* (arXiv:1711.07479). arXiv. http://arxiv.org/abs/1711.07479

Cardona, M. K. (2019). *Women in Cartography in the Progressive Era* , by Christina E. Dando. *Imago Mundi*, *71*(1), 102–103. https://doi.org/10.1080/03085694.2019.1529940

Casti, E. (2005). Towards a Theory of Interpretation: Cartographic Semiosis. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *40*(3), 1–16. https://doi.org/10.3138/M4M1-R663-32V2-W151

Corner, J. (2011). The Agency of Mapping: Speculation, Critique and Invention. In M. Dodge, R. Kitchin, & C. Perkins (Eds.), *The Map Reader* (1st ed., pp. 89–101). Wiley. https://doi.org/10.1002/9780470979587.ch12

Cosgrove, D. (2001). *Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination*. Johns Hopkins University Press.

Crampton, J. (1994). Cartography's Defining Moment: The Peters Projection Controversy, 1974–1990. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *31*(4), 16–32. https://doi.org/10.3138/1821-6811-L372-345P

Crampton, J. W. (2010). *Mapping: A critical introduction to cartography and GIS*. Wiley-Blackwell.

Crampton, J. W., & Krygier, J. (2006). An Introduction to Critical Cartography. *ACME: An International E-Journal for Critical Geographies*, *4*(1), 11–33.

Dora, V. D. (2009). Performative Atlases: Memory, Materiality, and (Co-)Authorship. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *44*(4), 240–255. https://doi.org/10.3138/carto.44.4.240

Edney, M. H. (2005). The Origins and Development of J.B. Harley's Cartographic Theories. *Cartographica*, *40*(1–2).

Edney, M. H. (2019). *Cartography: The Ideal and its History*. The University of Chicago Pres.

Goodchild, M. F. (2004). The Validity and Usefulness of Laws in Geographic Information Science and Geography. *Annals of the Association of American Geographers*, *94*(2), 300–303. https://doi.org/10.1111/j.1467-8306.2004.09402008.x

Harley, J. B. (1988). Maps, Knowledge and Power. In *The Iconography of Landscape: Essays on the Symbolic Represenation, Design and Use of Past Environment* (pp. 277–312). Cambridge University Press.

Harley, J. B. (1989). Deconstructing the map. *Cartographica*, *26*(2), 1–20.

Huggan, G. (2008). *Interdisciplinary Measures: Literature and the Future of Postcolonial Studies*. Liverpool University Press. https://doi.org/10.5949/UPO9781846313332

Ingold, T. (2021). *The perception of the environment: Essays on livelihood, dwelling and skill* (New edition). Routledge. https://doi.org/10.4324/9781003196662

Iosifescu Enescu, C. M., Montangero, J., & Hurni, L. (2015). Toward Dream Cartography: Mapping Dream Space and Content. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *50*(4), 224–237. https://doi.org/10.3138/cart.50.4.3137

Jacob, C. (1992). *L'empire des cartes: Appoche theorique de la cartographie a travers l'historie*. Albin Michel.

Jr, V. J. D. C. J. J. D. C., & Hanna, S. P. (2005). Beyond The 'Binaries': A Methodological Intervention for Interrogating Maps as Representational Practices. *ACME: An International Journal for Critical Geographies*, *4*(1), Article 1.

Kang, Y., Zhang, Q., & Roth, R. (2023). *The Ethics of AI-Generated Maps: A Study of DALLE 2 and Implications for Cartography* (arXiv:2304.10743). arXiv. http://arxiv.org/abs/2304.10743

Kitchin, R. (2008). The Practices of Mapping. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *43*(3), 211–215. https://doi.org/10.3138/carto.43.3.211

Kitchin, R., & Dodge, M. (2007). Rethinking maps. *Progress in Human Geography*, *31*(3), 331–344.

Kitchin, R., Gleeson, J., & Dodge, M. (2013). Unfolding mapping practices: A new epistemology for cartography: *Unfolding mapping practices*. *Transactions of the Institute of British Geographers*, *38*(3), 480–496. https://doi.org/10.1111/j.1475-5661.2012.00540.x

Kraak, M.-J., & Ormeling, F. (2020). *Cartography: Visualization of Geospatial Data* (4th ed.). CRC Press. https://doi.org/10.1201/9780429464195

Lucas Eades, G. (2015). *Maps and Memes: Redrawing Culture, Place, and Identity in Indigenous Communities*. McGill-Queen's University Press. https://doi.org/10.1515/9780773596771

Miller, H. J. (2004). Tobler's First Law and Spatial Analysis. *Annals of the Association of American Geographers*, *94*(2), 284–289. https://doi.org/10.1111/j.1467-8306.2004.09402005.x

Monmonier, M. (1991). *How to Lie with Maps*. University of Chicago Press.

Nelson, T. A., Goodchild, M. F., & Wright, D. J. (2022). Accelerating ethics, empathy, and equity in geographic information science. *Proceedings of the National Academy of Sciences*, *119*(19), e2119967119. https://doi.org/10.1073/pnas.2119967119

Peters, A. (1983). *The New Cartography*. Friendship Press.

Picker, M., Maleval, V., & Gabaude, F. (Eds.). (2013). *Die Zukunft der Kartographie: Neue und nicht so neue epistemologische Krisen*. Transcript.

Pickles, J. (2012). *A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World* (0 ed.). Routledge. https://doi.org/10.4324/9780203351437

Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimmerling, A. J., & Guptil, S. C. (1995). *Elements of cartography (sixth edition)*. Wiley.

Robinson, A. H., & Petchenik, B. B. (1976). *The Nature of Maps: Essays toward Understanding Maps and Mapping*. University of Chicago Press.

Wood, D., & Fels, J. (1992). *The power of maps*. The Guilford Press.

Wood, D., & Fels, J. (2008). The Natures of Maps: Cartographic Constructions of the Natural World. *Cartographica: The International Journal for Geographic Information and Geovisualization*, *43*(3), 189–202. https://doi.org/10.3138/carto.43.3.189