Exploring Psychological Boundaries: The human understanding of space and place.

By Colin Ellard

I chuckled when I was asked to write a piece for the Ontario Professional Surveyor Magazine related to my recent book **Where Am I? Why we can find our way to the moon but get lost at the mall** (HarperCollins, 2009), not because it was a funny idea but because it shook loose for me some very early memories of my father. You see, although I don't often think of this when I remember him, he was a surveyor of sorts—a quantity surveyor—and so spent much of his fifty-year-long career preoccupied with questions of length, size, shape and cost. I had never made the connection between his life's work and my own obsession with the shapes of things until I was asked to write this article.

One of my favourite memories of my father is of watching him at work, hunched over a massive table full of blueprints with a Minerva measuring wheel in his hand. This precious tool, like the wheels, perambulators, and hodometers that have been used by land surveyors for at least 400 years, was a clever but exceedingly simple piece of technology that could be used to measure lengths and dimensions with a degree of accuracy to which the human perceptual gear might aspire, but never reach. Now that I'm thinking about the perambulator, I'm also reminded of Roald Amundsen, the intrepid Antarctic explorer, who used a similar device on his sleds to keep track of his progress on his heroic drive to the Pole. One of the reasons for Amundsen's success in his quest was an unflinchingly realistic appraisal of the scope and limits of the human understanding of space. Unlike many of the animals that I've studied in both the field and in the laboratory, we human beings are capable of some surprising lapses in our understanding of space.

I've spent much of my research career studying the habits of movement and the spatial understanding of animals of the field, forest and air, and along the way I've met some fascinating creatures. The desert ant can wander for distances that, scaled for body size, would exceed the length of a human marathon race. At the end of such a journey, it can turn unerringly and run in a straight line for home, even knowing how far it has to run before it reaches its destination. The ant has an internal odometer whose mechanics we are only beginning to understand. A homing pigeon can be carried in a lightproof box for distances of hundreds of kilometers, and on release from the box it takes to the air and heads off in the direction of the home loft. The pigeon appears to use a marvelous toolkit of navigational resources, including magnetic field detection, mapping of landmarks,

This Minerva measuring wheel, the jewel of my inheritance from my father, was used by him to measure the exact lengths of lines on blueprints and survey maps. It is a close relative of instruments used by surveyors for hundreds of years to measure the dimensions of the Earth.

and possibly even the sense of smell. Bees have been studied intensively because of their remarkable abilities to generate accurate maps of their spatial surrounds and even to communicate some facts of these maps to their hivemates—all with a brain the size of the head of a pin. Even the field mouse, hardly a member of the legendary class of long-distance animal navigators, can triangulate accurately to discover a hidden source of forage by taking fixes on constellations of visible landmarks.

In recent years, I've turned more of my attention to the abilities of human beings to solve problems of space. Though

there is some remarkable variability, the average urban-dwelling human being spends most of their existence in something of a fog of mislocation. Although we usually know how to find our way to where we want to be, the routes we choose can carry us through a series of missteps, backtracks and strange, idiosyncratic habits even when we are traveling through the familiar spaces of our own neighbourhoods. I think that there are some good reasons for this that can, in some ways, be traced back to our biology. Our brains are wired to carry out some astonishing spatial leaps from the 'here and now' to the 'there and then'. We can easily imagine gigantic gulps of space from novel viewpoints as we mentally soar from one location to another, and we can put together very creative mosaics of locations and their connections with seeming ease. The problem is that these invented spaces often only have a pale resemblance to the real thing. As we imagine the path that we take from office to home, for instance, winding routes tend to be straightened and oblique angles move towards the Cartesian grid. There are good reasons for these tendencies, many of them having to do with our penchant for understanding and remembering information about places and things that are beyond our immediate visual grasp. Unlike a bear lumbering through thick woods, captured completely by an intimate awareness of its immediate surroundings, our consciousness tends to flit from place to place almost instantaneously. This remarkable talent is a part of what is responsible for our incredible mental flexibility, but it can cause errors to creep into our understanding of spaces.

There's much more to interest a psychologist about the human engagement with space than simple slips of wayfinding and position, though. Our entire built environment, because it involves an explicit set of constructions of space, can influence how we behave, where we go, and how we feel when we get there. Many of these influences are set up by the locations of boundaries—the stock-in-trade of the land surveyor. The positions of opaque walls in built space determine what an observer can see from any particular position. This seemingly trivial truth conditions deeply how we understand a space, how it attracts or repels us, causes us to move through it or to stop and linger. Good architects and planners understand some of these principles by intuition. In my book, I show how psychological principles, some of them probably written into our DNA to ensure that our ancient forebears kept themselves out of harm's way and close to abundance, can explain the subtle and profound influences of the shapes of spaces on our behaviour.

Now that I'm out on the road promoting my book, I'm getting lots of questions from people about variability in our experiences of spaces. How do men and women differ? What is the role of expertise? Does it make a difference whether you were raised in the city or in a rural setting? What role does culture play? Believe it or not, many of these questions don't have good answers yet, in part because the methodological problems involved in doing the required research are formidable. In the Research Laboratory for Immersive Virtual Environments at the University of Waterloo, we seek answers to these questions using the tools of virtual reality. Participants in our studies can don a headset and be transported to a space of our choosing—anything from a grand architectural monument to a thick tropical jungle. It's the best way that we can think of to try to tackle interesting questions about how our engagement with spaces influences our behaviour. I discuss some of the laboratory research we're doing in my book, and you can find some links at my website: **www.colinellard.com.** We spend a lot of time thinking about how individuals with particular expertise in problems of space and place might differ from the less schooled individuals who typically participate in our studies. So far, our expert way finders have mostly been architects, but it occurs to me that people who make a living measuring and exploring boundaries might also have some particularly precious experience and insight to lend to our venture. I'd be thrilled if you read my book, but I'd be even happier if you also got in touch with me to share your experiences. You can find my co-ordinates at my website (though they're not geometric ones). I hope to hear from you.

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