Living on a sphere does not prevent to think and behave like living on a plain

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The Earth—The Earth is the third planet from the Sun, the fifth-largest of the eight planets constituting the so-called Solar System with the Sun, a G2 yellow dwarf classified by the Hertzsprung–Russell diagram (see Mestel, 1961). This is typically what we will discover if we want to know something about the Earth, where we live on. It refers to explicit world knowledge stemming from the physical sciences telling us a lot of the Earth from the perspective of a detached, non-cognitive system being of allocentric nature. In contrast, human beings do not perceive and process information referring to the Earth in this respect as they are bounded to the specificities of their cognitive apparatus and also because they implicitly integrate their experiences of life into any kind of their processing.

If it comes to the nature of the Earth, most people today do have the explicit knowledge that the Earth is spherical (e.g., documented by a survey conducted by Carbon, 2010). On the level of modern natural sciences it is neither fruitful nor insightful to debate this issue any more. If, however, people are asked indirectly what the nature of the Earth is, the outcome is quite different. So-called “implicit” measures are quite common in modern psychological science. They follow the aim to reveal automatic or implicit processes which are not penetrated by second views generated by rationalization or logical verification. One of the most important examples is the *Implicit Association Test* (IAT, Greenwald, McGhee, & Schwartz, 1998) which is nowadays commonly used, for instance, to assess more validly stereotyping or automatic associations on consumer products (multidimensional IAT, Gattol, Sääksjärvi & Carbon, 2011).

To get insights into the nature of mental representations of the Earth, Carbon (2010) decided to run another path. He followed the scientific tradition of researching cognitive topographies, often termed as *cognitive maps* (Tolman, 1948), on the basis of distance estimations (cognitive distances, Montello, 1991). If we take cognitive distances together, we can re-calculate a cognitive map by a mathematical procedure called multidimensional scaling (MDS, Kruskal & Wish, 1978). If we constrain this scaling to fit on a spheroid, we can firstly measure the fit between the estimations and a curved shape, and secondly, we can even re-calculate the radius of the best fitting spheroid we could project the estimated distances on.

By doing so, Carbon (2010) found out that his participants split up into two general groups with different mental models of the Earth. One group’s cognitive distances fitted very well with a spheroid with a radius highly compatible with the Earth’s (r=5860 km vs. 6371 km). The other group’s estimations fitted much better with a simple mental model of a plane Earth. Both groups, interestingly, did *not* differ in performance of geographical knowledge of or explicit attitudes to the Earth. They neither differed in terms of travelling experience. This result is highly compatible with previous studies on the so-called *mental wall* (Carbon & Leder, 2005), a phenomenon that distances are over-estimated if one location of the line segment lies in an area people have negative attitudes to. This mental wall phenomenon emerged independently of travelling experience within and explicit knowledge on the geography of Germany (Carbon, 2007; Carbon & Leder, 2005).

What could be the cause of the differences between both groups? One item participants always were asked for at the end of the experiment potentially explains the source of the effect. Although people who had a spheroid model of the Earth in mind had not travelled more or further or had better explicit knowledge on physical or geographical facts of the Earth, they had one specific additional experience: They had personally experienced the Earth as a sphere, at least once in their life. When these people were asked “have you ever personally experienced the Earth as a sphere?”, they reported at least one event in their life doing so. For instance, “Yes, once. When I looked at the sea, I saw that the horizon was curved” (Carbon, 2010, p.132). The other group’s members lacked of such experiences. Often they were just confused by this question, e.g., “Of course, not: I am not an astronaut, so it is impossible to experience the sphericity at all” (p.132), or they just answered the question with “no” or “never”.

The simulation of cognitive concepts, exemplary shown in Carbon (2010) on the mental representation of the Earth, gives additional insights into the dissociation of implicit and explicit processing. Sometimes, as in the presented example, both types of processing do not have much in common (see Figure 1).

Figure 1

Figure 1: Abstracted view on a flat vs. spherical perspective on the world, foto taken by CCC capturing an art installation at the Milan Civico Museo d'Arte Contemporanea (CIMAC), Milan, Italy with visitors interacting with both characteristics of the art work.

Personal experiences shape our mental representations and thus our ongoing processing. Therefore, it is of high relevance how we teach and train humans. Though explicit knowledge seems important for founding a knowledge base, it is, though, not sufficient to evidently explain implicit processes and trigger adequate behavior. It is like rational vs. romantic love: we might cold-bloodedly analyze what the most suitable partner would be for us but might be actually attracted and fascinated by a total different type. Whom we will follow is, in the end, an indication on which cognitive level we are trusting most in the given situation.

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