THE YUPNO AS POST-NEWTONIAN SCIENTISTS: THE QUESTION OF WHAT IS 'NATURAL' IN SPATIAL DESCRIPTION

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Cognitive scientists were induced by the (European) cultures and (Indogermanic) languages already known to them to formulate over-hasty generalizations about the intrinsic structure of human thinking. They believe, for example, that it is natural and consequently universal to view the space around us from a relative, egocentric and anthropomorphic point of view. However, this way of seeing the world – with one's body at the centre of the universe from which spatial co-ordinates radiate out – is just one of the possible ways of viewing space, as the cultural conception of spatial order among the Yupno of Papua New Guinea illustrates.

A universalist claim

The approach to issues concerning the relations among language, culture and thought proceeds from different presuppositions today from the ones held previously. With the rise of the cognitive sciences in the 1960s, the commonalities in human thinking and their bases in the genetic endowment of humanity were emphasized, in part building on Piagetian universals of human development. This emphasis was strengthened by developments within cognitive anthropology, with its controversial discovery of significant universals in colour terms and in the structure of ethnobotanical nomenclature, and of kinship terms. The aim of research at that time shifted away from the description of cultural diversity towards the search for underlying human constants. Against this background, the overall discipline of anthropology was reduced to silence, due to its seemingly contradictory desire to stress differences, while simultaneously insisting on what is common to human kind.

All this somehow licensed the committed cognitivists, who were researching only European cultures and Indogermanic languages, to formulate hasty generalizations about the intrinsic structure of human thinking. However, there has been a recent change of intellectual climate in psychology, linguistics and other disciplines related to anthropology, towards an intermediate position, 'in which more attention is paid to linguistic and cultural

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differences, such diversity being viewed within the context of what we have learned about universals' (Gumperz & Levinson 1991: 614). There is also evidence for cognitive differences across cultural boundaries, differences in habitual strategies for classifying and for solving problems, as well as differences in cognitive style. However, research suggests that these differences are in performance rather than in competence, and are due to basic cognitive processes applied to particular contexts, rather than to the presence or absence of the processes. Despite cross-cultural cognitive differences, 'there is an underlying *universality* of cognitive processes' (Segall *et al.* 1990: 184, emphasis in original). These basic or elementary processes, such as visual perception, categorization, sorting and memory, are constructive, constitutive and complementary in the sense that they are adopted not as isolated elements, but in different combinations, as functional systems to solve everyday problems, according to varying circumstances and contexts. Thus, social relations and everyday practice enter into the cognitive processes of particular persons. For this reason it seems pertinent that anthropologists and other cognitive scientists listen to each other (Wassmann & Dasen 1993). Cognitive scientists have something to say about matters such as learning and memory. Anthropologists should not, therefore, 'avoid the attempt to make their theories about social life *compatible* with what other cognitive scientists have to say about the processes of learning and storage' (Bloch 1990: 184, emphasis in original). On the other hand, the 'cognitivists' should also question some of their partly ethnocentric and over-simplifying assumptions by examining the research of cognitive anthropologists, cultural anthropologists (whose work has implications for the nature of cognition [e.g. Munn 1989], and those scholars whose primary object is to understand how the history of social relations enters into the constitution of cognitive processes (e.g. Mimica 1988; Toren 1990; Walkerdine 1990; Kuchler & Melion 1992).

This challenge to the cognitive sciences applies in particular to the field of spatial conceptualizations. There are many reasons to think that spatial conceptualization is central to human cognition. Spatial understanding is perhaps the first major intellectual task facing a child. Above all, spatial thinking informs our conceptualizations of many other domains, such as time ('before tomorrow'), social structure ('low class', 'distant relatives'), music ('flat notes'), mathematics ('high numbers') and emotions ('high', 'depressed') (Levinson 1992*b*: 8). Spatial conceptualization also appears to be of interest when examining cultural relativity, since spatial conceptualization is clearly highly constrained by the nature of the physical world 'out there', as well as by the nature of human psycho-biology with its visual system and upright posture.

These environmental and cognitive constraints led the cognitive sciences to believe that it is natural and consequently universal to conceive of the space around us from a relative, egocentric and anthropomorphic point of view and to understand it accordingly. Cognitive science holds that:

1. Naive human spatial conception makes no use of fixed angles but always builds on relative relationships, i.e. objects are seen as relative, either in regard to another object, or (prototypically) to the speaker him- or herself. Thus people localize objects by using prepositions: notably in, at, on, behind, to, from, between, above, below, and a set of prepositional phrases such as in front of, to the left of, from the side of, next to (Miller & Johnson-Laird 1976; Talmy 1983).
2. Spatial conception is always understood from an egocentric and anthropomorphic perspective, i.e. it proceeds from the human body which stands upright and looks ahead – what Clark calls the 'canonical position' (1973: 34). Starting from this position, space is divided into in front and behind, into above and below, into left and right. This system of co-ordinates may then be projected onto an interlocutor or an oriented object (Piaget & Inhelder 1948; Clark 1973; Miller & Johnson-Laird 1976; Lyons 1977).

A person's body stands in the centre of the universe and the spatial co-ordinates radiate out from it. The Piagetian child struggles to extend this framework across the environment, learning slowly about the constants of the world beyond its perception (cf. Steiner 1987). Only the post-Newtonian scientist has escaped this anchored world where space is ego-centred, and has learned to think of space in absolute terms with an arbitrary displaced origo from which radiate infinite co-ordinates, i.e. independent of any objects that space might contain (Smart 1968; Harfield 1990). This idea of one's own body as the centre of the universe, and the conviction that the relativistic conception of space is 'more natural and primitive' (Miller & Johnson-Laird 1976: 381; cf. Gell 1985), is deeply rooted in Western traditions of scientific and philosophical thought (cf. Gosztonyi 1976).

Kant rejected the view of space as a sort of 'ethereal stuff' (as Newton claimed), as well as the view that space could be reduced to the sum of relationships between things (as Leibniz claimed). He postulated instead that space is a subjective framework we impose on the objective world and, in 1768, suggested that we conceive space in terms of three dimensions radiating out from our bodies along the orthogonal planes above/below, before/behind and right/left:

> In physical space, on account of its three dimensions, we can conceive three planes which intersect one another at right angles. Since through the senses we know what is outside us only in so far as it stands in relation to ourselves, it is not surprising that we find in the relationship of these intersecting planes to our body the first ground from which to derive the concept of regions in space... One of these vertical planes divides the body into two outwardly similar parts and supplies the ground for the distinction between *right* and *left*, the other, which is perpendicular to it, makes it possible for us to have the concept *before* and *behind* (Kant 1991: 28-29, emphasis in original).

It is due only to the orientation of our body, and to the relation between our sides and the regions projected from them, that we are able to localize something:

> Similarly, our geographical knowledge, even our commonest knowledge of the position of places, would be of no aid to us if we could not, by reference to the sides of our bodies, assign to regions the things so ordered and the whole system of mutually relative positions (Kant 1991: 29).

This idea of space as relative and egocentric still prevails today, and informs much contemporary work in cognitive science, as the following quotation illustrates:

> The conceptual core of space probably originates, as Cassirer (1923) and others have maintained, with the body concept – with what is at, in, or on our own bodies. The first spatial relatum we learn to use is ego... Piaget and Inhelder (1948) claim that escape from this egocentric space requires considerable cognitive development... The ability to decenter does not displace the egocentric conception of space, but it supplements it... Egocentric use of the space concept places ego at the center of the universe. From this point of origin ego can lay out a three-dimensional coordinate system that depends on his own orientation. With respect to this landmark other objects can be directionally located as above or below (ego), in front or in back (of ego), to the left or to the right (of ego) (Miller & Johnson-Laird 1976: 394-5).

In the West, space is understood within the framework of Euclidean geometry with its relationship between lengths, areas and volumes of objects referring to the location of a certain object in space, referring to its place, i.e. the part of space it occupies. Thus, the linguist Bowden argues:

> In order to specify the location of an object we must specify its location relative to something else whose position is already determined for us (1991: 87).

For this specification, we need a co-ordinate system with reference planes. It seems that we must realize that the 'influence of our bodily experiences extends very far into our conceptual system' of space (Lee 1988: 239), because it is biology that 'provides us with [the] three ready made planes of reference' (Bowden 1991: 88) required for establishing a necessary reference point in relation to which we can specify location (cf. Levelt 1989: 49 sq.)

Such views of space can be shown to be just plain wrong by looking at how conceptions of space vary cross-culturally. Humans have the cognitive capacity to decentre spatial description almost entirely in everyday life, in just the way that Newton explicitly pioneered as a scientific specialism.

A challenge

The two main assumptions about space can be confronted with two counter-examples from non-European cultures. First, it is maintained that 'ordinary languages are designed to deal with relativistic space; with space relative to objects that occupy it' and where 'no fixed units of angles or distance are involved' (Miller & Johnson-Laird 1976: 380). A counter-example comes from Australia (Haviland 1991; Levinson 1992*a*), from among the Guugu Yimidhirr in Northern Queensland, who conceive their spatial environment and orient themselves in it in fundamentally different ways compared to people in North America and Europe. Their language has no relative terms, only an absolute system of four cardinal edges which roughly correspond to the Euro-American four cardinal directions of North, South, West and East.

These cardinal points are determined mainly by the winds: from the North (i.e. the Guugu Yimidhirr 'North') there blows a strong hot wind, from the South an irregular cooler wind, from the East a constant soft current of air. In everyday life, this system is applied on every level, and is used to describe objects in close proximity, as well as those which are far away. If, for example, someone wants to say 'Bill is standing in front of the store', in Guugu Yimidhirr it has to be: 'Bill is standing in the North of the store'. Or: 'You there, move to the left a bit' becomes, 'You there, move to the West a bit'.

The use of absolute angles constitutes a fundamentally different strategy from a relative system such as that in the West, for it presupposes that at any one time people are absolutely oriented, and know exactly where certain points of reference (e.g. objects in the landscape) are situated. If they move, they must keep all the changes of direction in mind, and be able to report a scene from everyday life at a later date. The dramatic consequences of such a system can be illustrated with a hypothetical example taken from Haviland (1991, my paraphrase):

> Let us imagine I invite a Guugu Yimidhirr to dinner in a revolving restaurant. We sit at the same table and yet experience the environment in totally different ways. As far as I am concerned, while I am eating, all the furniture and persons in the restaurant remain in a constant (since relative) spatial relation to each other, i.e. I can always localize them in the same way. Thus my butter is always on my left side, my guest is always sitting opposite me. As far as my guest is concerned, the location of the objects and persons is constantly changing, since he does not measure their relation to each other but against a fixed exterior (absolute) system: the butter is now to his North and I to his West, soon the butter will be to his East and I to his North.

The second assumption regarding universal perceptions of space, which has many adherents in the cognitive sciences, states that space is always seen from an egocentric point of view. Tzeltal, a Mayan language spoken in Chiapas, provides a counter-example (P. Brown 1991; P. Brown & Levinson 1991). Tzeltal makes some, though much more limited, use of an absolute system. Its speakers inhabit a region consisting of a high mountain range in the south and lower-lying hilly areas in the north of Chiapas. Their absolute angles of orientation refer to a fixed notional 'uphill/downhill' inclined plane corresponding to the overall fall of the terrain along a South/North axis. West and East are not distinguished, both are held to be 'traverse'. If, for example, Tzeltal speakers want to point out a tree standing 'northerly' on a hilltop, they will say 'look, the tree downhill', even if the tree stands higher than the speaker.

This general 'uphill/downhill' contrast is supplemented by a more precise relative system of spatial description which, however, is not egocentric but intrinsic in character. The Tzeltal language has only one single preposition, i.e. 'at'. 'in', 'on', 'to', 'from' and so on cannot be distinguished. If an object (or figure, to use the term suggested by Talmy 1983) is localized, it is not its position *vis-à-vis* the speaker which is important, hence the egocentric point of view, but only the description of its exact disposition *vis-à-vis* a further object which is adjacent (or ground, to use Talmy's term). This second object

may be any other object found nearby – a house, a yard or a mountain, for instance. To localize it requires some system of mentally dismembering the reference object into its constituent parts. This is done by analogically mapping a human or animal body onto the object. Thus 'on the mountain' in Tzeltal means 'at the head of the mountain'; openings are 'mouth', a round part is 'belly', something carrying something else is 'leg', a smooth surface is 'face'. These associations are mostly made according to optical similarities, but in part also according to functions. The sharp part of a knife is 'teeth', the writing end of a ball-point pen is a '(dripping) nose'. An object (figure) is localized by describing it as being located 'at' a (body) part of the ground: no projections into a three-dimensional void are involved.

'The man is standing in front of the car' becomes 'the man at the nose of the car';

'The man is standing on the other side of the car' is 'the man at the flank of the car';

'The man is standing on the corner of the house' becomes 'the man at the ear of the house';

'The man is standing behind the house' is 'the man at the back of the house'.

These findings from Mayan (Dürr 1990; P. Brown 1991; Levinson 1991; de Leon 1992), Australian (Evans 1991; Haviland 1991; Levinson 1992*a*) and other Oceanic (Austronesian) languages (Ozanne-Rivierre 1987) disagree with the generalized view that spatial conception is 'naturally' relativistic and egocentric, and organized according to the co-ordinate system with its three planes of reference with which our body provides us. If we accept this, it seems plausible to assume that a language can possess either a relative and egocentric or an absolute system of spatial description. However, as we shall see below, the Yupno of Papua New Guinea show that this does not apply either: their (Papuan) language makes it possible for them to use both systems at the same time and, moreover, they also use landmarks and place names as references to localize objects. (I should stress here that these observations are about the *language* of spatial representation, rather than about embodied cognitive processes, though I will return to this point later.) Before elaborating on this, it is necessary to give an overview of the ethnographic context and methodologies which inform my analysis.

The ethnographic context

The Yupno inhabit a rugged and isolated region in the eastern part of the Finisterre Range, Madang Province of Papua New Guinea. The roughly 6000 inhabitants of the Yupno valley were virtually unknown to the outside world until a few years ago, although the German Lutheran Mission of Neuendettelsau started missionary work around 1930, increasing its effort in the 1950s. Some of the Yupno are still semi-nomadic. For several months of the year, they leave their villages to live in dispersed settlements at altitudes of over 2000 metres, collecting screw-pine (*Pandanus*) nuts and hunting marsupials, feral pigs, cassowaries and possums. Around their villages they cultivate sweet potatoes and, more recently, vegetables. Their houses, which look like big hay-stacks, are surrounded by high fences, a style of construction

found only in this area of Papua New Guinea. They are well adapted to the cold climate: they have no windows, and in the middle a fire burns almost continuously in an elongated fireplace (as long as 15 metres), providing heat and light (as well as large amounts of smoke), and the means to roast sweet potatoes and to cook food in bamboo pipes.

Characteristic of Yupno culture are the *koñgap* melodies: each individual owns a short tune, that belongs to the person just as a name does, and which has either been self-composed or provided by bush spirits in a dream. When crossing a particular garden or stretch of bush, the Yupno sing the tune belonging to the owner of that land, thus showing their local knowledge, and indicating their own status as a friend. Only strangers (i.e. enemies) are silent. Since 1971, the Yupno region has had an airfield and is in contact with the outside world (for a general ethnographic description see Keck 1992; Wassmann 1993*a*).

Space games

There is no question that a study of spatial conceptions requires rich ethnography and a vast amount of data based on natural interaction. But an ethnographer may have to wait a long time to assemble a reasonable sample of such data. Moreover, these data will not test the limits of the descriptive system. In everyday life, a systematic focus is feasible for only a few expressions (cf. Hanks 1990), and the rest must remain impressionistic. In order to stimulate verbal and gestural interaction over spatial issues, so-called 'space games' were played by Yupno informants in addition to a restricted systematic focus on spontaneous interaction. A battery of elicitation techniques was used, as developed by the Max Planck Cognitive Anthropology Research Group, drawing on work by cognitive psychologists (Clark & Wilkes-Gibbes 1986; Weissenborn 1986) and by linguists (de Leon 1991).

'Space games' here refers to tasks designed to stimulate conversation about space. The researcher is not an interrogator or participant observer, but rather is the instigator of an interaction. These games allow for some form of natural interaction, a crucial point if we are interested in data which not only reflect the knowledge or the structure of a language, but the actual practice of the speakers (cf. also Senft 1992: 14).

The games were designed as a communicative task performed by a pair of players. Two partners sit side by side with a screen separating them; each oriented in the same way. They are asked to perform a series of interactive tasks. For example, one informant (the 'director') must describe a route (marked with a cord) through a model town so that the other informant (the 'matcher') can emulate the route on an identical but screened-off model. In another task, the 'director' must describe the position and stance of an articulated wooden man, so that the 'matcher' can emulate the body positions on another identical figure. In a third task, the 'director' must describe the relative locations of a set of toy farm animals so that the 'matcher' can again reproduce the arrangement. By far the most informative task was a photo-photo

matching game: a total of forty-eight pairs of photographs were presented in groups of 12, the 'director' chose one of them and had to describe it in such a way that the 'matcher' could pick the same photograph from an identical stack. The positions of the plastic models shown in these photographs (male figures, trees, animals etc.) varied in a systematic way. The orientation of the players was periodically changed (i.e. they were looking in different 'directions'), just as their roles as 'director' and 'matcher' were also reversed (for further information on the space games cf. de Leon 1991; Levinson 1992*b*).

Fourteen Yupno subjects played the photo-photo matching game (only this game is considered here) in paired units which varied according to age, gender and school attendance. The duration of the game per pair was ninety minutes. The games were played at Gua village, on a table in front of the anthropologist's house; they were recorded on audio-tape and were also partially video-taped.

TABLE 1: The use of the three reference system.

the players	relative angles (egocentric)	field-names	absolute angles	absolute angles plus field-names
Nayakot/Yangogwak males, no schooling, 16 years	33 (20 thereof left/right)	2	30 (27 thereof uphill/downhill)	8
Gumban/Kandat, females, grade II, 18 years	4 (0)	21	8 (8)	61
Pol/Koki, males, 28 years with schooling, and 35 years, no schooling	53 (27)	35	47 (28)	18
Wakine/Gumeyu males, no schooling, approx. 40 years	3 (0)	33	12 (10)	22
Megau/Jim, males, no schooling, approx. 50 years	18 (16)	7	47 (20)	13
Nanguot/Sivik, males, no schooling, approx. 50 years	7 (0)	22	24 (11)	61
Yavit/Virinone, males, no schooling, approx. 60 years	6 (0)	29	11 (8)	21
Total	124 (63 thereof left/right)	149	179 (122 thereof uphill/downhill)	204

As already mentioned, the Yupno use three systems at the same time for their spatial descriptions: a relative (body-centred) system, an absolute system (not body-centred) and the systematic use of field-names which is often combined with the naming of the absolute angles. The frequency with which each system was used, and by which subjects, is shown in table 1. In which way these differing systems can be verbally applied is demonstrated, as we will see below, by the descriptions of the same photograph. This photograph, rendered here as a drawing (see fig. 1), shows the model of a boy turning his back to the observer and holding a stick in his right hand, while to his left is a tree. The three examples outlined below have been chosen in such a way that in each case one of the possible Yupno methods of description is favoured – although, as a rule, these methods are far more thoroughly mixed in everyday Yupno life. No gender-effect or age-effect in respect to the use of the terminologies was evident, though a more comprehensive analysis of their everyday use is yet to be carried out.

Yupno spatial descriptions

Let us discuss each of these three examples within the particular cultural context to which it belongs.

Case 1: the body-centred or relative reference system. In this example Nayakot, a boy of about 16 years of age and with no formal education, is the 'director'; he describes the picture to Yangogwak who is of the same age. While doing this, they both look downstream, i.e. towards (our) East.

> The ramifications of the tree are above (the man), a man is standing with his feet on a green elevation, he is wearing a very green (blue) T-shirt and his right hand holds a yellow stick or another thing, he is standing there and turning his buttocks (to me).[1]

The player describes how the male figure turns his back towards him (player), how he holds a stick in his right hand and how the tree stands above him (the branches are reaching slightly higher than his head); the term 'left' (which might have been expected) is not used. In order to understand this, we must consider the cultural context in which the verbal utterance is made, as well as Yupno conceptions of the human body.

In Yupno life, the complete human being (*amin*) consists of several parts (Keck 1993; Wassmann 1993*a*). As well as the body, a human being has two spiritual substances. The first is the free soul, *wopm* (the 'image', 'shadow'), which is not localized and leaves the body during sleep and in case of sickness. The second is the body soul, *moñan* (the 'steam appearing in the morning when the sun shines on the ground wet from the dew'). It is present in every part of the body but especially in the breath; since it contains the 'vital energy' of a person, it makes it possible for them to see, hear and move. Also part of the personality of a human being is the *koñgap* (melody), the 'voice of the dead spirits', a short sequence of three to five sounds which was 'found' during a dream and which acts as an individual identification call together with a personal name. An individual's personal name is identical to

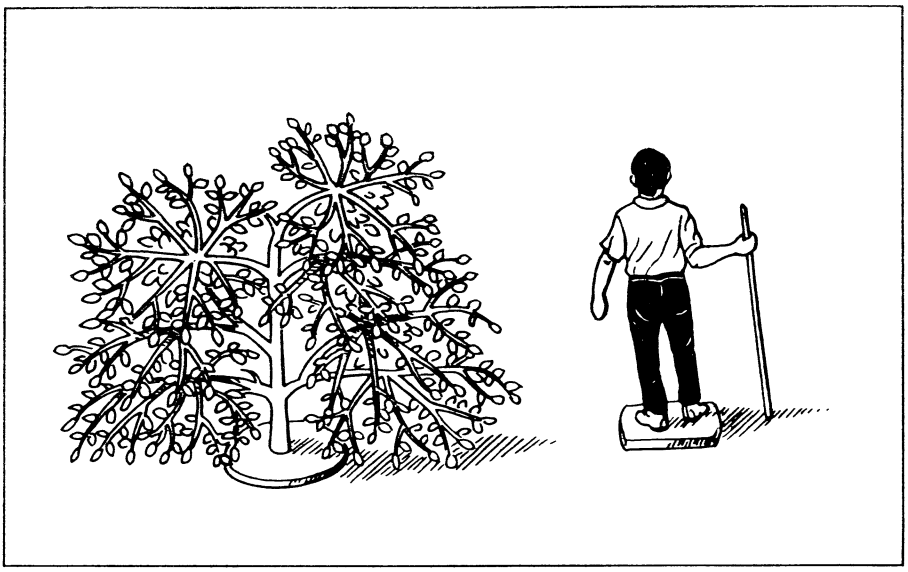

FIGURE 1: Drawing of the photograph which was shown to the Yupno: a tree and a man with a stick.

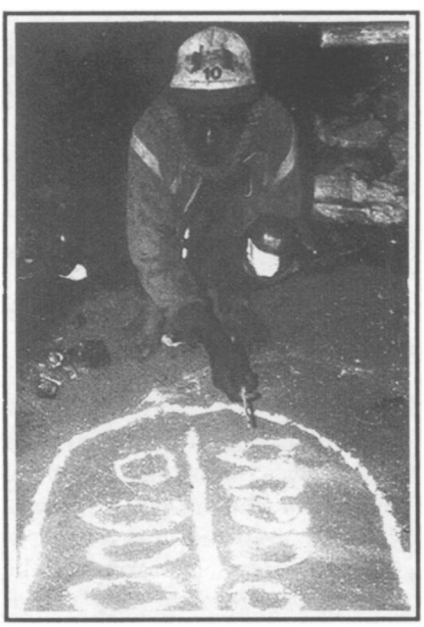

FIGURE 2: Photograph of Ndanda etching the 'world' with the middle line representing the river, and the small ovals the several fenced-in villages.

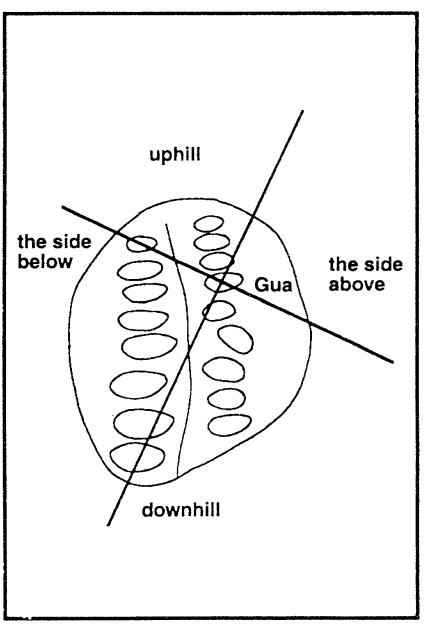

FIGURE 3: The 'world' (based on the drawing of Ndanda) and its quadrants as seen from Gua village.

the name of the man who contributed most towards his mother's bride-price. In this sense, a name is not so much an individual possession (like the *koñgap*) as an expression of a social relationship. Everybody also possesses 'vital energy' (*tevantok*), an impersonal energy contained in the body soul, the amount of which fluctuates and determines whether an individual is considered 'hot', 'cold' or 'cool'. A 'hot' person is overheated, angry, with a will of his or her own, and burdened with problems. As a result, such persons stand 'above' their social group. People who show inertia and display speechlessness are likely to be unpopular, and are held to be 'cold'. Only the 'cool' state is desired, since only in this state are individuals thought to be fully integrated and of the same social standing as their fellow human beings. Such individuals take on the ideal stance of a slightly bent posture. In this position, they can listen attentively to others and thereby become 'knowing human beings' (*nandak amin*: from *nanda*, 'to listen'; and *-k*, nominalizer; *amin*, 'human being').

The body (*ngodim*) is held upright by the bones (*kirat*), which are believed to have two important qualities: they prevent something from falling down (a man, a house) and at the same time they provide stability (vernacular terms for a house-post, firm ground, bamboo pipes or human skeletons always contain the term 'bone'). The body is covered by a wrapping, the human skin (*ngop*: skin, rind, husk), which is vulnerable to outside influences. Just as clumps of soil stick to sweet potatoes, and just as bean pods are bitten into by caterpillars, so the invisible 'oppressive problems' resulting from strained social relations leave 'cold' or 'heat' on a person's skin (cf. Keck 1993). Between bones and skin are flesh and muscles as well as blood, the latter coming from the mother and the former (flesh and bones) from the father. For conception to occur a single sexual act is insufficient, and a man must repeatedly 'feed' the embryo with his semen.

The body of each Yupno is divided into two unequal parts by an imaginary line leading from the nose to the penis. The left side is considered to be female, passive, 'cold' (i.e. with little 'vital energy' in the 'body soul'), and can act only as an 'assistant' (*kwandim*); the right side, in contrast, is considered male, active and 'hot' (i.e. with much 'vital energy'). This symbolic assignment applies especially to the hands: the right hand actively pulls the bowstring, the left one assists by holding the bow. In addition to being divided in this way, the body is also ideally oriented as a whole: it looks downstream (to the East). As we will see, this opposition is critical for my analysis.

If the location of objects in space is to be described, this may – but need not necessarily – be done in an ego(body)-centric and relative manner by using prepositions. The Yupno employ a range of prepositions for such descriptions: for example, in front, facing, facing each other, behind, this side, other side, contiguous, on top, at the base, on, above the speaker, below the speaker, between me and a 'border', beyond above a 'border', beyond below a 'border' (if I am sitting at the fireplace in the upper part, 'uphill', of the

house, the person opposite is 'beyond above a "border"', somebody at the other, lower end near the door, 'downhill' therefore, is 'beyond below a "border"').

The terms left (*kwandim*) and right (*amin teet*) may also be used (as in the case above), but with one important restriction: an object is only described as being to the left or right if there is direct contact between the object and the body half in question; that is, only if the object may be understood as a physical extension of the respective body half. If there is no immediate contact, the two terms are not used; the localization must be formulated differently, either misleadingly, like the 'director' in the first example (e.g. line 1.1 in footnote 1, where he uses 'above' as a substitute for 'left') or, for example, by using field-names, as in the following case.

Case 2: the field-names or local landmark system. Pol is a 28-year-old man who reached grade 5 in school. In this case, he is the 'director'. His 'matcher' is Koki, 35 years old, who never attended school. Both players again look downstream (eastwards). Again it is the photograph represented by the drawing in figure 1 which is being described.

> Director: A boy is turned to the place down there where you ('matcher') live, his right hand holds a stick, he stands and looks down to Mundogon and a shrub is standing on the hillside, on the side of Teptep village.
>
> Matcher: Is the tree on the hillside and the man turned to the place below, Mpagmbewuñok?
>
> Director: Yes.[2]

The problem of not being able to refer to the 'left', which Nayakot experienced in the first example, is solved by Pol in this example by naming the village of Teptep, since the tree is on that side, and the figure (with the stick in the right hand) looks towards Mundogon, down towards the site which borders on the area of Mpagmbewuñok where the 'matcher' has his house (it is typical that the 'matcher' mentions his own piece of land).

A generative system of place names offers an alternative to a relational (case l) or an angular (case 3 below) method of location-specification. In the Yupno valley, every piece of land, whether for settlements, gardens or part of the bush, has a specific, originally descriptive, proper name; in principle, this yields a checkerboard of named units for spatial description. Like absolute systems, these are effectively independent of the speaker. However, the directions are determined by reference not to conventionally agreed angles which will remain constant, but to specific fixed locations which may change from one speech event to another, mainly according to the respective site of the speech event itself (preference is given to tracts of land which are within sight) or to the person speaking (preference is given to tracts of land which belong to one's own kin group).

Of the 250 field-names around Gua (where the space games were carried out), 60 per cent. contain purely topographical indications, like 'place of the crumbling soil', while 40 per cent. state what is growing or frequently found

on the piece of land in question, often in connexion with a topographical indication. Surprisingly (in the context of Papua New Guinea) historic or mythological events are very rarely incorporated into field-names (for a counter-example cf. Wassmann 1991). In the course of the space games, the following field-names or landmarks were mentioned with greatest frequency:

For 'right/South' or 'slightly lower' (for players looking East, hence taking the ideal position of orienting the body as a whole): Sindalin, 'the place with a view'; Kamgwam, 'the place where everything grows fast'.

For 'left/North' or 'slightly higher': Mambapmbaga, 'the hill where the ginger grows big'; Kunagatowa, 'the place above the screw pines'.

For 'at the back/West' or 'steeply above': Waminokaa, 'the place of the many tree-beetles'.

For 'in front/East' or 'steeply down': Mpagmbewuñok, 'the place where water collects'; Mundogon, 'the place of the falling down rocks'.

Case 3: the absolute reference system. Let us now turn to the case where a system is used which is not centred on the body of the speaker but instead makes use of externally fixed angles. In this third example, Sivik is the 'director' and Nanguot the 'matcher'. Both men are about 50 years old. The photograph described is the same as that indicated by the drawing in figure 1 and again both men are looking downstream towards the East.

A man; a very green shrub is to the side higher up (North), a boy is to the side lower down (South), he stands on top of a stony elevation, he holds this yellow part of a stick to the side lower down (South), there he is standing and extending his arm to the side higher up (North) and is looking downhill (East) to Mundogon.[3]

In this case, the speaker does not use relative terms (even the right half of the body which holds the stick is missing), and limits himself to three absolute co-ordinates. In order to understand the space conception underlying the sentence, the topographic situation of the Yupno habitat must be described.

The Yupno Valley stretches approximately West to East and is bounded on three sides by high mountains, literally 'fences' (*naal*), reaching an altitude of up to 4,000 metres. From its source at about 3,000 metres, the Yupno River flows through steep gorges and along rock faces of up to 700 metres high into Astrolabe Bay. In this extremely rugged region, very few level areas can be found. Villages are situated on mountain ledges in small adjacent valleys at altitudes of between 600 and 2,200 metres, hence between the tropical rain forest and the treeless grassland.

According to the traditional Yupno view, this valley is the 'world' (Wassmann 1993*b*). It is shaped like an inclined oval with only one opening at the bottom, in the 'East', through which the Yupno River flows into the sea (see fig. 2). This 'world' is oriented by the course of the river, which at the same time is regarded as the creator Morap, 'the one who dwells in abundance'. Above ('West') is the source from which humanity originated, washed ashore in bamboo pipes (*teet*, the term which also stands for 'right') by the Yupno River, literally 'the one which washes everything ashore and deposits it on the banks'; at the bottom ('East') where the Yupno flows into the sea, is the

land of the dead, the island of Nomsa, 'the thing which rises like a fern stalk from the sea' (Arop or Long Island). The source of the river (above and at the back) is Morap's head, the estuary (below and to the front) is his feet. Morap is looking downstream (just as for the individual Yupno the canonical orientation is the one downstream).

This worldview is replicated in the structure of the traditional Yupno house, which is also oval, with a single opening at the front (towards the river). In the middle of the house there is a long fireplace which extends for the full length of the dwelling. Men sit to the right (which is active and 'hot'), while women and children sit on the left (passive and 'cold'). The same orientation of river, dwelling and human bodies is obvious, as is their symbolically unequal division into two parts. However, as we have seen, this partition does not radiate out from the body, so that it would be wrong to speak of a 'cold' and a 'hot' side of the valley.

Given this overall inclination of the valley from highland to lowland, the upper quadrant (with the source as its centre) is always called 'uphill' (in all the Yupno villages), while the lower quadrant (with the estuary as its centre) is referred to as 'downhill'. These two terms designate not only an incline but also fixed angles on the horizontal. Gua village lies in the upper third of the main valley about one and a half kilometres from the river, on the left side of the valley in an adjacent valley on a spit of land slightly descending towards the Yupno. Consequently, in Gua (though not necessarily in other villages) 'uphill' lies towards our West and 'downhill' towards our East (a description which is a bit misleading since edges and not cardinal points are meant by it). Apart from this main axis traced by the river, the local plane (in Gua) slightly inclines southwards from the North towards the Yupno and thereby defines the two further quadrants (see fig. 3). The four quadrants are:

omodeñ: from *omo*, 'down' and *deñ*, 'the whole'. Hence 'downhill'. This means the whole area downstream to the estuary in the East.

osodeñ: from *oso*, 'up' and *deñ*, 'the whole'. Hence 'uphill'. This means the whole area upstream up to the high mountains around the source in the West.

ngwisideñ: from *ngwi*, 'an area nearby' and *si*, 'up', *deñ*, 'the whole'. Used in the sense of 'sideways from the main axis', 'a bit higher up'. Thus *ngwisideñ* means the closer surroundings which slightly incline towards the North. The adjacent higher mountains are already thought of as 'beyond above' *(esigap)* or equally as 'uphill'. (It should be borne in mind that the 'world'-oval has a much shorter transverse axis.)

ngwimedeñ: from *ngwi*, 'an area nearby' and *me*, 'down', *deñ*, 'the whole'. Used in the sense of 'on the side of the main axis', 'somewhat lower'. This means the closer surroundings which slightly descend towards the South and the Yupno. The lower-lying Yupno may be designated as 'downhill', the higher mountains beyond are 'beyond below' (*emisan*).

The use of the conventionally agreed upon expressions 'uphill/downhill' and 'the side, above, below' to locate entities on two idealized West/East and North/South planes constitutes an absolute model of spatial description, since the terms label constant angles or quadrants, fixed without reference to the orientation of ego or another human body (see fig. 3). These angles may

be used to refer to an object several kilometres distant or to one only a few centimetres away . There is no contradiction in pointing to a tree standing in the East and saying 'look downhill at the tree', even if the tree is situated on a ridge at a higher altitude than the speaker (a similar example from Tzeltal has already been mentioned). Thus when talking about two cups on an East-West oriented table, one may be described quite naturally as being 'downhill' compared to the other, even though the table is horizontal.

'Downhill' and 'uphill' are also used when pointing to a nearby object or to describe physical motion. The Yupno language possesses a deictic term for 'this' (*on*), but no general term for 'there'; it first must be distinguished in which of the four quadrants 'there' is, and secondly if it is visible to the speaker (marked with *ñi*) or invisible (marked with *ngan*). Thus an object within arm's reach may be pointed to while saying *onñi* (*on* 'this'; *ñi*, 'visible'); if, however, the object is at a distance of about two metres (e.g. to the West), the word *ngwiñi* is used (*ngwi*, 'an area nearby'; *ñi* 'visible'), after four metres *ngwisiñi* (*si*, 'up'), after six metres *ngwasiñi* (*ngwa*, 'an area nearby but further away than *ngwi*') and beyond that, *ngwasingan* might be appropriate (*ngan* 'invisible', e.g. if the object is hidden behind a house). If the object is more than ten metres away, or is beyond the village fence, it is referred to as 'uphill'. The same deictic expressions are used for objects which stand North of the speaker; if they stand South, *si* (up) is replaced by *me* (down). If, however, a speaker is pointing to something to the East, they first say *oviñi* (*ovi*, 'below'), then *ovimeñi* (*me*, 'down'), and then 'downhill' depending on the distance. Thus once more West and North (both regions ascending, though to varying degrees), and East and South (both descending, though to different extents) are equated, and the East is terminologically marked as a special direction (the canonical orientation). Of course, the use of the different lexical indicators varies according to speaker and context and is not just a matter of degree from 'here'; if something is hidden, or out of hearing, or even beyond the village fence, then it is also 'farther away' than if it were visible (and the four absolute quadrants are more readily used).

Something similar happens when the Yupno describe physical motion. In correct usage, 'to go' (*ki*) should only be applied to the (more level) directions North and South. Once someone moves to the West, they 'go up' (*wuo*), while to the East they 'go down' (*po*). For example,

'*ngak omoden tet posat*'.	'I go down to downhill (the East)'.
ngak / omoden / tet / po-sat.	I / downhill / side / go down.

For the verb 'to come', Yupno must distinguish every one of the directions of provenance. If someone arrives from the East, they are said to 'go up' (*wuo*), from the West to 'go down' (*po*) from the North 'down from the side above' (*avi*), and from the South 'up from the side below' (*ovi*). Thus,

'*ngak ngwimedeñda ovisat*'.	'I come up from to the side below (South)'

ngak / ngwimedeñ-nda / ovi-sat. I / to the side further down (South)-from / go up from the side below–1.singular in present tense.

Conclusion

The Yupno – like true post-Newtonian scientists – make use of three different reference systems at the same time. As such, they not only offer counter-evidence to the universalistic claim for predominant traditions of Western thinking which look upon the body-centred spatial description as 'natural', but they also call into question the assumption that each language is structured only for one single system, be it relative or absolute. Table 1 shows that the 14 subjects used a total of 124 relative and egocentric terms (63 of them 'left' or 'right'), 149 geographically anchored field-names, and 179 topographically determined absolute angles, of which 122 were 'downhill' or 'uphill'. Absolute angles, which state the general direction, accompanied by a field-name (which further specifies the direction) were most frequently used (204 times). Unfortunately, with such a small sample, it is not clear whether certain groups of the population – men, women, the old, the young, those with or without formal schooling – prefer a particular method of description.

If one's own body is not necessarily always the deictic centre, neither are 'uphill/downhill' the only possible reference points. In other languages we also find locatives which seem also to have been culturally and geographically determined. In this connexion, Bowden emphasizes the following:

> In Oceania, SEA and LAND are the most striking examples of non-universal locative adpositions, but in other geographic or cultural environments there are other locatives which can also serve crucially important functions. One of the best known examples is the use of grammaticalised forms for 'up-river', 'up-valley', and 'down-river', 'down-valley' in some languages (1991: 109, emphasis in original; for further examples of spatial organization see Heeschen 1982; Mosel 1982; Ozanne-Rivierre 1987; Tòren 1990; Barnes 1993).

Systems that locate an object by reference to local landscape features are logically fallible outside a local territory and should therefore not be too readily equated with the Western cardinal points. For example, the widespread system of 'towards the mountains' versus 'seawards', when utilized on a small island, will obviously yield constantly changing angles as one circles the island (cf. van den Berg 1991; Nothofer 1991). This is notoriously the case on Bali, where what seems to be a cardinal direction 'North' when talking on the South side of the island, becomes 'South' when talking on the Northern side (since all directions refer to the central mountain Agung). Similarly with the Yupno, for whom 'uphill' always remains the same (the quadrant with the source as the centre); but not so for Europeans, since what in Gua lay to my west shifted depending on my location in the valley. That the lateral axis 'to the side above/below' reverses depending on the side of the valley, however, also applies to the Yupno. Furthermore, Yupno do not use their reference system only in their valley. They also use it, for example, when visiting the coastal town of Madang. The main street of the town

(Modilon Road), which leads straight down from the hilly hinterland to the harbour in an approximately South-North direction, is mentally equated by the Yupno with the Yupno River, so that in front (North) where the sea is, becomes 'downhill', the hinterland (South) becomes 'uphill', the North-west-coast (North Coast) is 'the side above', and the Southeast-coast (Rai Coast) becomes 'the side below'.

When the Yupno use their relative system, the distinction between left and right plays a major role, and as we have already seen each carries a different symbolic load. This recalls Hertz's (1909) suggestion that the slight physiological favouring of the right hand (in the majority right-handed population) provides a potent natural metaphor for a host of social dualisms, especially the opposition of sacred and profane, of good and evil, of birth and death, and of food and excretion. It seems that the Indo-European languages equate left with the cardinal point North, right with South, behind with West, and assume an East-facing canonical posture. C. Brown (1983) argues that the association between the cardinal directions and 'front', 'back', 'up' and 'down' is a universal tendency. Whether universal or not, it certainly applies to the Yupno, although their use of left/right is limited to their own bodies, the halves of which do not map out other space, something which field-names and absolute angles compensate for.

By way of conclusion it might be asked whether the linguistic differences described here also have cognitive consequences. In recent years it has been assumed that language has no effect on the way we think and most important processes are deemed to have a universal structure independent of language. Nevertheless, there has also been a growing insistence on linguistic difference and its possible conceptual implications (Bowerman 1991; Slobin 1991; Lucy 1992). Perhaps it is time cautiously to 'rethink linguistic relativity' (Gumperz & Levinson 1991) without immediately questioning the idea of the psychic unity of mankind. Let us return again to the Mexican and Australian examples cited earlier.

The Tzeltal apparently have no terms for left and right (P. Brown 1991). According to Brown, this inability to distinguish verbally between two sides of an object has far-reaching consequences (though we perhaps need to be cautious in interpreting Brown's preliminary results). Tzeltal speakers playing a photo-game failed verbally to distinguish objects displayed as 'mirror images' of one another. From a Western point of view, there is thus a gap in Tzeltal spatial concepts (not only a linguistic one), and Brown (1991: 64) notes that 'the most telling indication that there is such a left/right gap was the informants' complete bewilderment when faced with the request to distinguish verbally two configurations that to them apparently seemed identical' (despite the fact that, according to the neurologists, the division of our brain into two halves leads to a conception of the world as similarly divided).

Levinson (1992*a*) has described the results of a simple recall task among the Guugu Yimidhirr (other experiments referred to visual perception and inference). Subjects were shown a line-up of a toy man (A), a pig (B) and a cow (C), all looking North. The line headed East or towards the subject's right (A, B, C). The subject was told to memorize the assemblage so that if the experimenter put the figures in a heap, the subject could reconstruct it. The subject was then led into another room, positioned at a desk facing South, presented with three identical figures in a heap and asked to arrange them just as before. The majority (although not all) of the Guugu Yimidhirr chose to preserve the absolute orientation of the three objects (∀ 'ꓭ 'Ↄ); a Dutch control group, however, arranged the objects according to a relative point of view (Ↄ 'ꓭ '∀) (i.e. with the turning of the body the sequence of the objects was also rotated so that, for example, A always remained on the left; among the Guugu Yimidhirr, in contrast, A is always in the West, first to the left, then to the right of the body).

Although these are pilot experiments,they not only call into question some of the widespread universalistic assumptions about traditions of Western thought; they also suggest novel ways for exploring how the history of social relations enters into the constitution of cognitive processes.

NOTES

Some paragraphs of this article draw heavily on the unpublished working papers of the Cognitive Anthropology Research Group at the Max Planck Institute for Psycholinguistics, Nijmegen, and on talks with colleagues in this group. I wish to thank Christina Toren, Hastings Donnan, Thomas M. Wilson and Ingrid Bell for their comments on my paper and their attempts to improve my English. Fieldwork among the Yupno was carried out between 1986 and 1992 (24 months), and was supported by grant no. 1.185-0.85 from the Swiss Council for Scientific Research and by the German Max Planck Society.

[1] The Yupno text for this case is as follows:

1.1)	*'njarensok walinda akan avimban'* *njaren-sok / wal-i-nda / ak-an / avi-mban*	'The ramification of the tree above (the man)' flower (in the Mission language Kâte)-diminutive / the whole of the branches-its-possessive / stand-3.plural in present tense / above-direction from source
1.2)	*'amin kanda yo koman koman'* *amin / kanda / yo / koman / koman*	'A man is standing' human being / one / one thing / green, new / green, new
1.3)	*'tim mbaga kandakon mbamak akndak'* *tim / mbaga / kanda-kon / mbamak / ak-ndak*	'with his feet on a green elevation' part (pedestal) / hill / one-on / put foot down / stand-3.singular in present tense
1.4)	*'akwi komam komamo nampak eek'* *akwi / komam /komam-mo / nampak / eek*	'his wearing a very green (blue) T-shirt and' T-shirt (in the mission language Kâte) / green, new (here:blue) / green, new-emphasizer / wear / and
1.5)	*'aminteetnda njieñ kolon kolon'* *amin-teet-nda / njieñ / kolon / kolon*	'his right hand holds a yellow stick' human being-bowstring, hence: the side which pulls the bowstring-subject / stick / yellow / yellow

1.6)	*'o kandinan avidak'*	'or another thing'
	o / kanda-nan / avi-ndak	or / one-object / hold-3.singular in present tense
1.7)	*'mbon nameek akndak'*	'he is standing there and turning his buttocks (to me)'
	mbon / name-eek / ak-ndak	buttocks / turn towards-and / stand-3.singular in present tense

[2] The following is the Yupno text:

Director:

2.1)	*'aminsok kanda omo'*	'A boy is turned to the place down there'
	amin-sok / kanda / omo	human being-diminutive / one / down below
2.2)	*'gak yiknal tetngan akndak'*	'where you (matcher) live'
	gak / yik-ndal / tet-ngan / ak-ndak	2.singular emphatic / sit down-2.singular in present tense / side-to (not visible) / stand-3.singular in present tense
2.3)	*'njien aminteetnda avidak'*	'his right hand holds a stick, he stands and'
	njien / amin-teet-nda / avi-ndak	stick / human being-bamboo, bowstring, hence: the side which pulls the bowstring-subject / hold-3.singular in present tense
2.4)	*'omo Mundogon tetngan'*	'looks down…'
	omo / Mundogon / tet-ngan	down below / field-name: 'the place of the falling down rocks', Southeast and down below / side-to (not visible)
2.5)	*'wusieek akndak akan'*	'…to Mundogon'
	wusi-eek / ak-ndak / akan	look for-and / stand-3.singular in present tense / and
2.6)	*'kandapsok wali kanda'*	'and a shrub'
	kandap-sok / wal-i / kanda	tree-diminutive / the whole of the branches-its / one
2.7)	*'oso yuma mbaga akan Tidip tetngan ak'*	'is standing on the hillside, on the side of Teptep village'
	oso /yuma / mbaga / Tidip / tet-ngan / ak	up above / area / hill / and / name of the village (Teptep station, where the airstrip is): 'the place of the many stones', North and up above / side-locative (not visible) / stand

Matcher:

2.8)	*'kanda wal wusi mbagon akan'*	'Is the tree on the hillside and'
	kanda / wal / wusi / mbaga-kon / akan	one / the whole of the branches / up above / hill-locative / and
2.9)	*'amin omo Mpagmbewuñok tetngan tovilak ma'*	'the man turned to the place below, Mpagmbewuñok?'
	amin / omo / Mbagmbewuñok / tet-ngan / tovil-ak / ma	human being / down below / field-name: 'the place where water collects' (hollow), East and below / side-locative (not visible) / turn-3.singular in present tense / so?

Director

2.10)	*'o'*	'yes'
	o	yes

[3] The Yupno text is as follows:

3.1)	*'amin kanda'*	'A man'
	amin / kanda	human being / one

3.2)	*'kandap wal komam komamo ngwisireñ tet'*	'a very green shrub is to the side higher up (north)'
	kandap / wal / komam/ komam-mo / ngwisireñ tet	tree / the whole of the branches / green, new / green, new-emphasizer / to the side, a bit higher up (North) / side
3.3)	*'aminsok kanda ngwimedeñ tet'*	'a boy is to the side lower down (south)'
	amin-sok / kanda / ngwimedeñ / tet	human being-diminutive / one / to the side, a bit lower down /side
3.4)	*'tip mbaga kandara kwinon mbamak ak'*	'he stands on top of a stone elevation'
	tip / mbaga / kanda-ra / kwi-non / mbamak / ak	stone / hill / one-possessive / top-at / put foot down / stand
3.5)	*'njieñi kiron kolon avidak ngwimedeñ tet'*	'he holds this yellow part of a stick to the side lower down (South)
	njien-ñi / kiron / kolon / avi-dak / ngwimedeñ / tet	stick-this (visible) / part / yellow / hold-3.singular. in present tense / to the side, a bit further down (South) / side
3.6)	*'tedak eek kasiri ngwisireñ mavan keek'*	'there he is standing and extending his arm to the side higher up (north) and'
	tedak / eek / kasit-li / ngwisireñ / mavan / ki-eek	stand up / and / arm-its / to the side, a bit higher up (North) / to stretch out / to go-and
3.7)	*'omodeñ Mundogongen wusieek akndak'*	'he is looking downhill (East) to Mundogon'
	omodeñ / Mundogon-gen / wusi-eek / ak-ndak	downhill (East) / field-name: 'the place of the falling down rocks'-to / look for-and / stand-3.singular in present tense

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Les Yupno en tant que scientifiques post-newtoniens, ou qu'est-ce qu'il y a de 'naturel' dans la description de l'espace ?

Résumé

C'est le caractère circonscrit des cultures européennes et des langues indo-germaniques connues qui a conduit les chercheurs travaillant dans le domaine des sciences cognitives à proposer des généralisations par trop hâtives concernant la structure interne de la pensée humaine. Ils pensent, par exemple, qu'il est naturel, et par conséquent universel, de concevoir l'espace qui nous entoure d'un point de vue relatif, égocentrique, et anthropomorphique. La manière dont les Yupno de Papouasie (Nouvelle-Guinée) organisent et ordonnent l'espace sert d'exemple pour démontrer que la représentation des coordonnées spaciales comme autant de rayons jaillissant du corps d'observateurs placés au centre de l'univers, loin d'être unique ou universelle, n'est qu'une des visions possibles.

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