

George Lakoff

Women,
Fire, and
Dangerous
Things

*What Categories Reveal
about the Mind*

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Radial Categories

The category *mother*, as we saw above, is structured radially with respect to a number of its subcategories: there is a *central* subcategory, defined by a cluster of converging cognitive models (the birth model, the nurturance model, etc.); in addition, there are *noncentral extensions* which are not specialized instances of the central subcategory, but rather are variants of it (*adoptive mother, birth mother, foster mother, surrogate mother, etc.*). These variants are not generated from the central model by general rules; instead, they are extended by convention and must be learned one by one. But the extensions are by no means random. The central model determines the possibilities for extensions, together with the possible relations between the central model and the extension models. We will describe the extensions of a central model as being *motivated* by the central model plus certain general principles of extension. Much of the rest of this volume will be concerned with the concept of *motivation* and with the kinds of general principles of extension that govern the structure of radial categories.

As we saw in the case of *mother*, radial structure within a category is another source of prototype effects. Within radial categories in general, less central subcategories are understood as variants of more central categories. Thus, *birth mother* and *foster mother* are not understood purely on their own terms; they are comprehended via their relationship to the central model of *mother*.

Grammaticalized Categories

It is common for the grammars of languages to mark certain conceptual categories. Inasmuch as language is a part of cognition in general—and a major part at that—conceptual categories marked by the grammars of languages are important in understanding the nature of cognitive categories in general. Classifier languages—languages where nouns are marked

as being members of certain categories—are among the richest sources of data that we have concerning the structure of conceptual categories as they are revealed through language. Let us now turn to two examples of conceptual categories that are radially structured and that are marked by classifiers.

Women, Fire, and Dangerous Things

Borges attributes the following taxonomy of the animal kingdom to an ancient Chinese encyclopedia entitled the *Celestial Emporium of Benevolent Knowledge*.

On those remote pages it is written that animals are divided into (a) those that belong to the Emperor, (b) embalmed ones, (c) those that are trained, (d) suckling pigs, (e) mermaids, (f) fabulous ones, (g) stray dogs, (h) those that are included in this classification, (i) those that tremble as if they were mad, (j) innumerable ones, (k) those drawn with a very fine camel's hair brush, (l) others, (m) those that have just broken a flower vase, (n) those that resemble flies from a distance. (Borges 1966, p. 108)

Borges, of course, deals with the fantastic. These not only are not natural human categories—they could not be natural human categories. But part of what makes this passage art, rather than mere fantasy, is that it comes close to the impression a Western reader gets when reading descriptions of nonwestern languages and cultures. The fact is that people around the world categorize things in ways that both boggle the Western mind and stump Western linguists and anthropologists. More often than not, the linguist or anthropologist just throws up his hands and resorts to giving a list—a list that one would not be surprised to find in the writings of Borges.

An excellent example is the classification of things in the world that occurs in traditional Dyrirbal, an aboriginal language of Australia. The classification is built into the language, as is common in the world's languages. Whenever a Dyrirbal speaker uses a noun in a sentence, the noun must be preceded by a variant of one of four words: *bayi*, *balan*, *balam*, *bala*. These words classify all objects in the Dyrirbal universe, and to speak Dyrirbal correctly one must use the right classifier before each noun. Here is a brief version of the Dyrirbal classification of objects in the universe, as described by R. M. W. Dixon (1982):

- I. *Bayi*: men, kangaroos, possums, bats, most snakes, most fishes, some birds, most insects, the moon, storms, rainbows, boomerangs, some spears, etc.

- II. *Balan*: women, bandicoots, dogs, platypus, echidna, some snakes, some fishes, most birds, fireflies, scorpions, crickets, the hairy mary grub, anything connected with water or fire, sun and stars, shields, some spears, some trees, etc.
- III. *Balam*: all edible fruit and the plants that bear them, tubers, ferns, honey, cigarettes, wine, cake
- IV. *Bala*: parts of the body, meat, bees, wind, yamsticks, some spears, most trees, grass, mud, stones, noises and language, etc.

It is a list that any Borges fan would take delight in.

But Dixon did not stop with a list. He was determined to learn what made these categories of the human mind, categories that made sense to Dyirbal speakers—that they could learn uniformly and use unconsciously and automatically. In the course of his fieldwork, Dixon observed that speakers do not learn category members one by one, but operate in terms of some general principles. According to Dixon's analysis, there is a basic, productive, and fairly simple general schema that operates unless some specialized principle takes precedence. Dixon's proposed basic schema is this:

- I. *Bayi*: (human) males; animals
- II. *Balan*: (human) females; water; fire; fighting
- III. *Balam*: nonflesh food
- IV. *Bala*: everything not in the other classes

Here are some cases that fit this schema: Men, being human males, are in class I. Kangaroos and possums, being animals, are in class I. Women are in class II, since they are human females. Rivers and swamps, being bodies of water, are in class II. Fire is in class II. Wild figs are in class III. Tubers are in class III. Trees that don't bear fruit are in class IV. Rocks are in class IV. Language is in class IV.

The cases of particular interest are those that Dixon found to follow certain general principles beyond the basic cases given above. Perhaps the most general principle, which Dixon takes for granted and doesn't even bother to state explicitly, is what I will call the domain-of-experience principle:

If there is a basic domain of experience associated with *A*, then it is natural for entities in that domain to be in the same category as *A*.

For example, fish are in class I, since they are animate. Fishing implements (fishing spears, fishing line, etc.) are also in class I, even though they might be expected to be in class IV, since they are neither animate

nor a form of food. Similarly, plants that have edible fruit are in class III with the fruit they yield. One would otherwise expect fruit trees to be in class IV with the other trees. And in fact, if one is specifically referring to the wood of a fruit tree, say in reference to firewood or making an implement, then the classifier *bala* of class IV is used. Light and the stars, which are in the same domain of experience as fire, are in class II with fire. Fighting implements (e.g., fighting spears) and fighting ground are in the same domain of experience as fighting, and so are in class II with fighting.

Perhaps the most striking of Dixon's discoveries, and the one that accounts for most of the apparently aberrant cases, is what I will refer to as the myth-and-belief principle:

If some noun has characteristic *X* (on the basis of which its class membership is expected to be decided) but is, through belief or myth, connected with characteristic *Y*, then generally it will belong to the class corresponding to *Y* and not that corresponding to *X*.

Though birds are animate, they are not in class I with other animate beings. Birds are believed to be the spirits of dead human females, and so are in class II. In the so-called mother-in-law language of Dyirbal (used to speak to tabooed relatives of the opposite sex), there is only one word, *balan muguynyan*, for both female spirits and birds. Certain birds are exceptions to this. Three species of willy-wagtails are believed to be mythical men, and so are in class I with men. The spangled drongo is in myth the bringer of fire (from the clutches of the rainbow snake); thus, the spangled drongo is in class II with fire. (Dixon claims that there are a number of other cases of this sort.) In myth, crickets are "old ladies," and so are in class II. According to myth, the moon and the sun are husband and wife; consequently the moon is in class I with other husbands, while the sun is in class II with other wives. The hairy mary grub, whose sting is said to feel like sunburn, is in class II with the sun. Wind is in class IV, but storms and the rainbow are believed to be mythical men and are in class I.

Dixon suggests one further principle, the important-property principle:

If a subset of nouns has some particular important property that the rest of the set does not have, then the members of the subset may be assigned to a different class from the rest of the set to "mark" this property; the important property is most often 'harmfulness'.

Fishes are mostly in class I with other animate beings, but the stone fish and gar fish are harmful and so are in class II. These two fish are not included under the generic grouping for fish; thus, the generic term *bayi*

jabu 'fish' cannot be used to refer to these two types of fish. Trees, bushes, vines, and grasses with no edible parts are in class IV. But two stinging trees and a stinging nettle vine are in class II with harmful things. Hawks might be expected to be in class II with other birds, but since they are harmful, their harmfulness is marked by placing them in another category—class I.

These principles largely account for the classification of loan words. Fruit, flour, cake (made from flour), and wine (made from fruit) are in class III. White man is in class I, and white woman is in class II. Matches and pipes (concerned with fire) are in class II with fire, but cigarettes (leaves which are consumed) are in class III.

Dixon does not, however, claim that *all* Dyirbal classification works by his principles. He cites a small number of exceptions for which he could find no explanation and for which there may be none—or for which an explanation may have previously existed and been lost. For example, it is not known why dog, bandicoot, platypus, and echidna are in class II instead of class I. Among loan words, money (unlike anything previously in Dyirbal culture) is unpredictably in class I. But the number of these exceptions is small.

Dixon's achievement is remarkable. He has shown that what might look superficially, to the Western eye, as a fantastic classification out of Borges, is from the perspective of the people doing the classifying a relatively regular and principled way to classify things.

In the process, Dixon has provided a superb example of how human cognition works. Though the details of categorization may be unique to Dyirbal, the general principles at work in the Dyirbal system show up again and again in systems of human categorization. They are:

Centrality: What we have called the basic members of the category are central. Willy wagtails and the moon are less central members of category I than are men. Stinging vines, gar fish and the hairy mary grub are less central members of category II than are women.

Chaining: Complex categories are structured by chaining; central members are linked to other members, which are linked to other members, and so on. For example, women are linked to the sun, which is linked to sunburn, which is linked to the hairy mary grub. It is by virtue of such a chain that the hairy mary grub is in the same category as women.

Experiential Domains: There are basic domains of experience, which may be culture-specific. These can characterize links in category chains.

Idealized Models: There are idealized models of the world—myths and beliefs among them—that can characterize links in category chains.

Specific Knowledge: Specific knowledge (for example, knowledge of mythology) overrides general knowledge.

The Other: Borges was right about this. Conceptual systems can have an “everything else” category. It, of course, does not have central members, chaining, etc.

No Common Properties: Categories on the whole need not be defined by common properties. There is no reason to believe that the Dyrirbal find anything in common among women, fire, dangerous things, etc. Nor do they assume, so far as is known, that there is anything feminine about fire or danger, or anything fiery or dangerous about women. On the other hand, common properties seem to play a role in characterizing the basic schemas within a given category (edible plant, human male, human female).

Motivation: The general principles given make sense of Dyrirbal classification, but they do not predict exactly what the categories will be.

Of these principles, motivation is perhaps the least obvious and is worth some discussion. There is a big difference between giving principles that *motivate*, or *make sense of*, a system, and giving principles that *generate*, or *predict*, the system. Dixon’s analysis explains why the Dyrirbal system is the kind of system that human beings can function with. It does not predict exactly what the system will be. For example, one must learn which domains of experience are relevant to categorization and which are not. Thus, fish live in water, and fish are in class I, but that does not make water class I with fish, nor does it make fish class II with water. The domain of habitation is simply not important for Dyrirbal classification. Dyrirbal speakers simply must learn which domains of experience matter for classification and which myths and beliefs matter.

What *is* predicted is that systems of classification tend to be structured in this way, that is, that there tends to be centrality, chaining, etc. The theory of categorization makes predictions about what human category systems can and cannot be like. It does not predict exactly what will be in a given category in a given culture or language.

Evidence from Language Death

Dixon’s analysis on the whole makes sense of the Dyrirbal system. But how do we know that it is right? Couldn’t this just be some arbitrary analysis imposed by an outside analyst? Couldn’t it simply be akin to an

analysis of a literary work imposed by a critic? How do we know that there is anything psychologically real about Dixon's analysis?

In the first place, Dixon's analysis was not his own. The explanations he gives are just those that native speakers told him about. They are the accounts given by the Dyirbal themselves to explain those parts of their classification system for which they had a conscious explanation.

In addition, there is some indirect evidence that Dixon's analysis was basically correct. It comes from an unfortunate source. Dixon did his initial field research in 1963. At that time, English-speaking Australian culture had not yet impinged much on the Dyirbal community. But in the years since 1963, the impact of white Australian society has been greater because of compulsory schooling in English and exposure to radio and television. As of 1983, only twenty years later, Dyirbal culture and the Dyirbal language are dying. Young people in the Dyirbal community grow up speaking English primarily, and learn only an extremely oversimplified version of traditional Dyirbal. Their experiences are very different from those of their parents and they either don't learn the myths or find that the myths don't mean much in their lives.

As one might expect, this has resulted in a drastic change of the categorization system. This has been documented by Annette Schmidt in a remarkable study, *Young People's Dyirbal: An Example of Language Death from Australia* (Schmidt 1985). Dyirbals who are roughly 45 or older speak traditional Dyirbal. Speakers who are under 35 speak some more simplified form of the language. Schmidt's study of the overall demise of Dyirbal included two degenerate stages of the categorization system: an intermediate stage (from five fluent speakers from an intermediate generation) and a very simple system (from much younger speakers). These two degenerate stages provide evidence that the analysis given above, or something close to it, is correct for traditional Dyirbal.

The intermediate stage shows the radial structure in the process of breaking down. The five speakers surveyed each showed a somewhat different loss of an aspect of radial structure. But the systems of these speakers only make sense in terms of the breaking-off of some radial links in the traditional Dyirbal system. In other words, each intermediate system lacks some of the hypothesized links that allow things that are not males and females to be categorized in classes I and II.

All of the intermediate speakers surveyed shared the following characteristics:

- The mythic links are kept: the moon, storms, and rainbows are still in class I with men and animals. The sun, stars, and birds are still in class II with women.

- Fire is still in class II with women, except that one speaker has fireflies going into class I with other animates.
- Fishing is lost as a domain relevant to categorization. Though fish are in class I with other animates, fishing spears and fishing lines have gone into class IV with other inanimate objects.
- Water is still in class II with women.
- Platypuses and echidnas are still exceptional animals in class II.

There were, however, variations among the speakers of the sort one would expect in a rapidly changing system.

- One speaker lost the danger link entirely; one speaker kept the danger link intact. All speakers kept dangerous things connected with fighting intact, such as fighting spears and shields. One speaker lost the natural-danger link entirely from class II, with stonefish and garfish going to class I with other animates and stinging nettles going to class IV (the “other” class, which has trees, shrubs, etc.). Two other speakers each lost one natural danger from class II—the stonefish and garfish.
- Two speakers lost the dog and bandicoot as exceptional animals in class II; they went into class I with other animals. One additional speaker lost the dog from class II.

In general, this pattern of what is retained and lost supports a radial analysis of the traditional system of the sort proposed by Dixon.

In the simple stage of the youngest speakers, the system has broken down almost completely and only the central cases of classes I and II survive, while class III is lost completely. Here is the simple system:

- I. *Bayi*: human males and nonhuman animates
- II. *Balan*: human females
- III. *Bala*: everything else

There are two possible explanations for this resultant system. The first comes from language interference. These speakers have grown up with English, and this system is similar to the English pronominal system. It is also conceivable that this system preserves only the most central members of classes I and II and that human males and females are the most central members in all stages of Dyirbal. However, there is not enough data from other intermediate stages at this time to verify this.

Some Speculations

The analysis given above was based on what Dixon’s informants told him about their categorization system. They told him nothing about why ani-

mals were categorized with human males, nor why fire, water, and fighting were categorized in class II with human females. I would like to make some speculations about why I think the system is structured that way. But before I do, I would like to make a suggestion concerning Dixon's principles.

It seems to me that the myth-and-belief principle and the important-property principle amount pretty much to the same thing as the domain-of-experience principle. The domain-of-experience principle says that there are certain domains of experience that are significant for Dyirbal categorization. They have to be listed: fishing, fire, etc. These provide links in category chains. Thus, if fish are in class I, fishing implements are also in class I. One way to look at the myth-and-belief principle is that it is a special case of the domain-of-experience principle. It says that myths and beliefs are domains of experience that are relevant for categorization. Dixon's important-property principle can be looked at in this way as well. It was set up primarily to handle harmful or dangerous things. That is the only important property it works for. One could equally say that danger is an important domain of experience for Dyirbal categorization and that it is on the same list of relevant domains as fishing, fire, and myths. Thus, all we would need to know is which domains of experience are relevant for categorization and then we would need specific knowledge of the domains.

Continuing this speculation, we could account for Dyirbal categorization in the following way:

The basic divisions are:

- I. *Bayi*: human males
- II. *Balan*: human females
- III. *Balam*: edible plants
- IV. *Bala*: everything else

Classes I and II would be in minimal contrast—male versus female—a standard contrast in categorization systems around the world. According to Dixon's analysis, classes I and II are not in minimal contrast, any more than I and III or II and III are. The importance of this will become clear shortly.

The domain-of-experience principle would then list those domains of experience relevant for categorization: fishing, fire, myths, beliefs, danger. This would have the following consequences:

- Since fish are in class I, fishing implements are in class I.
- Since storms and the rainbow are believed to be mythic men, they are in class I.

- Since birds are believed to be female spirits, birds are in class II, except for those three species of willy-wagtails who are believed to be mythical men and are therefore in class I.
- Since crickets are believed to be “old ladies,” they are in class II.
- Since the moon is believed to be the husband of the sun, the moon is in class I and the sun is in class II.
- Since fire is in the same domain of experience as the sun, fire is in class II with the sun.
- Those things that are believed to be instances of fire are in the same domain as fire: the stars, hot coals, matches, etc.

What we have done is suggest that the domain-of-experience principle is responsible for fire being in the same category as women. The links are: women (via myth) to the sun (via relevant domain of experience) to fire. By the same means, we can link danger and water. Fire is dangerous, and thus dangerous things are in the same category as fire. Water, which extinguishes fire, is in the same domain of experience as fire, and hence in the same category.

It should be borne in mind that these are speculations of an outside analyst. Speakers of Dyirbal told Dixon nothing like this, neither pro nor con. Native speakers of a language are only sometimes aware of the principles that structure their language. Either this analysis is wrong, or the speakers aren't conscious of these structuring principles, or Dixon didn't ask the right questions. It is, at least in principle, an empirical issue, since this analysis makes somewhat different claims than Dixon's. This analysis suggests that fighting spears, stinging nettles, gar fish, and matches should be less central members of category II than girls. Tests have been developed by Eleanor Rosch and others (Rosch 1977) to measure relative centrality of members in a category. However, it is not clear that such tests can be applied in any sensible way to older members of an aborigine tribe. Still, the speculation is more than idle speculation. It is an empirical matter. The issue can be stated as follows:

Are women, fire, and dangerous things all equally central members of class II, with no motivating links among them?

Or are women central members of the category, linked in some fashion to the more peripheral fire and danger?

Schmidt's data on the breakdown of the system favor the latter hypothesis. But, in addition, Schmidt found one direct piece of evidence—a speaker who consciously linked fire and danger to women:

buni [fire] is a lady. ban buni [class II fire]. You never say bayi buni [class I fire]. It's a lady. Woman is a destroyer. 'e destroys anything. A woman is a fire. [BM, 33 years, aboriginal male, Jambun]

Several things should be borne in mind about this statement. This is not a speaker of traditional Dyirbal; it is a younger member of the community, still fluent in the old language, but brought up primarily speaking English. There is no evidence one way or the other whether older speakers of the traditional language held such a belief. All it shows is that, for this speaker, there is a conceptual link of some kind between the presence of women in the category and the presence of fire and danger.

Our analysis makes another prediction as well. As the system breaks down one might expect distant links of the chain to break off. Schmidt cites one example where the entire fishing link breaks off and another where the entire danger link breaks off for a single speaker, while for other speakers the natural dangers branch alone breaks off. Under Dixon's analysis, in which human females and fighting (or harmfulness) are equally central, one might equally well expect human females to be assigned to another category. The analysis I suggest has as a consequence that the central subcategory—human females—would be the last to go. This, too, is an empirical question. There may well be speakers with intermediate systems which have kept everything in *balan* except human females. But given the end point of the change, with *balan* containing only human females, that is unlikely.

Under the analysis I am suggesting, human males and females would be central members of categories I and II, which would place these categories in a minimal contrast. This would explain some interesting subregularities. Under such an analysis one would expect exceptions to class I to go into class II—the minimally contrasting category. And conversely, one would expect exceptions to class II to go into class I. One would not expect exceptions in these categories to go into classes III or IV. This is exactly what happens. Animals are in class I, but exceptional animals (dogs, platypuses, bandicoots, echidnas) are in class II. Snakes are in class I, but chicken snakes and water pythons are in class II. Birds are in class II, as are dangerous things. Since dangerous things have to be marked by special categorization, dangerous birds (hawks) are marked as exceptional by being placed in class I. Given this analysis, one can even find a regularity in the exceptions.

One thing we have not addressed is why animals are for the most part in class I with human males. Dixon observes that there are no separate words for male versus female animals; that is, there is a word for kangaroo, and no separate word for female kangaroo. Kangaroo (*bayi yuri*) is

in class I with most animals; if one wants to specify that a kangaroo is female, one must use the class II classifier (*balan yuri*). The reverse is true for exceptional animals. Dog is in class II (*balan guda*). If one wants to indicate that a certain dog is male, one must use the class I classifier (*bayi guda*). All this amounts to saying that animal names are unmarked for gender. The categorization system seems to be humans (male and female) versus edible plants versus inanimates. It seems to be a reasonable guess that if animals are going to go anywhere in a system like this, it will be with the humans rather than with the edible plants. And it would make sense that if the animals are unmarked for gender, they would be categorized with the unmarked human category, if there is one. In most languages that have classification by gender, the male category is unmarked. On the basis of such universal tendencies, it is not a surprise to find the animals categorized with the human males. However, all this is speculation. Dixon was unable to find any evidence that category I is unmarked relative to category II. It may be, but there is at present no positive evidence. Dixon did not want to speculate beyond his evidence, so he listed human males and animals as equally basic members of class I. According to his analysis, bats are no more central to this category than are boys. This is, at least in principle a testable matter. If I had to make a bet (a small bet) I would bet that boys are more central than bats.

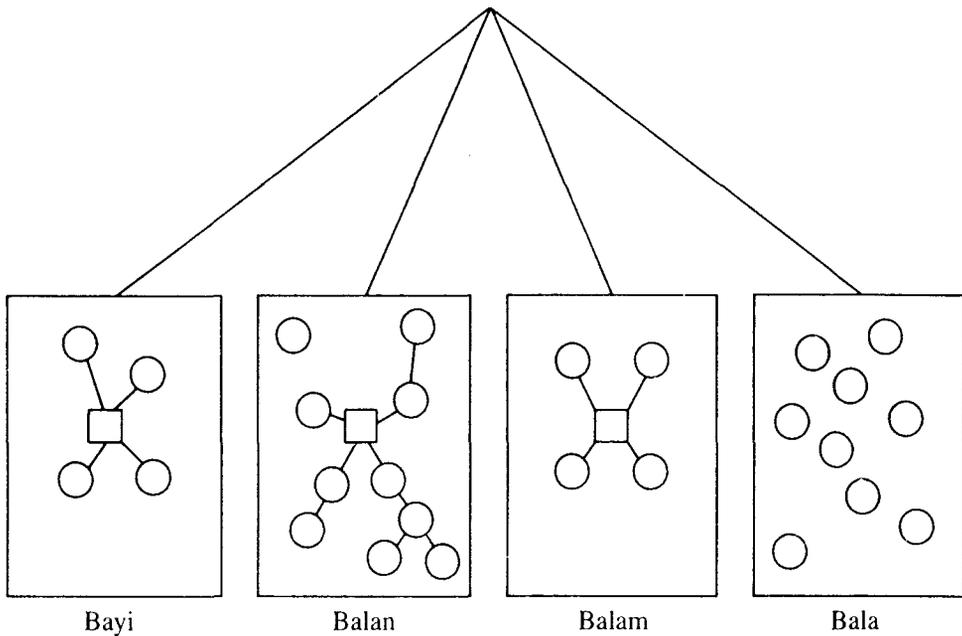
I have made these speculations to show that the kinds of regularities Dixon uncovered can, at least in principle, be extended even further and to show that these questions are empirical questions. Questions like these need to be asked by students of classifier languages.

Tentative Conclusions

The analysis of the Dyirbal classifier system is shown in the accompanying diagram. Here the universe is divided up into four clearly defined mutually exclusive domains, represented by the boxes. These form what we will be calling a *base model*. All the base model tells us is that there are four distinctions. Three of them have an internal structure, with elements at the center. The centers are indicated by squares in the diagram. The fourth, being made up of what is left over from the first three, has no internal structure. The centers of the domains in the base model are also structured, by what we will call a *basic opposition model*:

human males vs. human females, or center of class I vs. center of class II

people vs. edible plants, or centers of classes I and II vs. center of class III



Finally, and perhaps most significant, there is the chaining structure inside the base model.

The clearly defined mutually exclusive domains of the base model are consistent with the classical theory of categories. But that does not make it a classical system. This system differs from the classical theory in that it does not have any defining characteristics that are shared by the members of the categories.

To describe this system, we need

- a *base model*, which in this case is very simple. It specifies that there are four distinct mutually exclusive categories, and that the fourth is made up of what is not in the first three.
- a specification of which subcategories are central, or *most typical*, of the first three categories.
- a basic opposition model, which structures the centers with respect to one another; e.g., male contrasts with female.
- a specification of chaining principles, in this case the domain-of-experience principle together with a list of domains relevant for categorization; among such domains are myth, fishing, danger, etc.
- a short list of exceptions, which are distributed according to the basic opposition model; for example, exceptions that would otherwise go in the male-centered category go in the female-centered category, and conversely.

The Dyirbal classifier system exhibits certain of the basic mechanisms used in human categorization. I would now like to turn to another case that exhibits other fundamental mechanisms used in categorization. This example is based on field research done by Pamela Downing (1984) and on conversations with my colleague Professor H. Aoki.

Japanese *Hon*

The Japanese classifier *hon*, in its most common use, classifies long, thin objects: sticks, canes, pencils, candles, trees, ropes, hair, etc. Of these, the rigid long, thin objects are the best examples. Not surprisingly, *hon* can be used to classify dead snakes and dried fish, both of which are long and thin. But *hon* can be extended to what are presumably less representative cases:

- martial arts contests, with staffs or swords (which are long, thin, and rigid)
- hits (and sometimes pitches) in baseball (straight trajectories, formed by the forceful motion of a solid object, associated with baseball bat, which is long, thin, and rigid)
- shots in basketball, serves in volleyball, and rallies in ping pong
- judo matches (a martial arts contest, but without a staff or sword)
- a contest between a Zen master and student, in which each attempts to stump the other with Zen koans
- rolls of tape (which unrolled are long and thin)
- telephone calls (which come over wires and which are instances of the CONDUIT metaphor as described by Reddy 1979 and Lakoff and Johnson 1980)
- radio and TV programs (like telephone calls, but without the wires)
- letters (another instance of communication; moreover, in traditional Japan, letters were scrolls and hence sticklike)
- movies (like radio and TV; moreover, they come in reels like rolls of tape)
- medical injections (done with a needle, which is long and thin)

To get a feel for this phenomenon, let us consider a few examples of noncentral cases where *hon* is used. (The form *ppon* is a variant of *hon*.)

Telephone calls:

denwa-no	<i>i-ppon-gurai</i>	kakete-kite-mo	ii no ni
telephone-GEN	<i>i-hon-APPROX</i>	attach-come-	good although
		even	

‘Although it wouldn’t hurt to give (me) a phone call’

Baseball:

saisyo-ni	utta	zyuu-yon-hon-no	hoomuran-wa
first	hit	14-hon-GEN	home run-TOPIC

‘The first 14 home runs hit’

Pingpong:

rarii-ga	zyu-ppon	izyoo	tuzuku mono
rally-NOM	10-hon	above	continue people

‘People who can keep up 10 rallies’

Such cases, though not predictable from the central sense of *hon*, are nonetheless not arbitrary. They do not all have something in common with long, thin objects, but it *makes sense* that they might be classified with long, thin objects. Let us ask exactly what kind of sense it makes.

We will begin with martial arts contests using staffs or swords. Staffs and swords are long, thin, rigid objects, which are classified by *hon*. They are also the principal functional objects in these matches. A win in such a match can also be classified by *hon*. That is, the principal goal in this domain of experience is in the same category as the principal functional object.

Baseball bats are central members of the *hon* category. They are one of the two most salient functional objects in the game, the other being the ball. Baseball is centered on a contest between the pitcher and the batter. The batter’s principal goal is to get a hit. When a baseball is hit solidly, it forms a trajectory—that is, it traces a long, thin path along which a solid object travels quickly and with force. The image traced by the path of the ball is a *hon* image—long and thin.

The extension of the *hon* category from bats to hits is another case of an extension from a principal functional object to a principal goal. It is also an extension from one principal functional object with a *hon* shape to a *hon*-shaped path formed by the other principal functional object. Incidentally, in the small amount of research done on *hon* to date, it appears that while base hits and home runs are categorized with *hon*, foul balls, pop flies, ground balls, and bunts are not. This is not surprising, since these are not principal goals of hitting, nor do their trajectories form a *hon* shape.

The relationship between the shape of the bat and the trajectory formed by the batted ball—between a long, thin thing and a trajectory—is a common relationship between image schemas that forms the basis for the extension of a category from a central to a noncentral case. Let us consider some examples from English.

- The man ran into the woods.
- The road ran into the woods.

In the first case, *run* is used for a case where there is a (long, thin) trajectory. In the second case, *run* is used for a long, thin object, a road.

- The bird flew over the yard.
- The telephone line stretched over the yard.

In the first case, *over* is used for a (long, thin) trajectory. In the second case, *over* is used for a long, thin object, a telephone line.

- The rocket shot up.
- The lamp was standing up.

In the first case, *up* is used for a trajectory. In the second case, *up* is used for a long, thin object, a standing lamp.

Such relationships are common and suggest that there exists what might be called an *image-schema transformation* of the following sort:

TRAJECTORY SCHEMA ↔ LONG, THIN OBJECT SCHEMA

This image-schema transformation is one of the many kinds of cognitive relationships that can form a basis for the extension of a category.

Some speakers of Japanese extend the *hon* category to baseball pitches as well as hits—again on the basis of such an image-schema relationship within the same domain of experience. Some speakers extend *hon* to pitches using both the trajectory and the contest-perspective, in which the hitter and pitcher are engaged in a contest. These speakers use *hon* only for pitches seen from the point of view of the hitter. There are also speakers who classify pitches with *hon* only if they achieve the principal goal of pitching. Since getting strikes is the principal goal of pitching, such speakers can classify strikes, but not balls, with *hon*. No speakers have been found who use *hon* to classify balls but not strikes. Similarly, no speakers have been found who classify bunts and foul balls with *hon*, but not home runs and base hits.

There are similar motivations behind the extensions of *hon* to other concepts in sports. Thus, *hon* can classify shots and free throws in basketball, but not passes. And it can classify serves in volleyball and rallies in ping pong. These are cases where there is both a trajectory and a possibility of scoring (achieving a principal goal).

There are several morals to be drawn from these examples:

First, what are taken to be the central cases for the application of *hon* appear to be concrete basic-level objects: sticks, pencils, bamboo staffs, baseball bats, etc. The direction of extension appears to go from concrete basic-level objects to other things, like hits and pitches.

Second, a theory of motivations for the extension of a category is required. Among the things we need in such a theory are image-schema transformations and conceptual metonymies, that is, cases where a principal object like a staff or bat can stand for a principal goal like a win or hit.

Third, hits in baseball and long, thin objects do not have anything objective in common. The relationship between the bat and the hit is given by an image-schema transformation and a metonymy. Hence, the classical theory, which requires that categorization be based on common properties, is inadequate.

Fourth, the application of *hon* to hits in baseball may make sense, but it is not predictable. It is a matter of convention—not an arbitrary convention, but a *motivated* convention. Thus, the traditional generative view that everything must be either predictable or arbitrary is inadequate here. There is a third choice: motivation. In this case, the independently needed image-schema transformation and the object-for-goal metonymy provide the motivation.

Ideally, each instance of the use of a classifier outside the central sense should have a motivation. The motivation cannot be ad hoc—one cannot just make up a metonymy or image schema just to handle that case. It must be justified on the basis of other cases. This imposes a criterion of adequacy on the analysis of classifier languages.

Some investigators have suggested that such a criterion of adequacy is too strong; they have claimed that some classifications simply are arbitrary and that no non-ad hoc motivation exists. That is an empirical question, and the facts are by no means all in. But arbitrariness is a last resort. Even if there are some completely unmotivated cases, one can still apply a slightly weakened criterion of adequacy. Find out which extensions “make sense” to speakers and which extensions seem “senseless,” and account for those that make sense. Each sensible extension of a category needs to be independently motivated. It is important in a description of a language to distinguish those cases that are unrelated homonyms—that happen to have the same linguistic form, but for no good reason—from those cases which have the same linguistic form for a reason. No analysis of a classifier system is complete until this is done.

So far, we have seen that metonymies and image-schema transformations can provide motivation for the extension of a category. Another important kind of motivation comes from conventional mental images. Take the example of a roll of tape, which can be classified by *hon*. We know what rolls of tape look like, both when they are rolled up and when they are being unrolled. That is, we have conventional mental images of tape,

both when it is in storage form and when it is being put to use. We also know that we unroll tape when we are about to use it and that the tape is functional when it is unrolled. A conventional image of tape being unrolled has two parts—the rolled part and the unrolled, functional part. The image of the unrolled, functional part fits the long, thin object image schema associated with the central sense of *hon*. The image of the non-functional rolled part does not fit the central *hon* image-schema. Metonymy is involved here; the functional part of the conventional image is standing for the whole image, for the sake of categorization. The functional part fits the *hon* schema. This is, presumably, the motivation for the use of *hon* to classify rolls of tape. Again, we cannot predict the use of *hon* for rolls of tape, but we can do something that is extremely important—we can show why it makes sense. Making sense of categorization is no small matter. And doing so in a manner that shows in detail how basic cognitive mechanisms apply is anything but trivial. If the cognitive aspects of categorization are to be understood, it will require attention to detail at this level. For example, *hon* can be used to classify medical injections. Why does this make sense?

Medical injections are another case where the principal functional object (the needle) is long and thin; the needles can be classified with *hon* and, by metonymy, so can the injections.

So far we have seen how image-schema transformations, conventional mental images, and metonymy all enter into categorization by a classifier. Let us turn to a case that involves all of these plus metaphor. Recall that *hon* can be used to classify telephone calls. The conventional image of engaging in a telephone call involves using the most functional part of the telephone, the receiver, which is a long, thin, rigid object that fits the central image-schema for *hon*. The other principal conventional image related to telephone calls involves telephone wires. These are understood as playing a principal functional role in telephone communication. These fit the long, thin object image schema. They also fit the CONDUIT of the CONDUIT metaphor—the principal metaphor for communication. In short, there are two related but different motivations for the use of *hon* for telephone calls. That is, there are two ways in which this use of *hon* fits the conceptual system, and where motivation is concerned, the more kinds of motivation, the better. Thus, it is not a matter of finding which is right; both can be right simultaneously.

So far, we have seen that extended senses of *hon* can be based on the central sense of *hon*. But extended senses may themselves serve as the basis for further extensions via category chaining. Recall that letters are classified with *hon*. There are a number of considerations that motivate such a categorization. First, letters were originally in the form of scrolls, often wound around long thin wooden cylinders. They have been cate-

gorized with *hon* ever since, and that image remains very much alive in Japanese culture through paintings and the tradition of calligraphy. Second, the conventional image of writing a letter involves the use of a pen, which plays a principal functional role and is also a long, thin object. Third, letters are a form of communication and therefore an instance of the CONDUIT metaphor. These diverse motivations allow *hon* with all these senses to fit the ecology of the Japanese classifier system.

Letters and telephone calls are intermediate steps in a chain. Radio and TV programs are also classified with *hon*. They are forms of communication at a distance, like letter-writing and telephone communication. They, too, are motivated by the CONDUIT metaphor for communication. Given that letters and telephone calls are classified by *hon*, radio and TV programs constitute a well-motivated extension. Movies are also classified by *hon*. They are also instances of communication at a distance; in addition, one of the principal conventional images associated with movies is the movie reel, which looks like a spool of tape, which is classified with *hon*.

The phenomenon of category-chaining shows very clearly that the classical account of categorization is inadequate. Sticks and TV programs are both in the *hon* category, but they share no relevant common properties. They are categorized in the same way by virtue of the chain structure of the *hon* category.

Finally, let us turn our attention to judo matches and contests between Zen masters and students. Judo matches are in the same domain of experience as martial arts contests with staffs or swords. A win in a judo match can also be classified as a *hon*. Similarly, Zen contests are, in Japanese culture, in the same experiential domain as martial arts contests, and a win there also can be classified as a *hon*.

Incidentally, the noncentral cases of the *hon* category vary in some cases from speaker to speaker. Thus some speakers do not include baseball pitches and some do not include wins in Zen contests. But to my knowledge, every speaker of Japanese includes the central members—the candles, staffs, baseball bats, etc. Moreover, many of the extensions have become conventionalized for speakers in general: letters, telephone conversations, home runs, spools of thread. The variation just displayed involves chaining that has not yet stabilized but which shows the same principles at work as in the stable conventionalized extensions.

Categories of Mind or Mere Words

A possible objection to the kind of analyses we have been discussing is that classifiers are mere linguistic devices and do not reflect conceptual structure. That is, one might object that, say, the things categorized by

hon in Japanese do not form a single conceptual category. Thus, one might suggest that the analysis of *hon* given above may show something about principles of linguistic organization, but that it shows nothing about our conceptual system.

Let us, for the sake of argument, consider such a suggestion. Whatever their precise cognitive status is, principles of linguistic organization are some part or other of our cognitive apparatus. Just what would such “principles of linguistic organization” involve? In particular, they would involve all the things we discussed above in the analysis of *hon*:

- central and peripheral members
- basic-level objects at the center
- conventional mental images
- knowledge about conventional mental images
- Image-schema transformations
- Metonymy applied to mental imagery
- Metonymy applied to domains of experience
- Metaphors (which map domains into other domains)

These mechanisms are needed, no matter whether one calls them linguistic or not. Moreover, they appear to be the kinds of things that one would tend to call conceptual—mental images and image transformations do not appear to be merely linguistic. Moreover, linguistic categories can be used in nonlinguistic tasks, as Kay and Kempton (1984) have demonstrated (see chap. 18 below for a discussion). But whether they are used in nonlinguistic tasks or not, linguistic categories *are* categories—and they are part of our overall cognitive apparatus. Whether one wants to dignify them with the term “conceptual” or not, linguistic categories are categories within our cognitive system and a study of *all* categories within our cognitive system will have to include them.

Cognitive Categories or Mere Historical Relics

Another objection occasionally raised to the kind of analysis proposed above is that the noncentral cases are “mere historical relics” not parts of a live cognitive system. Dixon has already rebutted this persuasively for the Dyirbal cases in his observation that speakers do not learn the system one case at a time but use general principles. Moreover, Schmidt’s study of the decay of the Dyirbal system provides dramatic evidence that Dixon’s analysis was basically correct and psychologically real. Schmidt has shown that parts of the *system*, and not just individual cases, are being lost. This is a fact that cannot be explained by the claim that classifiers are mere historical relics, learned one by one, with no cognitively real system.

In addition, the “mere historical relics” argument cannot be used to argue that cognitive mechanisms of the sort we have postulated do not exist. There is nothing “mere” even about historical relics. When categories get extended in the course of history, there has to be some sort of cognitive basis for the extension. And for them to be adopted into the system, that is, “conventionalized,” they must make sense to the speakers who are making these innovations part of their linguistic system, which is, after all, a cognitive system. Chances are, the kinds of cognitive operations used to extend categories are pretty much the ones we have discussed. At the time the extension of the category occurs, such mechanisms are quite real. And any theory of historical semantic change must include an account of such mechanisms. At the time of an extension, the extension is *not a relic*! Since *hon* is in a period of extension right now, the mechanisms of extension are now operative and the extended senses cannot be considered relics.

In the two cases we have discussed, we have excellent reason to believe that the radial analyses we have given represent something alive in the minds of speakers. To see why, let us consider a possible retort to such radial analyses:

- Showing that there are real principles of extension that work over the course of history does not show that there are radial categories. Everything you have said is consistent with the following view: There are no radial categories. All such cases reflect the following historical development: At stage 1 there is a classical category *A*. At stage 2 a new classical category *B*, based on the old *A*, emerges. The principles of change may be exactly the principles of extension that you describe. But at both stages, there are only classical categories, but no radial categories in the minds of speakers. But the new classical category *B* will happen to look to a linguistic analyst like a radial category.

This position has an important consequence:

- At stage 2, there would be no radial structure, that is, no distinction between central and peripheral members. Future changes therefore could not be based on a central-peripheral distinction. The mechanisms of change should apply equally well to what we have called “central” and “peripheral” members.

It is this consequence that is demonstrably false for Dyirbal and Japanese. The evidence in Dyirbal has to do with language learning and language death. Dixon observed in his early fieldwork that children learned the category system according to the principles he described, principles that correlate with a radial structure. Schmidt has shown that the decay of

the system reflects the same radial structure. The evidence in Japanese has to do with ongoing contemporary change. The use of *hon* varies in the peripheral cases; the central cases of *hon* show no variation. Here the evidence from change supports the radial analysis for *synchronic* description.

However, such evidence is not always available. Other cases which can be analyzed radially may reflect the presence of a contemporary live system or a system which was once alive. It is an empirical question whether such systems are now present in the minds of speakers, or whether they used to be and are no longer. And, of course, there is also the possibility that the system present now does not directly reflect history, but may be a product of restructuring. Additional cases that reflect a live system are discussed in case study 2, where we raise the issue of the status of folk etymologies.

Experiential, Imaginative, and Ecological Aspects of Mind

We are now in a position to see how classifier systems reflect the experiential, imaginative, and ecological aspects of mind. Let us begin with the experiential aspects.

As Denny (1976) observes, “the semantic function of noun classifiers is to place objects within a set of classes different from and additional to those given by the nouns. These classes are concerned with objects as they enter into human interactions.” Denny notes that, cross-linguistically, classifiers fall into three basic semantic types, all having to do with human interaction: “*physical interaction* such as handling, *functional interaction* such as using an object as a vehicle, and *social interaction* such as interacting appropriately with a human compared to an animal, or a high status person compared to a low status one.” Denny argues persuasively that the range of physical interaction classifiers correlates with the kinds of significant physical activities performed in the given culture.

Denny’s observations fit nicely with observations by Berlin, Rosch, and their co-workers on basic-level categorization. What they found was that basic-level categorization depended on the nature of everyday human interaction both in a physical environment and in a culture (see Berlin, Breedlove, and Raven 1974 and Rosch 1977.) Factors involved in basic-level categorization include gestalt perception, motor interaction, mental images, and cultural importance.

Taken together, these observations support the view that our conceptual system is dependent on, and intimately linked to, our physical and

cultural experience. It disconfirms the classical view that concepts are abstract and separate from human experiences.

The use of *hon* in Japanese and the Dyirbal classifier system display many of the imaginative aspects of mind, especially the use of mental images, image-schema transformations, conceptual metonymies, and conceptual metaphors.

Finally, the fact that extensions from the center of categories are neither predictable nor arbitrary, but instead are motivated, demonstrates the ecological character of the human mind. I am using the term “ecological” in the sense of a system with an overall structure, where effects cannot be localized—that is, where something in one part of the system affects things elsewhere in the system. Motivation depends on overall characteristics of the conceptual system, not just local characteristics of the category at hand. In addition, the existence of the Dyirbal miscellaneous category indicates that categorization is not local, but at the very least depends upon contrasting alternatives.

Summary

Language is among the most characteristic of human cognitive activities. To understand how human beings categorize in general, one must at least understand human categorization in the special case of natural language. The two cases we have just discussed are quite typical of the way human categorization functions in natural language. What is it about the human mind that allows it to categorize in this way? Is there some general cognitive apparatus used by the mind that gives rise to categorizations of this sort? The theory of cognitive models is an attempt to answer these questions.

The analyses given above suggest that such categories can be characterized using cognitive models of four types:

Propositional models specify elements, their properties, and the relations holding among them. Much of our knowledge structure is in the form of propositional models. Thus, a model of a domain (like fighting in Dyirbal) would include elements that occur in that domain (like fighting spears). A propositional model characterizing our knowledge about fire would include the fact that fire is dangerous. A taxonomic model, like the base model for Dyirbal given above, would include four elements corresponding to each of the categories, and a condition stating that anything not a member of the first three categories is in the fourth.

Image-schematic models specify schematic images, such as trajectories

or long, thin shapes or containers. Our knowledge about baseball pitches includes a trajectory schema. Our knowledge about candles includes a long, thin object schema.

Metaphoric models are mappings from a propositional or image-schematic model in one domain to a corresponding structure in another domain. The CONDUIT metaphor for communication maps our knowledge about conveying objects in containers onto an understanding of communication as conveying ideas in words.

Metonymic models are models of one or more of the above types, together with a function from one element of the model to another. Thus, in a model that represents a part-whole structure, there may be a function from a part to the whole that enables the part to stand for the whole. In Dyirbal knowledge about the hairy mary grub, that is, knowledge of its sunburnlike sting, may stand for the grub itself in determining that it is a member of the same category as the sun.

Such models can characterize the overall category structure, indicate what the central members are, and characterize the links in the internal chains.