

Confronting the quantum: do maps visualize or create spatial reality and truth

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Abstract:

Quantum physics is redefining how other scientific disciplines must conceptualize fact, truth, space, and time. Research in physics and neuroscience continues to provide evidence that all four of the above do not exist in a classical sense and are entirely information- and/or perspective-based. Discoveries over the past 20 years in quantum information theory, neuroscience, and quantum physics on the epistemology of “what is real” (Fuchs, 2018) may have implications for the future direction of cartography and spatial data visualization.

Many data science and visualization disciplines, including cartography, emphasize the importance of collecting, analyzing, and presenting “factual” data in a “truthful” manner (Kent, 2017). Though promoting truthful visualizations is assuredly well meaning, many of our discipline’s axioms about mapping ethically may be based on false assumptions.

False Assumption 1: data reflects reality in a classical sense

First, data and information about the world may not exist in a classical state as we perceive it. In fact, it is now hypothesized that data (or what physicists call “information”) is a primordial form of mass (Vopson, 2019). Not only is information a core component of the physical world; it is malleable and impermanent. What we think we know about reality changes because reality is comprised of information, not because our information about the world changes. Reality literally changes when information is created, destroyed, and turned into energy (Vedral, 2018). In fact, physicists have hypothesized and are planning to test whether anthropomorphic data production itself is reshaping reality – i.e., in well-under 500 years over half the Earth’s mass may be comprised of human or AI-produced information (Vopson, 2020). If this is true, the geospatial data we collect and visualize is not merely mapping the Earth – it’s physically changing it (Vopson, 2020).

False Assumption 2: there is a single truth or reality

According to several neuroscientists, truth as most humans perceive it, may be nothing more than an agreed-upon cognitive hallucination (Hoffman, 2019a, 2019b; Lush et al., 2021; Prakash, 2020; Seth, 2021). If this is the case, the concept of “truth” itself is impermanent and completely malleable based on cognitive interpretations, distortions, and *which information* are accepted as true in any given conscious beings’ neural networks (Hoffman, 2019a). Parallel to Dawkins’ (2011) argument that religious beliefs are shared delusions among a mass of people, some neuroscientists are concluding there is a good chance majority perspectives about reality are simply majority-shared hallucinations (Seth, 2021). Beyond neuroscience, physicists have hypothesized and tested that reality may well be entirely two-dimensional (Vedral, 2018) and that truth is perspective based (e.g., time and space are manifestations of the observer).

False Assumption 3: science is the only way of interpreting reality

Most of us, as scientific-minded people, are blinded by our own powerful, cognitive bias. Due to previous successes, we often presume the scientific method is the best way to understand reality. It certainly can be useful, but not necessarily always or in all situations, much less to everyone. In fact, most “scientists” shun science in favor of competing ideologies about reality when socially or politically convenient (e.g., opposition to GMOs (Hefferon & Miller, 2020) and the belief that male/female biology is a social construction (Marinov, 2020)). Science is an ideology – a perspective shaping how people perceive reality – that is rarely followed faithfully even by its most dogmatic supporters.

Research shows science *may not* shed light on preexisting truth more than any other ideology, however, *because* there may not be any preexisting “truth” to shed light on (Hoffman, 2019a; Vedral, n.d.). In other words, what we scientists conclude is real may literally be created via the ideological processes of science, just as reality and truth to a religious practitioner are created via the ideology of religion. Arguably, both types of reality interpretation become legitimate

hallucinations if enough people subscribe to them (Dawkins, 2011; Seth, 2021). Regardless of one's ideological subscriptions – from science to nationalism – reality itself depends on information, perspective, and consciousness. Science doesn't document truth. It creates it for those believing in science.

Implications for cartography and mapmaking

In this paper, I propose scientific cartographers may want to stop and reconsider what they do when they produce maps. As demonstrated above, I argue we can't *represent* a singular truth or accurate reality in our maps. Spatial reality is built on quantum information, and there is no such thing as "true" or permanent information. (For example, physicists have demonstrated that what happens today can literally change the past, which in turn implies what is happening now may be occurring due to a future event.)

What does this mean for maps and cartography then? I argue it requires we reconceptualize, entirely, what we do when we conduct scientific cartography. I hypothesize that rather than representing reality...

Maps proselytize and create spatial realities.

I present my argument by combining research and theories from quantum information theory, quantum physics, and neuroscientific perspectives of consciousness. Though informed by previous readings in critical cartography and GIS, (Harley, 1989; Pickles, 1995; Taylor & Overton, 1991; Wood & Fels, 1986), my argument is not analogous to them. Power, control, and persuasion are irrelevant to this hypothesis. Instead, I propose every map impacts, however slightly, a conscious individual's assumptions about what is real, which in turn creates alternate, but still very legitimate, versions of truth. I hypothesize that maps as information distributors *construct new facts and new truths about reality* – regardless of the scientific voracity of information being presented.

Before continuing, I admit that this hypothesis is speculative and exploratory. Its underpinnings could well be disproven with further research in quantum theory and neuroscience. Nonetheless, I believe that contemporary knowledge and evidence in other sciences compels cartography, as a "scientific" discipline, to at least entertain this hypothesis.

A tertiary goal of mine is to advance our discipline's perspective about truth and reality past the twentieth century classical views to better align with contemporary scientific knowledge. As Arthur Robinson incorporated *classical information theory* to develop what is still considered one of the most holistic theories of academic cartography (Kent, 2018), it may make sense to incorporate aspects of *quantum information theory* today. We need to start considering the impact of quantum-based science on what it is we purport to be studying as a discipline.

After making the above arguments about maps constructing spatial realities for users, I conclude the paper by suggesting how exploring the quantum may help cartographic thought evolve in the following areas of research:

- 1) Map design
- 2) Ethics in cartography
- 3) Cartographic communication
- 4) Spatial cognition

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