

“Hot” and “Cold”: Classification and Sorting Among the Yupno of Papua New Guinea

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The authors advocate a combination of ethnographic and psychological methods: Cognitive processes and the social distribution of knowledge are to be studied not only through the collective representations derived from interviews with key informants, but through behaviour observations in everyday settings, as well as specifically designed tasks, in order to observe problem solving more directly.

The collaboration between an anthropologist and a psychologist is illustrated in a study of classification among the Yupno of Papua New Guinea. Their world-view classifies everything into three states: “hot”, “cold”, and “cool”. Only experts (sorcerers) can manipulate these states. After an ethnographic description of this classification system, a sorting task was given to six samples of Yupno subjects. Only the sorcerers used the abstract category of “hot/cold” explicitly; the other older adults used it implicitly through function, whereas schooling induced sorting by colour. These findings call into question the anthropological and developmental status of classifying by taxonomy.

Les auteurs préconisent une combinaison de méthodes ethnographiques et psychologiques: Les processus cognitifs et la distribution sociale des savoirs devraient être étudiés non seulement à travers les représentations collectives obtenues avec des informateurs privilégiés, mais également à travers des observations de comportement dans des situations quotidiennes, et des épreuves qui permettent d’observer la résolution de problèmes plus directement.

La collaboration entre un ethnologue et un psychologue est illustrée par une étude d’un système de classification chez les Yupno de Papouasie

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Nouvelle-Guinée. Selon leur vision du monde, tout peut être divisé en trois catégories: “chaud”, “froid”, et “tiède”. Seuls les experts sorciers peuvent manipuler ces états. Après une étude ethnographique de ce système, différents groupes de sujets sont soumis à une épreuve de classification. Les sorciers y utilisent explicitement la catégorie abstraite “chaud/froid”, les autres adultes l’utilisent implicitement en classifiant par fonction, alors que la scolarisation semble inciter à une centration sur la couleur.

INTRODUCTION

This paper explores the advantages and difficulties of a collaboration in fieldwork between a cultural anthropologist and a cross-cultural psychologist. In a previous paper also reporting interdisciplinary research among the Yupno of Papua New Guinea (Wassmann & Dasen, in press), we had illustrated this theme with a study of the Yupno body-count number system and its use in daily activities and in solving unfamiliar problems. We had found, in particular, that the system showed rather surprising individual differences among informants, a fact that could only be discovered because we did not rely on a single “omniscient” informant.

In this paper, we report a study of classification and sorting. The ethnographic documentation of the expert knowledge of “sorcery” (the manipulation of the “hot/cold” states), and a sorting task designed specifically for this study, will lead us to question some of the previous conclusions of cognitive anthropology as well as of developmental and cross-cultural psychology; in particular, we report that illiterate men use a highly abstract classification criterion (“hot/cold”) explicitly or implicitly (through its functional equivalent), whereas schooling seems to foster sorting according to colour. Whereas adult women did not use the “hot/cold” criterion in this part of the study, they demonstrate their knowledge of it when given another task (sorting food) within their socially sanctioned field of expertise. The second example, to be reported in detail elsewhere (Wassmann, 1993) also demonstrates that different classification schemes are obtained with different methods of investigation (asking them, listening to their conversations, watching them, and setting unfamiliar tasks). In short, ethnographic material obtained with selected informants is combined with sorting tasks performed by a variety of subgroups in order to maximize the likelihood of obtaining a clearer insight into Yupno classification behaviour.

COMBINING THE METHODS OF ANTHROPOLOGY AND PSYCHOLOGY

The combination of ethnographic and psychological methods is not obvious and needs much collaborative effort, because the traditional boundaries

between the two disciplines are still quite strong (Jahoda, 1982; Price-Williams, 1978). Cultural anthropology is typically concerned with how people understand their world; it attempts to study normative knowledge at the social level through ethnographic fieldwork (usually with a few main informants). Psychology describes processes that function at the individual level, and studies whether people differ from each other or not, often using artificial (laboratory) situations and samples of subjects selected according to pre-defined criteria. This specialisation has brought the two disciplines into what Lave (1988, p. 12) calls the "uniformist dilemma": Cultural anthropology recognizes the plurality of cultures, but tends to treat individuals within those cultures as homogenous; psychology recognizes the plurality of individuals, but tends to ignore the cultural diversity. In each case an important part of reality goes unstudied. In recent years, however, in particular with the advent of cross-cultural psychology (Berry, Poortinga, Segall, & Dasen, 1992; Segall, Dasen, Berry, & Poortinga, 1990) and cultural psychology (Boesch, 1991; Shweder, 1990), the two disciplines have started to come closer together.

From the beginning, cognitive anthropology had "the native's point of view" as its goal. It wants to describe which of the many possible ways of organizing the environment each specific social group has chosen, how it produces "order out of chaos". Cognitive anthropology studies the knowledge about one's world and culture, its content and especially its organization (structure), with the conviction that this structure must reflect the thinking process of the individuals. In the ethnoscientific paradigm that has dominated the field in the 1960s and 1970s, the organization of taxonomies in specific cultural domains (colours, kinship systems, zoology, botany, and so on), was derived from verbal materials obtained from a few main informants (the "experts" in those fields), believing this would provide information on the contents and processes of individuals' cognitions. However, although the study of collective representations has its own value, it cannot give a valid description of individual processes (Harris & Heelas, 1979; Jahoda, 1982). As Quinn and Holland (1987, p. 14) noted: "The organization of lexicon . . . offer[s] only limited insight into the organization of cultural knowledge" in the individual. In fact one has not taken seriously Frake's (1964, p. 133) following admonition: "We must get inside our subjects' heads".

To get inside subjects' heads, one needs psychology, but psychology itself suffers from limitations, not least being its inherent ethnocentrism (Dasen, 1993). Psychology tends to study the individual independently of any cultural context, or tries to control for culture. Thus, even within cross-cultural psychology, Poortinga, Van de Vijver, Joe, and Van de Koppel (1987, p. 22) are convinced that the main goal is to look for similarities through "peeling the onion called culture . . . until in the end

they [the cultural differences] have disappeared and with them the variable culture".

In this paper, if we are going to question the validity, in cognitive anthropology, of representational systems derived from questioning, we will also question the status of taxonomy as a developmental landmark given to it within mainstream psychology. A common task in cognitive developmental psychology is to give Ss a number of objects (or drawings or photographs), asking them to sort these into equivalent sets. To use Bruner's terminology, (Bruner, Oliver, & Greenfield, 1966), which "criterial attributes" are used for this sorting is said to depend on age and educational level, that is, it is taken as an indicator of levels of cognitive development. Young children tend to rely on immediately noticeable features such as number and colour, followed by form. Older children sort according to function (they match up a nail with the hammer, the knife with the orange, because the knife cuts the orange), and finally using nominal or taxonomic criteria (the hammer with the screwdriver because they are both tools), considered to be more "abstract". There have been several cross-cultural studies confirming this sequence, and showing that the performance level was dependent on the familiarity with the objects (Irwin & McLaughlin, 1970; Okonji, 1971; Price-Williams, 1962), mode of presentation (Derogowski & Serpell, 1971), and schooling (Evans, 1975; Evans & Segall, 1969).

Bringing anthropology and psychology together has led Super and Harkness (1986) and Valsiner (1989), among others, to suggest that the appropriate unit of analysis is the individual in the cultural context or, as Segall, Dasen, Berry, and Poortinga (1990, p. 352) have phrased it: "To understand human behavior, it must be viewed in the sociocultural context in which it occurs". In the cognitive domain, this interdisciplinary outlook is part of a larger movement, that of Gardner's (1985) "new cognitive science", bringing the viewpoints of various disciplines to bear on the same object. At the same time, a shift is noticeable towards studying the sharing and use of knowledge in "jpts" ("just plain folks") and in "everyday" situations (Dasen & Bossel-Lagos, 1989; Guberman & Greenfield, in press; Lave, 1988; Lave & Wenger, 1991; Rogoff, 1990; Rogoff & Lave, 1984; Segall et al., 1990; Wassmann & Dasen, 1993). How does the average member of a society acquire, store, and retrieve knowledge, make decisions, solve problems, interpret new experience, and thus produce new knowledge? This new outlook on cognition is not unrelated to such concepts as "practical intelligence" (Sternberg & Wagner, 1986), "indigenous cognition" (Berry, Irvine, & Hunt, 1988), and "distributed cognition". Everyday cognition tends to be procedural rather than conceptual (Hatano, 1982), linked to specific contexts (Cole, 1978) and to concrete activities, such as an "acting system" as well as an "understanding system" (D'Andrade, 1984, p. 91).

This casts doubt on the assumption, derived largely from Durkheim, that underlies much of traditional fieldwork practice, namely that anthropologists are not concerned with individuals as such, but merely with their functioning *qua* carriers of a common culture. With the aforementioned formulation of questions it becomes necessary to study individuals in their own right rather than merely as cultural "sub-units". For this reason also, a need was felt to go beyond the questioning and observation of everyday behaviour that forms the stock-in-trade of traditional anthropology, and it was thought that the special skills and techniques of psychology might usefully be employed as an integral part of the work.

The phrase "integral part" is crucial here. Historically, the first joint enterprise was the famous Cambridge Expedition to the Torres Straits, where anthropologists and psychologists worked in parallel, each group pursuing its own separate objectives. In subsequent co-operative ventures (e.g. in the culture and personality school, see Campbell & Naroll, 1972), there was closer contact, but, as a rule, still a rigid division of labour, with psychologists mainly administering tests of various kinds. By contrast, here, the anthropologist and the psychologist both planned and executed certain key aspects of the fieldwork together, pursuing as a joint field team the same objective: Mainly the ascertainment of the nature and distribution of cultural knowledge within a community.

In bringing together anthropology and psychology, we advocate the following general research strategy in three steps: (1) interviews with a few key informants and "jpts"; (2) behaviour observations in everyday settings, to get at the application of knowledge in daily life; (3) setting tasks, to induce behaviour that is not observable in everyday situations. We are describing here our general research strategy; the details of the techniques, informants and Ss will be described later as appropriate. It is obvious that the three steps do not assume the same importance in every research; for example, whereas the interviews and observations of "jpts" were very important in our study of the Yupno number system (Wassman & Dasen, in press), the present study has relied more on standard ethnography for the first two steps, but does introduce tasks as a necessary third step.

1. interviews

The ethnographer inevitably starts by interviewing a few key informants, usually the "big men" who are particularly knowledgeable in many aspects, "opinion leaders", persons with high social status in the community, who can present a coherent normative system. With these "omniscient informants", who are experienced in answering the anthropologist's questions, it is possible to elaborate intensively on the verbal material, to dissect concepts into their semantic components, i.e. to collect the

qualitative data that are basic to the ethnographic method (Agar, 1986; Bernard et al., 1986; Werner & Schöepfle, 1987).

This first model is then confronted by alternatives derived from interviews with as many individuals as possible, in order to collect variations and establish the distribution of knowledge in different segments of the population (according to age, sex, special experience, education, and so on).

2. Observations

Interview data are not sufficient to describe the use of knowledge; the observation of how "jpts" apply the normative system in concrete situations, and how they talk about it among themselves, is a necessary complementary step. In practice, interviews and observations are alternated and they complement each other.

But observation brings with it its own problems. In everyday settings, routines determine the actions; rarely can we observe spontaneously how an individual is confronted with a new problem that is conceptualized as such and leads to the search for solutions. Murtaugh (1985, p. 192) points out that: "Problem formation and problem solving are very likely to be integral parts of a single process in many real-world environments". If a problem is solved, this occurs automatically; it is almost impossible to see, and it is not easy to assess from the outside what the individual's thoughts have been. Another problem is that cultural knowledge (to use Quinn & Holland's, 1987, phrase) 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, p. 12). Thus cultural knowledge is often used unconsciously, it is implicit (Strauss, 1984), incorporated (Chamoux, 1981), and non-reflexive. For these reasons, tasks are often necessary.

3. Tasks and Tests

In order to observe problem solving more easily, Ss are confronted with artificial situations, accompanied with instructions and questions; a problem is created that can be solved through the explicit and conscious application of cultural knowledge. These situations are called tasks (Lave, 1988, speaks of "simulation experiments") because the Ss are asked to do something unusual that is new to them; when these tasks are standardized and norms are produced, they are called tests.

Although tasks, tests, and laboratory situations are the basic tools of psychologists, they are unusual in classical ethnography; they were carried to the field by cross-cultural psychologists, or through the enterprise that Cole and co-workers (Cole, Gay, Glick, & Sharp, 1971; Cole & Scribner,

1974; Scribner & Cole, 1981) have called "experimental anthropology". The advantages of such a procedure are obvious: How a particular knowledge is used in a new situation can be more easily observed and can tell us more about cognitive processes than can the observation of daily routines. Another advantage is that these tasks do not have to be verbal; non-verbal behaviour can be observed, although verbalization can help to render it more explicit. But there are disadvantages too, which is why anthropologists often reject the use of unfamiliar tasks: If the situations are too artificial, and the Ss not used to being put in such strange situations, it is not certain that they will be able to show their true cognitive competence. This is why it is important not to rely on single tasks, but to multiply the situations until the researcher can reasonably be assured that the performance reflects the competence (Ciborowski, 1980; Cole & Scribner, 1974; Dasen & Heron, 1981).

CLASSIFYING THE WORLD: "HOT", "COLD", AND "COOL"

In this study, we explore how the Yupno structure and use knowledge in a domain that is especially important to them: The "hot/cold" classification structure of their environment. Everything in the Yupno world, things, people, animals, plants, even actions, are always in a particular state on the dimension between "hot" and "cold", a medium position being the optimal condition ("cool", or "lukewarm"). Every Yupno knows about these states, but only a few of them know how to influence and change them: This is a specialized knowledge, retained only by "sorcerers", even though the theme of how this change is brought about is a most important one in Yupno culture, even for "jpis". The following research question arises: When confronted with objects that are "hot" and "cold", do these specialists deal with them differently from the non-specialists, who know about these states but not how to manipulate them?

Interviews

The following is a short ethnographic description of the "hot/cold" classification system derived from interviews with key informants (specialists) as well as other Yupno adults. All Yupno adults know the system about to be described, but only a few specialists know how to use it for active manipulations. Limitations of space prevent us from giving the full details that would be warranted by ethnographic methodology, but these are available in Wassmann (1993a), including a full geographical and ethnographic description of the Yupno.

All the things that the Yupno know about, the objects of the surrounding world, the village, the gardens, the bush, animals, and people, are always in one of three states: *tepm* ("hot"), *yawut* ("lukewarm", "fresh", "cool"), or *mbak* ("cold"). These words are used both to describe physical reality (temperature), and metaphorically to designate a qualitative state: "Hot" and "cold" are extreme states and thus undesirable; a "hot" state is dangerous because it cannot be controlled, and a "cold" state produces immobility, and speechlessness in humans. Normal and good is only the middle state "cool", and most objects in the environment are usually in this state.

Tepm also has the meaning of quick, immediate, strong, biting (on the tongue), painful, and sick; the word also designates objects that are long, high, and on top; it designates movement, and the right side of the body (because it is the right hand that bends the bow). Emotionally, *tepm* means sorrowful, depressed, determined, and enraged.

If someone has a serious problem (e.g. infertility), this is usually attributed to some misbehaviour (of that person or someone of the family or clan), like adultery or a mistake in paying bride price; the social harmony is disturbed, and that person is now *tepm*, "on top" or outside the social group. In the same way, someone who is independent and determined is "long", "carries the head straight", is "on top", i.e. "can no longer hear what others say", is outside of the social group. That person has a problem, and is therefore "hot". Someone who gets too hot may "burn", namely die.

Mbak means cold in the metaphorical sense: broken, shameful (the state that renders speechlessness), lethargic (but not dead). It also designates the left side of the body (because the left hand only holds the bow).

Yawut designates slow, careful, light, confident, weak, soft, and little. The word is used for things that are "below", short, and people who are socially well integrated. The person who is *yawut* is in the middle, is neither passive nor arrogant, is in the middle of people, at the same level, taking the ideal position: slightly bent. Just as a well-educated person enters a house slightly bent (if only to avoid breathing in the smoke), the *yawut* person avoids extremes, avoids taking sides, does not fight nor talk back, is neither lazy nor over-active, but does the needed work amidst all the others, listening to them at the same level. Only such a person can become knowledgeable and influential.

These are not static states; they are variable, can be influenced, and manipulated, but whereas all Yupnos know about the three states, only a few experts know how to change them. These experts are called "sorcerers" because they have special knowledge that relates to magic, which is to a large extent kept secret.

Daily Yupno life is marked by the constant efforts to manipulate the states of the environment; people, villages, gardens, and areas in the bush

are constantly "cooled down" or "heated up", and the specialists are paid to do this. For example, an area that has been "heated up" becomes protected against intruders; if someone enters that territory, that person gets "heated up" to a dangerous state: The consequences are an accident, illness, or even death (for that person, or someone in the same patrilineage). If that same area is "cooled down", the "cold" is transmitted to the animals that live there, i.e. they are frozen, motionless, and invisible, and therefore impossible to hunt.

These manipulations are a main theme in daily conversations, and all sorts of mishaps and accidents are explained by them: illness, sudden death, crop failure, problems in raising pigs, bad luck while hunting, and many more. The "hot-cool-cold" schema provides the Yupno with an "understanding system" and the manipulations with an "acting system" (D'Andrade, 1984, p. 91).

Manipulations are achieved through the principle of transmission through contact: If something has to be "heated up", it is brought into contact with already "hot" objects. The goal of manipulations is always to be useful or harmful. If that object was initially "cold", the change will be useful (making it "cool"), otherwise harmful. The transmission occurs through the adding or taking away of "vital energy" to or from the "body-soul-substance" and this makes things (objects) have a "body-soul-substance" and people "different" (which also means being beset by a taboo, holy, unapproachable). Someone who is different is outside of the social norm, is no longer socially integrated, and is exposed to the escalation of the abnormal state and possible destruction. On the other hand, the ideal state (of the bent person) is to have just enough vital energy, neither too little nor too much.

Some objects are predisposed to have a lot (or very little) of vital energy, and are thus particularly useful for manipulations. Thus, things that are red or black (dark), are dry, are stinging or burning, and are found "on top", are "hot". Things that are white (light), are linked to water, and are found "below", are "cold". If objects have a mixture of these attributes, the following priority list can be used to determine their state: colour, dryness, localization. However there are also exceptions to this scheme; for example, although bamboo is generally "cold", a particular species, the *teet*-bamboo is "hot" (both because it is used to make bows and arrows, and because it is linked to the Yupno myth of origin).

The objects a particular sorcerer chooses to use for manipulations is a highly personal affair, derived from experience and trial and error, inherited, or from knowledge acquired in dreams. In other words, as Quinn and Holland (1987, p. 1), note, given the "general purpose model" there are many individual "instantiations".

Observations

Because sorcerers' activities are secret, they are almost impossible to observe. The village of Gua in which our research was carried out has about seven sorcerers. One of them, named Yam, with whom a particularly trustful relationship was established, agreed to reconstitute for the anthropologist some of the manipulations, and to describe them in detail, but he requested that no photographs should be published. He spent days collecting the appropriate plants and materials.

The following is a shortened example of "cooling down" performed by the sorcerer Yam and retold by himself:

'In the neighbouring village of Uskokop, an older, married man, kidnapped the daughter of the headman Nanguot, and hid her somewhere in the bush. Nanguot called on me, and offered to pay me to bring his daughter back and to take revenge.

We first talked to the man, then destroyed his gardens and Pandanus trees, to no avail: the girl was not returned. So one afternoon, Nanguot and I took one of the man's largest pigs, killed it, cut it into pieces, and brought these in string bags to our village of Gua. So that the owner could not find his pig, I cooled it down'.

To do this, Yam sent Motamba (one of his cousins) to collect water from a lake at the Yupno river source, some damp sand from the lake bed, *medat* water-bugs, and *mada*-straws (*Mischanthus floridulus* Labill. *Warb.*, *Graminae*). Yam himself collected leaves from the light-coloured *petpat* bush (*Crinum asiatica*, *Amarillydaceae*), leaves from the *joñwajok* tree (*Buddleja asiatica* Lour., *Loganiaceae*), the *bukwak* tree (*Plectrathus* sp., *Labiateae*), *yagongwak* leaves (botanically unidentified), and "cold" *met maam* ginger (*Zingiber officinale*, *Zingiberaceae*). All of these ingredients were crushed inside of a *ndumban* (*Bambusa* sp., *Graminae*) bamboo segment (considered to be "cold") to form a paste. This he mixed with young, white sprouts of the *mbilin* (*Musa* sp., *Musaceae*) banana (prototypically "cold"), cut into small pieces, and small parts of the stolen pig (hair, bones, and meat). The "body-soul-substance" of the pig that clings to these pieces was thus "cooled-down", and hence in a *pars-pro-toto* analogy, so was the whole pig, so that it became invisible to its owner.

In further manipulations destined to "cool down" the owner (and culprit of the girl's abduction) himself, Yam crushed *sua goman* leaves (*Hypericum papuanum* Ridley, *Guttiferae*) and *ndamba pilin* ferns (*Cyathea* sp., *Cyatheaceae*), and threw them into the fire. He called out the names of *kinam* and *saup* (two tree-marsupials) and said: "You [meaning, the enemy man and his clan] are like these tree-kangaroos, your penises erected and produced this mess, now I am cutting you down, like I crush

these leaves." He filled the *mada* straws with the paste, and, at night, buried these on the path between the villages of Uskokop and Gua; he also put some paste on the doorstep of the man's dwelling. When the man would step over these manipulated areas, it would "cool down" his "body-soul-substance", and thus inactivate him, and make any search for the stolen pig useless.

The man and his friends searched for the pig everywhere, but it was useless, they could not find anything. We remained in Uskokop for two weeks, pretending not to know anything about the lost pig. The girl was returned after two weeks, and the man paid an adequate compensation, and everything returned to normal".

Sorting Tasks

Given the cultural model that all Yupno know about, and for which a few experts have the appropriate secret knowledge to put to action, how would this knowledge influence the behaviour in a cognitive task? Would the experts use the highly abstract dimension ("hot/cold") more readily than others?

METHOD

To answer these questions, a sorting task was constructed. Nineteen objects were selected that could clearly be classified as either "hot" or "cold", but could also be classified according to other criteria: colour, form, function, or taxonomy. Purposefully, some pairs of objects were included that look alike to the lay person, but are distinct to the experts (two sorts of bamboo and two sorts of ginger roots). These objects, classified according to colour, are illustrated in Figs. 1 and 2.

The objects were presented on a tray, in random order, and the Ss were first asked to name each object, and then to put together those that belonged together (that have the same characteristics). Pieces of cardboard were used to localize the subsets, and Ss could produce as many subsets as they wanted. Ss were then asked to explain the basis of their classification.

In a second part of the sorting task, the objects were put back on the tray, and the two ginger roots (seemingly identical, but one "hot" and one "cold") were set out on two pieces of cardboard, and Ss were asked to complete the sets with objects that were "similar". This technique was designed to give a clue to the "hot/cold" classification criterion.

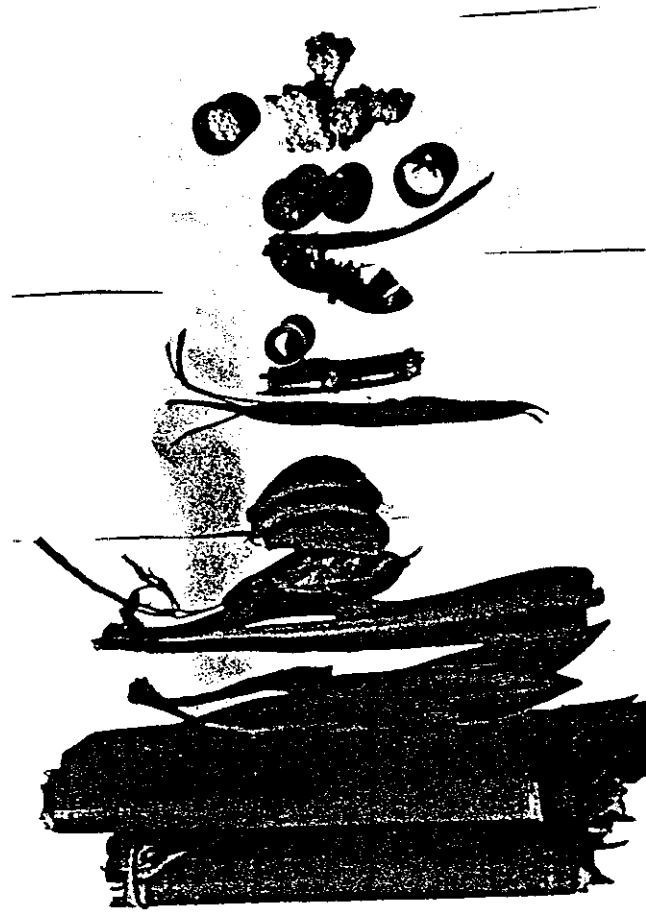


FIG. 1 Objects used in the sorting task.

The following groups of Ss were given these tasks:

- A. Five experts, known to be sorcerers, older men, no schooling, no knowledge of Tok Pisin (Neo-Melanesian Pidgin-English, the lingua franca of Papua New Guinea).
- B. Five non-experts, older men, no schooling, no Tok Pisin.
- C. Five women, two elderly, three aged 30-40, no schooling, no Tok Pisin.
- D. Five younger men, 30-40, some schooling and some Tok Pisin, have spent time on the coast and in cities.
- E. Five children, two boys, three girls, 14-16, no schooling, no Tok Pisin.
- F. Five children, three boys, two girls, 14-16, grade 2 education.

The criteria for sorting were classified as follows.

1. Using Categories

- C1 "Hot" and "cold"
- C2 Edible and inedible; cultivated and wild.
- C3 Taxonomy: leaves, bamboo, ginger, insects.
- C4 Colour.

2. Using Function

- F1 To "heat up"/to "cool down".
- F2 To be used in ritual (implicitly "hot").
- F3 To feed pigs (implicitly "to cool down").
- F4 To dye string-bags.
- V1 Form.
- V2 Various other explanations and stories.

RESULTS

Whether expressed as an abstract category or its associated function (to "heat up", to "cool down"), the "hot/cold" distinction is used explicitly and spontaneously only by the expert sorcerers (group A). Figure 2 illustrates one of the subjects producing two sets according to "hot" (in front) and "cold" (to his left). The other older men (group B) tend to give a slightly different, functional explanation: "things that are used in rituals", in which the "hot/cold" distinction is only implicitly present. Indeed, all things connected to rituals always tend to be "hot". Women (group C) also give mainly functional reasons, linked to their activities: to feed pigs, which is linked to "cold", and to dye string-bags. Two of the older women found it difficult to understand the task. The summary results are presented in Table 1.

The younger, more acculturated men (group D), and the children (groups E and F), along with some individual answers, predominantly chose the criterion of colour. Form is never used, and taxonomy very seldom. In the second part of the task, almost all older men (groups A and B) take advantage of the clue to use the "hot/cold" classification, as well as one S in group D and one in group E, while the others ignore the hint.

DISCUSSION

Comparing our results to those of previous developmental and cross-cultural studies of sorting, we can conclude that sorting behaviour is context- and task-specific. Although the preference of colour over form is confirmed (form was, in fact, never used), in our particular setting and given the particular task constraints, schooling seems to induce sorting by perceptual criteria (colour), whereas illiterate Ss (including some non-schooled children), used less obvious (more "abstract") characteristics, among which is the very abstract "hot/cold" category.

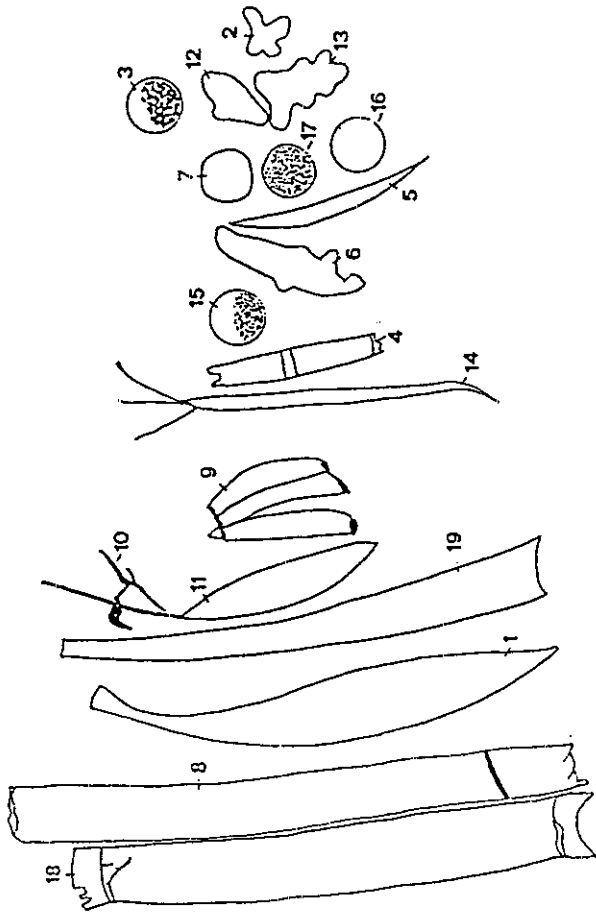


FIG. 2 Detailed description of objects used in the sorting task, classified according to colour.

Green			
18	Teet	Bambusa Sp., Graminae	"hot"
8	Ndumban	Bambusa Sp., Graminae	"cold"
1	Petpat	Crinum Asiaticum, Amarillydaceae	"cold"
19	Umban Pap	Cordyline Sp., Liliaceae	"hot"
11	Tambun	Cordia Alliodora, Euphorbiaceae	"cold"
10	Tira Kosum	Commelina Paicata Hassk., Commelinaceae	"cold"
9	Mbilin	Musa Sp., Musaceae	"cold"
Red			
14	Njimid	Cordyline Sp., Liliaceae	"hot"
4	Sugar cane	Saccharum Officinum, Graminae	"cold"
15	Red earth		"hot"
Black			
6	Butterfly		"cold"
5	Burned stick		"cold"
7	Yayaal	Elaeocarpus Sp., Elaeocarpaceae	"cold"
17	Black earth		"hot"
16	Gildip	Insects	"hot"
White			
3	White earth		"cold"
12	Stone		"cold"
2	Mel naam	Zingiber Off., Zingiberaceae	"cold"
13	Maam goman	Zingiber Off., Zingiberaceae	"hot"



FIG. 2 Example of Yupno expert sorting according to "hot" and "cold". "Hot", in front: red *Njimat* leaf (14), red earth (15), *Gildip* insect (17). "Cold", to his left: *Mbitin* bananas (9), *Peipat* leaf (1), and sugar-cane (4). Other objects are visible on the tray, still to be sorted.

The results also show that taxonomic classifications are a minor mode for the Yupno. That this finding does not reflect an inability to use "abstract", "more advanced" criteria should be obvious. However, we can recall the following anecdote recounted by Ciborowski (1980). When using

TABLE 1
Sorting Task (Parts 1 and 2)*

Part 1	Groups (n = 5)	Sorting Criteria									
		C1	F1	F2	F3	F4	C2	C3	C4	C5	V
A	4	4	3	3	4	1	1	1	0	0	0
B	2	0	4	0	4	3	0	2	0	2	0
C	0	0	1	3	3	1	1	1	0	2	0
D	1	1	0	0	3	3	2	3	0	0	0
E	0	0	2	0	1	2	0	3	0	0	0
F	0	0	0	0	0	0	1	5	0	0	0

Part 2	Groups	n	Sorting Criteria									
			C1	F1	F2	F3	F4	C2	C3	C4	C5	V
A	5	4	1	0	0	0	0	0	0	0	0	0
B	4	4	0	1	1	0	0	0	0	0	0	0
C	3	0	0	0	1	0	0	1	0	0	0	2
D	5	1	0	0	2	0	2	0	0	0	0	1
E	5	1	1	0	1	1	2	0	1	0	0	0
F	5	0	0	0	0	0	0	1	0	0	0	4

* Number of Ss using particular sorting criteria (Ss may use several different criteria). See text for details of groups and sorting criteria.

a sorting task among the Kpelle of Liberia, Glick found that illiterate adults would consistently use functional criteria (the knife with the cassava rather than with the machete, because it is used to cut the fruit). The instructions contributed to make the Ss think that they were being tested for their cleverness. But, (Ciborowski, 1980, p. 283), "acting on a hunch, Glick asked a subject to do the classification task as a *stupid* Kpelle person might do it. The result was dramatic. Under the new instructions the subjects produced a perfect taxonomic grouping."

The second part of the sorting task shows that the older non-expert men, even though they do not spontaneously use the "hot/cold" distinction, can produce it when induced to do so. Their implicit knowledge can easily be actualized (in other words, their competence turned into performance), which is not the case of the other, younger, and more acculturated men, the women, and children. For the women, the "hot/cold" distinction is not "their thing"; only men can be sorcerers among the Yupno, and only men deal with religious aspects (rituals).

However, this does not mean, as became obvious in still another sorting task (to be reported elsewhere), that they are unable to use the distinction when applied to their domain of interest, for example, the preparation of food. When observed and questioned while cooking, they explained that sweet potatoes always had to be prepared with green leaves, because the former "strengthen the bones" (together with potatoes and bananas), while the latter "help the blood"; the former provide "vital energy", they "heat up", while the latter (including also fruit and sugar cane) "cool down". An ideal meal is one that is balanced.

In a sorting task using food, the women used this distinction between strengtheners ("hot") and helpers ("cold") quite systematically. This shows that they know about the "hot/cold" model, but never use it explicitly, only implicitly when it is culturally appropriate for them to do so.

As Chamoux (1981) has shown in a study among the Nahuas of Mexico, some knowledge can be shared, and is available at the competence level, but it is not expressed because social custom does not allow it. In our research on the Yupno number system (Wassmann & Dasen, in press) we similarly found that women probably know the system, but pretend not to know it because they are not supposed to know it.

The research on food classification (Wassman, 1993b) also showed that the initial classification obtained through questioning, which is taxonomic (garden vs. bush), is of no relevance for food preparation, or in sorting tasks. Taxonomic systems are reported most often in the ethnographic literature, but although such taxonomic systems can indeed be found, and can help to order reality, they are not really relevant in daily activities or in cognitive processes evoked by tasks.

It took a multi-method approach, combining anthropological and psychological tools, to show that. A typical psychological study would have attempted to include more subjects, and would possibly have explored in more detail the changes with age; this was not our purpose, and would indeed have been difficult to carry out in this particular field situation. The use of a psychological approach in a typically ethnographic study has proved very informative. The "hot/cool/cold" model is an "understanding system" for all Yupno, which helps to order the world. Many anthropologists would say that this is *the* hallmark of Yupno culture. But what is the influence of this collective representation on individuals? How is this model available for action? How is the knowledge distributed in society?

The answer to these questions is that those who manipulate the system (i.e. the sorcerers) have the model present in their minds, and use it explicitly. For others it is hidden, present only at some deep level; they

use it implicitly (e.g. in sorting according to function) in specific domains and situations, depending on their sex and age. For the more acculturated Yupno and schooled children, this cultural knowledge is no longer relevant; in fact, in our sorting task, schooling seems to induce the use of the concrete, perceptual cue of colour, rather than the more abstract, traditional Yupno system.

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