John J. Rieser, Ph.D.

Professor of Psychology

Vanderbilt University Nashville, Tennessee

Born in 1949 in Pittsburgh, Pennsylvania

Studied Social Relations and Child Psychology at Harvard University and at the University of Minnesota

FOCUS

PROJECT

The Development of Spatial Cognition: Organization of Perception and Action During Learning and Development

A main goal is to complete a draft of a book about the organization of perception and action during learning and development. It will connect work on locomotion and navigation with work on imagery and perceptual-motor coordination for other actions, including using tools, hurling objects, and speaking. The core topic of the book is to understand how actions are scaled in environmental terms. How is it, we ask, that people know how to throw a ball to reach a given target? How is it, we ask, that people can proactively locomote and navigate even without continuous feedback? How is it, we ask, that people know how much vocal intensity is needed to communicate with a person who is listening at a distance? The amount of action in each case depends on the actor's distance from the goal, and in addition people learn to fine tune their actions to fit the details of their circumstances. A main thesis of the volume is that this learning is organized functionally, so that when people learn to adjust a particular form of action the learning transfers to all actions that serve the same functional goal. The volume should synthesize work about learning and development of humans and animals and consider ways the nervous system might be designed to accomplish a functional organization.

Recommended Reading

Rieser, John J. "Access to knowledge of spatial structure from novel points of observation." Journal of Experimental Psychology: Human Learning, Memory and Cognition 15 (1989): 1157-1165.

Rieser, John J., H. L. Pick, D. A. Ashmead, and A. E. Garing. "The calibration of human locomotion and models of perceptual-motor organization." Journal of Experimental Psychology: Human Perception and Performance 21 (1995): 480-497.

Rieser, John J. and H. L. Pick. "The perception and representation of human locomotion." In Common mechanisms in perception and action: Attention and performance XIX, edited by Wolfgang Prinz and Bernhard Hommel, 177-194. Oxford: Oxford University Press, 2002.

COLLOQUIUM, 13.01.2004

Dynamic Spatial Orientation: Problem, Theory, and Links to Broader Issues

The aim of this talk is to introduce the topic of human spatial orientation and use some of my research about spatial orientation when walking without vision to illustrate some of the methods that cognitive scientists use to

try to understand human cognition.

I use the term "spatial orientation" here to refer to ones location and facing direction relative to the surrounding environment. Spatial orientation is dynamic whenever one locomotes, whether the locomotion is in the form of walking, running, biking, and so forth -- that is, ones distances and directions relative to things in the surrounding environment change in conjunction with the translations and rotations in perspective that occur while locomoting. When walking with vision, one can see the changing self-to-object distances and directions. I will not talk much about visual perception and the biological computations that account for seeing this. Instead, I will focus on spatial orientation while walking without vision. In this case, one needs to keep up to date on how ones spatial orientation changes relative to objects in the remembered surroundings. This involves "memory" [hence, I am part of the group that is studying spatial representation; "spatial representation" is really another term for remembering the spatial properties of things]. Adults and even very young children do this relatively well. If you have the time, please try to demonstrate this for yourself:

If you have a chance, it might be useful for you to try this and demonstrate it to yourself in the following way. Stand in an open room and study the locations of a few objects around you in the room. Then close your eyes, review the locations of the objects in your mind; keep your eyes closed and point at them with your hand. Then take a few steps forward and turn around, and then point again toward the locations of the objects. While you do this, it is likely that you will experience "dynamic spatial orientation"; that is, it is likely that you will be aware of how your distances and facing directions relative to the objects in your remembered surroundings change. In some ways the experience of walking without vision is like the experience of walking with vision - in both situations, people have awareness of how their distances and directions change relative to objects in their surroundings. For me, a fundamental problem is to understand how your memory-based representation of the locations of the objects in your surrounding environment is integrated with the information from your motoric actions of walking with your eyes closed.

Now, if you have the time and patience, attempt the same thing but follow a different set of instructions while you attempt it. In this case stand in an open room and study the locations of a few objects around you in the room [it can be the same room]. Now, do not actually walk to a new location, but instead, quickly imagine that you walked a few feet forward and turned around. And now once again, try to point at the objects in your remembered surroundings as if you have actually moved to the new point of observation. Typically [if my written instructions have been clear!] people find it relatively difficult to imagine the change in perspective when following these instructions.

Herbert Pick and I devised a hypothesis to explain how it might be the case that motor information from walking is integrated with memory information about the locations of objects in the remembered surrounding environment. One of my goals for this colloquium is to explain the hypothesis and then show how we used experimental methods to test the hypothesis. A second goal is to explain a related finding: The related finding is that people who are born without vision tend get lost often and to have relatively poor skill at maintaining their spatial orientation while they walk "without vision". This observation is puzzling in some ways, since people who are born without vision have a lot of practice at walking without vision and a lot of motivation to maintain their spatial orientation while they walk. But the observation is not puzzling when considered in the context of our theory.

Here are some of the issues I hope to discuss [or issues that I hope you will discuss!] during my talk:

I am "use oriented" in terms of my approach to doing research on human cognition. By "use oriented" I mean that on the one hand I conduct research aimed at understanding how the mind works. But in addition, I also keep in mind several ways that this knowledge might be "put to use". There really are few things that are so useful as a good theory, and keeping the possible uses of my work in mind helps keep me grounded. In the case of this research about spatial orientation, one of the "uses" that I currently keep in mind is what cognitive strategies might be help the spatial orientation skills of people who are blind; and another of the uses is to understand why existing "virtual reality" devices seem so impoverished.

Cognition is "embodied", that is, it sensibly reflects the constraints of ones physical body and of ones physical surroundings; I wish that Janellen Huttenlocher were here to talk about this.

Experience plays an important role in development; in the case of this research, visual experience facilitates development of the skill at maintaining dynamic spatial orientation while walking without vision, but it is not necessary for development. What are some of the ways that experience shapes the development of basic skills?

Given that humans are so "smart", why is it that some non-human species are so skillful? Does this reflect that the animals are "smart" in a general way? And/or alternatively, does it reflect that some cognitive skills are highly modularized? This, I think, is a question that you should ask Ken Cheng, Sara Shettleworth, David Poeppel, Janellen and Peter Huttenlocher (if only they were here), Herb and Anne Pick (they are here), and Jim Hunt!

This research shows that human cognitive spatial representations are dynamic, but that the dynamics of the

representations are facilitated by locomotor actions. What commonalities might there be to connect the dynamic spatial representations of the types that I study to the human cognitive representations of the types that geographers like Jacques Levy and art historians/philosophers like Horst Bredekamp study? Do they think about spatial representations as things that are "dynamic"? Should they?

What are some of the similarities and differences in the simple hypothetico-deductive experimental methods that I have described and the methods used by those of you in history, philosophy, and literature here at WIKO?

PUBLICATIONS FROM THE FELLOW LIBRARY

Rieser, John J. (2007)

Bayesian integration of spatial information

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1047092409