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APPENDICES

APPENDIX A

ADDENDUM TO CHAPTER ONE

GLOSSARY OF TERMS AND PHRASES

Any definitions of terms involving categories and concepts will vary according to the perspectives of the different writers in the field. Those provided here are, at best, approximations to the general consensus. They are based upon terms specified by Murphy and Medin (1985) and by Hampton and Dubois (1993).

Human beings, in their thoughts and language, treat particular objects, living entities and events as members of *categories*. A *category* is a class or set of entities in the world (whether they be individual objects, actions, states, qualities or events) which seem to belong together on the basis of some criterion or rule. *Category* as defined here can be understood as a set of real objects in the world, or a set of mentally represented objects. A *concept* is the idea used to understand such a category, and is used to organize and select those entities or items which belong to the category. *Concept* as defined here can be constituted of an algorithmic formula, essential features, a prototype, diagnostic information or as an individual *exemplar*. *Exemplars* or *instances* are category members and can be any object or entity in the world which instantiates some mental concept. It is important to distinguish between *concept* and *category* as the two do not necessarily equate, as when someone's concept of *Animal* does not actually include all animals in the world (Murphy & Medin, 1985, Footnote 1, p. 290).

Classes are not the same as *categories*; their instances do not have an underlying structure, but are more like a grouping of objects. For example, linguistic classes would serve to classify an unstructured list of nouns. *Categorization* is the mental grouping of objects which are individually different, yet share certain characteristics in common. Categorization processes are the means by which a concept's representational structure and the external world interact. How an individual actually decides about membership in any particular situation need not be the same as the normative rule used by most people to map intensions onto extensions (Hampton & Dubois, 1993). Different concepts provide different categorization criteria, but almost all are based upon descriptive *property* information which enables the categorizer to divide the

world into, for example, *chairs* and *non-chairs*. *Property* refers to any predicate that can be truthfully stated of all or most of a category's instances.

Property is a generic term and Hampton and Dubois (1993) have listed various applications. Some descriptions involve perceptual properties, such as *wooden* or *dark*; while other properties, such as *supports weight* or *expensive*, require background knowledge to be known and applied by the categorizer. *Attribute* and *value* involve more abstract properties, and capture the existence of contrastive sets of properties in category members. *Attribute* is a property with a variety of mutually exclusive alternative possibilities termed its *values*. The attribute forms the dimension or aspect upon which the members of a category vary, while the values provide the different forms those aspects can take.

Thus, the foods of the category *What not to eat on a diet* will all have the attribute/property of being fattening, but have differently weighted values according to the number of calories they contain. *Feature* refers to an attribute which has only two values, present or absent (Jacobson, 1963; Bierwisch, 1971). Features have traditionally been considered to be perceptual or semantic primitives, the unanalyzed stuff out of which categories are made (Katz & Fodor, 1963). More specifically, *feature* usually means a physical property such as *wings* or *fins*.

Mental Representation is the form used by a person's mind to re-present an object or group of objects. In other words, the symbol (or type) stands for some object (or token) in its absence. "The token" can be an aspect of the external world or of one's own imagination (the internal world). *Structure* refers to the organized relationships among concepts which represent different categories. If the criteria for item-membership is not clearly defined, then a concept's boundaries with other concepts may be imprecise and "fuzzy". *Internal structure* refers to the relatedness of items within the same category. When a concept's internal structure is ill-defined, this "fuzziness" creates a gradience in the item's membership, so that some items have greater degrees of membership than others. This results in internal gradient structure, often described in the literature as *typicality*, though there is some controversy in the literature on whether *typicality* could be said to be the same as *membership*.

APPENDIX B

ADDENDUM TO CHAPTER ONE

PHILOSOPHICAL BACKGROUND

Plato and Aristotle gave distinctly opposed accounts for the origins of knowledge and the stuff of reality, but they agree on the *logical* nature of knowledge and the passivity of the mind which contains or reflects it. Plato (born 427 BC) believed that a person is born with an innate knowledge of ideal forms. Not all people are born with the same degree of knowledge, and this determines the stratum of society the person is born into, the highest being the Philosopher Kings. Aristotle (born 384 BC) began at the opposite end of the scale, describing the newborn infant's mind as a blank slate, waiting to be written upon by life, so that a person's degree of understanding was based upon his or her breadth of experience throughout a lifetime.

Plato's worldview

While Aristotle made no divisions between the study of mind and the study of matter, Plato described a world where reality was composed of three levels: the ideal, the tangible, and the copy, as in a work of art. For Plato, general concepts or ideal forms had objective reality and were embodied in sensible objects. Specific objects and living things of the perceptual world depended upon ideal forms for their existence, which in their turn existed in a real, but to us invisible, world. As an example, in Book 10 of *The Republic* (circa 380 B.C.), he argued that, over and above the particular objects that are beautiful, exists a separate form for beauty itself. There is an absolute and eternal Form which corresponds with any single term (*Furniture*) used for a group of particulars (*beds, tables*) which are subject to change and decay. These latter objects were only imperfect examples of the ideal form which existed in a timeless and unchanging realm.

> "The craftsman, in making either of these articles of furniture, keeps his eye upon the ideal and so makes the beds or tables which we use accordingly, and so with other things." (Plato, Book 10 of *The Republic*)

Aristotle's worldview

Overall, Aristotle made no division between the study of mind and the study of matter, and he did not propose a primary level of reality consisting of unseen, ideal forms. The primary substance of reality is the specific and concrete token (*bed*) while the species or type of particular object (*Furniture*) becomes only a secondary kind of substance. For Aristotle, knowledge was based upon a subjective experience of substance, so that all thoughts and perceptions of reality arose through the senses, and were determined by them. Aristotle's *De Anima* is for the most part empiricist and materialist in its approach to the concept of mind, which he describes as a passive "tabula rasa" upon which experiences are engraved.

> "In general, those things are really united which must be conceived by the same formula for their essential being." (Aristotle, Book Delta in the *Metaphysics*).

Both philosophers were metaphysical realists. Metaphysical realism is the doctrine that meanings are determined by the nature of the world, and are wholly independent of the way in which the mind works. Universal categories are "out there" and their existence is in no way dependent on minds or our own processes of conceptualization. If there were no minds to apprehend universals, they would still exist, as universals constitute primary reality, and it is the mind's task to "discover" them.

One traditional metaphysical issue between materialists and idealists concerns into what categories reality is divided. Since the problem is not an empirically resolvable one, it might be simply a verbal debate on how to categorize our experiences. But metaphysicians see their task as being one of "slicing reality at its joints", to paraphrase Plato and Rosch. For that, assumptions first need to be made about the primary substance of reality: are boundaries drawn between Plato's intangible and material levels of the world, or between Aristotle's bundles of material properties (Hospers, 1990)?

Things in the real world are of many different kinds - wood, chalk, granite, and so on - but the constituents of these various kinds are relatively small in number. Hospers (1990) claims that about a hundred basic elements are known, from which all objects and entities are composed in various mixtures or combinations, so that each material thing or entity has many different

characteristic elements. Is the primary reality of an entity an Aristotelian formula defining its complex of material properties, or do these properties presuppose some Platonic intangible form? One way to answer this is to first consider which is prior: substance or form?

How do objects and their constituents undergo change? To give an example taken from Hospers (1990), gold has a certain colour, melting-point, malleability, weight per unit of volume, and so on. The question is asked, "How many properties could be removed and still have the specific thing remain gold?" The physical property of colour might be removed, but the object would still be gold. To give a clear answer, one would have to know the defining characteristics of gold. So if these were removed, while the thing in question would no longer be called "gold", we would still be left with *some material substance or other.*

The metaphysical puzzle begins when all the material properties are removed, including extension, mass, and shape: would *nothing at all* be left? The answer given by an Aristotelian would be that not only is no material substance left, there is nothing left: no properties left, and no "it" to possess them. The defining formula needs the various physical elements to be present before it can come into being. Gold is no more than the sum of its parts, and the primary substance of reality is material properties.

A Platonic answer would be that gold is one thing and its properties are something else. Gold (or "it") has to exist, before the properties of gold can exist. Logically (not chrono-logically), gold is seen as a spiritual and intangible substance which exists prior to its elements. Gold is more than the sum of its parts: the phrase "its parts (or properties)" implies an "it" existing prior to them, to which such properties have to belong. Intangible substance serves to tie the bundle of physical properties together and make gold an entity. Unlike Aristotle's formulas, this pure qualityless form can also exist independently of a physical configuration of properties. If the whole debate about the nature of primary reality (substance or form) is simply a verbal or linguistic problem, then a nominalist position on categories is being assumed. This explains the Platonic "it" as simply the name given to a collection of properties coexisting in place and time, creating *an illusion* of something that exists other than the object's properties (Hospers, 1990).

These dichotomous views on what constituted primary reality were reflected in the classical categories of the ancient Greeks. Where Plato spoke of universal forms, Aristotle spoke of universal essences. In Aristotelian philosophy, a thing's essence is given by specifying its defining properties - its "essential" as opposed to "accidental" properties. Thus what sets a triangle apart from a square is the former's essential property of three-sidedness. Concerning categories, Aristotle argued that what makes a man a man is a set of essential characteristics, which do not have a separate existence, but must always be instantiated or embodied in particular individuals.

Both philosophers held the view that categories are "discovered" through passive abstractions. They simply differ in their accounts on how that abstraction came about, because they began with differing assumptions about the origins of knowledge: either it is innate, or it is due to environmental conditioning. Aristotle (who was a mathematician) describes the discovery of a universal algorithm or formula which covers many of the same experiences and facilitates memory of them. Notice that Aristotle uses the phrase "the same thing" rather than "similar things", suggesting that what is abstracted is an algorithm based upon essences defining membership

> "As a result of seeing the same thing happen many times we would look for the universal and have a proof; the universal becomes clear from a number of particular instances." (Aristotle, *Posterior Analytics,* Chapter 31, Book 1)

For Plato, the abstract plan governing membership of a classical category was the absolute and eternal Form, there in its own right, and irrespective of mankind's existence. The mind could possess (remember) all things through its use of such plans or organizing principles. The knowledge of innate ideal forms (or general rules) could be applied to discover the category to which an object belonged, and of which it was an embodiment. This innate abstraction is clearly a more economical way of storing knowledge than an Aristotelian universal algorithm applied to specific experiences. However, because such a mind can remember only the organizing principle underlying the many exemplars, rather than any specific exemplar, many specific details of experience would be lost.

The classical theories of categorization put forward by the ancient Greeks do not allow for much flexibility in drawing inferences, because the assumption is that each object in the world has one, and only one, correct category to which it belongs. A Platonic mind allows for inferential processes to be at work

discovering ideal forms, but these are unchanging and eternal, and any instance must belong to its category and no other. Such a mind has little room for alternative points of view. Similarly, the Aristotelian mind would entail that processes be automatic, making no allowance for effects of context. Both accounts of mind are describing more or less inflexible processes of categorization for new members (Gardner, 1987; Lakoff, 1987).

To summarize the two worldviews, Aristotle was claiming that the physical environment alone determines our concepts, engraving experiences upon our minds as upon a blank slate. Plato's world had an extra level of intangible reality which consisted of perfect ideals, and these forms (of which mankind had an innate knowledge) determined how we categorize our tangible reality. The main area of agreement among the ancient Greeks was that an objective reality does exist irrespective of mankind's presence or absence from the world, and that only one "correct" or truthful reality is possible.

The role of experience in knowledge: passive or active minds?

The ancient Greeks had been concerned with the metaphysical problem of "what is". With the advent of the era of Enlightenment, philosophers became concerned with "our knowledge of what is" or epistemology (Gardner, 1987). These later philosophers began to question whether minds passively "discover" laws of nature: or do they take a more active role in interpreting or creating reality, so that knowledge might be constituted of many people's different realities. Both the Empiricists and the Rationalists seem to have had difficulty in letting-go of the belief in one ultimate Truth, but they disagreed on where it was to be found.

One area of the debate concerned the role of sensory experience of the world around us: are the senses the source of all error, or our only source of reliable knowledge (Gregory, 1987)? A related area concerned the ontological status of concepts and categories. The Rationalists started on the assumption that we are born with *a priori* concepts which determine how we categorize our experiences and generally understand the world around us. The Empiricists believed that the world's objects, their properties and relations which we experienced, would influence the concepts we induced from the world's naturally occurring categories (Hampton & Dubois, 1993).

For Rationalist philosophers such as Descartes, the mind possesses innate awareness of certain fundamental concepts (God, triangle, mind, body) and elementary propositions of logic (such as it is impossible for the same thing to be and not to be). It is this innate awareness that enables the mind to arrive at knowledge which exists *a priori*, independently of the senses. Descartes gave the body a negative role in the construction of knowledge, describing the inconstancies of sense-experience as the source of all human error. He attributed thought and creativity to the mind, whose self-awareness was the ultimate arbiter of truth. Plato's theory of innate ideas played a crucial role in the metaphysical systems of seventeenth century Rationalist philosophers (Gregory, 1987).

The Rationalists' views were challenged by a group of philosophers known as the British empiricists, who lived and wrote between the 1650's and the 1770's: John Locke, George Berkeley, and David Hume. Although very different in detail, the common theme of all empiricist philosophies is that observations are taken as the source of all knowledge, and sensory knowledge is taken to be unquestionably true in order to give a basis for certain knowledge, although empiricist philosophers seldom agree as to what knowledge is certain. Empiricist philosophers derived their theories from Aristotle.

Locke introduced the notion of ideas and their relation to objects in the external world. His term "idea" refers to various things, including sensations, memories and concepts. Echoing Aristotle, in his "*Essay concerning human understanding*", John Locke (1968) described a mind that at birth was akin to a blank page.

> " Whence has it all the materials of Reason and Knowledge? How then comes it to be furnished with that vast store which the busy and boundless fancy of man has painted on it? To this I answer in one word, from experience." (Locke 1968)

Locke firmly believed that ideas based upon reflection do not lead to *reliable* knowledge. This is where the Empiricist philosophers differed most from Descartes. Unlike Descartes who believed "I think, therefore I am", introspective reflection was not considered enough to *prove* the existence of a thing, or arrive at the truth of a proposition. Such testing and verification was only possible through sense experiences. Simple concepts were induced from the sensory experience of associating the different objects in the world.

The debate between the Empiricists and the Rationalists was resolved by Immanuel Kant (1724-1804) with his philosophy of "transcendental idealism" which was actually a synthesis of rationalism and empiricism. On the one hand, he condemns the aspirations of the Rationalists for a world of pure, *a priori* knowledge independent of the senses; whilst on the other hand, he rejects the Empiricist notion that knowledge is founded purely on sensory data (Gregory, 1987).

A major theme in his philosophy is the question of whether human knowledge can transcend the senses; and of whether and in what sense, *a priori* knowledge is possible. He resolved the drawbacks of both philosophies by introducing the notion of mental representations of knowledge to explain how we use both *a priori* knowledge and sensory information to understand experience. In his *Critique of Pure Reason* (1934), Kant argues that in order to understand the world, the mind is born armed with certain concepts. These concepts are derived from certain fundamental categories (such as the Category of substance and the Category of causality). The Categories are *a priori* in that they already exist, but our concept of them can only be brought to awareness by experience. Kant (1934) distinguishes two primary subjective sources of these concepts: the *sensibility* and the *understanding*, with imagination serving as the go-between. In general, we cannot characterize even a momentary perception except by giving it a label of some sort: we see what we see *asa* tree, or *asa* cat. Thus, we unite an instantaneous impression with past impressions (of the same object or of objects of the same kind).

Kant (1934) saw imaginat on as a necessary and transcendental mediator, and as the source of those very general *a priori* concepts (the Categories) which were used in experience to organize types of objects and events. It is the subjective source of those general principles of conceptualization (the Categories) which enable and require us to conceptualize our intuitions in such a fashion that order is imposed upon our world. Consequently, we perceive objects as existing in a law-governed world (Gregory, 1987).

To sum up the debate, the Rationalists believed that the mind exhibits innate powers of reasoning and that innate concepts help us to achieve insight and understanding of the world of sensory experience. The Empiricists believed that our concepts either reflect, or are constructed on the basis of, external sensory impressions and the associations between them. Kant's (1781) account of an active mind which imposed order upon external reality, and created stable

mental representations of it, through use of its innate categories seemed to have resolved the debate. It fell into disfavour, however, with the rise of the Behaviourists, who distrusted any argument based on unseen and individual mental processes. Their theories renewed enthusiasm for the notion of a passive mind whose conditioning by sensory experience explained many abnormal and learned behaviours. They, in turn, were challenged by the advent of the computer and artificial intelligence, so that cognitive processes and representations again became the area of interest (Gardner, 1987).

Ultimately, the origins of knowledge first debated by the Rationalists and Empiricists have far-reaching implications for what constitutes genuine knowledge about the world. Does meaning and knowledge lie within ourselves, or should we look to the outside world and nature for it? The positions taken up by the Rationalists and Empiricists on this question meant that they differed on the ontological status of concepts and categories, which of these came first and consequently was the source of genuine knowledge and meaning. The *a priori* innate concepts described by Descartes were used to interpret meaning from the chaos of external reality by organizing it into categories. The Empiricists saw concepts and their rules as being induced from, and governed by, the ontological categories of the outside world (Hampton & Dubois, 1993; Van Mechelen, de Boeck, Theuns & Degreef, 1993). Yet a third view of concepts and their categories would probably derive from Kant's notions of the imagination acting as a mediator between understanding (innate knowledge) and sensibility (sensory input from the outside world). This last view might be termed constructivist, insofar that people are said to actively construe their own mental representation of how they conceptualize external reality (Hampton & Dubois, 1993; Murphy, 1993a; 1993b).

APPENDIX C

ADDENDUM TO CHAPTER TWO

ROSCH'S EARLY STUDIES IN PROTOTYPE THEORY

The Prototype as an abstract composite

In 1973 and 1975a, Rosch conducted studies where subjects were presented with the names of everyday categories, each followed by a randomly ordered list of members. Their task was to rate each category member according to how good an example it might be of that category, using a 7-point scale. Large numbers of subjects were used for such studies so that the data would provide a standardised control or cultural norm. The results showed that some category members were considered to be more typical than others, and there was a high level of agreement between ratings for an item given by different subjects.

But it could be argued that the high level of subject agreement about ratings, rather than indicating genuine typicality effects, might simply signify that most subjects used the same heuristics during task performance. In addition, a mere goodness-of-example task cannot undermine classical theories of categorization, as it cannot be said to be measuring membership decisions directly. Consequently, for the 1973 study, Rosch also used a semantic categorization task, and was able to show that highly typical instances are categorized more readily than atypical instances.

In this study, subjects were given, on each trial, the name of a target category such as *Bird* followed by a test item such as *robin*. The task was to decide as quickly as possible whether or not the test item was a member of the target category. Results showed that more typical items elicited faster response times and fewer errors. Supporting studies by Rosch showed that typicality can affect the order in which category items are remembered. For instance, when subjects are asked to list all the members of a given category, they tend to produce items in order of their typicality.

The Prototype as an independent feature list

Rosch and Mervis (1975) asked their subjects to list the attributes they associated with members of particular categories. Their aim was for subjects to externalize the defining characteristics of a category. Subjects were given

randomly ordered lists of terms belonging to everyday common categories such as *Fruit*, ranging from highly typical items like *orange* to culturally atypical items like *coconut*. Their task was to list any attributes such as *sweet* or *juicy* which they associated with the term. Results showed that subjects listed more shared attributes for highly typical items than for atypical ones. The atypical items generated some attributes which were generated for atypical items of a contrast category. This was evidence that subjects were using the attributes to characterize the categories in terms of what they are most typically like, rather than to provide an "either-or" rule to determine category membership.

The study could be criticized on a number of points. Firstly, the task of attribute-listing may not capture knowledge of defining attributes, if such knowledge is implicit and the subject is unaware of using it during membership decisions. Secondly, Rosch's instructions did not encourage subjects to give defining attributes but rather asked for *any* attributes associated with the categories. Thirdly, the instructions biased responses towards perceptual features rather than those attributes (perhaps functional ones) shared by all members.

The Prototype as a specific exemplar instance

In her 1975b paper, "Cognitive reference points", Rosch suggested that the most typical instance of a category might act as an ideal-type anchor to which other instances are seen to relate. For example, it seems more natural to say "A zebra is virtually a horse", than vice versa. The second noun, then, might be referred to as the *reference point*. In this study, subjects placed pairs of word-stimuli into sentences consisting of linguistic "hedges" or terms referring to types of metaphorical distance such as "almost", "virtually", "roughly" and "loosely speaking". For example, "A_____ is virtually, almost, essentially, a _____." The stimuli consisted of words for colours, lines and numbers. Subjects were given pairs of stimuli and their task was to place them in the sentence frame, according to whichever sequence of words made the most sense, or seemed to be most true. Results showed the proposed reference point words being placed in the second (reference) slot in the sentence frame. Rosch suggested that this evidence of a specific exemplar acting as prototype might also apply to common semantic categories, such as *Furniture, Bird* and *Vehicle.*

Prototypes as bundles of correlated features in a natural hierarchy

The aim of the Rosch, Mervis, Gray, Johnson, and Boyes-Braem (1976) study, "Attribute listings for basic level categories", was to investigate the attributes which people list for categories at three different levels in conceptual hierarchies. One level (the intermediate level) is predicted to be the most inclusive level at which subjects list many attributes common to most category members, and few in common with contrast categories. The task was similar to that used in the Rosch and Mervis (1975) study, with subjects being presented with lists of category labels, and asked to list the attributes they associated with each. In this case, the category labels were divided into hierarchies, for example, the superordinate (*Fruit*), intermediate terms (*orange, apple*) and subordinates (*Navel orange, Seville orange*). In their study, the stimulus materials used as natural categories included man-made (that is, artifact) objects such as *musical instruments, tools, furniture, clothing*, and natural objects such as food, like *Fruit, Vegetables* and *Animals*. Results showed that, as predicted, subjects tended to list more attributes for the intermediate level of artifactual categories than at the other two levels. However, the hypothesis was not supported in the case of biological categories, because, in this case, the higher number of attributes listed occurred at the superordinate level (e.g., *Birds, Trees, Fish*).

APPENDIX D

Twelve levels of exemplar production frequencies per category in three different category-types, nine categories each (N = 100).

Category-Type: Natural Superordinate

Vegetable		Furniture		Musical Instruments	
1. Potato	90	Table	96	Piano	89
2. Carrot	85	Chair	93	Guitar	74
3. Pumpkin	71	Bed	90	Flute	69
4. Peas	66	Lounge	59	Drums	66
5. Broccoli	63	Desk	57	Violin	63
6. Bean	60	Cupboard	43	Trumpet	50
7. Cauliflower	44	Wardrobe	37	Clarinet	45
8. Zucchini	30	Bookcase	34	Cello	38
9. Cabbage	29	Stool	32	Saxophone	34
10. Onion	27	Cabinet	19	Harp	28
11.Tomato	26	Lamp	19	Organ	25
12.Lettuce	23	Chest	18	Trombone	23

Clothing		Utensils		Beverages	
1. Shirt	76	Knife	87	Coffee	85
2. Jumper	70	Spoon	76	Tea	82
3. Socks	70	Fork	74	Juice	69
4. Skirt	52	Frypan	40	Water	60
5. Jeans	52	Saucepan	33	Beer	55
6. Dress	50	Spatula	32	Wine	52
7. Shoes	47	Bowl	29	Milk	51
8. Jacket	44	Whisk	28	Spirits	42
9. Coat	44	Plate	22	Coke	35
10.Trousers	27	Collander	21	Lemonade	30
11.Shorts	26	Saucer	21	Cordial	27
12.Hat	25	Canopener	20	Liqueur	25

Weapons		Birds		Fish	
1. Gun	91	Magpie	63	Shark	61
2. Knife	90	Budgie	49	Trout	54
3. Rifle	51	Sparrow	48	Goldfish	52
4. Sword	46	Parrot	44	Bream	41
5. Bomb	42	Cockatoo	42	Flathead	40
6. Spear	36	Emu	31	Cod	40
7. Pistol	32	Galah	29	Salmon	38
8. Bow	29	Kookaburra	27	Tuna	31
9. Cannon	27	Finch	25	Barramundi	28
10. Grenade	24	Crow	23	Whiting	24
11. Missile	20	Canary	22	Perch	24
12. Axe	19	Hawk	21	Catfish	23

Category-Type: Property

Poisonous Things		Hot-on-tongue Things		Indistinct Sounds	
1. Spiders	84	Chillies	87	Whispers	53
2. Snakes	81	Curry	71	Voices	44
3. Arsenic	55	Pepper	70	Wind	39
4. Toadstools	55	Sauce	67	Rustling	38
5. Plants	41	Coffee	63	Mumbling	37
6. Chemicals	41	Tea	44	Murmuring	32
7. Cyanide	30	Spices	37	Traffic/cars	31
8. Drugs	25	Soup	36	Footsteps	28
9. Alcohol	25	Alcohol	28	Waves	25
10. Nicotine	23	Pepperoni	26	Static	24
11. Petrol	21	Onions	23	Music	19
12. Fish	21	Garlic	15	Humming	18

Grating Sounds		Red Things		Smelly Things	
1. Screams	45	Blood	47	Perfume	67
2. Chalk	43	Cars	45	Flowers	52
3. Fingernails	42	Apples	41	Food	52
4. Drills	40	Fire-engine	40	Roses	28
5. Music	35	Roses	35	People	24
6. Shrieks	31	Tomatoes	34	Pigs	21
7. Saw	23	Stoplight	27	Sweat	21
8. Machinery	22	Strawberry	25	Skunks	20
9. Voices	21	Sunset	22	Grass	20
10. Crying	20	Pens	21	Shoes	18
11. Violin	20	Clothes	19	Garlic	17
12. Alarm	19	Wine	18	Garbage	16

Comfortable Things		Disgusting Things		Things which make eyes water	
1. Bed	85	Crudity	37	Onions	87
2. Clothes	45	Vomit	34	Sadness	54
3. Pillow	43	Violence	34	Pain	38
4. Chair	43	Pornography	31	Smoke	37
5. Friends	39	Drunkeness	30	Laughter	35
6. Lounges	38	Dishonesty	25	Chilli	30
7. Slippers	35	Swearing	23	Wind	28
8. Hugs	30	Littering	22	Dust	27
9. Warmth	25	Dirt	21	Crying	25
10. Bath-tub	24	Murder	21	Chemicals	23
11. Jumper	21	Rape	21	Movies	17
12. Home	17	Mobsters	21	Colds	17

Category-Type: Ad Hoc

	What not to eat on a diet		Traits which will facilitate friendship		Things to take on a picnic	
1.	Chocolate	83	Honesty	54	Rug	74
2.	Cake	71	Trust	50	Hamper	57
3.	Ice-cream	52	Humour	47	Food	51
4.	Chips	50	Interests	46	Drinks	46
5.	Biscuits	48	Caring	34	Plates	40
6.	Lollies	43	Friendly	29	Friend	33
7.	Cream	42	Kind	26	Cutlery	28
8.	Butter	40	Open	26	Sunshine	27
9.	Sugar	38	Cheerful	26	Sandwiches	24
10.	Pies	26	Personality	23	Cups	23
11.	Fat	23	Sharing	21	Wine	20
12.	Bread	21	Empathy	19	Napkins	20

	Things which can be looked through		Things which can get you past barriers		Things to save from a burning home	
1.	Window	92	Keys	44	People	75
2.	Glass	67	Determination	38	Cash	62
3.	Spectacles	58	Passport	34	Jewellery	60
4.	Key-hole	45	Money	30	Pets	55
5.	Telescope	42	Knowledge	26	Photographs	46
6.	Plastic	39	Effort	25	Clothes	32
7.	Binoculars	37	Work	25	Books	29
8.	Doors	25	Strength	23	Documents	28
9.	Microscope	24	Force	22	Paintings	27
10.	Books	20	Power	21	Television	27
11.	Windscreen	18	Tank	19	Stereo	25
12.	Mirror	17	Contacts	19	Keycards	22

	Things to be walked upon		Entertainments for the week-end		Containers to be used for liquids	
1.	Carpet	70	Movies	58	Bottle	70
2.	Grass	69	Reading	50	Cup	63
3.	Roads	55	Visiting	49	Glass	60
4.	Foot-paths	53	Parties	37	Bowl	64
5.	Floor	49	Television	36	Jug	43
6.	Concrete	44	Sports	35	Body	30
7.	Earth	40	Picnics	34	Pool	21
8.	Ground	34	Restaurants	33	Thermos	20
9.	Sand	31	Walking	32	Mug	20
10.	Bridges	29	Sleeping	31	Sink	19
11.	Stairs	22	Drinking	29	Bath-tub	19
12.	Shoes	21	Videos	24	Jar	19

APPENDIX E

INSTRUCTIONS FOR TASKS, EXPERIMENT 2.

Order of Generation Task

In the following pages you will find category labels for fifteen categories. Under each category label there are twelve blank lines. Your task is to write twelve items representative of that category, in the order in which they occur to you.

Membership Decision Task

You will be presented with a CATEGORY name on this screen. You are to read it, and then press the '+' key. A word in lower case letters will appear, directly under the category name. Your task is to decide if the lower case word is an example of the category. If it is a valid example of the category, press the '+' key; if it is not, press the ' - ' key. The items will be presented in three blocks, each block consisting of a different category-type. The first items in each block are for practice.

Goodness-of-Example Task

In the following pages you will find lists of items, belonging to fifteen categories. Each category holds six representative items, randomly listed. Your task is to arrange each word according to how good an example it is of its category. You have to judge how typical is the word you have chosen of the category it represents. Rate each word along a scale going from 1 to 6, where 1 stands for 'best example' of the category, and 6 signifies the very 'poorest example'. The numbers in-between should be used to allocate gradations of each item's goodness as an example of its category. EACH RANKING CAN BE USED ONLY ONCE. Proceed as follows :-

(a) Make sure you know how to use the scale, using the key;

(b) Read the category name given below the key, and the six items listed as examples; and

(c) Beside each of the six, place a number from 1 to 6, which you think best expresses that word's goodness as an example of its category. Each number can be used only once.

Guide for Judgment Rankings: Most people would say that 'Church' is a good example of the category 'Buildings'; and better than, say, 'Telephone Box' which some people would classify as a less appropriate example. Yet telephone boxes are seen much more often than churches. This description serves to illustrate the fact that a category item which is familiar to you as in, for example, 'telephone box', will not necessarily be also a very typical example. Here is a guide on questions to ask yourself: 'How good an example is Blanket of the category Comfortable Things?'

Frequency-of-Instantiation Task

In the following pages you will find lists of items belonging to fifteen categories. Each category holds six representative items, randomly listed. Your task is to rate each item of the six according to how often it has occurred in that particular category. In other words, you have to estimate how often that particular item has occurred in that context in your experience.

You will rate each word along a scale ranging from 1 to 6, where 1 represents the item most often occurring in that category, and 6 represents the item least often found in that context. The numbers in-between should be used to represent gradations in occurrence of each word-category context. EACH NUMBER CAN BE USED ONLY ONCE. Proceed as follows:

(a) Make sure you know how to use the scale, using the key at the top of the page;

(b) Read the category-name below that, and the six items listed as instantiations of that category-context;

(c) Beside each of the six, place a number ranging from 1 to 6, which you think best expresses the relative frequency of occurrence of that item in that category-context, starting from 1 'most frequent' to 6 ' least frequent'. Each number can be used only once.

Guide for Judgment Rankings: Most people would say that 'Magpie' *occurs more often* than 'Robin' in the category 'Bird' but then they might say that 'Robin' is *a better example* of a bird. This serves to illustrate the point that each word's frequency should be judged according to how often, IN YOUR EXPERIENCE, it occurs specifically in that category-context. Here is a guide on questions to ask yourself: 'IN MY EXPERIENCE of the category Comfortable Things, how often has a Blanket occurred, and does it occur more often than Slippers?'

APPENDIX F

STATISTICAL TABLES 9 TO 14, EXPERIMENT 2.

Table 9: Natural Superordinate Category-Types, Idiosyncratic items
Results of multiple regression analyses for individual subjects, using order of generation as the criterion measure (dependent variable).

Subjs.	R^2	df	Frequency	Instant	Good Example		Ranks	
			T-stat	sr^2	T-stat	sr^2	T-stat	sr^2
2.	.607	3/20	3.074	0.186				
3.	.673	3/23	3.712	0.196				
4.	.207	3/24	2.167	0.155				
5.	.774	3/22			4.794	.236	2.521	.065
6.	.630	3/25			3.525	.184	3.223	.154
7.	.352	3/22	2.437	0.175				
8.	.499	3/26	3.597	0.249				
9.	.633	3/22	4.591	0.352				
10.	.387	3/23			2.337	.145		
11.	.408	3/26			3.065	.214		
12.	.337	3/21	2.154	0.146				
13.	.277	3/26	2.953	0.242				

Note: See Table 9.1 in Chapter Four for a summary of Table 9; Table 10.1 in Chapter Four for a summary of Table 10 here; and so on for all the tables contained in this Appendix.

Table 10 Natural Superordinate Category-Types, Normative items
Results of multiple regression analyses for individual subjects, using frequency of production as the criterion measure (dependent variable).

Subjs.	R^2	df	FrequencyInstant		GoodExample		Ranks	
			T-stat	sr^2	T-stat	sr^2	T-stat	sr^2
1.	.614	3/24	3.954	.251	3.572	.205		
2.	.827	3/23			4.213	.134	4.138	.129
3.	.559	3/21	2.127	.095	3.578	.269		
4.	.493	3/22			3.693	.314		
5.	.751	3/23			6.653	.920		
6.	.618	3/24			5.895	.553		
7.	.530	3/24	3.093	.187	3.485	.238		
8.	.815	3/23	2.210	.039	4.362	.153		
9.	.867	3/23	5.722	.189	3.049	.054		
10.	.320	3/24			3.137	.279		
11.	.329	3/26			3.554	.326		
12.	.834	3/24			10.564	.772		
13.	.592	3/21			4.146	.334		

Table 11: Property Category-Types, Idiosyncratic items
Results of multiple regression analyses for individual subjects, using order of generation as the criterion measure (dependent variable).

Subjs.	R^2	df	FrequencyInstant		GoodExample		Ranks	
			T-stat	sr^2	T-stat	sr^2	T-stat	sr^2
1.	.354	3/20	2.258	.165				
4.	.515	3/22					4.555	.457
5.	.189	3/25					2.928	.278
6.	.264	3/21					2.776	.270
8.	.458	3/22			2.172	.116		
9.	.203	3/22					2.323	.195
10.	.216	3/26	2.809	.237				
11.	.213	3/26					2.982	.269
12.	.408	3/26			2.137	.104	3.035	.209
13.	.389	3/26	3.291	.254	2.305	.125	2.297	.124

Table 12: Property Category-Types, Normative items
Results of multiple regression analyses for individual subjects, using production frequency as the criterion measure (dependent variable).

Subjs.	R^2	df	Frequency	Instant	Good Example		Ranks	
			T-stat	sr^2	T-stat	sr^2	T-stat	sr^2
1.	.518	3/22			2.969	.193	2.327	.119
2.	.230	3/25					2.114	.138
3.	.628	3/19					4.259	.355
4.	.294	3/23			3.233	.321		
5.	.465	3/21			4.097	.428		
7.	.511	3/22					5.233	.609
9.	.435	3/19			2.866	.244		
10.	.682	3/22			6.035	.526		
11.	.238	3/22			2.334	.189		
12.	.405	3/21	2.108	.126	3.278	.304		
13.	.671	3/23			5.371	.413	3.314	.157

Table 13: Ad Hoc Category-Types, Idiosyncratic items
Results of multiple regression analyses for individual subjects, using order of generation as the criterion measure (dependent variable).

Subjs.	R^2	df	Frequency	Instant	Good Example		Ranks	
			T-stat	sr^2	T-stat	sr^2	T-stat	sr^2
2.	.361	3/25			2.489	.160		
3.	.763	3/20			4.906	.285	3.822	.173
4.	.605	3/25	2.267	.081	4.202	.279		
5.	.831	3/20			10.288	.894		
6.	.536	3/24			3.396	.223	2.972	.171
7.	.236	3/22	2.234	.173				
8.	.251	3/24			3.363	.297		
10.	.400	3/22			3.851	.404		
11.	.108	3/25			2.405	.206		
12.	.279	3/21	2.345	.096	4.095	.292	4.461	.347
13.	.578	3/24	6.306	.414	2.104	.046	2.499	.065

Table 14: Ad Hoc Category-Types, Normative items
Results of multiple regression analyses for individual subjects, using production frequency as the criterion measure (dependent variable).

Subjs.	R^2	df	Frequency	Instant	Good Example		Ranks	
			T-stat	sr^2	T-stat	sr^2	T-stat	sr^2
1.	.345	3/23	3.378	.325				
2.	.478	3/23			2.996	.204		
3.	.785	3/20	4.321	.201				
4.	.563	3/24	3.877	.274				
5.	.488	3/21	2.449	.146	3.141	.241		
6.	.339	3/22			2.954	.262		
7.	.131	3/26			2.629	.231		
8.	.619	3/23	4.712	.368	2.618	.114		
9.	.568	3/21	2.430	.122	2.706	.151		
10.	.470	3/23			3.305	.252		
11.	.432	3/24			3.338	.264	2.158	.110
12.	.313	3/23			3.366	.338		
13.	.801	3/22			7.492	.508	2.430	.054

APPENDIX G

DESCRIPTION OF STORY CONDITIONS.

The general empirical question being asked in Experiment 3 concerns what underlies a change from concept X to concept Y in people's judgments of categorization, similarity and typicality.

The independent variable for experiment three consisted of fourteen stories, which were divided into two concept-types: seven were concerned with some artifact object and seven involved a living creature. Each control condition had six variations upon a basic theme. The theme was that of change: the original artifact object or living creature undergoes a transformation of some sort. For example, a washing machine has its operating principle altered so that it can operate only as a cement mixer; or a horse which collapses in the desert needs to develop the characteristics of a camel in order to survive. The question is whether the washing machine is still a washing machine after its function changes, or whether the horse is still a horse, after its internal organs change?

The stories vary as to the kind of alteration undergone by the artifact or creature, the explanations for its occurrence, and the situation. Each of the six variations corresponds to a different experimental condition which is meant to test a different model of category representation. The seven conditions consist of control and six variations. The examples below have titles (i.e., Clock to Toaster), but these were not included in the participants' actual booklets, as they might bias their judgments.

DESCRIPTION OF CONDITIONS AND EXAMPLES OF SEVEN ARTIFACT STORIES, EXPERIMENT THREE

Condition 1: Control Statement

Describes the function, essence (either the abstract principle underlying the operating mechanism or an internal biological feature) and lists the 3 physical features of X, one of which is the function-part.

> *Example:* Clock to Toaster
> The Troid's function is to keep time, and it operates according to a repeatability principle whereby an oscillating pendulum swings back and forth repeatedly. The Troid has a flat face on which are attached two arms.

Condition 2: Family Resemblance

Appearance change of the three physical properties is listed, making X more similar to Y. Each "old" property of X is described as changing to, or being replaced by, a "new" property of Y. Because Rosch and Mervis's (1975) feature theory (or family resemblance) treats properties as independent of each other, no relationships among the "new" properties are described.

> *Example*: Clock to Toaster
> The Troid's function is to keep time, and it operates according to a repeatability principle whereby an oscillating pendulum swings back and forth repeatedly. The Troid has a flat face on which are attached two arms.
>
> This particular Troid was owned by a housewife who discovered that it had been altered. It was fitted with an electric, automatic timer. Two slots for bread had been made. Everything was placed in a metal box.

Condition 3: Classical

A change is described in the defining criterial property, with no appearance change. This assesses the potency of core essential properties alone to induce a change in judgement. In this condition, the essential core of the artifact object is either some internal product (for example, heavy banging sounds) or the abstract principle on which its mechanism operates (e.g. electricity).

> *Example*: Clock to Toaster
> The Troid's function is to keep time, and it operates according to a repeatability principle whereby an oscillating pendulum swings back and forth repeatedly. The Troid has a flat face on which are attached two arms.
>
> This particular Troid was owned by a housewife who found its operation had changed from one based on a repeatability principle to an object operating on electricity and automaticity.

Condition 4: Function-part relations

This condition consists of a change of function part which results in a new function. It assesses the potency of a contingent relationship to induce a change in judgment. The core for this condition is the function and the physical feature is the function-part.

> *Example:* Clock to Toaster
> The Troid's function is to keep time, and it operates according to a repeatability principle whereby an oscillating pendulum swings back and forth repeatedly. The Troid has a flat face on which are attached two arms.

This particular Troid was owned by a housewife who discovered that the two arms had been replaced with two slots into which bread could be placed to cook.

Condition 5: Two-tier representation

The core for this condition is the function of the object, and there are two physical features: the function-part and one ordinary physical feature. The explanation is *implicit*: For artifacts, the owner's new need is stated, then a change in the two physical features is described, but not explicitly connected to the new need, then there is a statement about fulfilment of the new need by a change in function. The physical appearance change is described first, with the physical features in the appearance change being described as implicit contrast sets, or before-and-after pairs. Then the core change is described, and the core in this condition is assumed to involve purpose and function of the object.

This condition tests the hypothesis that categorization judgments can involve implicit inferences derived from a core representation, which is based on purpose and function information about the object. The artifact owner's needs, emotions or preferences lead him or her to change the object's function. It is an explanation-based model as these circumstances are considered sufficient for the reader to decide upon a change in the object's categorization. Schwartz (1979) considers artifacts to belong to nominal kinds because they do not share a common, hidden nature (see C6 below); just a common function.

Example: Clock to Toaster

The Troid's function is to keep time, and it operates according to a repeatability principle whereby an oscillating pendulum swings back and forth repeatedly. The Troid has a flat face on which are attached two arms.

This particular Troid was owned by a housewife, whose family liked to have a hearty breakfast, with all the trimmings.

One day, she decided to alter the Troid. First she removed the pendulum and fitted an electric, automatic timer in its place. Then she made two slots for bread in place of the two arms.

From that day forward, she used the Troid to cook some of the breakfast, and it seemed to her that it had never tasted so good.

Condition 6: Essential core plus prototype

This condition involves an appearance (prototype) plus core change, where the core change is seen as causing the appearance change. The structure of the story reflects the psychological essentialism approach (Medin & Ortony, 1989) which sees the core as "the person's theory of an internal essence" of the object upon which diagnostic category decisions are based, and its appearance as the physical, outward expression of that essence.

The core for this condition is the mechanistic essence, and there are two physical features which are the same as in C5 above: the function-part and one ordinary physical feature. The explanation is *explicit*: For artifacts, the operating mechanism becomes worn-out, so it is "explicitly" stated that certain physical features have to change, so that a new operating mechanism/abstract principle can take over. Briefly, the essence change is given first in the story, before the appearance change, as it is assumed that conceptual (or top-down) processing is involved. The physical features in the appearance change are described as implicit contrast sets, or before-and-after pairs.

This condition tests the hypothesis that categorization judgments involve both the core representation and appearance of an object, where a category's core is considered to involve the metaphysical nature of the object. More specifically, the reader's ideas (which could be naive or expert or culturally influenced) about such a metaphysical nature are what constitute the internal core.

It is an explanation-based model because the circumstances under which the transformation takes place are said to be an important factor in the reader's decision to change category. Here, the artifact is said to be old and the abstract principle on which it operated is no longer working.

Philosophers like Losonsky (1990) and Putnam (1989), but not Schwartz (1979), claim that artifacts in the same category do share a metaphysical or underlying nature. They suggest such nature might be the internal product of the object (for example, heavy banging sounds) or the abstract principle on which its mechanism operates (for example, electricity). Losonsky (1990) claims that artifacts are not members of the same kind simply because they perform the same function; but they derive their "nature", they are "animated" by the work they do, either to produce something else or for consumption.

Example: Clock to Toaster
The Troid's function is to keep time, and it operates according to a repeatability principle whereby an oscillating pendulum swings back and forth repeatedly. The Troid has a flat face on which are attached two arms.

This particular Troid was owned by a housewife who altered it because it was worn-out. It had been a present long ago. Now, for sentimental reasons, rather than throw it out, she would change its operation from one of repeatability to one of electric automaticity.

Consequently, she removed the pendulum and fitted an electric automatic timer in its place. The place of the two arms was taken by two slots for bread.

Condition 7: Ideal prototypes

This involves the control condition content followed by a change to Y as a result of the manufacturer's intention, which is governed by consumers' demand for an artifact with the three physical features of Y. This tests the force of subjects' beliefs such as the law of supply and demand. Can an object be sold as another object, as long as there is enough demand and the two objects are very similar? If subjects have a strong belief about demand, then needing the second object would be enough to enable the first object to be sold as that.

What is of interest is whether background information about market forces (for example, consumer demand) is enough to bring about a change in the categorization judgement, which would be entirely belief-based, as there is no change in the appearance of the object.

Example: Clock to Toaster
The Troid's function is to keep time, and it operates according to a repeatability principle whereby an oscillating pendulum swings back and forth repeatedly. The Troid has a flat face on which are attached two arms.

One particular brand of Troids was not selling well and there was a glut of them on the market. However, there was heavy consumer-demand for utensils with timer mechanisms, two slots for bread, all set in a metal box. The manufacturers decided their products could be marketed and used by consumers as such items.

DESCRIPTION OF CONDITIONS AND EXAMPLES OF SEVEN ANIMAL STORIES, EXPERIMENT THREE

Condition 1: Control statement

Describes the function, essence (either the abstract principle underlying the operating mechanism or an internal biological feature) and lists the 3 physical features of X, one of which is the function-part.

> *Example:* Swan to Bat
> The Tarp is a warm-blooded creature. It has snowy white feathers on its wings, and a graceful head. The Tarp likes to paddle in rivers and lakes with webbed feet.

Condition 2: Family resemblance

Appearance change of the three physical properties is listed, making X more similar to Y. Each "old" property of X is described as changing to, or being replaced by, a "new" property of Y. Because Rosch and Mervis's (1975) feature theory (or family resemblance) treats properties as independent of each other, no relationships among the "new" properties are described.

> *Example*: Swan to Bat
> The Tarp is a warm-blooded creature. It has snowy white feathers on its wings, and a graceful head. The Tarp likes to paddle in rivers and lakes with webbed feet.
>
> One day, a Tarp called Henty was caught in a trap. Some time later, Henty grew large flappy ears. His wing surfaces became rough and brown. His feet now resembled strong, clawlike fingers.

Condition 3: Classical

This condition involves a change in the defining property, with no appearance change. It assesses the potency of essential properties alone to induce a change in judgment. In this condition, the essential core of the animal is some internal biological feature (e.g. cold-bloodedness, internal gills, number of stomachs, type of brain, internal skeleton). In the case of the human animal, the essential feature chosen was the soul, as this contrasted best with the vampire's lack of soul (see story item one)

The main difficulty is knowing what constitutes the necessary and sufficient features, that is, the essential or defining property which determines categorization decisions. In this condition, the category-definition has been

assumed to be the internal essence of the natural kind. No explanation for the change is considered necessary.

> *Example*: Swan to Bat
> The Tarp is a warm-blooded creature. It has snowy white feathers on its wings, and a graceful head. The Tarp likes to paddle in rivers and lakes with webbed feet.
>
> One day, a Tarp called Henty was caught in a trap. Some time later, Henty became cold-blooded. His body temperature grew very cold and heat conservation became a problem.

Condition 4: Function-part contingent relations

There is a functional change, with appearance change. A change of function-part results in a new function, thus assessing the potency of a contingent relationship to induce change in judgment. The core for this condition is the function, and the physical feature is the function-part.

> *Example*: Swan to Bat
> The Tarp is a warm-blooded creature. It has snowy white feathers on its wings, and a graceful head. The Tarp likes to paddle in rivers and lakes with webbed feet.
>
> One day, a Tarp called Henty was caught in a trap. Some time later, his feet resembled strong clawlike fingers and he used these to hang from the branches of fruit-trees, or from the ceiling of dark caves.

Condition 5: Two-tier representation

The core for this condition is the function of the animal (its preferences, abilities, behaviour), and there are two physical features: the function-part and one ordinary physical feature. The explanation is *implicit*: For animals, a new situation arises, then a change in the two physical features is described, but not explicitly connected to the situation, then there is a statement about the consequences of the physical change, such as new abilities or preferences. Briefly, the physical appearance change is described first, with the physical features described implicit contrast sets, that is, before-and-after pairs. Next the core is changed, with the core in this condition assumed to involve the animal's functions, needs, intentions, or preferences.

This condition tests the hypothesis that categorization judgments can involve implicit inferences derived from a core representation, which is based on functional information about the animal and its behaviour: needs, abilities,

and/or intentions. Some event occurs which changes the animal's preferences, functions or abilities. It is an explanation-based model as the circumstances under which the transformation occurred are considered to influence the reader's decision.

Example: Swan to Bat
The Tarp is a warm-blooded creature. It has snowy white feathers on its wings, and a graceful head. The Tarp likes to paddle in rivers and lakes with webbed feet.

One day, a Tarp called Henty was caught in a trap set by a researcher who was carrying out experiments on animals. Some time later, the graceful line of Henty's head was spoilt when he grew large flappy ears. His once-webbed feet now resembled strong, clawlike fingers.

Gone was Henty's preference for paddling in rivers and lakes, his concerns now were with fruit-trees or inside dark caves.

Condition 6: Essential core plus prototype

This condition involves appearance (prototype) plus core change, where the core change is seen as causing the appearance change. The structure of the story reflects the psychological essentialism approach which sees the core as the "Essence" of the animal, such core being the basis for diagnostic category decisions, and appearance as the physical, outward expression of that essence.

The core for this condition is the biological essence, and there are two physical features which are the same as in C5 above: the function-part and 1 ordinary physical feature.The explanation is *explicit*: The animals are placed in a situation where an *explicit* statement is made about contagion, genetic engineering, inoculation, or hibernation. Whichever particular event is used in the story, the general outcome is that a new essence is caused to develop, and as a consequence, certain new physical features. For example, in the case of the human animal, a visit to a vampire results in blood-sucking, which results in loss of soul. Briefly, the essence change is given first in the story, before appearance change, as it is assumed that conceptual (or top-down) processing is involved. The physical features in the appearance change are described as implicit contrast sets, as before-and-after pairs.

This condition tests the hypothesis that categorization judgments involve both the core representation and appearance of an object, where a category's core