BALINESE SPATIAL ORIENTATION: SOME EMPIRICAL EVIDENCE OF MODERATE LINGUISTIC RELATIVITY

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Through a combination of ethnographic and psychological observations, this article explores the intricacies of the Balinese geocentric spatial orientation system, its adaptation to topographical and historical contexts, its use in everyday language and behaviour, and its influence on the encoding of spatial relationships in memory tasks. While most Balinese use the absolute frame of reference provided by their language and culture, a relative (egocentric) encoding is also used, and the flexibility with which Balinese can switch from one encoding to the other increases with age. The study thus provides empirical evidence for moderate linguistic relativity.

Posing the problem

Does language constrain the way one thinks? In the last decade there has scarcely been any empirical research on this old question, but the issue of linguistic relativity has been revived recently by Brown & Levinson (1993*a*; 1993*b*), Hill & Mannheim (1992), Levinson (1992; 1996*b*) and Lucy (1992*a*; 1992*b*). For many thinkers from the eighteenth century through to the middle of this century, the presumption that cognitive functioning is subordinate to language was self-evident. For Humboldt (1827-9: 191), 'language' was 'the formative organ of thought'; in the middle of this century Whorf articulated his theory of linguistic determination of conceptual organization, which enjoyed prominence for many years. But in more recent times the answer to our initial question has become emphatically 'no'. The reasons for this negative answer are embedded, according to Brown & Levinson (1993*a*: 4), in the rationalist assumptions of current research throughout the linguistic and psychological sciences (Jackendoff 1991; Pinker 1985). This debate has undergone several movements of the pendulum and is probably not yet closed (Gumperz & Levinson 1996). Berry *et al.* (1992: 105) summarize the empirical data as follows: 'In general, we can conclude that there is at best limited support for the linguistic relativity hypothesis at the lexical

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level, but the last word has probably not been spoken on this issue.'

It seems that most important cognitive processes are now deemed to be universal (Segall *et al.* 1990), and languages themselves have been shown to conform to many universal principles (Holenstein 1993). One of these cognitive processes is the coding of spatial arrays for memory and it is clear that every language allows us to conceptualize the space surrounding us and to communicate about it. It is widely assumed in the cognitive sciences that such coding will be determined by general, innate properties of visual perception (Marr 1982),[1] and that it is natural and thus universal to conceptualize space from an anthropomorphic and egocentric point of view (Clark 1973; Miller & Johnson-Laird 1976).

All speakers of Indo-European languages are used to egocentric encoding. Other forms of encoding appear peculiar or even impossible to them, so much so that, in developmental psychology, in cognitive sciences and even in our philosophical traditions, the conception of space was considered necessarily to emanate from one's own body, standing in an upright position and looking straight ahead; that is, in the body's 'canonical position' (Clark 1973: 34). The egocentric conception of space was also considered universal, because it was 'more natural and primitive' (Miller & Johnson-Laird 1976: 34). Rooted in this tradition is the prediction that all languages use the planes through the human body to give us, as Kant put it in 1768 (cf. van Cleve & Frederick 1991), our first grounds for intuition about space, in terms of 'up' and 'down', 'left' and 'right' and 'back' and 'front'.

However, there are growing doubts about these basic assumptions, because they may well be ethnocentric and may partly reflect the linguistic prejudices of the Indo-European tongues (Wassmann 1994). Imagine that one has to describe the position of an object or person with respect to another. In English, we achieve this by utilizing the projective notions of right and left, in reference to the speaker's body. For example: 'Two men are standing before me side by side, and the man on the right is holding a stick'. If the viewer were to take up a position on the other side of the two men, it would be the man on the left who was holding the stick. At first sight this seems obvious and natural, among other reasons because the linguistic encoding is congruent with the kind of primary sensory information provided by the visual, auditory and haptic senses, which are egocentric because our sensory apparatus is bound to the human body with its two eyes, two ears and two hands (Landau & Jackendoff 1993; Paillard 1991).

But it is not so. We have to distinguish the level of sensory information from the level of concepts. Some languages (and here we refer to the conceptual level) do not use the apparently fundamental, body-centred spatial notions of 'left'/'right', 'front'/'back' at all. Instead, they rely on fixed, environment-centred frames of reference, such as cardinal directions or related terms. For example, speakers of such languages might say 'The man on the west side is holding a stick'. In this case, the description does not change with the viewer's position.

This has a surprising consequence: such a non-egocentric linguistic coding of a spatial array seems to be *incongruent* in fundamental ways with the primary sensory information, and the question arises whether these linguistic differences correspond to conceptual differences (Levinson 1996*b*). We may assume that spatial representations are influenced either by sensory information (which is egocentric according to the predominant idea in the cognitive sciences) or by

language (which may or may not be egocentric). In Indo-European languages, which are egocentric in this respect, the two are confounded. Carrying out a study in languages such as Balinese, that do not use the egocentric frame of reference, allows one to dissociate the two.

Space in everyday personal practice

The extensive ethnographic literature on spatial symbolism has tended to neglect the spatial concepts in daily use by individual actors. 'The focus has been on collective representations, on cosmologies and the symbolic uses and associations of space, with little mention of the kind of notions in daily use to solve problems' (Levinson 1996*a*: 354). Although studies have been made of navigational practices in Oceania (Feinberg 1988; Hutchins 1983; cf. also Frake 1985), this literature is very scanty and there seem to be surprisingly few data about how, for example, hunters and gatherers actually make their way through deserts and tundras (cf. Lahiri 1965; Nash 1993).

One approach to studying the everyday use of spatial concepts is to examine the language of spatial description: how do people refer to places, navigate in their spatial environment or describe spatial arrangements? This is of general anthropological interest because direct connexions can frequently be discerned between cosmology, practical activities and the linguistic resources used to make spatial distinctions in different cultures. In the cognitive sciences, there has been a strong interest recently in 'language and space'. It is exactly the divergence between the complex innate bases for spatial cognition, and a series of 'neo-Whorfian' findings in linguistics, psychology and anthropology suggesting far more cultural variation in spatial language and cognition, which renders this field so interesting. To take the example of the coding of a spatial array. This superficially simple process lends itself to investigation by various disciplines: by neurologists, cognitive psychologists, linguists and anthropologists. Some of them know something about neural coding possibilities and about memory, others about how vision is constructed mentally, others again know about the linguistic possibilities of communicating what has been coded, and others know about the cultural environment where the coding occurs. But the cognitive sciences have tended to make rash generalizations based on 'Western' data taken to be hard facts (here anthropology might be able to intervene), and anthropology has tended to take up too relativistic a position, reinventing humanity in every culture (cf. Bloch 1995).

In our opinion, however, to bring together the two approaches presupposes a collaborative effort of, for example, an anthropologist and a cross-cultural psychologist, both concentrating on the acting individual (Wassmann & Dasen 1993; 1994*a*; 1994*b*). For this reason, we felt that it was necessary to go beyond the questioning and observation of everyday behaviour that form the stock-in-trade of traditional anthropology, and that the special skills and techniques of psychology (and linguistics) might usefully be employed as an integral part of the work.

Imagine, as an anthropologist, having to investigate the spatial orientation of somebody in his environment. One can inquire and observe, but the results will probably be quite vague and accidental (for an anthropologist, the cognitive processes behind, let us say, the coding of spatial arrays for memory, are out of

reach in any case). The reason is simple. In everyday settings, routines determine people's actions; rarely can one spontaneously observe how an individual is confronted with a new problem, conceptualizes it as such and searches for solutions. 'Problem formation and problem solving are very likely to be integral parts of a single process in many real world environments' (Murtaugh 1985: 192). The solution of a problem occurs automatically, almost unobservably, and it is not easy to examine an individual's thoughts. A further problem is that cultural knowledge is often 'transparent to those who use it', and, once it is acquired, 'it becomes what one sees with, but seldom what one sees' (Hutchins 1980: 2). Thus, cultural knowledge is often used unconsciously: it is implicit, incorporated, non-reflexive (Keck 1998). For this reason, experiments may be a valuable tool for research. In an experiment, or 'controlled observation' or 'induced situation', an informant is confronted with an artificial situation, accompanied by instructions and questions; a problem is created which he can solve through the explicit and conscious application of his cultural knowledge.

The advantage of such a procedure is obvious: knowledge now used in a new situation can be more easily observed and can tell us more about cognitive processes than the observation of daily routine. But there are disadvantages, too, which is why anthropologists often reject experiments: above all, there is the possibility that the situations may be too artificial to be fully understood by the informants and may have no or only an indistinct connexion to daily routine. For this reason, we have made great efforts to minimize these disadvantages; the experiments we shall describe were adapted to the local culture in such a way that we believe they genuinely contribute to a better understanding of spatial orientation.

Spatial and spiritual orientation in Bali

Many authors have described the Balinese orientation system (Belo 1935; Covarrubias 1937; Hauser-Schäublin 1997; Hobart 1978; Hooykaas 1974; Howe 1980; James 1973; Ramseyer 1977; Reuter 1996). All acknowledge the extreme importance of orientation for the Balinese. A direction describes a vector, as it refers not only to physical but also to cultural, religious and social space. Orientation is geared to the island's central mountains, to the uphill direction, prototypically to the central volcano, Gunung Agung (3142 m.), the dwelling place of the Hindu gods of Bali: 'Towards the mountain', is the sacred and pure direction, and is called *kaja* (from *ke*, towards; and *aja*, hill, mountain) while 'towards the sea' is the direction called *kelod* (from *ke*, towards; and *laut*, sea). It should be noted that the sea is not impure in itself, only the direction towards it; indeed, the sea can purify and provide sacred water. *Kaja* is often translated into English and Indonesian as 'North'; that is, the situation of South Bali (where most of the population lives) is applied to the whole of the island. But the *kaja-kelod* axis is in effect variable – in the North of the island, *kaja* will be South. This type of topography-dependent orientation system can also be found in other languages of South-East Asia and Oceania (Barnes 1993; Ozanne-Rivierre 1987; Senft 1997).

Another direction, *kangin*, is also considered sacred: everywhere in Bali, this is the direction from which the sun rises. Its opposite is *kauh* (for both terms there is no literal translation). The axis *kangin-kauh* is fixed, whereas the *kaja-kelod* axis

is variable depending on one's position.

According to the literature mentioned above, the intercardinal directions, *kaja/kangin, kelod/kauh* and so forth are also commonly used. To each of the eight directions, as well as to the centre, correspond a god and a colour (see fig. 1). The entire Balinese cosmology is structured into high, middle and low, oriented *kaja-kelod*: from the human body to the entire universe, from the structure of temples and villages to social structure and even the various life stages. The equilibrium of this structure must be preserved at all times.

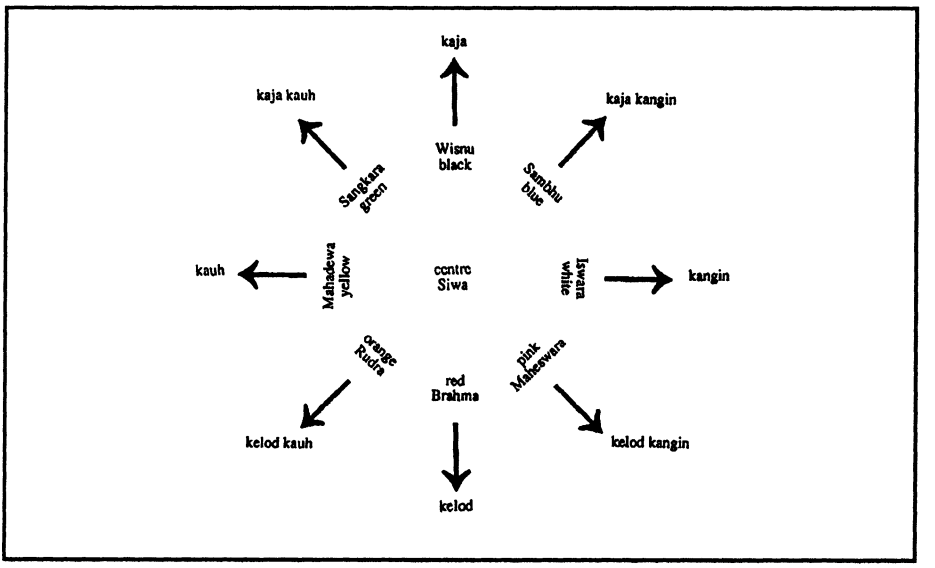

FIGURE 1. The Balinese spatial orientation system.

Numerous aspects of Balinese life are thus traditionally organized according to this scheme. Villages are built prototypically along a *kaja-kelod* line, with the main temple (Pura Bale Agung) and the temple of the purified village ancestors (Pura Puseh) on the mountain side and the cemetery on the sea side. Each temple is aligned in the same way, as well as the various shrines within the temples along both axes. The houses of a family compound are similarly oriented, with the family temple in the most sacred corner, situated *kaja/kangin*. The head of the family lives on the *kangin* side of the compound, and everyone sleeps with his or her head oriented towards *kaja* or *kangin*. The layout of various parts of the house and of the furniture follows similar rules: the kitchen will be built *kelod* and the animals and the rubbish can be found in the least sacred corner, *kelod/kauh*.

The disorientation felt by Balinese people when they 'lose the North' (lose their bearings) has often been mentioned. Geertz, for example, writes: 'Balinese regard the exact maintenance of spatial orientation ("not to know where north is" is to be crazy), balance, decorum, status relationships, and so forth, as fundamental to ordered life (*krama*)...' (1973: 446). Likewise, McPhee (1944) describes the total inhibition (bordering on depression) of a young boy, brought to an unknown village for a dance practice, who could not start dancing until he was shown Gunung Agung from some neighbouring rice fields.[2] Bateson and Mead (1942) speak of fear and anxiety associated with disorientation, saying that

people can sicken or fall asleep if they lose their sense of direction. Jensen and Suryani (1992), two psychiatrists, one of whom is Balinese, feel that this description is exaggerated and that what McPhee reported is atypical. They point out that when a Balinese arrives in an unknown place and cannot orient himself, he will simply make inquiries rather than fall ill; but they agree that disorientation produces tensions and a 'state of confusion (*bingung*) in which it is difficult to pursue one's thoughts and speech clearly' (1992: 76).

Early socialization

Children seem to learn the use of the orientation system very early in life. According to Bateson and Mead (1942: 6),

> the words for the cardinal points are among the first that a child learns and are used even for the geography of the body. A Balinese will tell you that there is a fly 'on the "west" side of your face'.

The Balinese baby also learns early on that the left hand must not be mistaken for the right hand. The latter is used to handle food, while the left is used for washing; it should never be used to touch food, point to something or receive a present.[3] It seems that the words for 'left hand' and 'right hand' are learned before the orientation terms.[4] A typical admonishment of parents to a child of twelve to eighteen months is: 'Use your right hand, not the left one!'. Or, when the child starts eating food, he may be asked: 'Where is your right hand?'. Note that left and right are only used to designate body sides, and are not used for spatial orientation.

The child is confronted with the orientation system for the first time when put to sleep. After he is eighteen months old, a typical admonition is: 'Put your head towards *kaja*!'. Often a phrase is used that expresses a contrast: 'Put your head *luan*, don't put your head *teben*'.[5] An often used proverb is 'Never ever use *kelod* as *luan*' (*sing dadi maluanan kelod*). By the age of three, the child – due to this habit – reacts when placed wrongly (head to *teben*) in bed. At the same age the child may be confronted with the orientation system when taken to the shrine in the *kaja/kangin* corner of the compound, with parents asking: 'Where are we looking?' If the child asks for the whereabouts of someone, such as his father, the answer might come: 'He is *kelod*' or 'He is at work in a ricepaddy that is *kelod*'. Learning the system depends largely on the child's knowledge of the local sociocultural geography. Initially, orientation terms are understood mainly as place names (cf. de Leon 1994), but after the age of four children gradually generalize the system from its local basis into an abstract system.

Linguistic survey: space games

The various examples cited above suggest that Balinese 'cardinals' are used in a fundamentally different way from the use of cardinals in Indo-European languages. They are applied not only to macro-space, but also to micro-space, whenever an object has to be located or a direction indicated.

In order to document the use of spatial terms in Balinese, we carried out a linguistic survey using a standard procedure called 'space games'.[6] To record the language used in the description of spatial references, a situation is organized in

which two speakers must verbally negotiate over spatial arrangements, with little or no interference from the researchers. Each 'player' has an identical set of photographs (or toy models) representing two persons in various positions and orientations, with the possible addition of some reference elements such as a tree or an animal. The two players look in the same direction and are separated by a screen. One of the players is designated the leader and has to take each photograph in turn and describe it so that the other player can select the corresponding photograph. The conversations, in low Balinese,[7] were recorded, transcribed and translated later. These 'space games' were carried out in two villages in South Bali and in various villages in the North and the East of the island. A total of 174 descriptions were obtained from 29 pairs of players, both children and adults.

We recorded the occurrence, in each description of a spatial array depicted in the photographs, of at least one absolute (a), egocentric (e) or intrinsic (i) descriptor. To explain these terms, let us take the example of one of the photographs used in the task. In English, it could be described in the following way:

> Two men are standing side by side, a short distance apart; each is holding a stick in his right hand. The man on the right is looking towards me; the one on the left is looking the other way.

Descriptors such as 'on the right', 'on the left' and 'towards me' may be called egocentric (e), because they are relative – prototypically – to the viewpoint of the speaker, with a co-ordinate system based on the planes through the body; the space is thus structured by the dichotomies 'up'/'down', 'back'/'front' and 'left'/'right'. On the other hand 'side by side' and 'a short distance apart' may be called intrinsic (i) descriptors, because they refer to the relative position of an object with respect to another, to a frame of reference that involves an object-centred co-ordinate system, where the co-ordinates are determined by the inherent features of the objects and independently of the speaker (cf. Levinson 1996*a*).

These two types of descriptor are familiar to speakers of Indo-European languages. However, many languages (including Balinese) use predominantly, and sometimes exclusively, geocentric or absolute (a) descriptors. This is the case with the Guugu Yimidhirr language of Queensland (Haviland 1993), Tzeltal, a Maya language from Chiapas in Mexico (Brown & Levinson 1993*b*), the Yupno language in Papua New Guinea (Wassmann 1993; 1994; 1995) and some languages in Nepal (Bickel 1994) and Southern India (Pederson 1993). These descriptors are independent of the speaker or the position of some other object, but they relate to arbitrary fixed bearings, for example in the landscape: upriver/downriver, towards the mountain/sea, towards sunrise/sunset, and so forth. No simple ecological determinism seems to explain the occurrence of such systems, which can be found alternating with relative (egocentric) systems across neighbouring ethnic groups in similar environments, and which occur in environments of contrastive kinds. In most cases, absolute descriptors are used in combination with intrinsic descriptors, which seem to be found in all languages.

The Balinese language allows the use of two of the three types of descriptor, the absolute and the intrinsic, but with a clear preference for absolute references (*kaja, kelod, kangin, kauh*). The photograph mentioned above would be typically

described (in South Bali) in the following fashion (the speaker being oriented towards the central mountain, i.e. *kaja*):

> One man is *kauh* and the other *kangin*. The one who is *kauh* is looking *kaja* and the other is looking *kelod*. They are slightly separated. The one who is *kangin* is holding a stick in his *kauh* hand; the right hand of the man who is *kauh* is also holding a stick.

In Table 1, such a description would be classified under column 'ai', since it contains at least one example of an absolute descriptor and at least one intrinsic ('slightly separated', 'right hand'). From this table, it is clear that the vast majority of speakers (98 per cent.) use at least one absolute descriptor for each photograph. Egocentric descriptors (as in 'the right-hand man looks *kelod*') are rare, except in adults from the (more Westernized and bilingual) south of the island where they were used with 36 per cent. of the photographs, but almost always in combination with absolute descriptors. Young children in the first years of school use exclusively absolute descriptors, whereas older children and adults add intrinsic descriptors.

TABLE 1. Percentages of absolute (a), intrinsic (i) and egocentric (e) referents utilized in spatial description. (Σ= sum of.)

	No. of pairs	*No. of photos*	*a*	*ai*	*i*	*e*	*ei*	*ea*	*eai*	Σa	Σi	Σe
North-East												
7-9 years	6	36	94	6	0	0	0	0	0	100	6	0
11-15 years	6	36	50	50	0	0	0	0	0	100	50	0
Adults	11	66	35	56	0	0	0	6	3	100	59	9
Total N-E	23	138	54	41	0	0	0	3	1	100	43	4
South												
Adults	6	36	0	58	6	0	3	11	22	92	89	36
Total N-E and S	29	174	43	45	1	0	0	3	3	98	52	11

The predominant use of the absolute reference system in the Balinese language fits perfectly with its symbolic importance in Balinese culture. In other words, there is an obvious coherence between the cultural and linguistic systems.

Only ritual specialists such as priests usually understand the cosmological significance of the cardinal directions, and it is of little concern to the majority of the population, at least in the remote Eastern part of the island. We carried out twenty-five interviews on this complex cosmological system, often with small groups of people. No-one knew the localization of the colours or the gods according to the eight directions. Our informants knew that such a symbolic system exists for the four main directions, but had not mastered the details, and explained that, when they need to, they consult a specialist. This shows that it is important to look beyond the high culture to the way ordinary people deal with such a system in everyday life.

The orientation system in everyday life: topographical variations

The importance of the orientation system in Balinese everyday life can easily be

observed, and orientation terms constantly crop up in conversation. Absolute terms are used to describe a place where one wants to go ('This afternoon, I'm going *kauh*'), or to give directions ('Turn left, then go *kangin*'); a mother might yell to her child 'Don't throw your shoes *kauh*!'. During a meal, someone might say 'Please pass the dish which is *kaja*'. When reporting on a meeting, a person will be designated as 'The one who was sitting *kelod*'. It seems therefore that positions are memorized in an absolute manner.

Whether at home or at school, children must learn to follow instructions according to this orientation system. Elementary school teachers even use this knowledge as a test of readiness for school. But teaching, which is done exclusively in Indonesian, relies on relative descriptors. For example, in order to point out the difference between the letters b and d, teachers say they use 'in front of'/'behind' and 'right'/'left' and only resort to *kaja/kelod* if the children have trouble understanding.

The orientation system is used in a large number of social situations. During cockfights, for example, when spectators determine which animal will be the favourite and fix the odds, they will shout a word that designates the chosen animal; it may be the colour of the feathers, but often it indicates the animal's position.

Another example of a situation where directions are constantly used is a game of chance called *kelos* or *kece*. The players are divided into four groups and sit according to the four directions. They first bet on one of the directions and the game leader then takes a handful of tokens (in fact old Chinese coins) which he throws in the centre of the circle four at a time, until only four coins, or fewer, remain. The number of remaining coins determines the winning direction (1 = *kaja*, 2 = *kauh*, 3 = *kelod*=, 4 = *kangin*).

In the village of Lean, in the East of Bali, we observed a game for which players had come from the neighbouring village of Bunutan. At the beginning of the game, the following surprising dialogue took place:

- Which system are we going to use, Bunutan or Lean?
- The Lean system.
- In Bunutan and here, *kaja* and *kelod* are in the same direction.
- *Kangin* and *kauh* are different.
- Here, *kauh* is this side (towards the village of Seraya).
- For *kangin*, it is four coins; *kangin* is there, Bunutan side.
- For *kelod*, it is three coins.
- It's the same as in Bunutan.
- If the rest are four coins, the winner is *kangin*.
- *Kangin* is this side (towards the village of Bunutan).
- ...

In this case, the players had to agree on which orientation system they would use, since, as we shall see, the two villages do not use identical systems.

Indeed, we have established, as we shall see in detail below, that the system is not at all uniform but strongly local, that it is adapted to topography and that it can even vary according to historical circumstances, or be used in different ways by individuals of the same village (cf. Wallace 1968). If *kaja* does indeed mean 'towards the mountain', it may not necessarily designate the central mountain Gunung Agung, particularly in places where this mountain is not visible, but another mountain close by. When the Balinese designate the cardinal points, they

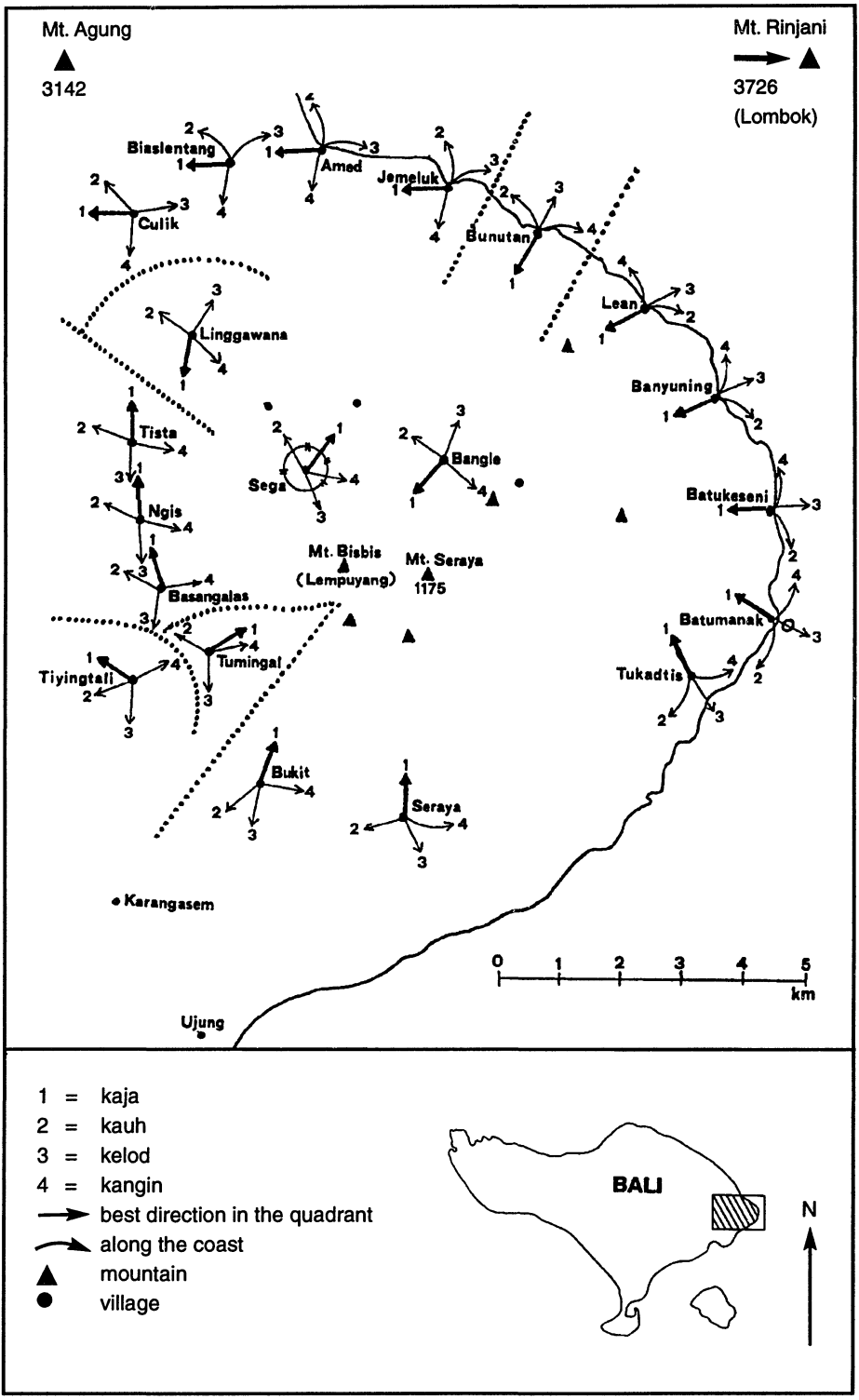

FIGURE 2. The topographical adaptations of the Balinese spatial orientation system around the North-East peninsula.

do not refer to abstract directions, but to the route towards a particular site, which can even be circular. Each direction represents a quadrant, with a focal point as a prototype indicating the 'best' spot, but one which is not necessarily at the centre of the quadrant. The four main directions are commonly used, but less so the intercardinal directions, which represent the borders between the main quadrants.

We have investigated in detail how the inhabitants of various sites on the Eastern peninsula of Bali use the system (see fig. 2). This peninsula is formed by a circular mountain range that includes Mount Seraya (1175m) and Mount Bisbis, which is not as high but is an important symbol because of the temple of Lempuyang perched at the top. Within the mountain range, a large region contains only a few villages (the principal ones are Sega and Bangle). South of the peninsula lies the village of Seraya, where the orientation system is applied following practically the same modalities as in South Bali. That is, *kaja* (coded 1 in fig. 2) means North towards one of the peaks, and *kangin* (coded 4) represents the geographical East. Going around the peninsula on the circular road (anti-clockwise), *kaja* remains oriented towards the closest peak, while *kangin* 'moves' further and further towards the North, following the curve of the coast. For the inhabitants of the easternmost cape on the island, the sun rises *kelod* (towards the sea) and *kangin* (sunrise) designates the North.

One might have expected to see *kangin* and *kauh* remaining respectively, right and left of the *kaja-kelod* axis, in the same way as East and West remain immutable when we go around the globe on the equator. However, this is not the case: at a certain point, the system reverses itself. If there is a reversal, one might have expected to see it at the easternmost cape, but this is not the case either: *kangin* continues to be on the right side up to the village of Lean, where it designates the North-West (and where the sun rises *kelod/kauh*!), then *kauh* and *kangin* are reversed in the next village, Bunutan. The villagers are quite aware of this situation and, as demonstrated in the example mentioned above, they adjust their language when they visit their neighbours. There is even a hamlet (Lipah) between the two villages, where both systems co-exist. This situation seems to be linked to the history of this region, villages from Seraya to Lean having been populated from the former, while Bunutan was populated from the mountain village of Bangle.[8]

In the next village the system changes again, with a 90° rotation. Mount Agung is now visible and *kaja* is directed to it, with *kelod* along the coast and *kauh* towards the sea. But it would be wrong to infer from this that as soon as Agung is visible it necessarily designates *kaja*. Indeed, if we continue along the road circling the peninsula (in a southerly direction), we arrive between two mountains (Mount Bisbis and Mount Agung). Here, the people call these two directions respectively *kangin* and *kauh,* referring to actual sunrise and sunset. For a short distance (to Linggawana), *kaja* designates the pass between the two mountains, then *kaja* and *kelod* are reversed; in some localities (for example on the road from Ngis to Lempuyang), one finds oneself in the astonishing situation where *kaja* (towards the mountain) is the direction in which one sees the ocean. However, it is also the direction towards the pass, i.e. upstream. The Seraya system is found again past the village of Tumingal, which uses an intermediate system. Thus three systems exist around the peninsula, with intermediate systems valid on short stretches at the border between each system.

In some cases, the adaptation to local topology, combined with historical factors, produces a complete modification of the system. For example, in one of the mountain villages (Sega) located in the circuit mentioned earlier, *kaja* designates the top of the slope on which the village lies, with a quadrant of approximately 60°, *kelod* (towards the sea) is oriented towards Mount Bisbis and represents a 150° quadrant, *kangin* is located towards sunrise (60° quadrant) and *kauh* occupies the remaining 90°. All the inhabitants of Sega know the system, which they sometimes call the 'traditional' system because it is the system of the village of Ngis from which the people of Sega historically came (see fig. 2). But some of them, mainly those who often travel to Bunutan on the coast for trade, use another system in which *kaja* remains oriented the same way, but in which *kelod* designates the actual road to the sea; in this way the axial opposites *kaja* and *kelod* differ only by about 30°, whereas *kangin* indicates a wide 210° angle oriented towards the geographical East and South, and becomes adjacent to the axial opposite *kauh*.

Given the wide topographical variations in the system, 'North' is patently inadequate as a translation of *kaja*, but even 'towards the mountain' is not always correct. *Kangin* may be right or left of this axis, designating more or less the direction of sunrise in the majority of cases, but not always.

The translation of these terms into Indonesian is equally problematic. *Kaja* is translated as *utara*, and *kelod* as *selatan*, but these terms may be used in the Balinese way (as a topographically dependent axis 'towards the mountain/the sea'), or in the standard dictionary translation, as the geographical North and South of the compass. During a discussion we had with a group of primary school teachers in Bunutan, it was found that half of them were using these Indonesian words in one way and half in the other way; a lively debate ensued, and no agreement could be reached.[9]

Right and left

How are the terms 'right'/'left' and 'in front of/'behind' used in everyday life? Most of the time, their use in Balinese is limited to the individual's body or to objects touching the body. However, absolute descriptors can also be used in the latter case. Although they are able to designate their right and left hands, children always use absolute descriptors, even for hand-held objects. To describe a route, adults often use 'turn right or left', but systematically add 'towards' and one of the absolute directions (e.g. 'turn right towards *kaja*'). So what may look like a familiar, egocentric left-right system is not really one, because it has no true projective semantic application ('turn right: turn to the right side of your body').

Here is an example of a route description. An old man described to us the path from the school in Sega to the village of Bunutan. Note that he used the traditional system in Sega demarcation but changed the system implicitly after reaching the fields of the neighbouring village of Bangle: *kelod* first means South, then North.

> You start here and from here you walk down towards *kangin* (East) and then turn left towards *kaja* (North) until you reach the junction. There you turn right towards *kangin* (East) in front of the store, there you keep left, turn down towards *kangin* (East), keep left until near the coconut tree that is bent ... After reaching the side of the bamboo grove, you turn left towards *kaja* (North) and walk until the big mango tree in Blimbing. After crossing the

Blimbing river you turn right towards *kangin* (East) until you reach the *beluhu* plant in Batugorok. From there you walk towards *kelod* (South) for a short distance before turning left towards *kaja* (North/East) until you arrive at the house of Jero Sergi. There you turn right towards *kelod* (South), you will arrive under the *aya* bamboo in Tunbul (Bangle village), then turn towards *kelod* (North!) ...

Probably due to the influence of the (spatially-relative) Indonesian language that has been established as the national tongue, even relative (egocentric) descriptors may today occur – mostly as imports from Indonesian. This would explain why only older school children and adults, who tend to be bilingual, use these relative terms, and it may also be the reason why the corresponding Indonesian words (*kiri/kanan*) are very often used in Balinese speech.

It seems that left and right are mainly used in everyday life, but not by dancers, musicians or craftsmen, who prefer the religiously loaded *kaja-kelod* during their activities. But there is a reason to avoid left and right even in colloquial speech: politeness. Absolute terms are valid for both the speaker and the (facing) interlocutor,[10] and they avoid the speaker putting himself at the centre, instead of being just part of the social and topographical environment. Left and right are simply too individualistic!

In sum, the Balinese language uses a frame of reference that is absolute, albeit in an extremely localized manner, as became evident on our tour of the Eastern peninsula.[11] Relative terms are 'available' to adults and may be used sporadically, as we saw in the 'space games'.[12] How does this characteristic influence *non-linguistic spatial representations*? If one needs to memorize a certain ordering of objects in space, there are three different ways to encode the information: one can use exclusively relative referents, or exclusively absolute referents, or a combination of the two.[13]

Induced situations: encoding for spatial representation

The experiment described below is based on a simple paradigm. The subjects are presented with a stimulus containing spatial information; they are then asked to turn 180° and requested to carry out an action with regard to a related stimulus. This rotation is a simple and direct way of discriminating between absolute and relative strategies for encoding spatial relations.

Let us suppose, for example, that the subjects of an experiment are presented with an arrow pointing left on a table; the subjects then turn 180° and are presented with two arrows, one pointing to the left and the other pointing to the right, and are asked which of the two arrows is identical to the one on the first table (Levinson 1992). If they choose the arrow oriented to the left, they have used an egocentric encoding, related to their own bodies. But, if they are encoding space in the geocentric way, they will chose the arrow oriented to the right, because it points to the same absolute direction.

It should be repeated that a relative encoding will lead them to choose a stimulus that seems to be identical (congruent) with the visual image of the arrow on the first table, whereas an absolute encoding will make them choose a stimulus that is a mirror image of the first stimulus, i.e. that is incongruent with the initial arrow, and represents therefore an additional processing of the primary sensory information. A delay of 30 seconds is inserted between the stimulus and the response after the 180° rotation. This is to minimize specific short-term

memory effects ('snap-shots') that could lead the subjects to relative solutions (since a visual image automatically encodes an egocentric viewpoint). But a visual image is normally flushed by new visual information and has a natural decay period of below 30 seconds (Baddeley 1990: 31). Furthermore, it is crucial that the task be presented initially without verbal cues, because linguistic coding may predispose towards an encoding in line with the language.

The experiment

In a series of induced situations we used two tasks called 'Animals in a Row' and 'Steve's Mazes.'[14] The tasks were carried out on the verandah of the house of one of the authors, in the fishing village of Bunutan in the North-East of Bali (for the local reference system see fig. 2). Two tables were arranged at a distance of 5 metres, oriented *kaja-kelod*. Going from one table to the other, the subject rotated 180° after a 30-second wait (with no other diversion than watching a clock).[15] In this experiment, no verbal explanation was given that might have induced the subjects to use one or the other spatial reference system; the instructions were devoid of as much spatial information as possible.

For the Animals task, a series of three animals (chosen from four locally available figurines – duck, goat, frog, tortoise) was presented on the first table for five successive trials following a demonstration trial. The figurines were arranged in a row and oriented alternately to the right (*kelod*) and to the left (*kaja*). The subject was instructed to remember this arrangement in order to reproduce it on the second table. Note was taken of the order in which the subject would lay out the animals and the orientation of the alignment.

For the second task (Steve's Mazes), a drawing of a landscape including a house, rice-fields and trees was presented on the first table. A path was indicated on it with a meandering line stopping a short distance from the house. The researcher explained to the subjects that they had to find the way from the end of the path to the house without crossing the rice-fields or the wood, then indicated the solution by tracing the remaining path with a finger, and tell the subjects to memorize it. On the second table, three cards were placed, showing different path segments, one representing the relative solution, another the absolute solution and the third an irrelevant choice (distractor). The task was composed of five of these drawings, besides a demonstration trial (see fig. 3).

We use the following criteria for the presentation of our results: If the subjects, out of five trials, give four or five answers of a single type, they are classified as A or R (A = absolute; R = relative); if they give three answers of one type, they are classified respectively as A- or R-.

This experiment was carried out with twenty-eight subjects (140 trials), including eight children aged 7 to 9 (wf to 2 years of schooling), eight children aged 11 to 15 (2 to 5 years of schooling) and twelve adults between 20 and 60 years of age (wf to 6 years of schooling), with a virtually equal distribution between sexes. Moreover, a simplified version of the Animals task (two figurines instead of three, 5- to 10-second wait) was administered to ten children aged 4-5 years.[16]

The results are presented in Tables 2 and 3.

In the Animals task, most subjects showed systematically absolute (geocentric) reactions, and none showed systematically relative (egocentric) reactions. In

comparing these results with those of Brown & Levinson (1993*a*), we can see that they are similar to those obtained with the Tzeltal of Tenejapa in Mexico, and completely opposite to those of the Dutch (also collected by Brown & Levinson), virtually all of whom reacted in a relative way.

In Steve's Mazes, only one quarter of the subjects make systematically absolute choices, and most of them mix absolute and relative choices; another quarter of the subjects make systematically relative choices.

For the first task, the reaction of 4- to 5-year-old children can be added to these results. This group gives systematically absolute answers. This corresponds well to the language they use, which is totally absolute: even when designating a hand-held object, these children never use right or left but always absolute directions.

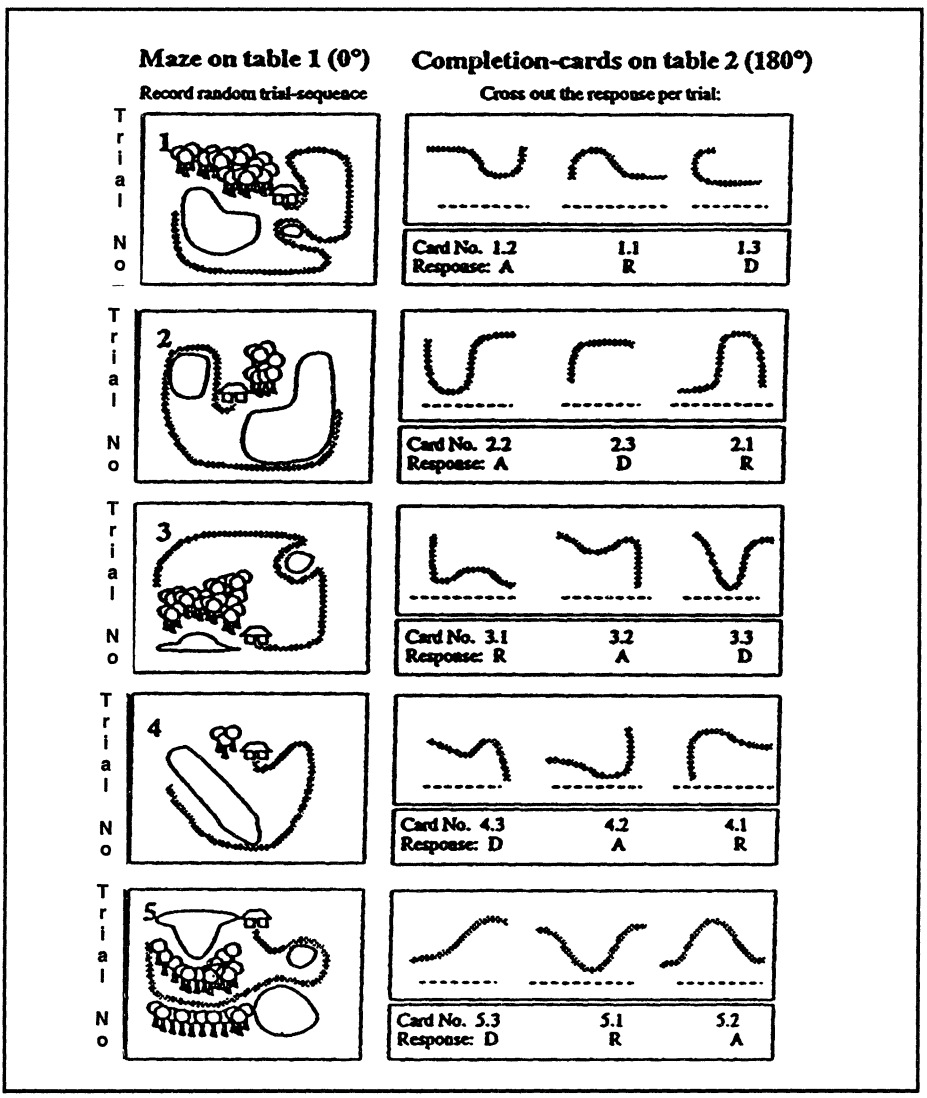

FIGURE 3. Transcription sheet for Steve's Mazes.

Seven- to 9-year-old children use an absolute encoding for the first task, but half their answers are relative in the second task. The increase in relative responses is also noticeable in the 11- to 15-year-old group for the first task and in the adult group for the second. There appears to be a slight age trend, relative responses increasing with age (or with the number of years of schooling), but this trend is not statistically significant.

The fact that a test is non-verbal does not mean that no linguistic encoding occurs. The Animals task certainly lends itself quite easily to such an encoding, in the form of such phrases as 'the duck is in front and the tortoise in the middle, and all of them are looking towards *kaja*'. It is obvious that a linguistic encoding would be just as easy in a relative form ('they all look to the right'), but we noticed that in the use of language the absolute system was strongly predominant. Such a linguistic encoding strategy does not apply as well to Steve's Mazes, where the configuration is a shape that is more difficult to describe than a single direction. Children use some non-linguistic mnemonics such as tracing the path with their fingers, but, surprisingly, this kinaesthetic memorizing of a gesture did not foster relative answers. There are other differences between the two tasks which may also have an effect. For example, the Maze task invites an encoding as a journey and may be more connected to motion-coding, while the Animals task may be more connected to order and direction coding (cf. McNamara 1986; Thorndyke & Hayes-Roth 1982).

The differences between the strategies used in the two tasks are reflected in the thoughts the subjects expressed after the fifth trial. First, subjects find it easier to describe the strategies they used in the first task than in the second. In the first task, most of them say 'There [on the first table] the animals are looking towards *kaja*; here [on the second table] they are also looking towards *kaja*'. The relative responses are never justified with reference to right or left but simply through a description of the order of the animals, or even by using absolute terms: 'If over there they are looking *kaja*, here they are looking towards *kelod*'. In the second task, subjects who mainly provide absolute answers explain that they have memorized an image of the path, and they sometimes describe its shape ('it's like the letter u', 'like a belly curved towards *kauh*'). Those who give relative answers talk about following the path, for instance, from left to right. An adult who gave five relative responses in this task said 'I remember the shape; the path goes from left to right. It cannot be described with *kaja-kelod*'. However, in the first task, this person had given five absolute answers.

In conclusion, all our subjects can use two coding systems. However, preference for the absolute system is clear, especially in the first task, in which a single word from the absolute system enables the coding of the orientation (order and direction) of the arrangement. A relative encoding is more frequently chosen in the second task which is more difficult to code verbally and which may be more tied to motion.

Table 3 shows that, out of all the subjects, only five give systematically absolute answers to both tasks. Thus it appears that all subjects can, in a way, 'choose', or be induced by the device, to use one or the other mode.[17]

Discussion

Our research raises once again the old question of linguistic relativity: to what

TABLE 2. Frequencies of systematically absolute (A) or relative (R), marginally absolute (A-) or relative (R-) reactions, to both of the tasks used, according to age groups. Tenejapan and Dutch data are results of Brown and Levinson (1993*a*).

	Animals (Order and Direction)				*Mazes*				
	A	*A-*	*R-*	*R*	*A*	*A-*	*R-*	*R*	*N*
Age (years)									
7-9	8	0	0	0	2	2	3	1	8
11-15	5	1	2	0	2	2	3	1	8
Adults	9	3	0	0	3	4	0	5	12
Total	22	4	2	0	7	8	6	7	28
%	79	14	7	0	25	29	21	25	2
		21				50			
% Tenejapan	74		19	7					27
% Dutch	0		5	95					37

extent is cognitive functioning subordinate to language? Our results indicate a

TABLE 3. Frequencies of systematically absolute (A) or relative (R), marginally absolute (A-) or relative (R-) reactions, to both of the tasks used.

	Animals (order and direction)					
Mazes	*A*	*A-*	*R-*	*R*	*Total*	%
A	5	1	1	0	7	25
A-	6	2	0	0	8	29
R-	5	0	1	0	6	21
R	6	1	0	0	7	25
Total	22	4	2	0	28	
%	79	14	7	0		

moderate linguistic relativity. In the Balinese language, the system of geocentric spatial reference is so strong that it determines not only the manner of speaking, but also a mode of spatial representation and its commitment to memory that seems incongruent with egocentric visual information. This type of absolute coding is not what is considered natural by the cognitive sciences.

The majority of our subjects in the first task, and slightly over half in the second, utilize an absolute encoding. But they also have at their disposal a relative encoding, even if they do not often use it in common language. In the second task, which does not easily lend itself to a linguistic formulation, half of the subjects directly use this relative mode. Even if the 'choice' of an encoding system is not fixed, the individual characteristics of the subjects play a part; some

of them have a clear preference for one of the systems.

Among those individual characteristics, the age factor should be noted. The very young children (4-5 years) use exclusively the absolute system in their speech and, as far as one could observe from the only task they were able to perform, also in their way of memorizing a spatial device. This predominance of the absolute system persists in language throughout childhood, whereas for memorizing tasks there seems to be a developmental change towards relative solutions. It would be worth replicating this developmental trend in a study with a larger number of subjects. Having been unable to include a sample of unschooled children (school being compulsory in Bali), we were not in a position to separate the confounded factors of schooling and age, both of which are packaged variables, in that they can by and of themselves represent a large variety of possible influences.

This age trend seems to be in contradiction to the developmental theories of Piaget and Inhelder, Werner and Wapner, and others, as discussed for example by Acredolo (1988) and Pick (1993), all of whom describe a movement from a relative, egocentric spatial representation, centred on the individual's body, towards an external and objective system of abstract axes and co-ordinates. It would thus be interesting to continue the research in this cultural context in order to determine if, by using tasks adapted from these theories of Western origin, we would really find a reversal of the developmental sequence described for Western children. Our research does not enable us to answer this question; indeed, the early utilization of an absolute system of directional axes does not necessarily mean that these young children could solve problems involving a system of Euclidian co-ordinates. But one can hypothesize that the development of spatial notions is encouraged if the problems linked to decentring with regard to personal space are avoided (for example, the problems encountered by children regarding the right and left side of a person facing them). Thus, de León (1994) found that Tzotzil-speaking children acquire topological notions of space before projective ones, but

> Tzotzil children begin to master the geocentric system between ages 4 and 5, an age at which European children cannot systematically label their own right and left (...). This finding suggests that the presence of a geocentric system in grammar may orient language learners to more rapid acquisition of a spatial skill than might be predicted by Piagetian research (1994: 857).

Finally, for the time being it has to remain an open question whether children start out naturally the same and end up in adolescence as culturally specific or whether they rapidly acquire, by the age of four, a kind of exaggerated cultural cognitive style which in later life phases out. We do not know what happens to Balinese infants between birth and the age of four.

The experiments reported above show a moderate link between language-specific verbal coding and the conceptual representation involved in solving non-verbal tasks. Similar experiments have been conducted in other cultures, with a predominantly absolute linguistic coding of spatial arrays, and have yielded similar results (e.g. Brown & Levinson 1993*a*). Across all these tasks, subjects of different speech communities tended to find one kind of coding the most natural, the one congruent with their linguistic coding: subjects align with the dominant coding system in their speech community. But languages can use

different kinds of encoding. One of these systems, the absolute (geocentric or viewpoint-independent) one, seems to be incongruent with the sensory information which is viewer-centred. So the idea that frames of reference in language are imposed just by the mapping from perception to language via the encoding process has to be discarded.

We can assume (following Levinson 1996*b*; cf. Levelt 1989) that corresponding to the different senses there are specialized encoding (representational) systems (or modules; cf. Cole 1992; Fodor 1983; Paillard 1991): an imagistic system related to vision, a propositional system related to language, a kinaesthetic system related to gesture, and so on. But we intuitively know that we can indeed form mental images of contour shapes explored by touch alone, we can gesture about what we have seen, and we can talk about what we have felt with our fingers; in other words, we can 'translate' information from one kind of encoding to another. So we may assume that these encoding systems of different kinds, specific to different sensory modes, may be capable of additionally adapting to different frames of reference. This would explain how it is that Balinese subjects can adopt a single dominant frame of reference (i.e. absolute) while utilizing different encoding systems (both absolute and relative, namely those involved in speaking and in visual memory).

If it is possible to maintain the same frame of reference across representations, then the next question arises naturally. Is it possible to convert an encoding in one frame of reference (let us say, absolute) into another frame of reference (for instance, relative)? The answer, strikingly, is no. Consider the example of our space games. If one codes and remembers the scene in a relative frame of reference ('the man on the right faces me, the man on the left looks away'), one cannot later generate an absolute description; 'left' and 'right' will not tell one whether the men are standing *kangin, kauh, kaja* or *kelod*. The same holds for an absolute description: from a geocentric coding ('the *kauh* man is facing me') one cannot derive a viewpoint-relative description. This non-translatability requires individuals to 'stabilize their representational systems within a limited set of frames of references' (Levinson 1996*b*).

It follows that if individuals want to describe any spatial experience, they have to adjust their sensory information to the kind of frames that are dominant in their language. They have to conceptualize space according to the dominant frames in language and culture. Since perceptual coding on the level of primary sensory information seems to be egocentric (relative), absolute coders must in effect process the sensory information in some additional ways; this, of course, may become automatic and unconscious through early training, and may thus be the most 'natural' way of encoding space. So the frame of reference dominant in one's language 'infiltrates' all other kinds of encoding, presumably to ensure that we can talk about what we see, feel and hear. But this seems correct mainly for those spatial experiences that are easily encoded and then described through language. When spatial experiences are less easy to process in this way (as in Steve's Mazes) the linguistically dominant frame (here absolute) loses its impact and the innate perceptual (egocentric) descriptors push forward – though even here the linguistically dominant coding plays a role.

Consequently, to our initial question 'does language constrain the way one thinks?', our answer, based on empirical evidence, is in favour of moderate linguistic relativity.

NOTES

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[1] The nature of this encoding remains controversial: is it iconic or propositional in nature? For a discussion of the so-called 'imagery debate' cf. Tye 1991, as well as Herskovits 1986, Humphreys & Bruce 1989, Pinker 1985 and Potter 1990.

[2] To learn dancing, directions are used: the teacher will give instructions such as 'take three steps east, bend south-west' (McPhee 1944: 124).

[3] The Balinese mother or nurse carries a child, either in or out of a sling, on her left hip, thus leaving her own right hand free. In this position, the baby's left arm is free, while the right is frequently pinioned in against the breast, or at best extended behind the mother's back. Naturally, when a baby is offered a flower or a bit of cake, it reaches for it with the free left hand, and the mother or the child's nurse invariably pulls the left hand back, extricates the baby's right hand – usually limp and motionless under this interference with the free gesture – and extends the right hand to receive the gift. This training is begun long before the child is able to learn the distinction, begun in fact as soon as the child is able to grasp at a proffered object, and discontinued usually when the child is off the hip (Bateson & Mead 1942: 13).

[4] This information is based on our own non-systematic observations of child care and talks with parents of young children.

[5] *Luan*: to the head, upstream; *teben*: to the feet, downstream; *kaja* is *luan*, in contrast to *kelod*, which is *teben*.

[6] The procedure was developed by the Cognitive Anthropology Research Group at the Max Planck Institute of Psycholinguistics in Nijmegen (de León 1991; Levinson 1992).

[7] The Balinese language possesses three different speech levels: low, middle and high. The 'space games' and all interviews were conducted in low Balinese. *Kaja, kelod, kangin* and *kauh* are terms in low and middle Balinese; they are replaced in *kawi* (old Javanese texts) by *uttara, kidul, purwa* and *kulon*. In the same way *kebot* and *kenawan* (left and right) become *kiwa* and *tengen* in high Balinese and in ritual contexts.

[8] When the Bunutan fishermen are in their boats out at sea, *kaja* and *kelod* retain their local meaning (roughly South and North), *kangin* points to Mt Rinjani on the adjacent island of Lombok (exactly where the sun rises, East) and *kauh* to Mt Agung (exactly where the sun sets, West).

[9] The issue is how people communicate if crucial parts of their semantics are variable. A question which arises is to what extent the swivelling of the system is predictable once the geographical location of the village and the topographical situation of the speaker's village of origin are known – even if it is, one has to publicly negotiate, as in our coin game, or one has to rely on tacit knowledge including the everyday routines of the speaker.

[10] A remarkable exception is the *wayan* shadow play. Here the two ancestor figures of Kurawa (evil) and Pandawa (good) are explicitly associated with the left and right side, respectively, and the spectators localize the two figures using 'left' and 'right'.

[11] Probably the same kind of local variations occur elsewhere in Bali; it certainly occurs in the villages around Mount Batukau and Mount Batur in Central Bali (personal communication of I Gede Pitana, a Balinese anthropologist).

[12] In the space games the two players were not facing each other but faced the same direction. This may have prompted the use of egocentric terms.

[13] We do not consider here the intrinsic referents, because they are ubiquitous and probably play a role in most languages.

[14] Both tasks were developed by the Cognitive Anthropology Research Group at the Max Planck Institute for Psycholinguistics in Nijmegen; cf. Danziger (1993).

[15] We maintained this precaution systematically throughout all the experiments, even though spot checks have shown that identical results can be obtained with time intervals of only five seconds.

[16] We tried this task with seventeen children of this age group, but seven of them were unable to understand the instructions. We also found it impossible to administer Steve's Mazes to children of that age.

[17] After seven weeks, we repeated this experiment with the same subjects with some changes in the arrangements intended to favour the opposite encoding from the one the informants had used spontaneously. The results show that a relatively large number of the older informants can be induced to modify their predominant type of response. They show flexibility of coding. At the same time, the rest of the subjects, i.e. the younger ones, resist suggestion and maintain their type of response. The experiments will be published in full elsewhere.

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Orientation spatiale à Bali: quelques preuves empiriques d'une relativité linguistique modérée

Résumé

Par le biais d'observations ethnographiques et psychologiques combinées, cet article explore la complexité du système d'orientation spatial géocentrique balinais, son adaptation aux contextes topographiques et historiques, son usage dans la langue et le comportement quotidiens et son influence sur la codification des relations spatiales dans les tâches faites de mémoire. Tandis que la plupart des Balinais utilisent le cadre référentiel absolu que leur donnent leur langage et leur culture, une codification relative (égocentrique) est aussi utilisée et la flexibilité avec laquelle les Balinais sont capables de changer d'un code à l'autre augmente avec l'âge. Cette étude apporte ainsi des preuves empiriques d'une relativité linguistique modérée.

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