

Nanocartography and its potentials regarding infectious disease research

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In this research note, I attempt to discuss potential meanings of the word nanocartography. This term can describe two completely different areas of research: It can be related, on the one hand, to the field of nanotechnology resulting in tiny maps (nanocartography 1). On the other hand, the word nanocartography can refer to investigations of infectious diseases based on the environmental paradigms of epidemiology and microbiology (nanocartography 2).

In each of the two above-mentioned cases, the scale of nanocartography is highly unusual for traditional geography and cartography since nanocartographic representations either scale down objects in dimensions of nanometre (μm ; 10^{-9}m), picometre (pm; 10^{-12}m) or even yoctometre (ym; 10^{-24}m) or scale up processes taking place in the “territory” of micro-organisms.

An impressive example of nanocartographic modeling (nanocartography 1) is the world map that has been elaborated by IBM-Research (cf. Knoll et al., 2010) – a three-dimensional representation written on a polymer, measuring only 22×11 micrometers. In this product, eight nanometers represent 1000 meters of altitude.

Nanocartographic investigations in terms of magnification (nanocartography 2) build up on the base of research on infectious diseases, where micro-organisms and their spatio-temporal patterns are being studied in their natural habitat: Eukaryotic organisms, for instance, play a critical role in maintaining natural pathogens; the infectious disease tularemia, whose causative agent (*Francisella tularensis*) survives and successfully grows in certain genus of amoebae (*Acanthamoeba castellanii*), can be mentioned as an example for this interconnection (Abd, 2003). Due to these spatial dimensions of infectious diseases, nanocartographic research may offer fundamentally new interpretations that allow to develop hypotheses of infection-properties and GIS-based explanations. Thereby, it supports the environmental paradigm of epidemiology, which aims at understanding the appearance of inflectional (pathogen) properties of micro-organisms in their habitats. In doing so, pathogenic properties of micro-organisms are interpreted not as constant (permanent) characteristics, but as a reaction on specific conditions (status) of an EpiGeoSystem. The essence of the infection-property idea consists in a revelation of this specific reaction of micro-organisms. This reaction serves as foundation of the appearance of infectious diseases at specimen of some biological species. Pathogenic properties of micro-organisms can be a reaction on strictly definite conditions of an EpiGeoSystem, vital for micro-organism. A pathogenic property can be a very specific and temporary status (Nikolaenko, 2010).

Against the background of the ideas outlined above, a geography of micro-organisms is a new and extremely promising direction of scientific development. Both understandings of nanocartography (i.e. technologically and geographically), closely related with such research, make nanocartography an interesting field of scientific activities in the nearest future.

References

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