Which Direction Now? Just Ask the North-Facing Map in Your Head

January 17, 2012

You're driving from work to pick up your kids at school. The drive is familiar; you've done it almost every day for years. But how do you know in which direction the school is from your home? Landmarks? The sun? Animal instinct? Now, a new study published in *Psychological Science*, a journal published by the Association for Psychological Science, yields an alternative answer that surprised even its authors, Julia Frankenstein, Betty J. Mohler, Heinrich H. Bülthoff, and Tobias Meilinger, who collaborated at the Max Planck Institute for Biological Cybernetics, in Tübingen, Germany. "Our memory for our city of residence shows a map-like character," says Meilinger, a research scientist at the institute. "And that map seems to be oriented towards the north." Frankenstein adds: "At least in western societies, where maps are north-oriented, and people usually use maps and are able to read them, they can -and will- rely on their memory of city maps for certain spatial tasks."

Some theories of how we locate ourselves in place and space posit that each of us creates a personal "global reference frame," constructed of environmental factors (a city's grid, a cathedral visible everywhere in town) and individual experience, such as where we live in town. Others say we orient ourselves depending on where we are—parallel to the street we're on. According to either of these theories, the further away an invisible location is, the longer it takes us to point in its direction and the more likely we are to make a mistake.

The Tübingen study does not support these theories. In it, 26 residents of Tübingen (who had lived in Tübingen for at least two years) were put into a virtual-reality headset and seated in a chair that didn't allow them to swivel. Participants found themselves in the virtual three-dimensional photorealistic model of their hometown, at locations familiar to them, surrounded by fog masking all but the near distance. Then they had to point to an invisible location—say, the main gate of the university or the fire station. The scenes changed, and so did the participant's spatial orientation. After 60 three-location trials, participants were asked to draw a map of the town including all the locations they'd pointed to.

The results: Although participants drew differently oriented maps, everyone performed most accurately when facing north and got worse the further they deviated from north. The only explanation the researchers could figure was that they'd all seen, and internalized, a map of Tübingen at some point, and Western maps are all oriented the same way—north on top.

Meilinger conjectures that we rely on this mental map out of cognitive laziness. "If you acquire your knowledge from navigation only, the task [of pointing to an invisible target] requires you to coordinate a lot of things into the same reference frame"— walked trajectories, experienced views, and so on. "A map gives all that information within one frame." Frankenstein refines: "The memory of a map does not need to be updated by further experience, as it depicts all spatial relations undistorted within one reference frame. It therefore provides a very reliable source of spatial information." She emphasizes, that "remembering a map is not the only strategy to solve spatial tasks. We do not necessarily get lost in

environments where we have never seen a map of- e.g., buildings or our flat." And while participants used the map for pointing, the replication of the map (i.e., drawing a map) did not result necessarily in north-oriented maps. "Our brain seems to choose the easiest and best strategy to solve spatial tasks, but relying on a mental city-map is one of them," concludes Frankenstein.

Meilinger says it's possible that the increasing reliance on GPS devices will eventually erase these memorized maps. "If somebody doesn't care to learn the environment, that's totally fine with me," he comments. "But they shouldn't complain if their mobile is not working and they are completely lost." How to avoid this? "Look at maps before you start your trip, keep them at hand, but navigate yourself, and try to rely on your memory- it will work better than you expect! Give your brain the chance to train its spatial abilities – use them or lose them," adds Frankenstein.