

CHAPTER 1

Introduction: Categories, Classification and Cognitive Anthropology¹

An overview of the anthropological study of classifications and classifying behaviour during the twentieth century, especially attempts to differentiate and then reconcile the role of cultural, psychological and biological processes. Philosophy is a graveyard of 'isms' (Edelman 1992: 158)

Categories are those entities which the human mind creates in order to make sense of the diversity of experience, by grouping things, attributes and phenomena on the basis of similarity and difference. Categorisation, therefore, is the means by which 'the uniqueness of each experience is transformed into the more limited set of learned, meaningful categories to which humans and other organisms respond' (Varela et al. 1993: 176). By comparison, classification is here understood as the way in which categories are related to each other, and the means by which particular cultural patterns are produced. Neither categorisation nor classification are cognitively autonomous processes, and in this book the emphasis is on how both articulate with cultural input in social contexts. The title 'The Categorical Impulse', suggests, with quite deliberate ambivalence, that not only is our capacity to create and manipulate categories impulsive (something which is deep-seated and driven) but that it is 'categorical' in the sense simultaneously of 'referring to categories' and 'asserting absolutely'. In this respect it is consistent with the rationality of propositional logic, which can only be achieved by imposing systematic cultural conventions.

Categories and classifications have been the subject of interest within philosophy, mathematics, logic, linguistics, cognitive psychology, anthropology, and more recently neurobiology and interdisciplinary cognitive science (via artificial intelligence and computing), for much of the twentieth century. Classification, as an object of recent anthropological scrutiny

came to prominence during the 1960s, exemplified in the British (constructionist) tradition by the writings of Mary Douglas, and in the American ethnosemantics (cognitive) tradition by the likes of Harold Conklin and Brent Berlin. Both schools shared roots in cultural relativism, though an influential strand of the American lineage was subsequently to turn relativism on its head. This historical background is explored here in Chapters 2 and 3. What I wish to do in this introductory chapter is to situate what follows by summarising some of the significant developments that occurred in the study of categories and classification during the period that the essays first appeared in print, that is between 1975 and 2001, a period which has seen a revolution in our understanding of the interrelationship between language, categories, culture, social behaviour and the mind. When Chapter 3 was first published, the constructivist and cognitive approaches seemed almost irreconcilable, to exist, as it were, in parallel universes, in much the same way as scientific and postmodernist approaches have done more recently. However, over the last thirty years we have witnessed both a reinvigoration of classification studies and a cross-fertilisation of these once antagonistic approaches.

My own work has always tried to bridge this divide and develop a more embedded and processual approach. In particular, I have used the detailed empirical analysis of people's categorisation of natural kinds as a portal through which to achieve an understanding of how classifying behaviour in general works, engaging with the ideas of both anthropologists and psychologists. This tendency to see the merits of both the cognitivist and social approaches has led some, with good reason I think at the time, to chide me for being 'equivocal' (Friedberg 1995: 210). Douglas, as late as the early 1990s (1993: 161–5) continued to warn us against compromise and the 'eclectic muddle' which must inevitably follow. She offered just three alternatives to the study of classification – naturalism, idealism and constructivism – denying the validity of all but the last, which she deemed essential to provide 'a general framework' (*ibid.*, 182). Such stark polarity looks distinctly out of kilter in the light of contemporary rethinking of conventional nature (innate) – nurture (acquired) arguments, in both biology (Ridley 2003) and anthropology (Ingold 2001: 129–33). Indeed, for many it is no longer necessary, when speaking of cognition, to choose between the 'chicken position' (an approach which assumes a world with pre-given qualities) and the 'egg position' (where reality is simply the reflection of internal laws of the system). It seems that we can, after all, negotiate a middle path (Varela et al. 1993: 172).

I have focused predominantly on studies of categorisation in anthropology, and yet in the development of the interdisciplinary field of cognitive science the absence of an obvious and continuous anthropological contribution has often seemed a mystery (Boden, forthcoming). Despite the formative inputs into the theory of cognitive science made by the likes

of Bruner, Bartlett, Bateson and Wallace, and more contemporary work on distributed cognition and schema theory, much anthropology between the 1960s and 1990s actively resisted making connections between culture and the mind, and in recent decades has positively seemed to marginalise even the cognitive anthropology within. While we can share Geertz's disquiet with what he calls 'the cognitivist fallacy' (1973: 12), the idea that culture consists primordially of mental phenomena, it is manifestly absurd that culture might exist 'primordially' elsewhere, devolved perhaps in inter-subjective social space. It is increasingly difficult to determine where a boundary between the internal world of mental representation and the external world of cultural practice might lie. The conceptual boundary between mind and brain is no longer as conveniently maintained as was once possible, some preferring to use the term 'mind-brain' to express this uncertainty (Laughlin et al. 1992), and questions are posed as to whether we should include our external sensory perceptors – our eyes, ears, even our hands, as part of the spatially devolved mind. The body, in a word, encompasses the function of the brain which, when it experiences itself through interaction with other mind-bodies and things in its perceptual field, is what we understand by consciousness. For Bruner (1996) culture has long been as much a precondition for the development of human cognition as human cognition has been for the development of culture, and work in brain science and cognitive anthropology has now begun to show us the beginnings of how this might work empirically. The consequence has been the return of cognition to the centre of anthropological theorising, using both neo-Darwinian (e.g. Sperber 1996; Atran 1998; Boyer 2001) and non-Darwinian (e.g. Holland and Quinn 1987; Bloch 1991; d'Andrade 1995; Whitehouse 2001; Reyna 2002) approaches. But increasingly this is a cognition which is 'experientialist' or 'embodied' (Lakoff and Johnson 1980: 178), and one which relies crucially on a concept of culture which by definition is interactive and inter-subjective, enculturating the different brains it inhabits. This trend has been accompanied by a recognition that the boundary between shared and individual representations is difficult to maintain (Sperber 1985), and that therefore semantic organisation at the personal as well as at the shared cultural level is a proper focus of anthropological scrutiny (Strauss 1992).

I Words and the Structure of Categories

Most studies of classification continue to approach the subject linguistically, and the beginnings of cognitive anthropology are indeed to be found in the application of linguistic models, most notably as formal semantics. This is understandable, for the obvious reasons that most data

acquired in fieldwork settings are generated through interviews and by hearing people talk about what they think, perceive and experience; because this is how most people themselves share classificatory knowledge; and because many classificatory strategies are revealed through language. However, it has long been recognised that words are not always a good guide to the existence of categories: there may be several words which label the same category (synonyms), and the same word can be used for quite different ideas. Moreover, some categories may exist without being labelled.

The nomenclature for labelling categories tells us something both about classificatory knowledge and about the attributes which people find important in distinguishing different entities, attributes and phenomena. Labels provide us with evidence of more inclusive categorising strategies: for example, plant binomials often indicate two categories linked by a *kind of* relationship. Thus for Nuauulu, *sinsin msinae*, 'red sinsinte' (a kind of croton, *Codiaeum variegatum*), is a binomial. In this case the more inclusive category is identified not only by its priority but because it has been lexically-reduced: thus *sinsinte* becomes *sinsin*. Local linguistic conventions have to be carefully observed, and it is important to note, for example, that *kasipi sinsinte* is not a kind of *sinsinte*, but rather a variety of manioc, *Manihot esculenta*. In this linguistic context *sinsinte* becomes, instead, an adjectival qualifier. The kinds of adjectival qualifiers used vary, from descriptions of diagnostic visual attributes, uses, smells, to sounds, depending on the semantic domain. The important thing is not that something has a fixed name, but that the percept is registered through continual and repeated perceptual events, reinforced over the longer term and transmitted between individuals. A shared name, however ad hoc, might be the outcome of such a process, but it need not be.

Early attempts by anthropologists and linguists to understand how categories are established and used employed a distinctive feature model, in which category A was thought to be distinguished from category B in terms of a number of key characteristics. For example, birds have wings, feathers, beaks and fly, in contrast to fish, which swim and have fins. This model was largely drawn from lexicography and logic (Conklin 1962). However, it was noted that the condition of contrast required for this model to work was not always evident. Thus category A might be linked to category B by one common attribute, and category B linked to category C through a different common attribute, thus linking categories A and C even though they had nothing in common: this is known as 'polythetic classification' (see Chapter 3). As work on classification (particularly ethnobiological classification) expanded it became obvious that the digital distinctive feature model was inadequate, and that a better way of modelling the cognition of basic and more inclusive categories might be in analogue terms, as cognitive prototypes. In this model the brain has an

image of, say, 'birdness' or 'treeness' or 'cup-ness' to which incoming perceptual images are matched; the presence or absence of particular features is not an overriding consideration, only closeness of match (Rosch 1977). In this core-periphery model an image could be a close match or a marginal match. Thus in British English classification of birds a robin would configure closely the core prototype, but an ostrich would be marginal, whereas in the folk classification of crockery a mug is a kind of cup, but only peripherally so. As it happens, this critique of functionalist views of cognition has been recently reinvigorated by work at a neurobiological level (Edelman 1992: 233), to which I shall return below. Of course in practice, both the notion of contrasting features and cognitive prototypes are necessary to understand how classifications work in detail.

The difficulties of assigning things to categories may be made easier, then, by imposing culturally agreed boundaries, or indeed by creating these inadvertently or deliberately through genetic and other physical manipulations of the natural world e.g. breeding varieties of plant which emphasise phenotypic difference for aesthetic reasons or planting trees individually to display their architecture in ways which are often occluded in natural settings. Because parts of our experience of the world are complexly continuous, it is occasionally necessary to impose boundaries to produce categories at all, for example in certain parts of the colour spectrum. Sometimes these can be quite arbitrary, and even in such an apparently technically precise area as engineering design it is now evident that the scope for cultural arbitrariness over technical necessity is considerable (e.g. Lemonnier 1992).

II The Relations between Categories

It has become conventional, following the analytical procedures of cognitive anthropology, to begin any analysis of classificatory knowledge by establishing a cognitive or semantic domain or field (Frake 1962). The domain in question can be established at varying degrees of classificatory inclusiveness: thus it might be determined as 'all genealogically specified relatives', 'all living things', 'furniture', 'plants', 'trees', 'rice', depending on the focus of the analysis. Although the domain may be isolated for analytical reasons, and is to this extent arbitrary, its boundaries are generally understood to reflect distinctions which are empirically important for the population who share them. Thus if a population has no concept of 'fish' then such a category cannot be established as a cognitive domain. On the other hand, as we have noted, categories do not need to be labelled in order to exist, even at the level of domain. Where a cognitive domain has been established, it is usually understood that most categories which subdivide it will be labelled, and a domain or field identified in terms of

its labels is usually known as a lexical field. Of course, the lexical field, for say plants, may not correspond with the cognitive domain, because of the existence of covert categories (see Chapters 4 and 7) at various levels of inclusiveness.

The earliest work on cognitive domains modelled the internal subdivisions largely in terms of a taxonomic model: that is, in terms of a hierarchical model of contrast and class inclusion. This is partly because this form of classifying is so dominant in the literary and scientific tradition of the West, and particularly because of the precedent of Linnaean taxonomy. The work of Brent Berlin (1972, 1992; and Berlin et al. 1973, 1974) developed the taxonomic idea further, putting forward a strong claim for it to be considered the general way in which at least ethnobiological classification works cross-culturally, hypothesising that a series of levels could be established, broadly reflected in the main ranks of the Linnaean scheme: unique beginners, life-forms, intermediates, generics, specifics and varietals.

I have stated my own views on the adequacy of the taxonomic model in *The Cultural Relations of Classification* (1993). In brief, I agree that the principle of taxonomy is a persuasive one as a universal classifying strategy. There can be little doubt also that people classify living things into increasingly inclusive groups, and that this provides a powerful inductive framework for making systematic inferences about the properties of organisms. But this need not imply taxonomy in the formal or domain-specific sense. Systematic contrast and class inclusion are present across a number of domains. It is particularly striking in plants and animals because of their 'thinginess' (Chapter 10) and because they are the outcome of an evolutionary process which is reflected in patterned physical and behavioural resemblance. In the domain of living kinds these tendencies converge in a special way, not obviously because of the character of the mind which does the classifying, but because of regularities in the objective world which is classified and to which the mind responds.

Some cultural profiles encourage taxonomic thinking as a way of representing relationships between things more than others (see e.g. Lancy and Strathern 1981), and some subcultural contexts encourage it more than others (e.g. formal literary-based operations in classroom contexts). Moreover, because of the propensity of most anthropological researchers to rely heavily on a taxonomic approach embedded in Western science, it is easy to yield taxonomies in patterns of data collected from non-literate informants. In asserting a universal 'abstract taxonomic structure' the methodology all too often seems to be one in which inconvenient features of peoples' classifying behaviour which do not fit the expected pattern are systematically ignored or explained away as exceptions, until a suitably 'taxonomic' pattern is obtained. But if we accept instead the centrality of prototypical thinking and polythesis in classifying activity, it is not at all

surprising that it is often difficult to establish systematic and consistent hierarchical relationships between superordinate and subordinate categories (Edelman 1992: 236).

III Classifying Strategies and Cultural Universals

When Chapter 4, which looks at evidence for the different ways in which the Nuauulu classify cassowaries and marsupials, was first written (1975), studies of local variability, flexibility and consistency in classifying behaviour were unusual. Consequently, claims to the universality of certain patterns and, therefore, of cognitive determinism were easier to sustain. However, studies of variability are now numerous (Berlin 1992: 199–231) and provide strong evidence of the role of social and situational factors, challenging the validity of some key assumptions regarding sharing characteristic of the first phase in the development of cognitive anthropology (Lave 1988: 10–11).

One universal, however, the existence of which few would now deny, is that all classifications display some concept of basic category: that logically all classifications start from a hypothesised 'level', series or group of percepts or concretised entities or things, the segregates of which are then either aggregated or disaggregated. These basic categories may refer to biota (or things in nature, or natural kinds), people, social groups or other types of object or entity. But there is less agreement as to how consistent such a level of basic categorising is cross-culturally. When applied to natural kinds, Haudricourt (1973: 268) noted that in many vernaculars it is the genus that gives us the basic level for plants, and that species only obtain priority with Linnaeus. This view is echoed by Berlin, though more recently there has been doubt expressed as to the level at which basic categories of natural kinds might be found (Ellen 1993: 67–71). The issue is also taken up in places in this book, including especially Chapters 9 and 10.

More problematic has been the notion of taxonomy, to which I have already referred. Brent Berlin has consistently argued in favour of the universality of taxonomy for ethnobiological schemes, but this only really works if we also assert the clear separation of general-purpose from special-purpose schemes; that is, those that are logical and 'natural' from those that arise to meet particular cultural requirements. This distinction is discussed further in Chapters 2, 3, 4 and 6 below. Indeed, the effective demonstration of the empirical primacy of taxonomy depends on the extent to which categories are linked in a particular way, although we know that they are often flexibly connected in numerous different ways, ways which undermine implicit taxonomic levels and contrasts and the general-purpose/special-purpose distinction. It also depends upon the

ease with which ethnographers can elicit transitivity statements (of the kind a is a b and b is a c , therefore a is a c). It is, then, fundamentally an appeal to our common (cultural) sense.

Atran (1998: 563) no longer thinks that folk taxonomy defines the inferential character of folk biology as suggested in his *Cognitive Foundations of Natural History*, and his recent findings do not uphold the customary distinction between general-purpose and special-purpose classifications. This is consistent with the results of my own ethnobiological ethnography (Ellen 1993: 123–4). Nuaulu, like Itzaj Maya, do not ‘essentialise ranks’, which would violate their primary concern with ‘ecological and morpho-behavioural relationships’ in favour of abstract properties. The development of worldwide scientific systematics has until recently explicitly required rejecting such relationships with their cross-cutting classifications (Atran 1998: 561–2). I believe that one of the problems central to the methodology that we use to generate so much of our ethnobiological data is not knowing quite how independent the system of ranks that we discover is from the kinds of concepts with which we start. On the whole, it is my experience that data from long-term ethnographic research are more consistent with the notion of a holistic and dynamic conception of the relations between categories, one which allows for the generation of particular ‘classifications’ depending on context. Thus, the variable position of ‘palms’ in comparative ethnobotanical schemes and the nebulousness of its position as a ‘life-form’, intermediate or ‘unaffiliated generic’ (Chapter 7), is an excellent example of the preeminence of local ecological and cultural considerations, but also of some general fundamental ambiguity. On balance, I agree with what I understand to be Atran’s current position, that the more dense our knowledge the more we deviate from the general model, and that in a very real sense taxonomies are the result of ‘degenerate knowledge’: that is they only become possible by simplifying experiential complexity in ways which make knowledge less useful. Thus the failure to integrate the classification of plant and animal domesticates into general accounts of the working of classifications of the natural world, given the practical importance of such classificatory knowledge for most humans, is a major problem in this sense, since it cannot easily be rejected as a ‘special case’. I also find the idea that cultural selection of domesticates makes taxonomy possible by heightening the differences between categories of cultivars a neat and fertile one, and one which reinforces the interpretation of other current work (e.g. Shigeta 1996).

Irrespective of the degree to which we can accept a single, common, non-cultural model for classification, we can agree, I think, that folk classifications of biological species at least coevolve with the plants and animals that are their subject. We can, therefore, in the most general sense, agree with Boster (1996) that at the level of clearly discriminated prototypes of natural kinds, humans ‘carve nature at the joints’: there are

certain discontinuities that are so protean, so much part of the lives of so many human populations, that they can be said to be universal. I believe this to be true for natural kinds as a phenomenal type, but also ‘unique beginners’, such as plant or animal. One is reminded here of the position adopted by Reed (1988), that ‘animacy’ or ‘animality’ is not simply an end-product of classification based on multiple cognitive discriminations, but relates to a fundamental ability of the brain to distinguish an organic form that registers a particular kind of saliency which matches objective phylogenetic features. Since hominids have evolved in environments which display a particular phylogenetic and phenomenal discontinuity, it is not entirely surprising that they should demonstrate a capacity (a) to utilise a notion of natural kind which assists the management of diversity, and (b) to recognise more diffuse prototypes in non-cultural ways (e.g. ‘animal’, ‘plant’, perhaps ‘tree’, ‘bird’, ‘fish’). The argument for some unique beginners (plant, animal, person, artefact) having non-cultural roots is also supported by negative evidence, that it is difficult to see how cultural and developmental factors in themselves could generate such salient if sometimes lexically covert categories (Boyer 2001). However, such artifacts of cognition are logically different from ‘life-forms’ in the sense developed by Berlin (e.g. Berlin et al. 1973). These latter vary cross-culturally, but do not always partition ‘the living world into broadly equivalent divisions’ (Atran 1998, note 5). Thus, though the basic image prototype of ‘tree’ may have existed for millions of years (see section 1.6 below), the life-form category and term seem relatively recent (Witkowski et al. 1981), while its earliest labelling appears to have involved functional considerations reflected in tree/wood polysemy (see Chapter 7). Indeed, Brown’s work (1984) confirms the variability of many life-forms as much as it has demonstrated the universality of a few. Chapter 6 examines one Nuaulu plant life-form which is difficult to explain in universalistic terms.

Much emphasis (e.g. Boster 1996; Brown 1984) has been placed on the roots of natural kind classification in evolutionary psychology when there is equal reason to believe that classifications which cut across morphologically ‘natural’ classifications, such as ‘edible-nonedible’ and ‘dangerous-nondangerous’, may also be in part a consequence of non-cultural recognition abilities. Thus, humans may not see ‘stones’ but they may well perceive objects in their environment with the properties of stones which can serve a particular purpose, and be grouped accordingly (Ingold 1992). Hence function may precede classification, and it is not essential to classify in order to use. We certainly need to investigate further the extent to which ‘affordance-based’ classification can operate independent of cultural inputs or context, but my own view is that these cognitive propensities are so abstract as to tell us relatively little about how people classify in their everyday lives, at less inclusive (and more functional) levels of discrimination. On the whole, non-cultural input

operates in terms of the process of categorisation, rather than underpinning particular categories, while certain regularities may be the product of general mechanisms operating across different and very varied domains, constrained by the data being organised.

IV Category Formation in Different Kinds of Semantic Domain

Many aspects of rule-governed category formation and classification work in the same way irrespective of cognitive or semantic domain, but there are also significant differences which we must note, some of which have major theoretical and methodological implications. If we consider four different domains – colour, kinship, biodiversity and the body – we can note that all are qualitatively different in terms of the ‘things’ classified. Colours are not really ‘things’ at all, but rather properties of things, measurable along the dimensions of hue, saturation and brightness (Kay and Kempton 1984); while kinship classes are part of social deixis (those aspects of language which vary with the occasion, time and location of utterance, and with the identity of speaker and hearer), and refer to the properties of the relations between things. Bodies are clearly bounded entities, but the way we divide them up into parts-through analytic (that is paronymic) classifications-involves some degree of arbitrary grouping, despite a large degree of cross-cultural conformity. Of the three domains only natural kinds map directly on to real, discrete objects in an objective world. But even with biodiversity, some gaps between purportedly discrete kinds and objects are bigger and more salient than others, in most environments, and therefore serve as more widespread (even universal) markers in classifying behaviour. Our experience, in many diverse environments, does not mean that we automatically recognise, for example, a ‘tree’ as a clearly separate bounded kind of thing, as we can see in any photograph of a stretch of forest. Trees often merge imperceptibly into bushes, are polythetic in definition, single features being neither essential to group membership nor sufficient to allocate an item to a group. It may seem, therefore, that categories vary according to the complexity of their definition, rather than simply the scope of their content.

In an important sense, then, the objective ‘thinginess’ of the biota sets it apart from many other semantic domains (Chapter 10), and what separates it from other domains which classify objects (say, cultural objects) is the degree to which we can organise it according to its plausibly conjectured evolution. Thus classifying natural objects a and b together is more likely to indicate (though not always) natural historical affinities (common origin) than, say, a classification of furniture. We underestimate the difficulties of categorising the natural world precisely because it consists

of concrete entities with utilitarian referents. But to speak of the thinginess of the natural world is simply to acknowledge the universal human imperative to turn the natural world into things and to think of the things so prehended in terms of their essential qualities. This is not to say that such a capacity is innate in the sense of springing into action from the first moment of postpartum development: it is simply to recognise the existence of a process that takes place over time, a consequence of interaction between normal developmental processes and environmental stimuli.

The operations of categorisation and classification work equally in terms of unmodified sense data or their cultural representations. In this sense the cognitive and cultural tools available to do this do not distinguish between the social world and the non-social world, though in the analysis of classification this has become a conventional distinction. Similarly, classification can treat its subject in a pragmatic and mundane way or by using various symbolic allusions. Since so much of what we sense and experience is mediated by social consciousness, and since the boundary between the mundane (technical) and symbolic is often unclear, it has sometimes been difficult, in practice, to know how to divide these two axes. It seems to me that there is more consensus on the principles of categorisation than on the status of patterns of categories which are the outcome.

The distinctions between symbolic and mundane classifications, and between those of the social and non-social worlds, cannot always, therefore, be neatly drawn: symbolic things are in an important sense practical, and practical classifications of the non-social world often rely on metaphors which are ultimately social, as in the use of the terms 'genus' and 'family' to organise plants and animals. In totemism, touched on briefly in Chapter 4 and discussed in more depth in Chapter 8, we usually find biological distinctions being used to make sense of social groupings. But on the other hand we also use forms of intelligence which appear to have evolved to cope with social interaction between humans to make sense of the natural world. In other words, we 'anthropomorphise' nature through 'cognitive fluidity', through the merging and transposition of different kinds of thought process. And we all know that many semantic domains overlap not simply in the way they are used to describe another, but in their empirical content. One striking example of this is the essential unity and continuity of natural and supernatural, of visible and invisible forms, highlighted in the ambivalence shown by Nuaulu over the correct classification of numerous monsters in myths and stories (Ellen 1993: 176–8). Another is the impossibility of making sense of many Austronesian terms and categories for 'bird/chicken', 'mammal/meat' and 'tree/wood' without considering utilitarian and symbolic criteria.

Although there have been several attempts to force a marriage between cognitive and symbolic anthropology in the way these data would seem

to require (beginning with Colby et al. 1980), all have so far met with questionable degrees of success. Those who espouse extreme formulations of the universalistic (formal)-relativist (symbolic) divide sometimes claim that they are engaged in separate kinds of endeavour, and that one body of work should not invalidate the other. This is, I think, the view which Mary Douglas has defended for the symbolists (e.g. 1993: 161–5), and Brent Berlin for the formalists. However, though I notice no inclination on the part of Douglas to shift ground in the face of recent evidence and arguments, Berlin (1992) does appear to present a moderated version of his early views in *Ethnobiological Classification*.

The truth is that we cannot keep semantic domains separate. Quite apart from anything else, no one domain can be represented in its own terms: it needs to be translated into some other domain in order to be understood. Thus metaphorical and symbolic thought are central to cognition. Given what we know about the role and dominance of the social intellect in primate evolution, it is understandable that this might have influenced classifications of the material world. Thus the material is explained in terms of the social, and the social in terms of the material. The material-social distinction is, of course, anyway empirically arbitrary, and in one sense entrenches through cognition the methodology of Cartesian dualism. Like Newtonian physics, though we know it to be ultimately a distortion, it does work sufficiently well for most of the time for us to rely upon it for practical purposes. Or to put it another way, the subjective and objective can be the same thing, depending on your position (Reyna 2002: 49): every categorical instance, every event must be understood as a simultaneity (Ardener 1989), both category and ‘category’.

When we classify as humans, not only do we use codes established in one domain to make sense of another in ways which distort aspects of experience, we systematically repress or forget or ignore certain characteristics and associations of particular natural things, and exaggerate and foreground others. Any one species, entity, idea or percept presents too complex an aggregation of traits to take into account in routine practical memory storage and information handling. This is why, for example, numerical taxonomy does not provide a good model for understanding how human minds process data – it is just too multidimensional. Sometimes this simplification results in more naturalistic classifications, sometimes it results in more symbolic ones, or a combination of the two. This is very clear when we look at graphic icons for natural species in different aesthetic and writing traditions. Thus in Britain a child is likely to see a picture of a ‘teddy-bear’ before it sees a real bear. I think that on the whole I am rather suspicious of theories claiming that we should always try to conflate or aggregate all meanings of nature and natural things in order to achieve some inductive under-

standing of the whole. When we do, we often generate cognitive contradictions that pose spurious interpretative problems for those scholars seeking an overall synthesis. Perhaps it is the ability to cope with these contradictions, to separate out potentially awkward representations of the same perceptual reality, that is itself some kind of universal mechanism of the mind.

V The Biological Basis of Classification: Old and New Versions

For an earlier generation, the biology of categorisation meant only our genetic propensity to classify in particular ways, and the way in which the brain was organised to facilitate this: the legacy of Cartesian mind-body dualism (Harré 1986). Recent research has confirmed some of this. There can be little doubt, for example, that gene interactions responsible for neurobiological organisation (a) govern what Rosch (1977) calls ‘cognitive economy’, the propensity to store information in ways which make best use of the perceptual and cultural resources available; (b) provide templates with which to model ‘fuzzy’ concepts and ‘core’ prototypes, some of which even prompt predictable behavioural responses (see section 1.6, below); (c) permit recognition of ‘animacy’; (d) allow for registration of some kinds of natural discontinuity on a pan-human level with some life-forms more salient than others; and (e) generate a repertoire of artefacts through the physiology of perception which themselves can be used to organise perceptual and symbolic data such as phosphenes (McDougall 1977).

None of this should be unexpected as our sense organs are, after all, products of an evolutionary selection process. Although such ideas had a pre-life in the work of some psychologists and animal ethologists working in the 1960s and 1970s, they were to be translated during the 1980s and 1990s into the language of modularity (Fodor 1983), whether the ‘Swiss penknife’ model of domain-specific modules (Barkow et al. 1992), including the derivative ‘cathedral architecture’ analogue developed by Steven Mithen (1996), or the memetic theories of others inspired by Dawkins (1976). Whereas previous commentators treated apparent biological predispositions as discrete emanations of general intelligence, the modularists sort to group them into generic kinds of cognition (e.g. intuitive physics, natural history intelligence, social cognition) which themselves reflected neurobiological organisation. The difficulty for anthropologists and psychologists alike here has been in identifying cultural and cognitive traits of sufficient discreteness to be accepted as unitary modules or memes in the first place, and the ways in which the human mind unhelpfully interferes with the conventional forces of

selection by reforming such units, linking them together in novel ways and attributing to them new (and sometimes contradictory) linkages and meanings (Aunger 2000). If natural history knowledge – say – is a meme, and if Bruner (1996: 101) is correct in his claim that the intersubjective, the actional and the normative probably all have biological roots in the genome, then science and folk, or indigenous, knowledge are cognitively closer than we might think.

Anthropological interest in neurobiology, rather than cognitive or evolutionary psychology, has been minimal until the last decade, when new technologies for viewing the living brain have generated more interest in the link between social action, cultural constructs and physiological processes. One figure whose work was seriously in advance of other developments, but who has been otherwise marginalised, is Robin Fox. Fox is a British-trained social anthropologist, much influenced by the work of animal ethologists and the early neo-Darwinian sociobiology, who also found inspiration in the late work of Victor Turner (1983). Fox begins with the anthropological truism that a major characteristic of humankind is the formulation of rules about things which are crucial to effective reproductive strategies – food, sex and violence – and that we need to categorise collectively useful behavioural tendencies in order to interact socially. He argues that we do this by reinforcing category boundaries through the use of emotional resources. Fox accepts the neurological hypothesis that this is an engagement between the prefrontal cortex and the limbic system through the hippocampus (Fox 1986: 32; also 1980: 194). Drawing on the work of Mark, Ervin, Winson and their associates, Fox (1980: 253, n.19) notes that one function of the hippocampus is short-term memory processing, and that people with lesions in this part of the brain cannot remember anything from one moment to next and live in an ‘eternal present’. But the hippocampus is also involved in long-term memory storage, and those with lesions can still remember things they learned much earlier. It seems that a three-year cycle is necessary for experiences to enter long-term memory, but once they are entered they are resistant to loss (Fox 1986: 35), reinforced through slow-wave rapid eye movement (REM) sleep which we associate with dreaming. Items assembled in the prefrontal cortex are repeatedly ‘rehearsed’ by passing them through the limbic system, which is also the centre for emotional facilitation and control. Dreaming, it is suggested, triggers biochemical changes at ‘neuronal gates’.

Through this mechanism, logical statements such as ‘ $1 + 1 = 2$ ’ are emotionally reinforced through notions of ‘rightness’. Similarly, a tendency to right-handedness is amplified strongly by cultural stories about right being good and left being bad. In other words, ‘is’ statements become ‘ought’ statements: emotion reinforces rules (Skoyles and Sagan 2002: 133; Holland and Quinn 1987). The crucial distinctions of social classification,

such as whether something can be eaten or not, or whether something is dangerous or not, are therefore established physically through changes in the size and shape of synapses. No wonder we react with anxiety (even pain) to threats to our classifications. More challengingly, Fox (1979: 136) also argues, this time drawing upon the inspiration of componential analysis and Lévi-Strauss's structuralism, that such mechanisms are sufficient to cope with the complexities of kinship categories. This is because, of the ninety-four combinatorial types possible, surprisingly few actually occur, and because logically the minimal elements necessary to generate the possibilities are few in number (generation, sex, affinity, collaterality, bifurcation and polarity).

What Fox had discovered was a theory of 'cognitive fluidity', which contrasted markedly with the modular theories that were to become more influential but are really too rigid to account for what we now know, especially given the short time-scale of human evolution. He was able to demonstrate a plausible way in which social intelligence could make sense of natural difference, and vice versa, and of how mental processes of individual humans might derive from collective social processes. In this he even appeared to reconcile psychology with Durkheimian collective consciousness (Fox 1980: 183, 188; cf. Skoyles and Sagan 2002: 134–5), to show how a cognitive model might provide a mechanism for integrating shared patterns of acquired behaviour (Donald 1993: 9).

The neurobiological work which so stimulated Fox has subsequently grown into a more widely held view of cortical function as an emergent phenomenon, rather than as hard-wired cyto-architectonic circuitry (Donald 1993: 5). Current work suggests that cognitive fluidity is materially rooted in neural plasticity (Buonomo and Merzenich 1998; Skoyles and Sagan 2002: 26–7), that is, in the capacity of neurons to change the spatial and volume location in the brain devoted to particular functions, to undertake new, reordered functions and activities during development, or in response to changed environmental stimuli (for example, following injury, disease or pain). This is, in effect, a theory of neuronal group selection (Edelman 1992), in which software routines are programmed and continually reprogrammed by each of us extrasomatically. Although such 'mindware' (Skoyles and Sagan 2002: 21) of the prefrontal cortex is particularly important in modulating, coordinating and organising routines originating elsewhere in the cortex, some cognitive functions (e.g. language) historically associated with certain regions, are most likely distributed throughout the 'triune' brain (MacLean 1973), that is, between its ontogenetically reptilian, mammalian and neocortical components.

Such mindware 'booting' may occur through play or, for language acquisition, through an infant repeating overheard sounds, the meaning of which can be explored in later verbal exchanges. The human brain is at

its most receptive to this kind of moulding during the first ten years of life, but retains much flexibility throughout life. Thus, through social experience, the human brain is quite literally ‘enculturated’: culture constraining and actively restructuring the brain (Donald 1993: 14) by configuring the arrangement of neurons, as much as the brain constraining and determining culture. It therefore follows – and this is the radical implication for a comparative anthropology – that since the potential input is highly localised, culture colonises the brain in different ways in different places. Our understanding of this process of individual neural enculturation has itself borrowed from observations of somatic processes of cultural selection and simplification. Thus for some, neuronal selection is comparable to the way in which a child establishes competence in a native language by selecting an appropriate phonemic infrastructure from the vast array of biologically phonetic possibilities. And the fact that such a process of ‘syllabic attrition’ is as evident in learning birdsong as in human speech acquisition (Changeux 1985) suggests that the mechanism is phylogenetically widespread and therefore probably primitive from an evolutionary standpoint.

What I have just described constitutes the basis for ‘neuroanthropology’ or ‘neurohermeneutic theories of culture’, espoused by, amongst others, Reyna (2002: 13, 156, 180), and Whitehouse (2001). In its most recent form these draw largely on the inspired synthesis of Edelman (1992), but also owe much to, for example, Changeux. The central idea is of selection pressure being exercised over epigenetic neuronal development to produce a distinctive topobiology and neuroanatomy, which then serves as the basis for experiential selection resulting in actual rather than potential synaptic connections. This in turn allows for ‘re-entrant mapping’, the interactive process between firing patterns which coordinates different parts of the brain involved in perception, some patterns being reinforced through experience, while others are weakened or eliminated. In such a model, ‘classification of the environment is not a process of *instruction* (as in conventional cognitivism) but of *selection*’ (Edelman 1992: 210). Edelman (p. 211) uses the example of an automaton which distinguishes objects with characteristic A and objects with characteristic B, which through a process of experiential selection can learn to distinguish those which are both A and B and those that are just A or just B. In this model, categorisation therefore involves a minimal unit of two functionally different maps connected by re-entry, though they may separately receive signals. Over time, re-entrant signalling strongly connects active combinations of neuronal groups in one map with those in another, through the strengthening and weakening of the synapses, establishing a ‘dynamic loop’ (pp. 87–9) that continually matches a percept’s characteristics (for example, the gestures and postures of an animal) to the independent sampling of several kinds of sensory signal. As with Fox’s borrowing

from an earlier generation of neurobiologists, 'an emotionally stimulating configuration of firing patterns has a greater chance of being repeated than a neutral configuration'. Categorical decisions are consequently based on 'the statistics of signal correlations' over time (p. 90), and interpretation might be said to operate simultaneously with classification (Reyna 2002: 112). This process can be elaborated at the non-neurological level as one of cognitive 'resonance', whereby bodies of cultural data, schemata and cultural models tend to harmonise or modify over time through mutual interaction in contexts of use.

An important part of the mechanism linking the cultural with the cognitive involves the role of memory, which for Edelman (1992: 102) 'is the specific enhancement of a previously established ability to categorise'. Following Tulving (1983), it has now become conventional to distinguish episodic from semantic memory, the difference between the remembering of past events, and remembering cultural rules and the meaning of abstract concepts, including their linguistic manifestations. In one sense, the establishment of categories in the brain is ultimately rooted in particular experiential events, but over time the brain works on the episodic real-time data to generate semantic memories through the kinds of mechanism discussed so far in this section. Although our first perceptions of a particular segment of the world are often stored in deep memory and inevitably influence our perception of the same or similar stimulus on a subsequent occasion, memory (semantic as much as episodic) is a work of 'imaginative reconstruction' (Bartlett 1932). It is unlikely, therefore, that we can understand perception independent of previously accumulated mental images (that is, cultural representations), not only those which we store in individual brains but also those distributed (through multiple brains and artifacts) in intersubjective space. The alarming consequence of this idea is therefore that when we think we 'see' something, our first impressions at least are highly influenced by previous occasions when we have seen the same or a similar stimulus. Most of what we sense, interpret, say, or do, such as linguistic utterance, is unconscious: for most of the time we are on 'automatic pilot'. The 'act' of perception is like joining up the dots in a children's puzzle, and every act of perception involves a central role for this kind of imagination, which is no more than drawing on reserves of memory and socially distributed information to interpret a present sensory experience. Indeed, we now know that the areas of the brain used in imagining are identical to those areas involved in actual sensing or doing, though imagination may require more blood and energy (Skoyles and Sagan 2002: 36). And this role of imagination is not by any means restricted to categorical perception. We imagine what others feel about us, and we imagine amputated limbs as if they were there. Since that memory will make all kinds of connections between phenomena with

degrees of resemblance, whether perceived at first hand or acquired from someone else, one can see how imagination easily connects the symbolic with the material.

The danger in such persuasive theories as these, which at last seem to have achieved the anthropological Holy Grail of linking cultural particulars with neurophysiological process, which seem to provide a justification for epigenetic permissiveness, is that they reduce everything to neuronal firing patterns. It is important to remember that while biology is not just about genetic propensities, neither is cultural cognition just about brains. Quite apart from anything else, genes are not equal in what they express phenotypically. They influence the process of ontogenetic development and phenotypic expression through complex organism-environment interaction (Ingold 2001: 121–5), while the human genome project has revealed that it is not the number of genes which is important so much as the number of combinatory possibilities achieved during neoteny. Indeed, what engages with the environment to generate classificatory activity is not just the brain but the body. We experience not the world but interaction with the world through our bodies (Bateson 1973), and the materiality of the human body presents us with the context in which classification works. Indeed, a brain without sensory and motor interfaces cannot possibly have consciousness. While we have a genetic propensity towards right-hand asymmetry which is amplified culturally, right and left asymmetry are also influenced by our direct experience of living in a particular three-dimensional world (Needham 1973; McManus 2003); the very shape of the body and our disposition towards the principle of symmetry directs the selection of anatomical semiotica (Chapter 5); part-whole schemas originate in bodily experience; and the zero-to-infinity principle is attributable in part to the canonical forward posture and upright movement of human beings (Clark 1973). Thus categorisation and classification are embodied and experienced, not just imposed or constructed (Edelman 1992: 236; Skoyles and Sagan 2002: 162–3); they proceed as synesthetic processes, combining all our senses (Varela, Thompson and Rosch 1993: 172–7).

Thus in the new neurobiology brains do not come pre-equipped with tight genetic specifications, hard-wiring or modules for classifying the world, for acquiring grammars in terms of the memorability of representations, or for any other mental function; rather, they have ‘a mass of ever-changing circuitry’ which is capable of endlessly creating new maps (and new configurations of maps). Genes work *with* neural plasticity, as revealed, for example, in twin studies, by laying down the basic linkages rather than the detailed blueprints. Put slightly differently, our brains ‘are programmed for nothing except to explore the potentialities of our bodies and environments via a process of learning by neuronal group selection’ (Edelman 1992: 212); they are ‘programmed to get us programmed’

(Skoyles and Sagan 2002: 34–5). Moreover, the brain is continuously recategorising data, and although such brain-based memory is inexact and probabilistic when compared with, say, computers and other cultural artefacts, it is capable of great degrees of generalization (Edelman 1992: 102–4), making theories of cognitive semantics, such as those of Lakoff, more consistent with current neurological research, than the deep structures of Chomsky. And since the most stimulating aspects of the human environment are social, we must ‘envisage all processes of transmission in terms that are simultaneously sociological, psychological and neurological (Whitehouse 2001: 217)’.

VI The Evolution of Hominid Categorisation Processes

We have evidence for neuronal plasticity and for the ‘flexible learning’ that it permits in the simplest of organisms (Ridley 2003), and may reasonably conclude that the kinds of processes explored in the previous section have a long evolutionary history. However, it is the macroscopic organisation of the brain found in much higher chordates which made possible both the increasing use of cultural transmission, and categorical thinking. It is the macroscopic organisation of the brain which, fortunately, we can trace through fossil evidence. Nevertheless, we can reasonably infer that as the reptilian brain gave rise to the old mammalian ‘limbic’ brain, and through it the new mammalian ‘cortical’ brain, so new parts were not simply added, but more elaborate functions emerged which connected the microanatomy of all existing structures.

As far as we know, non-human animals do not consistently construct categories in a way we would instantly recognise; even less so do they classify. However, we have already noted some of the evidence for genetically encoded image prototypes in non-human vertebrates which trigger characteristic behavioural responses, such as aversion behaviour with respect to predator-like images. It has even been suggested that such behaviours; which evolved early in the evolution of terrestrial vertebrates; have left traces in highly encultured human categories: for example, ‘dragons’ imaginatively combine the prototypical aversion characteristics of three types of predator which threatened early humans: big cats, big snakes and raptors (Jones 2002). More prosaically, Herrnstein (1985) performed a much-reported set of experiments on pigeons that were shown pictures of all kinds of trees, as well as trees in different contexts, and could selectively differentiate these from non-trees (see also Cheney and Seyfarth 1990: 87). As discrimination did not appear to be based on a single set of perceptual criteria, the experiments are usually interpreted as providing evidence for the existence of a concept of ‘treeness’ as a general cognitive prototype, an idea which has

been subsequently explored further (Orians and Heerwagen 1992: 4559). In the realm of social intelligence too, non-human primate studies yield evidence that individuals can classify others according to their pattern of association (Cheney and Seyfarth 1990: 86). Comparative studies of different species of non-human primates have now demonstrated the cognitive importance of an ability to compose two or more objects into sets, in other words to achieve minimal classifying, though they have yet to show good evidence of more advanced hierarchic cognitions such as comprehensive taxonomising, or of developing synchronically with notions of causality (Langer 1993). For Premack (1983; Cheney and Seyfarth 1990: 88) abstract categories require the kind of language training which some chimpanzees have undergone, while other chimps can achieve the same end using an 'imaginal' code. Chimpanzees can also classify functionally, as well as according to perceptual criteria, grouping, for example, pips and fruit rather than apples and pears (Premack 1976, 1986; Cheney and Seyfarth 1990), though it is still unclear whether these kinds of operation are realised in routine behaviours in natural settings, or are simply pre-adapted potential evident in experimental situations only. Nevertheless, we can be sure, as suggested by Fox (1986: 24), that categorical thinking does not in itself separate humans from other animals, and we probably share an array of biological prompts which help us make sense of the world, combined with some more specific genetically encoded image-response patterns. The tendency to categorise the world and then act on this redefinition is itself, therefore, an evolved and ancient natural function.

In the preceding paragraph I provided undifferentiated examples of categorising from both natural history and social intelligence for non-hominids. In all apes and hominids these processes are achieved through advanced neural plasticity of the prefrontal cortex, augmented by 'fission-fusion' mind skills, and somatic sensory and motor skills (Skoyles and Sagan 2002: 77–9). Since their popularisation by Fodor, our understanding of the evolution of the hominid brain has been much influenced by modular theories (domain specificity), which stress the differential development of categorising abilities in different functionally discrete domains (language, mathematical ability, intuitive physics and so on). The evidence for this in part comes from our understanding of those brain pathologies we label autism, where certain kinds of intelligence may be very sophisticated and other cognitive skills (say those associated with social intelligence) impaired (e.g. Sacks 1995). Such approaches have allowed for a sophisticated modelling of cognitive evolution, but as we have already seen, in the light of the new neurobiology, this view of the brain, with its computational and algorithmic representation, is increasingly incompatible with what we now know of brains and bodies and how they interact with the world.

Whether or not the modular view can be sustained, we can agree that early hominid environments were more risky than they are now and that food resources were irregularly distributed, all of which exerted selective pressure in favour of ways of more efficiently using increasing numbers of kinship connections and extended social links beyond the immediate present. What Daniel Dennett has called ‘the great encephalisation’ was, therefore, driven by the size of social groups (Dunbar 1993), the demands of increased sociability, the need to handle social complexity (including fission and fusion of relationships), and a broad-spectrum food-getting strategy. Such an argument emphasising the selection of systems of social categories and symbolism in order to handle and maintain kin and relationship recognition over time and space, even when the relevant individuals are absent, again reminds us of Fox.

If we link these developments to what we now know of culture-brain interaction, we can see that these conditions were the forcing house for what Reyna (2002: 128) calls the ‘neurohermeneutic system’, which involved a shift from a predominantly episodic memorate culture to one which was predominantly mimetic, but one also reinforced and modified episodically (Donald 1993; Reyna 2002: 65). As far as we can judge from the fossil evidence, these developments took place between 2 and 0.5 million years BP, beginning at least with *Homo habilis*; and were complete with the appearance of anatomically modern humans. The ability to develop mindware based on symbolism – abstract notions which stand for other entities in non-mechanistic ways – was a capability which already characterised Lower and Middle Pleistocene *Homo erectus* groups. This phase witnessed the emergence of a more complex language capacity from proto-language of the kind displayed by chimpanzees, perhaps encouraged by sexual selection on the part of those individuals who were the most effective communicators and thereby the most adept social manipulators. Neurologically it was mirrored in the developing ability of the cortex to construct maps of its own activities, not just responding to external stimuli, and recombining these maps in different ways. Concept formation, therefore, involved percept categorisation, adjusted by the memory of previous similar perceptual events (resemblance), and augmented by learning, language and intention (Skoyles and Sagan 2002: 109–10). Even language competence itself, Edelman (1992: 129) suggests, emerges through a self-learning process that he calls ‘semantic bootstrapping’, in which as a lexicon grows and sentences are experienced the categorisation of the experience leads to syntax.

In understanding how somatically distributed and shared cognition evolved, the palaeo-skeletal evidence is helpfully biased, for, after the brain, no organ has been subject to as much debate concerning its role in hominisation as the hand. We have already noted that other parts of the body are integral to the process of cognition, and that category mecha-

nisms work through a kind of mapping which necessarily involves our bodies and our personal histories (Edelman 1992: 152). But the evolution of the hand, and with it the tool, brought about a transformation in the relationship between hominids and their own body, a greater level of physical self-awareness and sense of self. The whole human organism became, as it were, an instrument to solve problems, establishing an exponential 'virtuous circle of self-consciousness and agency' which was to drive cognitive evolution thereafter (Tallis 2003).

With the appearance of the first anatomically modern humans, around 130,000 years ago, mindware networks had evolved a potential to encompass abstract processes, operations and extended symbolic systems, the manipulation of which enables individuals to carry out complex operations, greatly enhancing cognitive power. For Skoyles and Sagan (2002) symbols are not just 'propagated arbitrary associations' but 'active shapers of the very substrate by which we act, think and feel. Symbols, working together with our prefrontal cortex and neural plasticity, transform our minds and the character of our consciousness.' The uncontested evidence for this transformation first appears with the technological specialisation, art and decoration of the Upper Palaeolithic, though there is recent African evidence suggesting that it may have begun much earlier, or at least that the potential for such developments could be much older.

The development of second-order representations, images of images, is certainly crucial. The generalisation of percepts until this point was in the form of material inscriptions only in the minds of individual humans. The abilities to first describe those images to others through language, and secondly to materially inscribe visual representations graphically, were to have a profound consequence because they allowed people to share those same images – brains could communicate with other brains in ways that had not been previously possible. The integration of abstract concepts through socially transmitted visual and other categorical images involved processes of cognitive simplification, reification, iconification and anthropomorphisation, and new kinds of explicit rules to maximise shared understanding. Put in diachronic evolutionary terms, this is essentially the same logical and ontogenetic model developed in Chapter 9 below to account for the process by which categories become more detached from the percepts which initially prompted them, through constant reinforcement by engagement with the material world, achieved through mapping one thing on to another in a different domain. The influence of the acquisition of effective language made classifying much easier but more arbitrary, enforcing boundaries and the general rule-governed dimension.

VII Changing Category Systems in Anatomically Modern Humans

Classifying behaviour, as it evolved in early anatomically modern humans, was the consequence of practical engagement in everyday life, constantly reinforced by experience. Its adaptiveness stemmed from the multiplicity of ways it could reorganise perceptual data and from the redundancy built into this process. The classifications which resulted were fluid and negotiable, produced as well as reproduced. As we know from contemporary ethnographic studies, although particular kinds of empirical knowledge might focus on particular individuals and might achieve a degree of coherence in rituals and other symbolic constructs, the distribution of classificatory knowledge is always fragmentary. It does not exist in its totality in any one place or individual, despite the extraordinary oral encyclopaedism of the likes of Alonso Ton Mendez (Berlin 2003) or Saem Majnep (Marcus 1991). Indeed, to a considerable extent classificatory knowledge has become increasingly devolved not in individuals at all, but in cultural artefacts, and in the practices and interactions in which people themselves engage.

Because we know that people vary in the consistency with which they label and use categories, in the degree to which they share both labels and categories within a given population and deploy names and categories flexibly in response to particular cues and contexts, it is obvious that they are in a constant state of change. We now have good descriptions of how classifications change in the short-term through category extension (as reflected in, for example, lexical marking behaviour), category obsolescence, the way ranks grow in particular ways, and how new life forms are added to natural history knowledge (Berlin 1972; Brown 1984). But for as long as classifications were oral and shared they were constantly being reinforced by cognitive limitations of the brain and body. Johnson-Laird (1982), for example, claims that storing knowledge as causal hypotheses (or models) is efficient because humans (and we might add, relying on oral culture and low levels of division of labour) do not have sufficient memory to make the right responses by induction alone.

Specialisation, the creation of visual images, and the written word permitted the long-term storage of classifications, which were not limited by (even distributed) memory, and could be manipulated in new ways. Social distribution of knowledge and increasing specialisation led to specific semantic domains and classifications having a semi-autonomous history of their own, and to the 'emergent' generation of categories within a completely cultural framework unconstrained by ecological experience and cognitive limitations. Folk classifications generally organise knowledge which is orally transmitted, that is through imitation and demonstration. The corollary of this is that writing it down changes some of its

fundamental properties. Writing, of course, also makes it more portable and permanent, reinforcing the dislocation that arises when knowledge rooted in a particular place and set of experiences (i.e. local or indigenous), and generated by people living in those places, is transferred to other places (see Chapter 2). Thus, 'lion' could be imagined as a category and transmitted between generations even where lions had never existed; and people could agree on categories even where there was apparent disagreement over descriptions of what were to be put in them. Consider, for example, what Heppell has to say about the basilisk in medieval and early modern writings:

descriptions and illustrations of the basilisk are abundant. There was little consensus about the basilisk's appearance. It is represented with either two or eight legs, or even none, and is sometimes winged and sometimes not. Its head resembles that of a snake, a bird, or a horse, and its tail tapers to a point, or is forked. How then does a one recognize a basilisk? (Heppell 1990: 13)

An excellent example, you might think, of a Sperberian 'half understood concept'. At the same time, culture permitted degrees of complexity in the arrangement of categories which individual brains could not cope with. Thus although in terms of global linguistic comparison there is a strong association between meat and mammal-like categories, David Knight's (1981: 25) description of the emergence of the highly culturally specific mammal life-form in European languages suggests that its ultimate acceptance as a folk concept was largely a result of the development of modern scientific taxonomy:

in natural history, throughout the eighteenth century in Britain and in France, our own class of mammals was generally described as the quadrupeds, and indeed this was the term used by Cuvier in his great works on living and fossils mammals published in republican and Napoleonic France. Most mammals are indeed quadrupeds, but man is not and nor are seals, dolphins or whales; while on the other hand lizards and frogs are quadrupeds but not mammals. By a rather different process, the terms 'reptile', which in the eighteenth century meant anything creepy-crawly (and therefore made an excellent term of abuse), was narrowed down so as to exclude invertebrate creatures like centipedes by the end of the century. And 'amphibia' was similarly refined by the middle of the nineteenth. 'Insect' in the eighteenth century had been synonymous with 'reptile', as in Lawson's *History of Carolina*, 1709; and it still was in Victorian railway taxonomy, for Frank Buckland the naturalist found that he must pay for a monkey which counted as a 'dog', but not for a tortoise which was an 'insect'. (Knight 1981: 25)

In France, language dynamics were different. This is partly exemplified by the way in which Latin scientific names influenced French but not English vernaculars, including the priority given to genus over species in

nomenclature (Haudricourt 1973). Indeed, the conflict between proponents of alternative scientific classification systems during the eighteenth and nineteenth centuries was often heated (Ritvo 1997: 1–50). But although there has been a constant interaction between general (folk) and specialist (scientific) classifications throughout history, the differences are being constantly reinvented. What are we to make, for example, of the groupings in medieval bestiaries? Are they ‘special-purpose’ or ‘general-purpose’?

Categories, then, have detailed cultural histories, which have a bearing on their current usage but which also reveal much of past classificatory practice. Thus, ‘animal’ is hardly used in English as a norm before the end of the sixteenth century, according to the *Oxford English Dictionary*, and is not found in the Authorised (1611) Version of the English Bible. The word used commonly before this was ‘beast’, and for 1513 we find under animal ‘beyn contenyt all mankynd, beist, byrd, fowll, fisch, serpent, and all sik thingis’. Part of the problem faced by European folk classifications after 1500 was exposure to an increasing diversity and quantity of species which did not always fit easily into established categories based on European endemic wildlife, and in this respect European classifications faced the same problems as those routinely reported in ethnolinguistic accounts of how novel species are assigned to categories (Ritvo 1997: xiii–xiv).

To move from the sublime to the ridiculous, a rather different history is attached to the category ‘adhesives’. We now live in a world where most of these are synthesised chemically, but until the 1930s all were based on natural products: ‘pastes’ were sticky mixtures of flour and water, ‘gums’ oozed from trees, ‘cements’ were rubber dissolved in solvents (or latterly burned clay mixed with lime) and ‘glue’ was a sticky solid made by boiling bones. Now we tend to call them all ‘glue’, or use some of the terms interchangeably for products to which they were originally never meant to apply. Such terms and categories change informally to reflect subgroup dynamics, but in some cases classification may be the subject of legislation, ecclesiastical or secular. Many famous British law cases revolve around decisions to distinguish clearly between one thing and another, for example ‘male’ and ‘female’ (Douglas 1973: 115–17). A more mundane distinction was the subject of some discussion in 1972 in the House of Commons, as a result of damage caused to trees by grey squirrels. One Member of Parliament wanted their name changed to ‘tree rats’ to promote a less friendly image. The idea was rejected by a Government Under Secretary on the grounds that squirrels were *Sciuromorpha* and not *Myomorpha*. In this instance, a supposedly morally neutral taxonomic legitimation was used to support a pre-existing folk classification which triumphed in the face of a morally charged but probably more useful folk innovation.

Thus the liberation of the process of category formation from cognitive and ecological constraints and their semi-autonomous development in intersubjective space led to the creation of kinds and degrees of complexity that had not hitherto been possible. But while it is evident that categories do vary in their complexity, to date little attention has been paid to how we measure this. Complexity, for example, might refer to density of content, range of content, number of distinguishing features, extent of polythesis, absence or presence of a cognitive prototype, whether a category is 'perceptual' or 'symbolic' (material or metaphysical), the degree to which members of a population share definitions, the degree to which definitions are context-bound, and the range of contexts in which a category works. In each case we must ask whether the complexity lies in the categories of the classification or within the context of the classification.

One criterion for distinguishing simple from complex categories is the type of specification required to distinguish a member (or instance) of the category. The simplest case is where a single feature is required for the distinction. More complex are multiple features. More complex still is the inclusion of optional features – x and y and z or q . In all but the latter case there is implicit subcategorisation of the first type: the presence of a category is sufficient to limit the possibilities inherent in the assignment of a case to a category. This principle of inherent subcategorisation has been amply used to justify the taxonomic type of classification, as well as the feature tree specification, the former summarising the relationships between categories in a two-dimensional format, the latter as a two-dimensional projection of an n -dimensional classification space. In these terms, a more complex type of category is one in which there is no useful subcategorisation by the use of features: the presence or absence of a particular feature value by itself yields far less than one piece of information in the classification scheme. In some sense this is true of all classification schemes, as the information inherent in the classification of features themselves is a neglected one; the act of imposing more inclusive ('higher-level') order over sets of category alternatives itself adds a large amount of information to the scheme; indeed, this is one of the reasons why we strive to produce classification schemes in the first place.

Another potential difference between 'simple' and 'complex' categories is the apparent unboundedness of the latter, in the sense that complex, symbolically derived, categories can be constructed in an enormous number of ways. If, as shown in Chapter 4, variability is apparent in 'simple' folk-zoological classifications, then it is much more so in complex ones. While complex categories might have a large number of possible cognitive forms, culturally these must conform within specific boundaries in any given context over an interval of time. While there may not be strict determinism of an individual's model of a category, use as a social device requires that a condition of structural stability must be reached; a restric-

tion in the range of variation. Symbols must not only be constructed, they must be identifiable and identified, if not on physical precepts (such as a tree) then on symbolic ones (such as a basilisk).

VIII Distributed Models, Cognitive Process and Prehension

Early anthropological models of category formation were heavily constrained by adherence to linguistically defined entities and a language-based interpretation of how classification worked, even if formal recognition was given to the separation of category and label. This model has been described by some (e.g. Bloch 1991) as the 'linear-sentential' model of culture. With a shift away from the use of distinctive features, emphasis on core-periphery models and cognitive prototypes, and with a growth in the use of psychological approaches at the expense of linguistic ones, greater recognition has been given to how we might classify and engage with differences in the world without necessarily using language as an intermediary.

Problems arise when the process of classifying (the cultural and cognitive mechanisms by which the assignation of objects, concepts and relations to categories is achieved) is conflated with classifications (the linguistic, mental and other cultural representations which result). To speak of 'classifications' is to run the risk of reifying schemes as permanent cultural artefacts or mentally stored old knowledge, when they are more often properly understood as the spontaneous and often transient end-product of underlying processes in an individual classifying act. We might call such an error 'the classificatory fallacy' (see Chapter 2 below). In view of this, I should perhaps add that when I use the phrases 'classifying act' or 'an act of classification' here I do so purely as a rhetorical device, and I fully accept that in real life acts of classification are embedded in real situations and hardly separable from what goes before and what comes afterwards. Indeed, the 'act' may evolve, be reinforced or rescinded, over a period of time, as in, for example, drawing a person's attention to an object .

To extend this distinction, and make it more productive, it is useful to employ the model of agency and structure (structuration) which we owe in its sociological form to Anthony Giddens (e.g. 1986). Thus the relationship between classifying as a cognitive and cultural process and 'a classification' as a representation is recursive and dialectical: you cannot have one without the other. The classifying process is always situated in, and assumes some context of, previous classifications, while itself modifying the context for the next time a classifying act takes place. As this largely operates within the constraints of human culture and memory it is clearly

a matter of degree, depending on the knowledgeableability of the classifier, the variability of the contexts and the entities being classified (Ellen 2003a: 53, fig. 2.1).

Rather than documenting taxonomies or other kind of classification and category as so many butterflies (Leach 1961: 21), it is important to focus upon the processes which generate them – not detached cognitive processes, but those rooted in particular situations. In a review of ethno-biological classification published in 1986 (republished with modifications as pp. 229–31 of Ellen 1993) I introduced the term ‘prehension’ as a framework for discussing these problems.² Prehension, literally from the Latin *prehendere*, ‘to grasp’, suggests that classification is not only an act, but a process that is contextually bound: the sum total of those empirical processes determined by the interaction between knowledge, context, purpose and the cognitive architecture which give rise to particular classificatory outcomes. Prehension:

- (a) refers to those processes which through various cultural and other constraints give rise to particular classifications, designations and representations;
- (b) entails a process which integrates the context of the classifying activity, including the interactive interplay with others in that context (and even the elicitory techniques of an ethnographic interview), and diverse information derived from past experience;
- (c) emerges from a sequence of individual ‘acts’ of perception, but is not (and cannot be) confined to them;
- (d) is a model that can cope explicitly with imperfect processing and communication of information, and with the capacity of humans to adapt and modify their store of information and the interrelations between that information;
- (e) suggests that there can be no adequate model of classification that attempts to separate the structure of classification from its context and content.

Whereas cognition and perception suggest purely cerebral processes, prehension recognises, without the necessity of qualification, the difficulty of distinguishing mind from matter, thinking from doing or speaking, individual from group, cerebral from social, natural from cultural. Category formation and classifying behaviour are inherently adaptive processes, and must incorporate facilities for relating those instances of the present with those of the past, but provide a structure of stability over a context of chaos. All of this echoes Varela, Thompson and Rosch (1993: 173), who emphasise how sensory and motor processes, perception and action, are fundamentally inseparable in lived cognition, having co-evolved. They argue that ‘mind and the world together arise in *enaction* [italics added], [though] their manner of arising in any particular situa-

tion is not arbitrary' (p. 177); while knowledge, located at 'the interface between mind, society, and culture, rather than in one or even in all of them ... does not preexist in any one place or form but is enacted in particular situations' (p. 179). Classificatory engagement with the physical world involves not only interlection but sensation (to use an Ingoldian distinction); and prehension involves the whole person as he or she moves around the world in space and time.

We can only begin to approach a realistic understanding of categorisation and classifying behaviour if we begin by observing people assigning items to categories and using names in natural ethnographic settings as well as in experimental ones. People bring to situations in which classifying activity takes place, and from which verbal statements about classifying behaviour result, information of diverse kinds acquired through both informal and formal socialisation experience, of the world in general and of earlier classifying situations. How they then classify depends upon the interplay of this past knowledge (including prescriptions and preferences with regard to particular cognitive and linguistic idioms) with the material constraints of the classifying situation, between conscious and subconscious, the purposes of the classifying act, and the inputs of others. Thus thinking, saying and doing are not separate activities but interpenetrating ones, while the same cognitive bricolage provides us with both models 'of' and models 'for' in terms of Geertz's (1966) distinction. Classifications of all kinds connect culture, psychology and perceptual discontinuities of the concrete world, and as we can now see, also aspects of brain organisation through neural plasticity. Confusion has arisen in the past from failure to distinguish clearly between individual instruments of cognitive process and the collective medium in which these operate, comprising belief, cultural representations and social practice, between information storage and representation, and between abstract knowledge of the world and the pragmatic schemata we use to negotiate our way through it. Our propensity to classify in the ways we do certainly involves the possession of innate cognitive skills, but is mainly an ability to organise our perceptions through culture (aided by language) based on models drawn from somatic experience, and from social and perceptual experience of the material world. The form a particular classification takes will sometimes be a culturally defined whole, but as often as not will be the outcome of interaction in particular circumstances – the interplay of past knowledge, material context and social inputs. Classifications as *things*, therefore, are not the inventions of individuals, but arise through the historically contingent character of cultural transmission, linguistic constraints, metaphorical extensions and shared social experience in relation to individual cognitive practice.

Notes

1. This chapter includes material first developed in 'How complex are complex cultural categories? Distributed and global models in cognitive anthropology', presented with Michael Fischer at a Cambridge seminar organised by Pascal Boyer in 1990. Some of the text also draws on Ellen 2003, and Ellen 2003a.
2. For a somewhat different use of the same term see Tallis (2003: 32–43, 279), for whom 'modes of prehension' appears to refer quite explicitly to the range of sensory and cognitive implications following from the evolved human hand, between manipulative function and the growth of intelligence.