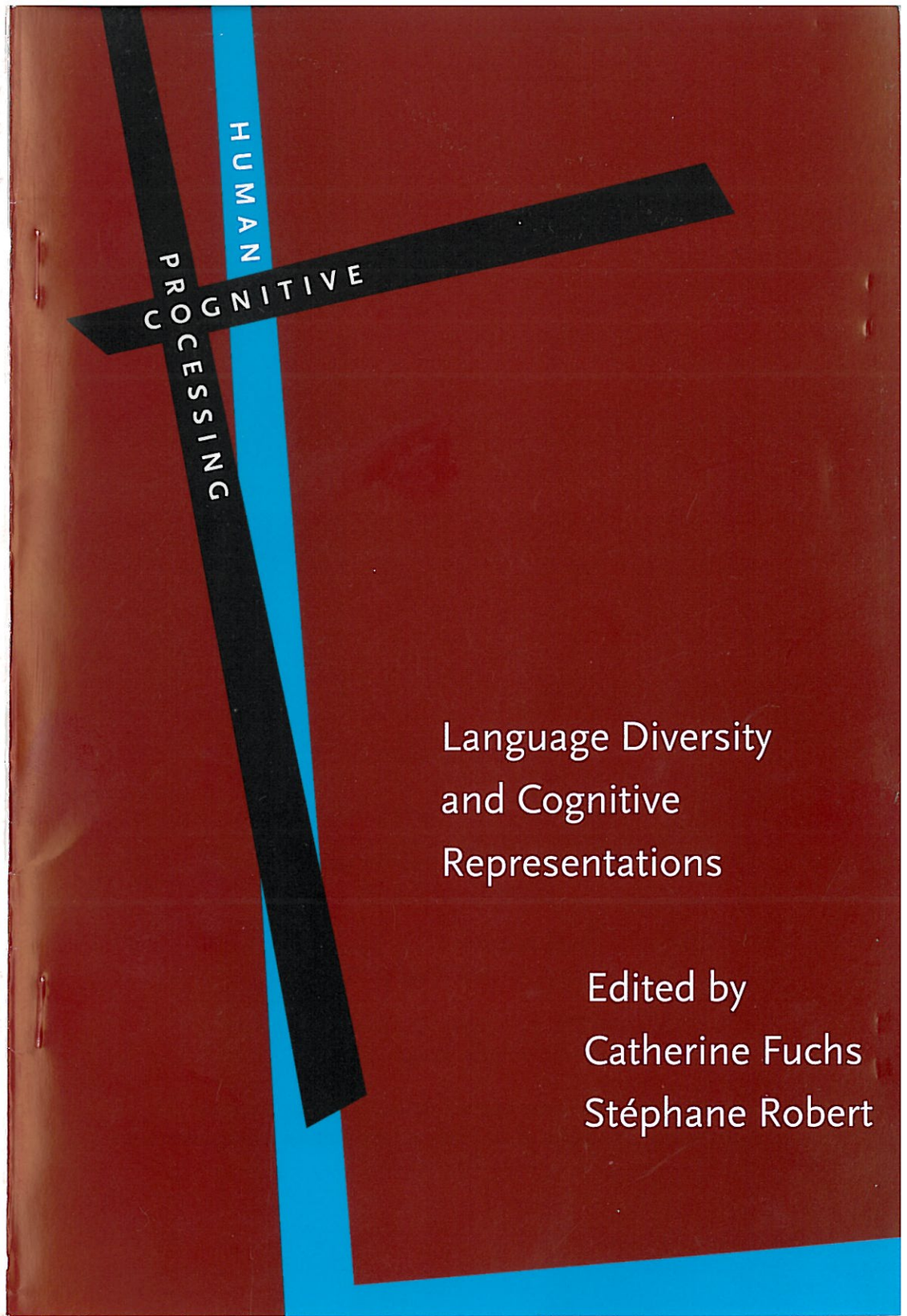

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Language Space and Sociolect
Cognitive Correlates of Gendered Speech in Mopan Maya

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Introduction

It is widely acknowledged that languages differ from one another in all sorts of ways. What is less clearly understood is the nature of the relationship between variation in language structure and non-linguistic cognition. If languages differ in their classification of phenomena, does this mean that the way that their speakers make decisions about nonlinguistic categorization also differs? Data collected from languages around the world, and in particular from Mopan Maya – an indigenous language of Central America – suggest that this question can be answered, at least sometimes, in the affirmative.[1]

1. Cross-linguistic variation in the encoding of spatial information

The members of the Cognitive Anthropology Research Group asked speakers of many different languages to describe the six pictures below to a partner (Pederson et al 1998).[2] Both partners see an identical set of pictures, but neither can see what the other is looking at (this is usually accomplished by placing a curtain or screen between the partners, who sit side by side). The game consists in having the listening partner pick out each photo in turn, on the basis of the verbal description alone. Partners are free to discuss their descriptions and choices fully, and this discussion is videotaped. After all of the pictures have been described, the partners check the matches that they have

made with one another. Data from three pairs of speakers is collected for each language.[3]

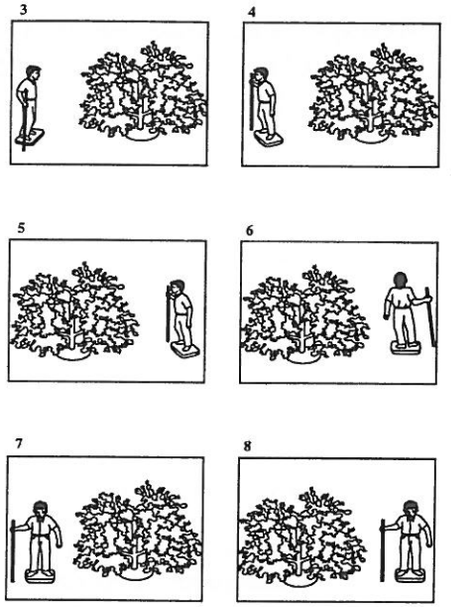

Figure 1. Men and tree (Pictures for description)

Many different strategies are used across languages to describe the pictures under these conditions. These strategies can, however, be grouped together according to the kind of information that is used to construct the answer (Levelt 1984, 1996, Levinson 1996). For example, speakers of many languages – including European languages such as Dutch and English, but also including Japanese for example – make reference to *the left and right sides of their own bodies* when making statements about the differences among the photos. For example, English speakers might say that picture 7 differs from picture 8, because in picture 7, "The man is to the left of the tree". Such speakers make use of elements of their own physiology as the coordinate system with which they anchor the relationship of the Figure and Ground, while they themselves remain construed as third parties, outside the scene and playing the role neither of Figure nor of Ground. I use the terms 'Figure' and 'Ground' in Talmy's (1983) sense, so that 'Figure' refers to the Relator or element being located – in the English example above, the *man* – and 'Ground' refers to the Relatum, or

element with respect to which the Figure is located – in the English example, the *tree*.

In certain languages, however, reference to the speaker's own physiology is a rare occurrence when making these descriptions. For example, speakers of Arrernte – an Aboriginal language of Central Australia – describe the six pictures in terms of the cardinal directions that actually obtain at the moment the description is made. That is, depending how the pictures have been laid out for the players, the man in picture 7 may be described as being to the north, south, east, or west of the tree (data from David Wilkins. See also Haviland 1979, 1993, 1998). In Tzeltal Maya meanwhile (Brown and Levinson 1993), speakers describe the pictures in terms of the 'uphill' and 'downhill' relations between man and tree – again based on the realities of the surrounding terrain. These descriptions make use of what has been called an 'Absolute' frame of reference, and rely for the anchoring of their coordinate system on features of surrounding geography rather than on those of participants' physiology. Speakers of many of the languages of Oceania would be expected to describe the six pictures using this type of information (see Ozanne-Riviere, this volume).

The work of the Cognitive Anthropology Research Group has also shown that speakers of different languages find different solutions to non-linguistic cognitive tasks involving rotation, in just the directions predicted by their linguistic preferences (Danziger in press (a), Levinson 1998, Pederson et al. 1998, Levinson and Nagy ms.). In one experiment, for example, participants are asked to reconstruct an array of toy animals after they themselves (the participants) have undergone a rotation of 180 degrees (they are now facing precisely opposite to the direction in which they had been facing when they saw the original array). Speakers of languages in which information about speaker's and hearer's right and left – rather than information about surrounding geography – is used in verbal descriptions, reconstruct the array of toy animals in such a way as to respect the original right/left relationship of the array to their own bodies – even though this means violating the relationships of the original array to surrounding geography. On the contrary, speakers of languages in which information about surrounding geography ('uphill', 'seaward', 'north') rather than information about speech participants' right and left is used in verbal descriptions, reconstruct the array of toy animals in such a way as to respect the original relationship of the array to the local landscape – even though this means violating the relationships of the original array to their own bodies. Even the non-linguistic conceptualization of spatial relationships therefore appears to be at least partly a matter of construal. And the kind of

construal an individual is likely to make appears to a large extent to correlate with variable aspects of linguistic practice.

2. Universal strategies: Figure and Ground only

Although the use of information about speech participants' left and right, and the use of information about surrounding geography varies across the languages in our sample, certain of the informational strategies used to describe the six pictures appear to be *universal* across languages (based on data collected by members of the Cognitive Anthropology Research Group in ten languages of eight different families, see Pederson et al 1998).[4] First, almost all speakers in all of the languages surveyed chose at times to construe themselves and/or their partner, either explicitly or implicitly as the nonce *Ground* of the spatial relation to be described, describing the position of the toy man, for example, with respect not to the toy tree, but to the speaker and listener themselves (eg. For English, picture 6, "He's got his back to us"; picture 7, "He's facing us"). Let us call this the encoding strategy that takes 'Self-as-Ground'. Second, almost all speakers, in all of the languages, often gave information about the *scene-internal* relationship of the toy man with respect to the toy tree. That is, speakers made statements about the relationship of the different parts of the toy man to the tree (eg. English picture 4: "The man has his back to the tree"; Picture 7: "The tree is to the man's left"). We may call this a 'Scene-Internal' informational strategy. Notice that since one internal element of the scene (the toy man) represents a human body, a 'Scene-Internal' statement can sometimes be made which makes use of expressions for "left" and "right". Picture 7 is illuminating here, and can serve as a diagnostic tool. Under a 'Scene-Internal' description, the tree is at the man's *left* hand. Making use of information about the physiology of speech participants however, one would describe the tree as being to the *right* of the man. It is thus possible to discover referential situations in which the difference between reference to the speakers' right and left and reference to the right and left of a Ground object which is not the speaker, is quite clear. [5]

The two information strategies that appear to vary in their distribution across languages – those that make use of speech participant right/left, and those that make use of surrounding geography – share certain properties which are not shared by the 'Self-as-Ground' and the 'Scene-Internal' information strategies. Both of the optional information strategies make use of information from *outside* the Figure-Ground scene, and they use this information to project a vector between Figure and Ground that locates these with respect to one another – and within a matrix of space which is external to them both (see Danziger 1996b). The 'Scene-Internal' and the 'Self-as-Ground' information strategies meanwhile are to-date universally encountered across languages, and make use only of information about the Figure and the Ground themselves.

3. Mopan speakers and the picture description task

Three pairs of Mopan speakers were consulted in the picture description task. Like speakers of all the languages surveyed, these six Mopan speakers made use both of 'Scene-Internal' information, and of a nonce construal of the 'Self-as-Ground' in order to describe the location of the toy man with respect to the tree in the 6 pictures shown above.

(1) Mopan use of Self-as-Ground Strategy. Picture 6 is described.

Käx-t-e'	a	tz'ub'	a...
seek-TR-SUBJ	DET	child	DET

Find the child who...

chun-pach	a	tun-cha'an	waye'-ji.
only-3A-back	DET	DUR-3A-look	DX1-SCOPE

only his back is looking here.

(2) Mopan use of Scene-Internal Strategy. Picture 4 is described.

Ka'	a-käx-t-e'	a	nene'	tz'ub'	ada',
CONJ	2A-seek-TR-SUBJ	DET	little	child	DX1

You should find this little child,

a	t-u-pach	ke'en-Ø	a	t'opo.
DET	at-3A-back	be-located-3B	DET	flower

who has the flower at his back.

What is striking about the Mopan data is that these are the *only* informational strategies used. These speakers never referred to surrounding geography to make their descriptions of these pictures, and their reference to speech participant's right and left was also nearly nonexistent. In the one instance that such a reference was made, it was rejected by the partner. It is clear from that exchange that the listening partner (M.) interprets all instances of the (borrowed) Mopan words *suldeero*, *lef* ('left') and *rait* ('right') as referring only to the elements internal to the scene.

(3) Mopan Use of Speaker's Right-Left Strategy. Picture 7 described.

D. Käx -t-e' a tz'ub' a w-a'an-Ø yok'ol tunich.
seek-TR-SUBJ DET child DET stand-STAT-3B on stone
Find the child who's standing on a stone.

Toj-Ø u-che' ti yan-Ø.
straight-3B 3A-stick at exist-3B.
His stick is quite straight.

I suldeero ke'en-Ø u-che'.
and left be-located-3B 3A-stick
And his stick is on the left.

M. Puuro ich rait. Ma' suldeero
only in right. NEG left
It's only on the right. It's not on the left.

D. U-che' ab'e'?
3A-stick DX3I
You're talking about his stick?

M. Mmhm. Puuro ich rait. Ma' yan-Ø a–
AFFIRM. Only in right.NEG exist-3B DET
Yes. It's only on the right. There aren't any –

D. Yan-Ø u-che' ke'en-Ø suldeero.
exist-3B 3A-stick be-located-3B left
They exist with his stick on the left.

M. Ma' yan-Ø ich lef-i!
NEG exist-3B in left-SCOPE.
There aren't any on the left!

Puuro ich rait ke'en-Ø u-k'ä'.
only in right be-located-3B 3A-hand
His hand is always on the right.

Figure 2 shows the distribution of the four kinds of information strategies (Speech Participant RL, Geographical, Self-as-Ground, and Scene-Internal) just outlined, as they appear in the distinguishing propositions used by three speakers of Dutch, three speakers of Arrernte, and three speakers of Mopan Maya to describe the six pictures in this interactive game.

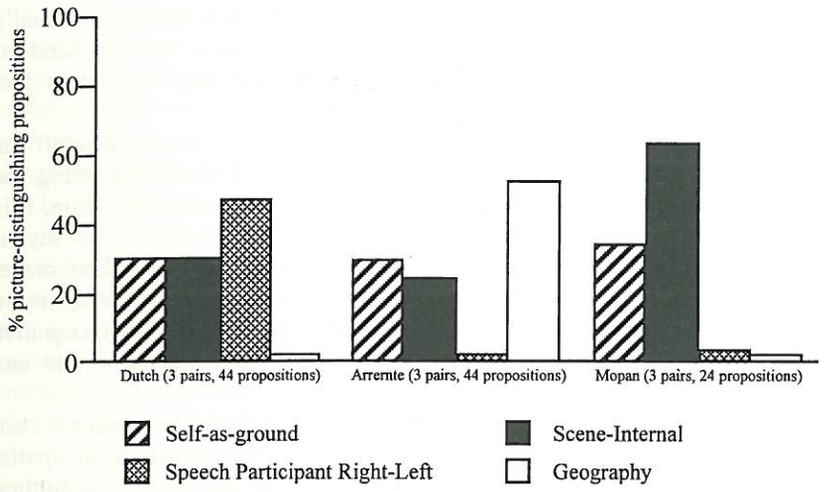

Figure 2. Distribution of Information Strategies in three languages: Man and Tree pictures - (Data: E. Danziger, D. Wilkins, FGKA)

The pattern of descriptions provided by Mopan speakers shows us that while use of 'Scene-Internal' and 'Self-as Ground' information strategies appear to be cross-linguistically universal in this context, the use of *any* kind of information external to the Figure-Ground scene – whether about 'speech participant right/left' or about 'geographical' information – is apparently dispensable. The distribution of information strategies across languages suggests that we should now see the encoding of spatial relationships in language in terms of two distinct components – one universal and obligatory in this kind of context, and one variable, contingent and optional in the same context. Where the optional slot for scene-external information is filled, the kinds of information resorted to are culturally variable, and they have different consequences for preferred solutions to non-linguistic tasks.

This cross-linguistic distribution should be of interest to psychologists, since we know from the work of previous scholars (Piaget 1928, Piaget and Inhelder 1963 [1948]) that use of scene-internal information to encode spatial relations is acquired very early, when compared to scene-external or 'Projective' kinds of information. This priority of scene-internal and self-as-ground information is also the general finding in language acquisition studies (Johnston and Slobin 1979, Tanz 1980). The information strategies based on information from outside the Figure-Ground scene (those based on speech-participant physiology and surrounding geography) meanwhile, are usually acquired late

and must often be formally taught. As we have now seen, these are actually culturally contingent and quite optional habits of speech, for the kind of situation represented by the pictures in Figure 1 – and they are not in fact taught or acquired in all speech communities.

In another intriguing branch of the cognitive science literature, Jackendoff has explicitly proposed (1987) that the immediate product of visual processing has direct input privileges to language. According to Marr's theory of vision, this product is described as an 'object-centered 3D model' – that is to say it incorporates only Scene-Internal information (see Levinson 1994). This model may well provide the common ground for visual and linguistic encoding, upon which additional properties are erected: culturally optional, linguistic-cognitive edifices of spatial conceptualization based on speech-participant's right and left, or on surrounding geography.

The data presented here, and the place of Mopan in particular, makes it clear that as far as linguistic encoding is concerned, the representation of spatial relationships in terms of a dimensional matrix of absolute space is a cultural option, and one not taken up in all cases. Can the same be said of non-linguistic conceptualization in the realm of space? Could it be the case that Mopan individuals who speak this way actually also conceive of spatial relationships in a way analogous to their descriptions?

We can examine this question, making use of the fact that the Mopan speakers' characterization of pictures number 3 and number 5 (in Figure 1) has some interesting properties – pictures 3 and 5 are near reflections of one another. As we have seen, while using very different types of information, the speech-participant's right/left strategy and the surrounding-geography information strategy nevertheless readily characterize these two photos as quite different from one another. All of the six Dutch and the six Arrernte speakers whose utterances are summarized in Figure 2 made this distinction. However, not one of the six Mopan speakers represented in Figure 2 distinguished linguistically between these two pictures. This is of course directly related to the fact that the Mopan speakers made no use of information about speech participant's right and left or about the surrounding geography.

(4) Mopan description of picture 5

Ka'	a-käx-t-e'	a	nene'	tz'ub'
CONJ	2A-seek-TR-SUBJ	DET	little	child

You should find the little child,

a	t-u-ta'an	ke'en-Ø	t'opo.
DET	at-3A-chest	be-located-3B	flower

who has the flower at his chest.

Not surprisingly, when this type of description is given and is accepted as complete, picture 3 and picture 5 are frequently selected as matches for one another. It is of interest however to note that when the players check their matches at the end of the session, such matching of picture 3 with picture 5 *may be accepted as correct,* even by players who readily reject non-mirror-image mismatches (say, of picture 4 with picture 6) as obvious errors.

This is a startling observation. It suggests that the Mopan tendency to describe 2D left / right mirror image reflections in identical terms (using Scene-internal information only) goes hand in hand with an analogous psychological phenomenon. This phenomenon, also found elsewhere in the world (Verhaeghe ms., Levinson and Brown 1994, Verhaeghe and Kolinsky 1991) consists in treating the perceptual difference between mirror images as conceptually unimportant. The nature of an individual's judgements in this respect seem often to depend upon his or her previous exposure to cultural experiences in which this distinction has been made functionally salient. Verhaeghe and Kolinsky (1991) show for example that literacy is a major experiential variable affecting judgements about mirror-images. In their study, literate individuals strongly rejected mirror-images as not the same, while many non-literate subjects accepted them (see also Danziger and Pederson 1998).

In short, the convention of counting 2D left/right mirror images as different from one another is culturally learned and arbitrary, and has little importance in everyday life where particular cultural systems do not choose to emphasize it (Van Cleve and Frederick 1991). Various sorts of cultural experience can serve to teach it. What then of habitual language use? Levinson and Brown (1994) posit a link between the common intuition among Tzeltal Maya speakers that 2D mirror images should be considered as the same, and the very infrequent use of terms for 'right' and 'left' in the Tzeltal (Mayan) language. [6]

4. The Mirror Image task

Levinson and Brown's results were obtained in an experiment designed by Stephen Levinson and Bernadette Schmitt, and based on techniques pioneered by Stephen Palmer (1977). The implementation of techniques of this kind in the context of cross-linguistic research was inspired by the work of Arlette Verhaeghe and Régine Kolinsky.

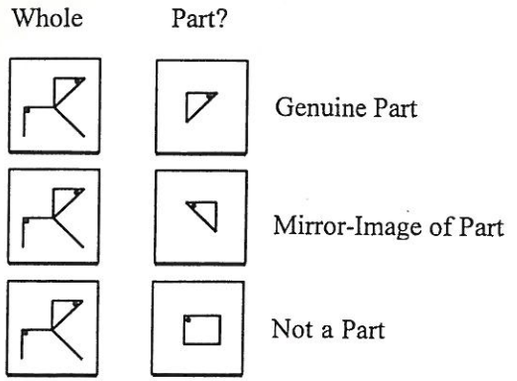

Figure 3. Mirror-Image Part task design

In the task, an individual is shown two different plastic cards with simple abstract line drawings printed on them. He or she is asked to judge whether or not the figure on one card can be found as part of ("inside") the figure drawn on the other. There are five full figure cards. Each is shown three different times, once in conjunction with a true part, once with a clear non-part, and once with a figure that is the left/right mirror image of the true part. Participants were presented with such Part/Whole pairs and asked to decide "if there isn't this one inside that one as well".

(5) Mopan Instructions, Mirror Image Task

Ka'	a-wil-a'	waj	ma'	yan-Ø	ada'
CONJ	2A-see-TR-SUBJ	Q	NEG	exist-3B	DX1

You should see if there isn't this one

ichil	ilik	akana'
inside	same	DX2

inside that one as well.

Using transparencies, participants were taught to accept the Genuine Part and to reject the clear Non-Part. Among those Mopan participants who completed the protocol, all were able to do this successfully on a subsequent practice trial. Participants were at the same time explicitly trained to *reject* the mirror image match.

Data was analyzed only for participants who accepted at least 4 Genuine Parts and who rejected at least 4 Non-Parts over 5 trials each. Over 5 trials

involving Mirror-image Parts, the rejection rates of 34 Mopan subjects were very low indeed. On average, the Mopan participants accepted 2.7 mirror-image parts over the 5 trials. These Mopan results are significantly different from European results (Dutch), where virtually 100 % of the mirror image parts are rejected. This result systematizes what had been an anecdotal observation from Mopan. With the language transcripts, this result shows systematic and quantifiable parallel performance in linguistic and in non-linguistic Mopan treatment of spatial phenomena.

But the phenomenon of mirror-image part acceptance in Mopan is not sociologically undifferentiated. We know from previous studies that literacy has been a significant facilitating factor in the acquired intuition that mirror images can count as different from one another. And literacy is also a significant variable in the Mopan results. The tendency to accept mirror-image parts (average: 3.8 mirror-image-parts accepted over 5 trials) for Mopan speakers who told me that they could not read and write (n = 20) was significantly greater than chance. The tendency to accept these (average: 2.1 mirror image parts accepted over 5 trials) among Mopan speakers who reported that they were able to read and write (n = 14) was not significantly greater than chance, although the acceptance rate even among Mopan literates is still well above the rate in the Dutch sample.[7]

At the same time, Mopan men and women also show interesting differences on this task. The tendency for Mopan women (n = 21) to accept mirror image parts on this task (average: 3.3 mirror-image parts accepted over 5 trials) was significantly greater than chance. The tendency for Mopan men (n = 13) was not (average: 2.0 mirror-image parts accepted over 5 trials), although once again, even this latter group showed an acceptance rate well above that of the Dutch sample.

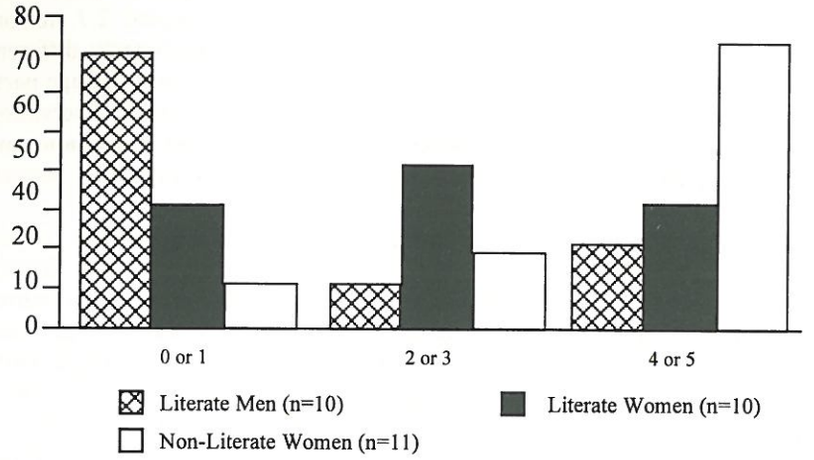

Figure 4. Gender and Literacy in Mopan: Mirror-Image Part Task (% participants, by number of acceptances over 5 trials).

The two sub-populations of Mopan speakers for whom mirror-image part acceptance is significantly high – non-literates and women – are confounded in the Mopan sample, since almost all non-literate Mopan speakers are women (11 of 14). The two appear to be independent factors however, as we can see if we examine separately on the one hand the contrast between men and women in the literate sub-population, and on the other the contrast between literates and non-literates in the female sub-population. The literate Mopan speakers in the sample are equally divided among men (n=10) and women (n=10). The rate for literate Mopan men who succeed at *rejecting* mirror-image parts is significantly greater than chance. The rate for literate Mopan women is not significantly greater than chance. Meanwhile the tendency for non-literate Mopan women to *accept* mirror-image parts in this task differs significantly from chance occurrence.

Figure 5. Distribution of Mopan Mirror-Image Parts Data across social groupings

	Mopan literates (n=20)	**Mopan non-literates** (n=14)
Mopan men (n=13)	Significant *rejection* of mirror-image parts (n=10) Average Accepted: 1.6	Insufficient sample size (n=3) Average Accepted: 3.3
Mopan women (n=21)	Acceptance/ rejection of mirror-image parts is like chance. (n=10) Average Accepted: 2.6	Significant *acceptance* of mirror-image parts. (n=11) Average Accepted: 3.7

As has been found in other studies, literacy is a significant factor here – one which apparently makes it easier for individuals to follow the instructions on this task. But the effect of literacy is much more pronounced in Mopan men than it is in Mopan women. Analogously, being female is also associated here with the acceptance of mirror-image parts – but much more so to the extent that one is not literate. It seems clear that not only literacy, but also gender are important variables in this sample. (Recall that the response pattern of literate Mopan women, characterized as 'near chance', still means that half of the individuals in this group are accepting a majority of mirror-image parts – such a pattern is very different for example from that of Dutch speakers).

5. Discussion of gender

The Mopan people (there are about 5000 today) are peasant farmers who make a living by working small plots of land for themselves in the Highlands of Central America. The society is extremely egalitarian, and every farmer has access to substantially the same subsistence resources. There is little social stratification and few if any occupational specialities. The main basis for economic division of labour is gender. Men work in the fields, and they also usually deal with the world outside the household and outside the village when that is necessary. Women work inside the house, and at domestic tasks inside the village. In particular, the grinding of maize into a form that can be processed for cooking is an extremely time-consuming task that is still often done by hand. Children acquire Mopan as a first language, and, in the community in which I have worked, both boys and girls today usually attend the (non-Mopan) village school sporadically for several years (Crooks 1997). But in this community it is still rare to encounter an individual who has actually completed

a full course of primary education, and it is quite common to meet adults – especially women – who never went to school and who cannot read or write.

The differences observed here between Mopan men and Mopan women are without doubt the products of cultural socialization. In other investigations of spatial cognition cross-culturally, where gender differences have been found (Stewart van Leeuwen 1978, Segall et al 1990) such differences have been clearly related to generalized differences in socialization practices, such that a general emphasis on gender separation (usually associated with peasant agriculture and accompanied by an insistence on conformity and obedience in childhood, especially for girls) also correlates with gender differences on standardized cognitive tasks.

Considerable differences in life experience and in cultural style divide men and women in traditional Mopan society (Gregory 1984, Danziger in press (b)). Mopan boys and Mopan girls are socialized very differently, and adult Mopan men and Mopan women have access to very different types of cultural experience. Although the previous cross-cultural studies which have found differences in men's and women's performance on spatial tasks have not discussed language issues, the Mopan constitute a cultural case in which we are not unduly surprised to find socially correlated gender differences in responses to a spatial task.

6. Gender and spatial language in Mopan

We accept that the difference between Mopan men's and Mopan women's performance on the mirror-image part task is due to experiential variables. But could some of the relevant experience be linguistic? It so happens that the characterization of Mopan speech given in Figure 2 above was based on women speakers only (just as was the characterization of Dutch). In light of the analysis of the data from the non-linguistic task involving mirror-image parts, it seems reasonable to ask about Mopan men's linguistic descriptions of the pictures in Figure 1. Recall that our hypothesis links the emphasis on use of scene-internal information in speech (characteristic of Mopan female speakers as seen in Figure 2), to the possibility that non-linguistic tasks would be approached also on a scene-internal basis, resulting in the intuition that 2D left/right mirror image counterparts should be treated in the same way.

On my most recent field trip I collected linguistic data which strongly suggests that among the many experiential and cultural differences between Mopan men and Mopan women are certain habits of spatial language use. As we have seen, across three pairs of partners, Mopan women describing the 6

pictures in Figure 1 did not use terms for their own right and left. Instead, they referred to parts of the toy man's body (including at times, his own right and left) to locate him with respect to the tree. As we saw, this meant that across the three pairs of Mopan women partners represented in Figure 2, pictures 3 and 5 of Figure 1 were never linguistically distinguished from one another.[8]

Figure 6 repeats the data already shown in Figure 2 for Mopan women speakers. In figure 6, these data are compared to the data collected from three pairs of Mopan men. A heavy reliance on scene-internal information is apparent in the male as in the female data (one pair of male speakers used no speech participant right / left, or surrounding geographic information at all, and in this respect looks very similar to the female speakers' profile). However, of the three pairs of male Mopan speakers faced with this description task, two pairs also had recourse to linguistic informational strategies that would enable them reliably to describe the difference between 2D right/left mirror-images. One of these pairs made reference to surrounding geography in the form of local landmarks. The second pair made systematic use of reference to the speaker's right and left, as well as reference to surrounding geography. Of three pairs of female Mopan speakers, none had successful recourse to such an informational system.[9]

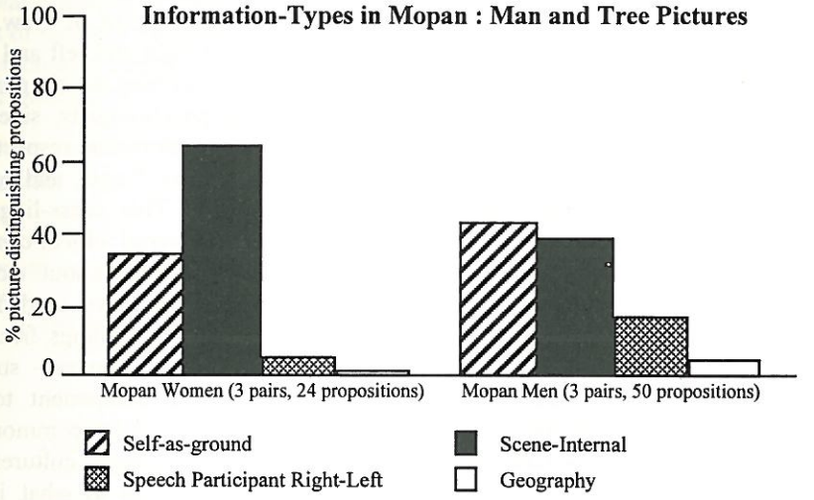

Figure 6. Compares propositional content of six male with six female Mopan speakers

I have been suggesting that the non-use of terms from speech participant's right/left strategies or from surrounding geography strategies in Mopan speech

might be associated with the cognitive phenomenon of mirror image acceptance. The male Mopan speakers consulted in the picture description task show certain language choices which tend in the same direction as does the male data from the non-linguistic cognitive task. The additional speech data from male Mopan speakers supports the association between reliance on scene-internal information (characteristic of Mopan women's speech) and the intuition that 2D left/right mirror images ought to be treated alike (characteristic of Mopan women's reactions to the non-linguistic task).[10]

7. Discussion and conclusion

In comparing sub-populations with different sociolects from within a single speech community, we have surely reduced a large number of the unknowable additional cultural and linguistic factors that might play a role in comparisons across more widely divergent language varieties. I therefore would not hesitate to place this Mopan data alongside previous studies which compare spatial problem-solving strategies across languages. The Mopan case offers extremely suggestive data that indicates the existence of a relationship between habitual language use and conceptual construal in the domain of space.

The Mopan data is also interesting from a *typological* point of view. The fact that the use of information from speech participant right and left and from surrounding geography are both optional additions in describing the six pictures of Figure 1 is one that should be of some interest to psychologists, since the Scene-Internal Frame of Reference corresponds in many interesting respects, on the one hand to the kind of 'topological' space invoked by Piaget, and on the other to Marr's 'object-centered' perceptual encoding. This cross-linguistic evidence thus suggests the existence of a basic and universal object-centered encoding of relations in space. It seems that specifications about external orientation may or may not be added to this, in different ways in different languages, and with corresponding cognitive correlates. The findings from the mirror-image part task – and especially those from Mopan women – suggest however that the existence of a universal informational component to the linguistic encoding of spatial relations *does not* imply a necessary commonality of the subjective experience of spatial cognition across languages, cultures and sub-cultures, nor necessary agreement across communities as to what is the natural and basic way to look at spatial relationships. The cultural option to specify orientation *neither* in terms of speech participant's right/left *nor* in terms of surrounding geography brings with it its own conceptual correlates, in the form of intuitions about 2D left-right mirror-image reflections.

Finally, the Mopan case does more than bring another language and even another language type into the discussion of language and cognition in the area of spatial relationships. The fact that in Mopan we have dealt with *socio-linguistic* differences within a single speech community brings home to us the fact that we need to examine not only the relationship of language to thinking, but of both to 'culture' or 'subculture'. We will have to go beyond the referential (perhaps the most prototypically 'cognitive') function of language, and explore other, more social and communicative ones, in order to gain an understanding of why languages are the way they are, why they play the roles that they do – even in spatial reference– and why language varieties differ in the first place.

The gender data from Mopan make us particularly aware of this, since the differences between Mopan men's and women's speech are those of *sociolect*. They play the role of linguistic indices within the community, as well as that of linguistic symbols. It is not just for referential reasons, or for reasons of arbitrary language-historical convention, that individual speakers (thinkers?) choose and maintain a sociolect. The reasons also have to do with the individual's personal and often unconscious commitment to a particular social identity. Through this mechanism, sociolects also have to do with the symbolic maintenance of the very social order which gives rise to those identities in the first place. Mopan women's language use is part of a complex that *includes* the habits of spatial construal which we have tapped into in our experimental task, but which also clearly includes many other elements of 'language', of 'thought' and of 'culture'.

Appendix

Abbreviations used in Glossing

2A	2nd person Actor or Possessor	STAT	Stativizer
3A	3rd person Actor or Possessor	SUBJ	Subjunctive
3B	3rd person Undergoer	TR	Transitivizer
AFFIRM	Affirmative		
CONJ	Conjunction		
DET	Determiner		
DUR	Durative		
DX1	Speaker-proximal deixis		
DX2	Hearer-proximal Deixis		
DX3I	Textual Deixis		
NEG	Negation		
Q	Interrogative		
SCOPE	Scope		

Mirror-Image-Part Acceptance. Mopan Speakers

Participant	*M/F*	*Lit/Non*	*# Mirror-Image-Part Accepted (/ 5)*
1	F	N	5
2	F	N	5
3	F	N	5
4	F	N	5
5	F	N	5
6	F	N	4
7	F	N	4
8	F	N	4
9	F	N	3
10	F	N	2
11	F	N	1
12	F	Y	5
13	F	Y	5
14	F	Y	4
15	F	Y	3
16	F	Y	3
17	F	Y	3
18	F	Y	2
19	F	Y	1
20	F	Y	0
21	F	Y	0
22	M	N	5
23	M	N	3
24	M	N	2
25	M	Y	5
26	M	Y	4
27	M	Y	3
28	M	Y	1
29	M	Y	1
30	M	Y	1
31	M	Y	1
32	M	Y	0
33	M	Y	0
34	M	Y	0

Notes

1. This work was conducted with the support of the Cognitive Anthropology Research Group of the Max Planck Institute for Psycholinguistics. The ideas it contains are the product of intellectual exchange with many colleagues there, including in particular Stephen Levinson, Eric Pederson, and David Wilkins. Special thanks are due also to David Wilkins for permission to publish his data in Figure 2. Mopan examples are given in the orthography outlined in England and Elliott (1990). A key to the abbreviations used in morphological glosses is to be found in the Appendix. For more information on Mopan grammar, the reader is referred to Danziger (1996a).

2. This interactive elicitation technique draws on work by Clark and Wilkes-Gibbs (1986), and was adapted to the cross-linguistic elicitation of spatial language by Lourdes de León (1991). Figure 1 presents line-drawing renditions of photographs of toy objects. This series of photos was designed by Eve Danziger and Eric Pederson. A comparative semantic analysis based on the functional equivalence of distinguishing propositions used to describe these pictures across languages was developed by David Wilkins. Typological observations made here are based on that analysis.

3. Figures 1 and 3 are copyright of the Max Planck Institute for Psycholinguistics, and are published here with the Institute's permisssion.

4. Data was contributed by Balthasar Bickel (Belhare – Tibeto-Burman, Nepal), Penelope Brown and Stephen Levinson (Tzeltal – Mayan, Mexico), Eve Danziger (Mopan – Mayan, Belize), Kyoko Inoue and Sotaro Kita (Japanese), Sabine Neumann (Kgalagadi – Bantu, Botswana), Eric Pederson (Tamil – Dravidian, India), Gunter Senft (Kilivila – Austronesian, Trobriand Islands), Christel Stolz (Yucatec – Mayan, Mexico), Thomas Widlok (Hai//om – Khoisan, Namibia), and David Wilkins (Arandic – Pama-Nyungan, Australia). Dutch data was also collected and forms part of the sample.

5. This work owes much to Levelt (1984, 1996) and bears obvious similarities to the analysis proposed by Levinson (1996). Levinson correctly appreciates the importance of separating deictic Origo from spatial Ground, and therefore rightly distinguishes the kind of 'right-left' informational strategy discussed above, in which the point of reference for the calculation of spatial coordinates is the deictic Origo but *not* the spatial Ground (– in Levinson's terms, this is the 'Relative Frame of Reference') from other 'Deictic' Frames (Levelt 1984) in which the point of reference is an Origo that is *also* the spatial Ground. Levinson's proposal, however, classifies this latter kind of strategy, (here called 'Self-as-Ground') with all other cases in which the spatial Ground is the point of reference for calculation of spatial relations (here called 'Scene-Internal'). Levinson characterizes both of these as 'Intrinsic' (Levelt 1984), regardless of whether the Ground is or is not a speech participant. He thus restricts the number of informational strategies (Frames of Reference) to three. The four-way analysis proposed here was inspired by conversations with David Wilkins.

6. Tzeltal speakers make little use of speech participant's right and left to describe the pictures in Figure 1. They do however make exuberant use of information from surrounding geography (Brown and Levinson 1993). Literacy is also a significant factor in the Tzeltal mirror-image data (Danziger and Pederson 1998).

7. This statement and the succeeding ones involving probability are based on a simple Chi squared calculation in which the data are divided into two cells: The first cell contains the number of individuals accepting 0, 1, or 2 mirror-image parts over 5 trials. The second cell contains the number of individuals accepting 3, 4, or 5 mirror image parts over 5 trials. The raw data appear in the Appendix.

8. Scene-Internal reference to the left and right hands of the toy man will distinguish picture 7 from picture 8. But it will not distinguish picture 3 from picture 5. Nor will it distinguish between other mirror-image counterparts in which the elements are not considered animate (therefore having their own right and left sides).
9. Recall that it is possible to construct or discover situations in which reference to the speakers' right and left can readily be distinguished from reference to the right and left sides of non-speaker Ground (here, the toy man). It is not possible however, within the corpus of descriptions of these pictures, to discover situations which necessarily distinguish between uses of 'right' and 'left' that refer to the speaker's own parts, where the speaker is understood as a third point, outside the Figure-Ground scene (most explicitly stated, for example, of Picture 7 as "The man is to my right of the tree"), and those where the speaker is construed as also being the Ground of the spatial relation (most explicitly stated, for example, of Picture 7: "The man is to my right"). All too often, utterances take an ambiguous form – in Mopan as in English – such that they are best glossed simply 'Man on the right'. For the purposes of this paper then, which is primarily concerned with the issue of mirror-image description and distinction in the very specific contexts of the materials provided (for which both kinds of reference to speakers' right and left do equally well), all reference to speakers' right and left is classified together, and no such reference is considered an example of the Self-as-Ground, or of the Scene-Internal strategy. As a final characterization of the information strategies used in Mopan however, this will probably not be ultimately satisfactory. Elicitation and specific questioning, conducted with both Mopan men and Mopan women, indicates that Mopan understandings of the terms *seeb'* or *rait* 'right' and *suldeero* or *lef* 'left' are always two-placed rather than three-placed, even when they refer to parts of the speaker (Danziger 1996b). Mopan 'right' and 'left', for example, are not transitive, and the middle object of three placed across a consultant's line of vision cannot be understood to be in any kind of speakers' left/right relation to the two others.
10. It is worth noting here that of the original six Mopan women whose speech is represented in Figure 2, four are literate. The distribution is such that at least one member of each speaker-listener pair is literate. Thus, the data which showed Mopan speakers massively preferring scene-internal to speech participant right and left or to surrounding geographical information in describing the pictures of Figure 1, came from literate as well as non-literate Mopan speakers. There is an indication that literacy may also be a factor in speech patterns however. In the exchange in Example (3), it is a literate woman who initiates the use of speech participant 'left' which is rejected by her non-literate partner.

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