



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

Rotatings maps and readers: praxiological aspects of alignment and orientation

Citation for published version:

Laurier, E & Brown, B 2008, 'Rotatings maps and readers: praxiological aspects of alignment and orientation', *Transactions of the Institute of British Geographers*, vol. 33, no. 2, pp. 201-216.
<https://doi.org/10.1111/j.1475-5661.2008.00300.x>

Digital Object Identifier (DOI):

[10.1111/j.1475-5661.2008.00300.x](https://doi.org/10.1111/j.1475-5661.2008.00300.x)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Early version, also known as pre-print

Published In:

Transactions of the Institute of British Geographers

Publisher Rights Statement:

Published version is available copyright of Wiley-Blackwell (2008) available at www.interscience.wiley.com

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



This is an author original draft or 'pre-print' version. The final version of this article was published in Transactions of the Institute of British Geographers by Wiley-Blackwell (2008).

Cite As: Laurier, E & Brown, B 2008, 'Rotatings maps and readers: praxiological aspects of alignment and orientation' *Transactions of the Institute of British Geographers*, vol 33, no. 2, pp. 201-216. DOI: 10.1111/j.1475-5661.2008.00300.x

Rotating maps and users: praxiological aspects of alignment and orientation

Authors: Eric Laurier and Barry Brown

Address for correspondence:

Institute of Geography and the Lived Environment,
School of Geosciences,
University of Edinburgh,
Edinburgh
Midlothian
UK
EH8 9XP

eric.laurier@ed.ac.uk

Rotating maps and users: praxiological aspects of alignment and orientation

Eric Laurier

Institute of Geography, University of Edinburgh, Edinburgh

Barry Brown

Department of Computing Science, University of Glasgow, 17 Lilybank Gardens

Abstract

A longstanding topic in our notions of what geographic knowledge could be is the mental map, or, in its most recent form, mental spatial representations. In this paper we draw upon ethnomethodological critiques of cognition, and mind more generally, to re-specify navigation, orientation and alignment in terms of human practices of navigating, orienting and aligning in particular settings. Our ambition in the paper is less to dismantle notions of cognition still present in studies of map use; instead we offer the beginnings of a way of analyzing ordinary practices of wayfinding that treats matters of reasoning as publicly available in gestures and conversation rather than hidden indirectly accessible in inner processes of mental map use. To do so we describe what occurs during two video fragments involving consultation of maps in commonplace situations. The first is a group of tourists on foot trying to find an old building in Edinburgh and the second daytrippers traveling out for a day in the countryside locating some recommended places to visit in a road atlas.

Introduction

While maps are a powerful resource for the orienteer, agronomist and tourist alike, their examination *in use in the midst of everyday practices* has been a surprisingly neglected part of geographical investigations. Indeed, much more attention has been given to mental maps (Tolman 1948; Sanders and Porter 1974) schemata (Tuan 1975; Sholl 1987), cognitive maps (LLoyd 1989; Golledge 2002), cognitive representations of space or route (Cornell, Sorenson, and Mio 2003) and “map like-models” (Blaut et al. 2003). These strange species of map, schemata or model allegedly abide, in some form or other, in the minds of all navigators. In this paper, following on from our earlier work (Brown and Laurier 2003), we attempt to free maps from their mental prison, and return them to places wherein spatial reasoning is exercised intelligently or otherwise. Maps are seldom put to use for solely navigational purposes, rather they are made sense of by way of the particularities of the activities and persons that constitute journeys. In what follows we will present an alternate to classic cognitive studies of orientation & alignment (and misalignment & disorientation) with maps. Our focus will be on problem-solving with maps as a publicly available, socially and locally constituted activity, and how such an approach helps us avoid the traps we are lead into by the concept of mental maps and cognitive representations of space (see also Ingold 2000).

In what follows we will tease out problems of how a group bring their movements, the maps they are carrying and themselves as a navigational unit into alignment. In doing so we want to provide an alternate to the replicated and familiar result of experimental work that maps which are misaligned with respect to their reader’s forward/rearward and left/right disrupt orientation (Levine 1982; Shepard and Hurwitz 1984). As most of us will know from experience, finding your way when a map is upside down in respect to its conventional alignment is quite a challenge. It can be done but it slows you down considerably and you tend to make many more mistakes. In the psychological literature on spatial knowledge and learning these delays and errors are referred to as ‘alignment effects’. According to the theory if we attempt to use a map which is misaligned with our environment, we need to mentally rotate the map ‘in our heads’ to be able to use the map. Alignment effects are thus the extra time and effort required to rotate mental representation of physical maps. (Shepard & Hurvitz 1984)(Finke 1990). (LLoyd 1997; Golledge 1999; LLoyd 1989; Shepard and Metzler 1971). Consequently these mental rotations add to the already considerable burden of navigating through unfamiliar territories (LLoyd 1997; Golledge 1999; LLoyd 1989; Shepard and Metzler 1971, particularly if we happen to be simultaneously trying to make sense of the surrounding landscape. This is not just an issue which concerns the immediately visible surroundings either: experiments involving abstract diagrams show that individuals find it easier to identify spatial relationships when presented with them from consistent orientations (Presson and Hazelrigg 1984). Alignment effects have been demonstrated with regard navigational structures in environments, such as the street grids of cities or layout of corridors (Levine 1982; Nori and Giusberti 2002; Werner and Schindler 2004; Werner 2004).

In agreement with ethnomethodological (Coulter 1983; Watson 1998; Sharrock and Coulter 1998) and Wittgensteinian (Bennett and Hacker 2003; Hacker 1990) critiques of the relationships between seeing, mental images and imagination we find this depiction of an inner rotating map (or representation) which is distortedly congruent with the outer world misleading. While we can use our imagination to picture details of a map this does not mean there is a mental map or cognitive representation that we can rotate inside our mind. It is not a question of seeing an inner map with our mind’s eye, where if it is out of focus we could hold it a little closer, or that we could apply little more light because it is in the dark or that an internal hand could rotate the image for us. While we use eyes to look at the outer world, there are no sense organs that could be used to look at images conjured up by our imagination. There is no misalignment between mental maps and the space we

are in. There are on the other hand extra difficulties in transposing perspectives with depth into recollectable two dimensional maps or equally between what we are making sense of with a map in hand and what is in front of us as embodied persons with 'left' and 'right', 'ahead' and 'behind' and so on (Schutz 1973a; Merleau-Ponty 1962).

To give an example in order to be a little more grounded in what is involved in orienting ourselves with a map: you are standing in New York, the map is held in our hands or placed on a surface so that 'up' on the map is aligned with the forward of our body and we turn around until 'up' on the map is where in the centre of the landscape we are looking into (for a nuanced account of depth: Wylie in press). From this alignment a gestalt of spatial embodied properties emerge: backwards, left, right, close, far away, behind, in front of etc. We need only continue the movement of our hands and eye from the map, tracing up and into the world we can see. If "5th Avenue" is on the right hand side of the map, then so it will be aligned to our body. Never mind that we cannot make out 5th Avenue because buildings are in the way, we can point and look in its direction from where we are now. The search for how to get to 5th Avenue will start by working out how we find our way there from details supplied by the map, identifying a route, usually in parts, on the map and then looking for those parts of it in the landscape around us. In the city with its topology of streets, we typically build a sequence of what left and right turns will need to be done to bring us to our destination. With a misaligned map when we look up from the map then there is no longer simple correspondence between map and objects rather there will be numerous translations and transformations required. What is left on the map is straight ahead of us and what is right on the map is behind us, second on the right on the map means two street behind us, the sequences of left, right, ahead and backwards are harder to produce without error by mirroring or reversing etc.

Common cultural conventions such as North being up allow for practised skills in navigating with maps, consequently if we have to do things unconventionally, such as consulting a map constantly kept at an 85 degree angle, that can slow us down, at least initially. Soon enough we get used to the new convention and start to speed up again. School teachers learn quickly to read upside down and mechanical typesetters read mirrored letters as fast as conventional layout. Cognitive research on the time it takes experimental subjects to read letters, variously rotated, found a correlation between degree of rotation and time taken to work out by the subject what letter they are seeing. Famously the argument is that the mind has to do a mental rotation (Shepard and Metzler 1971). By contrast we would say that as the distortion of the letters increases, the letter is becoming less easily recognisable and it takes 'longer to work out how a certain figure will appear when rotated otherwise' p197 (Bennett and Hacker 2003). If you mess around with the conventions then it will take time to re-acquire the skills at using the new ones. In fieldwork with staff at a tourist information centre (Brown In press) they found it difficult to read maps *the right way* up, since they were so used to helping staff out over a desk, with the map correctly oriented for the tourist. Are we to believe that their mental orientation has been transformed? Or simply that they have learnt a different way of working with maps?

In this paper, we look afresh at navigation with maps, by examining two ordinary situations involving navigating, map reading and alignment. Our goal is to reexamine what alignment might be, and to put it into its context of real-world map use. We develop a distinct description of orientation and wayfinding in terms of shared, socially organised practical reasoning. Alignment, situated ecologically in the rich environments we navigate through is a process by which we think through - with 'hands and eyes' in Latour's (1986) phrase - how we will get to where we want to go. As often as not, in doing so we are coming to agreement on what that 'where' is at the same time. A number of phenomena need to be brought into alignment on any occasion when we navigate with maps - descriptions of the thing we are looking for, other maps, the help of others, what we can see around us, and so on, shifts and changes as one builds on another (similarly on radar, see Bailey, Housley, and Belcher 2006). Alignment, as *accomplishment* rather than *effect* or *bias*, is not only about bringing

things together around maps and working out what to do, it is about in what sequence does each aligning, orienting and way finding progress or, equally, regress (since we also get lost in the world). Experiments on aligning maps, in order to maintain ‘all other things being equal’, use pre-organised ‘correct solutions’ to test the ability of a range of persons looking at the maps. While this allows a standardised replicable test situation it drastically reduces the sometimes hesitant, sometimes confident steps that we ordinarily have to take in dealing with ‘just this’ setting, with ‘just this’ map and ‘just these’ other persons just now to help, hinder, confuse and clarify with us.

Reading maps in the wild

By examining map reading in any specific instance, any singular course of its conduct we come upon a host of ‘curious properties’ (Garfinkel 2002) missed by studies which seek to produce general (or even ‘universal’ (Blaut et al. 2003)) mapping as spatio-cognitive process or ability. In singular instances the problems we find of specific map users are ‘just these’ and rather than orders elsewhere supplying what the situation lacks, each problem’s generality, reasonableness, orderliness, classification, exceptionality, gendered nature, affect and more are the *in vivo* accomplishments of the joint courses of conduct by unexceptional navigators, then and there. What we are suggesting is that there is a promising avenue away from mental explanations of spatial cognition to return to how maps are made sense of in and by an array of practices in places and paths where we dwell (Ingold 2000; Lorimer and Lund in press). In relation to alignment and orientation this suggests that we look for unexceptional and fairly typical occasions where we turn maps around or map readers turning themselves around and examine them as spatial reasoning in *concretia*. Goodwin’s (2000; 2003b; 2003a) work on archaeologists making and consulting diagrams and charts during field digs has been exemplary in this respect, building on Woolgar & Latour’s (1979) and Lynch’s (1990) work on how scientific diagrams, sketches and images are attended to, and arranged with respect to one another and accompanying text.

What Goodwin adds to the research of Latour, Lynch & Woolgar is a focus on “how participants treat the visual displays of each other’s bodies as consequential, and how this is relevant to the moment-by-moment production of talk” 174 (Goodwin 2000). Alongside foregrounding the complex ecologies of settings, in terms of furniture, tools, images, maps, charts and other instruments, Goodwin highlights four broad ranges of methodological problems that participants must ongoingly solve in pursuing courses of action together. Firstly participants need to select particular details of visual material from the whole assortment of images, environment and texts available. This selection is done so that what is relevant at one moment in time is confirmed, discounted, built upon, re-inspected etc. at the next. Second, these materials must be managed and brought to attention at the right moment. In the unfolding of an event there are multiple courses of action at work, with potentially divergent speeds, projectable endings, rhythms and so on. Different things are done at the same time - such as walking up to read a signpost while another person scrutinizes a guidebook. Participants are sometimes choreographing and sometimes mis-timing, having to do certain things first, others things last, able to slot an action inbetween or in parallel with another. Third, the objects involved inescapably mediate what happens, having been assembled elsewhere, embodying instructions, potential courses of actions and so forth. Though Goodwin is careful to remind us that objects are not determinate but rather come to life in particular ways according to how they are involved in fields of practice. Of relevance here, he brings out the details of how a trowel become a pointer that connects a feature recently drawn on a map with a mark in the soil at an archeological dig. A final point made by Goodwin is that ‘settings’ are often assembled in order to support and structure the visual aspects of activities that occur within them. A panopticon is an extreme example, a more relevant example here is the location of street signs, advertising and information boards in relation to where tourists are looking toward and away from (see also (Mondada forthcoming)). The environment is not passively laid out, it is pre-constructed with an eye to the navigation of its likely inhabitants (be they tourists, shoppers, bank customers, students in libraries (Crabtree 2000;

Carlin 2003)), although as we know that pre-construction is, as often, unsuccessful. In finding the way it is not only that navigational problem beset tourists and the like, the potentially lost, and usually found, have to find and make apprehensible the problem they are up against.

Empirical materials

Goodwin's work has led us toward social settings which implicate maps in a less nakedly instrumental manner than that found in experiments (Montello 2003). Field studies of map use are still quite rare - as Malinowski and Gillespie comment "although spatial ability research conducted in small-scale or laboratory settings has flourished, fewer studies have been done in real-world, large scale settings" (Malinowski and Gillespie 2001). Cornell and Heth go further and argue that there is an important need for studies of "humans navigating real world routes" since little work has looked at orientation which is not part of experimental tasks (Cornell and Heth 2000). Following the lead of psychologists such as Hutchins (1993; 1995), and more specifically Garfinkel's (2002) ethnomethodological program, we will look at alignment as 'cognition in the wild' using video fragments we have collected of map reading in varied situations. By way of contrast with controlled studies we will describe how maps are 'naturally' consulted and 'naturally' followed during the course of a journey (Heath 1997; Watson 1999). In particular, we will focus on how the movement of perspective (re)arranges scenic features into analysable spatial relations, how orientation involves multiple shifts back and forth between map and features of the scene and how the multiple perspectives of a group are brought to bear on the problem of where we are and where we are going. The two video fragments we will examine are of a group of tourists 'found' on a street corner lost, and a group of day-trippers organising their day out as they drive into the Scottish highlands. In the clips we will describe, in some detail, the mundane everyday resources which are used to *achieve* orientation around maps.

The materials we use here may seem unusual for those who are familiar with the existing literature on cognition and wayfinding. To provide access to the details of map work we will use two video recordings of episodes of map consultation. These episodes happened during ethnographic fieldwork we were conducting on tourism (Brown In press). While we would not argue that having a camcorder trained on a setting does not change elements of what happens in such a setting we would suggest there is less self-consciousness than one might expect in the map use we recorded. In the daytrippers clip we had been filming the subjects in advance to get them used to the presence of the camcorder and for the tourists the presence of the camcorder was as unremarkable as could be, given that the street they were on was teeming with other cameras and camcorders. Moreover the filming was done in a low key way, which also explains some of the poor quality of the framing since only one mini-camcorder was used and the authors would get involved in other tasks while holding it.

There is a further spontaneity to the map use since maps and wayfinding were not understood by the subjects to be the focus of our study, nor was it at the time we were filming. As we noted above our project was on tourism. Indeed the fact that we have examined map use without it being part of the *a priori* aims of our projects gives the material a certain strength. Conversation analysis tries where possible to listen to conversations, at least at first, in an 'unmotivated manner' (Have 1998; Sacks 1972) in order to hear what is there, rather than to begin by, say, searching for a research project's object and then counting instances of items which correspond to that object (e.g. numbers of times X points at the map). To begin to hear and see what was in our data we met for 'data sessions' where we viewed and reviewed these short strips of video up to twenty times or more. Notes were made throughout the sessions which were tidied up and elaborated upon for this article. Tran-

scripts were rendered of the talk and actions occurring during the clips using CA conventions (Jefferson 1984) and they are listed in the appendix.

Aligning the guidebook and the junction on foot

The first episode that we will examine takes place around a group of four tourists looking for a particular historic house with a map contained in a guidebook and a page of text describing different attractions. They formulate the old house they are looking for in a number of ways: locating it on a map in the guidebook, analysing the surrounding scene for features which will orient their map to just where they are and where they would like to go. “Where they are” is not a static viewpoint however (as many psychology experiments have treated perspective) the group’s analysis of ‘where are we?’ is an active ‘feeling toward’ and ‘grasping’ of the space. Glances lightly touch upon certain buildings, signs and roads, looks rapidly rove around the restricted horizon, extended stares hold on to and acquire a surer sense of other buildings, signs and roads. As we shall show below, not only does each member of the tourist party turn around to try out different lines of sight, the group itself utilises its different perspectives to see if any of its members can find from their perspective, items that will lead them to their objective. We do not need to search for *inner* mental map readers swivelling on their cognitive heels with misaligned representations (and presumably mental guidebooks) hidden inside our tourist’s minds - the map readers are right in front of us, trying to orientate themselves, their map with and the junction where they have not quite found themselves.

Bringing their map into alignment with the surrounding cityscape is not as simple as turning a map - the tourists have the map ‘the right way up’. Their problem will turn out to be more subtle: moving from a description, guidebook and map to an identified object, or even, just finding one thing’s direction in their visual field. This is still a challenge. The alignment they seek is not a complete correspondence of the map and visible scenic features, there is an economy of navigation in providing sufficient and profitably vague shared sense of where they are going. It is simply impossible to align the inexhaustible details of their surroundings, what is required is just enough of an awareness of where a few place are to allow them to do the next thing.

Fragment 1 - Gladstone’s Land

As the episode begins the group of four tourists are all standing together in a group at a crossroads trying to recall and make sense of a recommendation they have been given. The two women on the right walk away to look down a street close to where Barry is standing with the camcorder.

- 1 **Tourist1:** Maybe it’s down there.
 It could be down there Fran ----->

(4.0)

- 2 **Barry:** ((to the two women standing beside him looking along the street)) Are you looking for a street?

3. **Tourist1:** Nooo it’s a (.5) a very old house, is it Gladstone or Livingstone. (.5) Very old place. I think it’s to the left of Deacon Brodie’s ehh



This extract starts with a group of tourists on a street corner, consulting a map and looking for a particular attraction. As locals to Edinburgh, one piece of *post-hoc* analysis we can offer is that the tourists were only a few meters from the historic house that they were searching for. However we are not interested in evaluating their competence against an external analyst's ideal of navigation. Nor, equally, are we intending to show how their methods for using maps and guidebooks were deficient. Their unexceptional competence in navigating with a map is typical of tourists (as against professional orienteers) and it is of a level that is good enough for the task in hand. The reality of being in the midst of their inquiry is that it is simply impossible for them to have the solution that we have *post-hoc*. Our purpose in what follows is to describe what it is they are doing as typical tourists, where it might turn out to display various seen but unnoticed skills. While the proximity of their objective makes it clear how difficult it can be to find a destination in the city, we want to retain a sense of the tourists' inquiry as a real and serious problem that they are inquiring into. This is a common situation we find ourselves in when we are tourists in a foreign city: being unable to find our way to a place recommended by a guidebook and/or someone else. To recover the sense of the unfolding action we will pay attention to the *solving* and not to their 'final' or our 'correct' solution.

The junction where one of the authors crossed the paths of the 'searching' tourists is a popular spot for tourists to stand and consult maps. This is not incidental - by placing themselves at a street corner on a busy intersection (and getting in the way of locals trying to cross the street) tourists can see the names of the streets, scenes along the streets and sections of the skyline. They can inspect the map for 'landmarks' such as 'the castle', 'the cathedral' and the 'Royal Mile' then look along the street for any visible parts of these landmarks (crenulations, spires etc.) Not only is the junction a good spot in terms of its observational arrangements, the ongoing crowd of tourists pausing there to search, make observable to other tourists that it is a good spot for working out where you are in an unfamiliar city.

The group of tourists begin, closely packed, all looking at the Edinburgh Old Town map in their "insight" guidebook to Scotland. In their close-knit standing arrangement they have arranged themselves behind the guidebook with the map (Mondada forthcoming). As their inspection of the map provides no immediate solution, two of the members of the group split off, walking away to scout. Standing at a distance they can gather additional perspectives up and down the street orthogonal to where the remaining group members are standing (see Brown, 2006 for more discussion of tourist collaboration). From this we can see what tourists can do when they are a group rather than a lone traveller - they can distribute and co-ordinate the activities involved in orienting their unit. The mapreader has rotated the guidebook so that the map is held in one of the possible matches with the cross of the junction - one aspect of a junction is that it limits you to four possible alignments with the map. Further adjustment is required of the book, the available horizon and the group. To produce a shared orientation of left and right, up and down, in front & behind etc.. the group has squeezed together in order to stand behind the book facing the same way. In other words, the alignment between the map and what they can see comes *after* their alignment with each other as pedestrians. With this side-by-side arrangement any one in the unit, on pointing, can have the potential building or sign or street they are picking out easily found by the others in the group (see also Mondada forthcoming).

Barry did not offer his services as a local accidentally, the tourists were visibly engaged in a search and thus candidates for the category: 'lost'. The two 'scouts' had walked into his proximity and were standing continuing to look around. His first question (line 2) is, in this way, a response to their status as persons who, while not asking help, can be offered help. As such the tourists don't tell him to butt out nor challenge his question, Tourist1 jumps straight to refining his formulation of their search as 'for a street' to a 'very old house' (line 3). One of the puzzles facing them being that they are uncertain of the proper noun that will identify the 'very old place' they are looking for. So they offer the problem of locating what they are unsuccessfully formulating to Barry as something, as a

local, he might reformulate for them correctly (e.g. by saying ‘Ah you must be looking for John Knox’s House’). Note here that Barry is not struggling to look for the inner cause of mere outward behaviour, he sees persons conventionally categorisable as tourists, visibly searching for something. His question is not as to what could be passing through their minds at this point, it is directly as to what it is they could be searching for. As analysts, we can doubt that they are lost, but for bystanders they do not begin with doubt nor become doubtful without some anomaly.

The search unfolds in turns of talk wherein Barry displays his understanding of what they might be doing in his first question. In response the two members of the group begin to formulate their problem. What they have established is that they are looking for an old house but they are not clear by what particular name it is known, either ‘Gladstone’ or ‘Livingstone’. In fact, as we soon discover, this is what they left the other two members of the group investigating with the guidebook. That they were looking for an ancient house gave them enough of a formulation of place to begin looking at the houses up the street to see if any stood out as being noticeably older. One major orientational problem on the High Street in the Old Town in Edinburgh is that many of the houses look very old (and are very old).

4. **Fran:** ((still in the distance. Looking intently at one page after flicking through the book))



Gladstone’s Land? Gladstone’s Land? ----->

((Fran looks back down at the book as she closes in on the group))

5. Tourist1: What?
 6. Tourist2: Say we’re on the Northern
 7. Fran: Uh huh

Back together again, the group re-initiates their search with “Gladstone’s Land” now in hand. In the background we can now see, if only partially in the still from video, how the man is peering around and up the street and becomes a sort of scenic watchman while Tourist1 (in light grey outfit) is drawn back into the inquiry with guidebook. The guidebook, we should note, has a list of historic sites on one page with a map on the opposite. Fran shows that the guidebook has provided the refinement in the way that she looks at it each time she announces the particular place they are looking for. For Barry the relevancing of the guidebook is important if he is help them make sense of specifically the guidebook’s recommendations. Bringing the book back over takes them forward in their search as they now have a name for the place that they wish to see.

8. **Tourist1:** Uhh I think Gladstone’s land is number six

((moves index finger to touch map on list one left page of guidebook))----->



9. **Tourist1:** Where's six?

10. **Fran:** Six is (.5) ----->

((tourist1 takes away index finger and shifts to holding the book))

fifteen. Five. Six. Castle hill. (1.5) High Street



11. **Barry:** Castle hill is [just there] ((points at street))

12. **Fran:** [iddsh] well it, it, it has a description. ((turns toward Barry holding book))

The two guidebook readers have stopped looking around the streets and returned to the guidebook. They use the list of significant tourist sites on one page to collect the number for their object. With the number in hand they then have to transpose that to the map. It is Grey that picks out the number by pointing, though once she has the number, she offers up the book for their joint inspection by pulling her finger back. The gesture supporting her question in offering the turn back to Fran. Fran, finding the number on the map on her side of the book she can then read off the streets that it lies on: "Castle Hill" and "High Street". At this point it is Barry who picks out the street for them from the streets visible to them from where they are standing. Rather than taking Barry's orientational pointing up, Fran as the guidebook consulter presses on. The book remains held firmly in play (see below)

13. **Fran:** [iddsh] well it, it, it has a description. ((turns toward Barry holding book))

Let's see what it says ((looks at guidebook))-----
----- >

14. **Fran:** It's a six storey home and look at the year: 1620



15. **Barry:** It's on the Lawnmarket

16. **Tourist1:** Yeah

17. **Fran:** Where does it say, oh Lawnmarket Oh. He said it was on the High Street

18. **Tourist1:** Maybe they've got it .. ok

While the group now gather further resources, in terms of a description of the potentially identifiable appearances of the building, Barry continues to pursue the name of the street from the map and offers "the Lawnmarket". Fran returns to the map, making available what she is up to by saying "where does it say" and then, on seeing what Barry has already found for them, offers a recognition token, "oh", being a token (by contrast with Tourist 1's "yeah") that this is indeed news. Something of the source of the group's disorientation becomes apparent as it becomes clear they are not only

trying to align the map with the surrounding street names, someone has told them previously it was on the “High Street” (line 14). Who that someone is, is left out at this stage, since what is being made available in their remarks is that “High Street” came from another source. The pronomial “he” distinct from the “it” of the book (line 10), being analysable thereby as a person of some kind. *Retrospectively*, Barry and ourselves as listeners can use this remark to analyse the search backwards as for the “High Street” from another source, in combination with an old building. The tourists were looking for ‘Old Building / High Street’ - but this lacks the details they need here - the road sign does not have “High Street” (even though it is part of it) it has ‘Lawnmarket’ written on it. Where reading texts on maps and then texts on signs normally quickly matches scenic features to the map, here it does not.

19. **Barry:** Lawnmarket’s just here ((Barry points forwards from where he is standing down the street))

20. **Fran:** Oh oh:.....

((tourist 1 turns around to face away from the guidebook and look at the street))

what’s this street called? Is this Lawnmarket too?

((Barry turns around to face up the street))

21. **Barry:** This is Lawnmarket ----->

But then it becomes High Street ermm

((Barry returns to facing downhill))



What Barry is leading the group to, here, is the step-by-step establishment of their orientation. In line 19 following the arc of his gesture, as he swings around and points, the group look together along the street labelled ‘Lawnmarket’ running downhill from them on the other side of the traffic lights. Anticipating and building up the sense of her next inquiry Fran turns from the street Barry has brought to their collective attention to look uphill. Barry follows her, turning his bodily orientation and confirming her question. The turning around and aligning of bodies is key in all this in keeping their inspection of the streets aligned in terms of up and down, left and right, particularly at a crossroads. Barry’s solution to the “High Street” is then to turn Fran’s attention back downhill once more. The street changes its name downhill.

It was at this point where Barry as a local really began to help (since he did not know directly where Gladstone’s Land was or would have offered them directions immediately). His local knowledge of the city brought out a likely source of the confusion arising from the map and guidebook. As a local he knows that the Royal Mile goes by several different street names along its course and so he looked to see what the name was of the section they were currently standing on and how this related to the street name found on the map and in the guidebook. At this point, a further source of their disorientation became apparent: they are not on the wrong street, the same street has several correct names for it. This unconventional naming of what is visibly a continuous street is the navigational problem. As they grasped this and its implications (e.g. ‘X’ becomes ‘Y’ at a certain junction (lines 19-23) then they were ready to begin walking again.

Even though the actual buildings that the tourists want cannot be seen, they turned so as to see the segment of the city, *there*, where they were going from *here*. This is our *embodied* sense of position and location (Jonsson 2002), how we see and understand where things are in, and beyond, our visual field. A rough and ready solution to find a place, although obviously fallible in a ‘maze’ like Edinburgh, to finding it is to walk in *its* direction and try out another, usually closer, perspective (Ingold 2000).

In following these tourists, as they gradually found their attraction, we have been attempting to excavate some of their skills of hand, eye and talk. Orientation here isn’t simply turning the map - although we see lots of that (and turning of bodies). Accomplishing orientation in this instance involves coming upon *the essential insufficiency of directions, looking and walking around, dis-assembling the group and re-assembling it, shifting back and forth between texts and directions in hand, the utilisation of the formulation of a building as much as the names of streets and more*. These behaviours may seem a curiously un-academic way of describing the work of orientation: yet this is witness-ably what occurs as a course of intelligible action. Alignment, in this case, of tourists, locals, guidebooks, maps, pre-existing directions, buildings, streets is brought together as a navigational, conversational, rotational, intentional, translational and procedural matter. This is not a for-ever, all-the-time, complete alignment, it is a for another first-time orienting to these streets, looming buildings and related features with respect to a destination only actually emerging in the midst of searching: ‘Gladstone’s land.’ Although seemingly so unexceptional it nevertheless locally produces its reason, order, puzzles, solutions and criteria. Alignment here is visible here as not a cognitive rotation but in an intersubjective architecting of questions, replies, formulations, gestures and shared sense and sense-making of joint action (Bailey, Housley, and Belcher 2006). The fragments above offer a description of what the tourists are doing on the way to their destination and the bricolage-ing of resources in ordinary navigation (Lynch 1993).

Locating places in a road atlas while driving

Some map orientations make maps harder or easier to understand than others. When using maps to navigate a large majority of people find them easiest to use if the top direction of the map is the facing direction (heading) of the viewer. Thus, the “navigator” in the front passenger seat of the car frequently turns the road map as the car turns. This is “forwards-up” or “track up” alignment. If the map is not so orientated, the person navigates less accurately and/or more slowly (Montello, 2005, 271-272)

We now shift from pedestrian tourists to car daytrippers and describing this video fragment we will end up following a slightly different course of action. Rather than orient themselves to what they can see and point at (and what they cannot see though they can point towards), our second group of tourists are orienting themselves to the *road ahead*. A map is being used to discuss, plan and arrange activities drawing upon the road’s emergent features as they drive along its course, where it can go, and where (taking the correct turnings) it could get them to.

As we have seen in the first episode alignment’s criteria are not about completion but found in relation to what we can do next, it has an ‘in order to’ (Schutz 1973b) orientation. We achieve sufficient matching of our map to features of the surrounding world to get somewhere else. With our tourists they were going to an essentially and inescapably vaguely formulated but definitely recommended place, so the , there, was done with respect to the next activity - going to a place we do not yet recognize as the place. In this clip we find a group of daytrippers orienting to where their car can go next which is a remarkably limited set of directions. The correspondence between map and

world is not between what is forward for an imagined walker in an open landscape, rather it is what is forward and next for the car on the road and the daytrippers in the car.

Fragment 2 – Finding the road we are on

On a daytrip into the countryside four friends have some recommended places to visit. As we join them the two backseat passengers have been going over the names of the places they've been given, what they can do there and finding them on the map. Jane is on left, Fay on right and driver out of shot in front seat.

1. Driver: Well there's a loch with a nice pub too

(1.0)

2. Jane: Is that separate though from Killin

3. Driver: Yeah Killin is::: further on

4. Jane: [Then it must be the loch there]
 ((Jane points halfway up page
 +

5. Fay: [((Fay points))-----]-



6. Jane: Possibly that one.

((turns page of atlas to next page))

7. which is (.) there ((touches map with thumb)) -----

(2.0)



((Fay reaches over and points again))

8. Fay: Yeah or this road -----

((runs finger along road on map))



9. is the one we're coming up

((Fay drops thumb under map)) -----

((Jane turns page))

10. Jane: Yeah



11. Fay: is that one there -----

((Fay circles a feature and then withdraws hand from atlas))

12. Jane: That's (1.0)

13. Jane: Well it's not much farther on (3.0)



While, as a unit, these daytrippers are mobile in the sense that they are in a moving car, their orientation to each other is relatively immobile. The car locks the daytrippers into a side-by-side and front-to-back orientation - one reminiscent of the initial orientation of the pedestrian tourists in our first clip. Side-by-side the backseat map-readers do not spend much time watching one another's faces, yet this is, of course, not a great source of trouble given that their focus is the map. Being side-by-side fits well with the task at hand, 'up' will be 'up', 'down' will be 'down', 'left' will be 'left' for both of them. Equally they share an embodied orientation toward the road ahead, behind, to the left and right. What makes aligning the map's features, with what they see ahead, behind and out of the side windows, potentially complex, is that they are moving steadily forward at times turning with things close up flashing by while those in the distance move slowly.

In finding the different places on the road map our map users need to make the move from one page of the map to another, using their fingers and hands to hold specific parts of the map open. This is because the road which they are following goes over from one side of the map to another. Indeed, one place they are looking for ("Killin") is on two pages of the map since it falls into the overlap between the pages. This 'border' is repeated from one page to the next so as to make the job of finding and moving between places easier. However, this means that for some places they are on the map twice - indeed some places can be on potentially four different pages if they are in the box where four pages overlap. This means there is no one-to-one correspondence between places and positions on the map. If one is looking to the west of a point one page is likely to be the more useful, and the opposite if one is looking east. In the video fragment the map readers current position is south of the map and thus several pages in the atlas backwards.

As we can see, the 'paged' nature of the atlas can also make it difficult to follow roads as they cross pages - unlike a folded out map at times is difficult to keep two things one wants to track in the visual field simultaneously. One can fold pages over and arrange two places so that they can both be seen, but if the two places are on different sides of the same page this is very difficult. This commonly happens when we are following a road along and it goes off the end of one page. Then, we need to track the road as it goes off the page and then find the road on the next page. The road atlas can be quite cumbersome to manipulate, since when opened up it spans nearly 25" across. Jane holds the book almost half closed with the pages bent open at the top between the pages. This lets her see the edge of one page and the features she is looking at. By holding her fingers in the book she can 'hold' two pages while she looks at the two pages the book is open to. Using the finger which is held in the book she can flick the page over very quickly, allowing her to move quickly between the pages in the middle and one on each side (image two). Since she also has the book almost closed, this means that the page only had to travel a very short distance - flick between two pages.

Holding fingers in the pages of atlases is a very simple technique to using a map contained in a book, fitting well with the ongoing navigational task. In this case it is important to compare differ-

ent places, and the routes between those places. This involves moving between different areas quickly – one might want to compare two different places on a map to see how to get different transport links between them. By holding fingers in the map and thumbs actually on the page as in the above figure it is possible to quickly jump from the current page, to another page and back again. Moreover if we use both our hands and keep our fingers in the book on both sides we can do this with pages which are beyond our current page. It is even possible to ‘hold’ six pages – two currently in view, two on the left and two on the right. Multiple fingers can be used on each hand to keep multiple pages of the book on each side ‘held’. This sort of manipulation of the map might seem of little interest, but reflect on the comparison with computer mapping technologies. They seldom allow the viewer to quickly jump back and forth between two different areas of a map. Indeed, some web mapping systems would take five or six seconds to move the next map ‘tile’. With a paper maps, and fingers inserted into the page, the area under consideration can be skipped around in fractions of a second. The paper has rich affordances (Sellen and Harper, 1999).

2. Jane: Is that separate though from Killin
3. Driver: Yeah Killin is::: further on
4. Jane: [Then it must be the loch there]
((Jane points halfway up page))
+
5. Fay: [(look/loch) ((Fay points at bottom corner))]------
-



There are two things the backseat navigators are trying to establish in the ongoing work around the map - clarification of where *we are on the map* and *where our recommended destinations are*. Hopefully the similarities with the pedestrian tourists are apparent and we can begin to tease out the particularities of what happens in this episode in the car. The car travelers have a number of recommended places to locate rather than one, the two being dealt with here are Killin and the loch. Killin has been found on the map already so that when the driver tells her navigators “Killin is further on”, by examining the atlas they can identify candidate lochs. Killin can be found, like ‘Gladstone’s Land’ because it is a placename, whereas the loch’s location is formulated in relation to Killin.

One of the things we would like draw out is Fay’s engagement with the map: pointing at one feature (*line 5*), then leaning in, later on, in order to trace another feature (*line 8-12*). In the first instance we have lochs being pointed at and in the second roads being traced. Much like the abundance of old buildings in Edinburgh, there are several lochs in the region of Scotland they are traveling toward. When the driver had provided that the place-name ‘Killin’ is further on in their journey (*line 3*), then Jane reaches for a loch below Killin on the map as the one that it ‘must be’ (*line 4*). Due to the camera angle her gesture is obscured by the head rest of the driver’s seat, so we have circled and arrowed the relevant gestures. From what we can see Jane makes a finely tuned gesture that wags her fingers down from Killin to a loch a centimeter or so below on the map. Even as Jane is confidently identifying one loch as the loch which has Killin ‘further on’ from it in relation to their journey. Fay is reaching toward the map and picking out an alternate loch by touching on its icon on the map. Jane responds to Fay’s identification of an alternate, even though she had expressed certainty earlier ‘it must be that one’ by accepting it as a possible alternative. Moreover, she then picks the alternative loch out with her other hand’s thumb over the page (see below *line 7*). It is worth speculating

whether the switch of hands is a way of inviting Fay to continue helping her out with finding their destinations.

6. Jane: Possibly that one.

((turns page of atlas to next page))

7. which is (.) there ((touches map with thumb)) -----

(2.0)



Jane and Fay gaze for a while at the surrounding region ‘taking in’ that loch and its nearby features over the page. Shifting pages with this second possible loch now in hand allows a scan of the Eastward area. To switch register for a moment to the notional mental representation could it ever come in atlas form with pages that need turning. We would want say this is absurd. Yet why is the notion that we might be rotating mental images to see other sides of them not so absurd?

After their pause where taking in what is on the next (Eastward page) Fay leans in and switches her pointing hand. What is of interest here is how her leaning in, rather than reaching across with her nearest arm establishes a different involvement with the tack of map reading than from her first point. What she is about to do is fairly complicated and requires access to the map over an extended period of time (compared to the short sharp point from before). The gesturing and the speaking work together here: what ‘this road’ could be is established by her pointing to a road on the map. Her finger does not rest on the map feature as it did with the loch, rather it runs along the map, along the line of the road. While gesture is temporarily extended there is the space for her bring in its relevance for their problem, that it is the road they are currently driving along. And part of its artfulness is that the gesture therefore is also establishing the direction which they travel into the landscape and as it traces along the paper it passes by various features. While her index finger is doing this, Fay as the road reaches its visible end at the edge of the page requests a turning of the page, in (9) she drops her thumb under the page which Jane recognises as a request to turn the page and does so.

((Fay reaches over and points with other hand))

8. Fay: Yeah this road -----

((runs finger along road on map))



9. is the one we’re coming up

((Fay drops thumb under map)) -----

((Jane turns page))



10. Jane: Yeah

11. Fay: is that one there -----

((Fay circles a feature and then withdraws hand from atlas))



The turning of the page is used a resource by Fay in that the first page become the one that is used to secure that 'we are here' (e.g. like you are here arrows on maps) and the understanding of this point is marked by Jane's 'yeah' (10). On turning to the second page which is where the two possible lochs are we have the proximity of their road to Fay's alternate loch being established. Once again the gesture and speaking working together in the elegant way Fay does not trace on the second page. Her gesture is quick point that pulls away quickly, 'revealing' as it were the loch and the road will converge.

12. Jane: That's (1.0)

13. Jane: Well it's not much farther on (3.0)

14. Fay: Ah well, let's just drive and see what happens

As we noted of our earlier fragment we are not so much interested in the solution as the solving, or rather, not final alignment so much as aligning. In the final sections of the fragment Jane comes to no conclusion, she looks a little longer at the focused small patch of relevance that Fay has revealed. Her remark echoes the tactics of the pedestrian tourists, they are driving in that direction and so will by closing in on the territory be able to use the perspective they have there to try and establish which loch is which.

Finding the road we are travelling along, from the many possible roads shown on the map, involves tracing any, or each, potential road as marked on the map to see if it links up those recollected features of the road we have been passing by. Their tracing places features and placenames (e.g. two possible lochs one reached first, the other second and Killin third) in sequences, and, on the left or right side of the route. Because driving along a road puts places in order of this first, this after, this nearer, this closer etc., members of the car can, and do, use their journey as a shared sequencing device. In contrast to standing on a hilltop, travelling along a road by car produces a perspective of things passed one after/before another. As a visual order the journey forms a gestalt field of changing points-of-view and perspectival arrangements of surrounding features from its sequence (Ingold 2000). The shared sense of the movement of the car in one direction along the road establishes steady bodily coordinates of ahead, behind, left and right. Moreover features such as lochs, forests, towns and so on will come one after the other as they travel along the road. Where we might want assume that the constant movement along road complicates navigation, instead it is a device that can help in making sense of the map in terms not only of where are we now but bringing new per-

spectives and revealing more about places as we enter into them (e.g. does this loch have a pub on it, then it may well be the one we were recommended).

Where for the tourists in our first example, their orientation was one of streets and what they can see, the daytrippers orientate the map with where they *were last*, *before that*, *will be next*, and *after that* and *after that*. Unable to rotate their perspective 'to the left' or 'to the right' remain fixed. Unlike orienteering through woods or across open land, the navigators of the tarmac road do not choose where to go from the cardinal directions or distant features, they are restricted to a small set of junctional options where there are: t-junctions, crossroads, slip roads, exits, roundabouts and so on. The ordering of towns, lakes, rivers, road signs, and the like along a road as they travel along it are the way which they can find themselves somewhere along. Sequential ordering is important in further ways, turning after the loch is different from a turning before the loch and analysis of the map is done through movement across it as they establish what to look out for in the route ahead. The uncompleted orientation task which we have for the daytrippers is to align not only the rest of the journey in the car with the road on the map but also to establish relations of proximity, distance and sequence for the recommended places they began with. By bringing these together as their joint accomplishment with road atlases, tracings, pointings, gazings and speech they can organise their trip and be prepared to take correct turns in time.

Orientation in this case has not simply been one of map and direction, it has been one of map, road and journey. In describing Fay and Jane's joint map reading we can see a number of the features of consultation of maps and diagrams that Goodwin has emphasized (Goodwin 2003a). As part of an evolving inquiry different parts of the map - the loch, road, and road names, are selected, pointed at and mentioned by backseat mapreaders. Features are brought into consideration at times appropriate to the course of action and different concerns addressed (often simultaneously). Roads have relevance, for example, of not only 'where we are going' but 'where we are now'. While the map itself is a constructed and mass produced artefact, it is in their lived work of reading it on an easygoing day out in the Scottish countryside that the daytrippers find in the map its relevance to the problem at hand here and now.

Conclusions

In his 2002 presidential address Golledge (2002) argues that Geography as a discipline has moved from declarative knowledge – collecting and representing the physical and human facts of existence, “onto emphasizing cognitive demands” (p1). In this paper we have approached one geographical phenomena in a different way, staying with the details of the activity, trying to understand the publicly available nature of map use in the wild. To draw our analyses of the two video fragments together let us return to the original orientation, alignment and mental rotation models of spatial cognition that we considered in the introduction. Our goal in addressing these cognitive theories was to re-specify orientation and alignment as publicly available and practically accomplished reasoning without recourse to mental representation of space or, of course, mental maps. In studies of alignment effects rooted in cognitive science there is assumed to be an equivalence between mental manipulation and physical manipulation. If a map is misaligned with respect to the environment, it must be mentally rotated to be in alignment with what can be seen. Our point, here, one made also by (Bennett and Hacker 2003, p197) is that there is no such thing as mentally rotating a map to get a different view of it. What we hope has become apparent from the episodes we have described above is it takes a long time to *work out* how to align the map with the perspective, and even longer to ponder if the two have any points of alignment.

By looking at navigation in action in the two video fragments we have shown elements of why it might be that tourists are to be found standing blocking busy street corners, turning around slowly to look at the surrounding city and why maps are rotated by all manner of people in all manner of settings. As Ingold (2000) has argued forcefully, more or less disengaged cognitive models of navigation, alignment or orientation gloss numerous features of what ordinary navigators are doing with maps. Finding our way to destinations in unfamiliar terrains involves a host of different resources when we navigate with maps: descriptions of the thing we are looking for, other maps, place-names or place-terms offered by others as directions and/or recommendations, what we passed by one mile back, what another member of our group as a scout is able to see by walking one hundred meters further on and so on. Our analyses of the gestures, postures and conversation involved in everyday navigating owes much, as we noted at the outset, to Goodwin’s exemplary studies of seeing, pointing and joint action in workplaces populated with diagrams and maps (Goodwin 2000, 2002, 2003b). The small supplement this paper has provided is perhaps in terms of how recommendations, in the form of place names, are dealt with through the evolving and sequential perspectives provided by distinctive forms of human locomotion. How pedestrians walking city centre streets and automobiles driving on country roads provide distinctive contextures of navigation and alignment with particular forms of maps (the guidebook and the atlas) in unfamiliar places.

The real world skills of navigation are not those of mental reasoning and spatial models, instead we find map readers looking and reading signs, misunderstanding street names, grappling with cumbersome paper documents and the like. Reading maps, we are arguing, is so much more than mental cognition, if it is at all. When we pick up maps we are consulting, reading, pondering, planning, checking and more, practical reasoning that is done in the midst of particular projects (e.g. on a city-break with family or an outing in the car with friends) with the help, hindrance and sufferance of others, rather than inaccessibly in an individual’s head. Of course sometimes we read maps alone, as often we work collaboratively around maps as groups to find our way (Bailey, Housley, and Belcher 2006). Our undertakings or overtakings with maps are produced in order to be sensible, follow-able and morally evaluated by others (as anyone who has misread a map while out driving with their loved one will know).

While the map has often been used elsewhere metaphorically as implying a possible completion and static representation of the world. Maps in practice are quite opposite, as Garfinkel puts it:

Maps ... have a marvellously incongruous property that users can come upon as a cause for complaint "I can't find what I'm doing wrong." ... Complaints will go to the ... (map's) incompleteness, ambiguity, equivocality, errors, mistakes, gaps, omissions, the recalcitrant teacher, sloppy craft, metaphoric description, lies and the rest of endless whatnot... Recurrently, in vivo, maps and manuals present their users the in vivo witnessed incompetence of the text. The way that text fails you, just the thing that you want from it, which you must have, now, here, just where you are in your project – of that trouble it is guaranteed will be waiting for you[...]

The examples in this paper touch upon research on human behaviour and spatial cognition more generally. As Coulter (1989) and Watson (1994; 1998) argue, all too often a multitude of disciplines concerned with human conduct and reason concede various terms associated with human mind and reason to cognitive psychology. Cognition becomes the province of those sciences that provide explanations in terms of indirectly accessible yet causative psychological processes. Perception, beliefs, mental representation, decision-making, psychological processes come to replace socially situated and localised (or globalised) practices of seeing, looking, imagining, categorising, inferring and so on (Lynch 1993; Latour 2003). In terms of way finding and navigation with maps the over-riding desire is to leap to psychological explanations, models or ontologies of way finding when we might instead examine actual instances. While reason and accountability are topics that science (be it social or natural) treats as its own, instances of step-by-step, second-by-second planning, locating and looking at and with maps exhibit, display and accomplish order, reason and accountability as topics of their own.

Bibliography

- Bailey, N., W. Housley, and P. Belcher. 2006. Navigation, interaction and bridge team work *Sociological Review* 54 (2):342-362.
- Bennett, M. R., and P. M. S. Hacker. 2003. *Philosophical Foundations of Neuroscience*. Oxford: Blackwell.
- Blaut, J. M., D. Stea, C. Spencer, and M. Blades. 2003. Mapping as a Cultural and Cognitive Universal. *Annals of the Association of American Geographers* 93 (1):165-185.
- Brown, B. A. T. In press. Working the problems of tourism *Annals of Tourism Research*.
- Brown, B. A. T., and E. Laurier. 2003. Maps & Journeying: an ethnographic approach. *online paper* Department of Geography, University of Glasgow: www.geog.gla.ac.uk/Online_Papers/elaurier003.pdf.
- Carlin, A. P. 2003. Aspects of Spatial Arrangement in Libraries. In *Constructions sociales de l'espace, Les territoires de l'anthropologie de la communication*, ed. T. Lask, 87-99. Liège: Les Éditions de l'Université de Liège.
- Cornell, E. H., A. Sorenson, and T. Mio. 2003. Human Sense of Direction and Wayfinding. *Annals of the Association of American Geographers* 93 (2):399-245.
- Coulter, J. 1983. *Rethinking Cognitive Theory*. London: Macmillan.
- . 1989. *Mind in Action*. Atlantic Highlands, NJ: Humanities Press International.
- Crabtree, A. 2000. Remarks on the social organisation of space and place. *Journal of Mundane Behaviour* 1 (1):<http://www.mundanebehaviour.org/issues/v1n1/crabtree.html>.
- Finke, R. A. 1990. *Principles of Mental Imagery*. London: MIT Press.
- Garfinkel, H. 2002. *Ethnomethodology's Program, Working Out Durkheim's Aphorism*. Edited by A. W. Rawls, *Legacies of Social Thought*. New York: Rowman & Littlefield Publishers.
- Golledge, R. G. 1999. Human Wayfinding and Cognitive Maps. In *Wayfinding Behavior, Cognitive Mapping and Other Spatial Processes*, ed. R. G. Golledge, 5-45. London: The John Hopkins University Press.
- . 2002. The Nature of Geographic Knowledge. *Annals of the Association of American Geographers* 92 (1):1-14.
- Goodwin, C. 2000. Practices of Seeing, Visual Analysis: An Ethnomethodological Approach. In *Handbook of Visual Analysis*, eds. C. Jewitt and T. V. Leeuwen, 157-182. London: Sage.
- . 2002. Time in Action. *Current Anthropology* 43 (Supplement):s19-s35.
- . 2003a. Pointing as Situated Practice. In *Pointing: Where Language, Culture and Cognition Meet*, ed. S. Kita, 217-241. Mahwah NJ: Lawrence Erlbaum.
- . 2003b. The Body in Action. In *Discourse, the body & identity*, eds. J. Coupland and R. Gwyn, 19-42. Houndmills: Palgrave Macmillan.
- Hacker, P. M. S. 1990. *Wittgenstein - meaning and mind. An analytical commentary on the Philosophical Investigations ; v. 2*. Oxford: Basil Blackwell.
- Have, P. T. 1998. *Doing Conversational Analysis: a practical guide*. London: Sage.
- Heath, C. 1997. Analysing work activities in face to face interaction using video. In *Qualitative Methods*, ed. D. Silverman, 183-200. London: Sage.
- Hutchins, E. 1993. Learning to navigate. In *Understanding Practice: Perspectives on activity and context*, ed. S. Chaiklin, & Lave, J., 35-63. Cambridge: Cambridge University Press.
- . 1995. *Cognition in the wild*. London: MIT Press.
- Ingold, T. 2000. *The Perception of the Environment: Essays in livelihood, dwelling and skill*. London: Routledge.
- Jefferson, G. 1984. Transcript Notation. In *Structures of social action: studies in conversation analysis*, eds. J. M. Atkinson and J. Heritage, ix-xvi. Cambridge: Cambridge University Press.
- Latour, B. 1986. Visualization and cognition : Thinking with eyes and hands. *Knowledge and Society* 6:1040.
- . 2003. *Paris: Invisible City*. Translated by L. Libbrecht. Paris, <http://www.ensmp.fr/~latour/virtual/index.html>; Photos by Emilie Hermant, Web Design by Patricia Reed.
- Latour, B., and S. Woolgar. 1979. *Laboratory Life : The Social Construction of Scientific Facts*. London: Sage.
- Levine, M. 1982. You-Are-Here Maps, Psychological Considerations. *Environment & Behavior* 14 (2):221-237.
- LLOYD, R. E. 1989. Cognitive Maps: Encoding and Decoding Information. *Annals of the Association of American Geograph* 79 (1):101-124.
- . 1997. *Spatial Cognition, Geographic Environments*. AH Dordrecht: Kluwer.

- Lorimer, H., and K. Lund. in press. Performing facts: finding a way over Scotland's mountains. In *Nature performed: environment, culture and performance*, eds. B. Szerszynski, W. Heim and C. Waterton, NYP. Oxford: Sociological Review.
- Lynch, M. 1990. The Externalized Retina: Selection and Mathematization in the Visual Documentation of Objects in the Life Sciences. In *Representation in Scientific Practice*, eds. M. Lynch and S. Woolgar, 153-186. Cambridge MA: MIT Press.
- . 1993. *Scientific practice and ordinary action: ethnomethodology and social studies of science*. Cambridge: Cambridge University Press.
- Merleau-Ponty, M. 1962. *The Phenomenology of Perception*. London: Routledge & Kegan Paul.
- Mondada, L. forthcoming. Deixis spatiale, gestes de pointage et formes de coordination de l'action. In *Verbalisation de l'espace et cognition située: la description d'itinéraires piétons*, eds. J.-M. Barberis and M. C. Manes-Gallo. Paris: Editions CNRS.
- Nori, R., and F. Giusberti. 2002. Cognitive styles: errors in directional judgements. *Perception* 32:307-320.
- Presson, C. C., and M. D. Hazelrigg. 1984. Building spatial representations through primary and secondary learning. *Journal of Experimental Psychology, Learning, Memory and Cognition* 10 (4):716-722.
- Sacks, H. 1972. An initial investigation of the usability of conversational data for doing sociology. In *Studies on social interaction*, ed. D. Sudnow, 31-74. New York: Free Press.
- Sanders, R. A., and P. W. Porter. 1974. Shape revealed in mental maps. *Annals of the Association of American Geographers* 64 (2):258-267.
- Schutz, A. 1973a. *Collected Papers Volume 3*. The Hague: Martinus Nijhoff.
- . 1973b. *Structures of the Life-World: Vol 1*. Chicago: Northwestern University Press.
- Sharrock, W., and J. Coulter. 1998. On What We Can See. *Theory & Psychology* 8:147-164.
- Shepard, R. N., and S. Hurwitz. 1984. Upward direction, mental rotation and discrimination of left and right turns in maps. *Cognition* 18 (161-193).
- Shepard, R. N., and J. Metzler. 1971. Mental Rotation of three-dimensional objects. *Science* 171:701-703.
- Sholl, M. J. 1987. Cognitive Maps as Orienting Schemata. *Journal of Experimental Psychology, Learning, Memory and Cognition* 13:615-628.
- Tolman, E. C. 1948. Cognitive maps in rats and men. *Psychological Review* 55:189-208.
- Tuan, Y.-F. 1975. Images and Mental Maps. *Annals of the Association of American Geographers* 65 (2):205-212.
- Watson, R. 1994. Harvey Sacks's Sociology of Mind in Action. *Theory, Culture and Society* 11:169-186.
- . 1998. Ethnomethodology, consciousness and self. *Journal of Consciousness Studies* 5 (2):202-223.
- . 1999. Driving in Forests and Mountains : A Pure and Applied Ethnography. *Ethnographic Studies* 3:50-60.
- Werner, S. 2004. Cognition meets Le Corbusier: Cognitive Principles of Architectural Design. *online paper*: <http://www.geog.ucsb.edu/~sara/teaching/int200/werner.pdf> accessed 24th August 2006.
- Werner, S., and L. E. Schindler. 2004. The Role of Spatial Reference Frames in Architecture, Misalignment Impairs Way-Finding Performance. *Environment & Behavior* 36 (4):461-482.
- Wylie, J. in press. Depths and Folds: Actualising Landscape and the Gazing Subject. *Environment and Planning D: Society and Space*.