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ARISTOTELIAN CATEGORIES AND COGNITIVE DOMAINS

ABSTRACT. This paper puts together an ancient and a recent approach to classificatory language, thought, and ontology. It includes on the one hand an interpretation of Aristotle's ten categories, with remarks on his first category, called (or translated as) *substance* in the *Categories* or *What a thing is* in the *Topics*. On the other hand is the idea of domain-specific cognitive abilities urged in contemporary developmental psychology. Each family of ideas can be used to understand the other. Neither the metaphysical nor the psychological approach is intrinsically more fundamental; they complement each other. The paper incidentally clarifies distinct uses of the word "category" in different disciplines, and also attempts to make explicit several notions of "domain". It also examines Aristotle's most exotic and least discussed categories, *being-in-a-position* (e.g., sitting) and *having-(on)* (e.g., armour). Finally the paper suggests a tentative connection between Fred Sommers' theory of types and Aristotle's first category.

Domains, as they are called, play a major role in some recent theorising about cognitive skills. Domain-specific abilities and domain-specific knowledge have been of particular interest to developmental psychologists studying the ways in which infants and children acquire concepts. Sometimes there is more than a whiff of metaphysics in this work. One influential contributor writes that with every domain there is associated a way of construing the items in the domain and that "the fundamental modes of construal give us immediate intuitive feelings not only for how and why things are the way they are, but equally important, of what sorts of things there are; they yield our ontologies" (Keil 1994, 252).

This work may be understood in a way that makes remarkably good sense of Aristotle's categories. Conversely, one interpretation of Aristotle on categories provides a way to think about some recent and still evolving work on cognition. A structure of categories combined with an account of his first category (called "substance", or more strictly "secondary substance" in Categories and called "What a thing is" in *Topics*) is well suited to some recent cognitive science that addresses domain-specific classification. Another idea also found in Aristotle, and to which Aristotle gave no name, might be explicated by Fred Sommers' theory of types and/or categories. Sommers' theory may even tie in with Aristotle's first category (but not, otherwise, with what Aristotle called categories).

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I have no interest in viewing Aristotle as a precursor of recent theories about cognitive abilities. I certainly do not claim, as a point of classical scholarship, that the interpretation that comes to the fore here definitively represents Aristotle's own intentions. Likewise I mostly refer to one school of developmental cognitive psychology but do not mean to imply that it is better than its competitors, or will prove to be the most fruitful. The point is only that we do have two influential bodies of thought about interconnections between language, thinking, and the world; the structure of each of the two organisations of ideas illuminates the other in unexpected ways.

1. INTRODUCTION

1.1. *Not the Usual Philosophical Concerns*

Recent cognitive science is permeated by old philosophical themes, but I wish to avoid precisely the ones that have attracted attention, such as innateness, essence, and a priori knowledge. Innateness has had a long run for its money since Noam Chomsky's pioneering contributions. Essence has been popular among some developmental psychologists: it is argued for example that children in learning about different kinds of things act *as if* things of different kinds had essences – whether or not, as a matter of metaphysics, things do have essences (e.g., Gelman and Hirschfeld 1998).

As for a priori knowledge, it is seldom spoken of as such, but for example Karmiloff-Smith (1991, 174) writes of *domain-specific* "innately specified knowledge about persons, objects, space, cause-effect relations, number, language, and so forth". Innately specified knowledge about space and number are reminiscent of Kant's doctrine about arithmetic and geometry in the Transcendental Aesthetic of the *Critique of Pure Reason*. Innately specified knowledge about persons, objects, and cause-effect relations recalls the synthetic a priori knowledge of the Transcendental Analytic. Kant is seldom mentioned in this connection. It is easy to see why. Language is the only domain in Karmiloff–Smith's list that does not figure in Kant as a priori knowledge. Since innateness was restored to contemporary thought by Chomsky, language has been the paradigm for thought about innateness in cognitive psychology, and so Kant has not come readily to mind.

Not one of these philosophical concepts from recent psychology, not innateness, not essence, not the synthetic a priori, is my topic here. Instead I focus on categories.

1.2. *Rampant Ambiguity about Categories*

Categories certainly seem to appear in recent psychology. Here for example is a remark from a much reprinted essay that first appeared in *American Psychologist*: "I believe that questions about the nature of categories may be psychological questions as much as metaphysical questions" (Medin 1989, 1469). Yet this quotation is misleading in the present context, because what the psychologists call categories are not, in general, what Aristotle called categories. An incidental aim in what follows is to clarify some distinct scholarly or scientific uses of the very word, "category". I have no illusions that the usage I adopt in this paper will result in some future uniform usage. Gilbert Ryle began his famous 1938 paper on categories by saying that "the exploration of [categories and theories of types] is at present handicapped by certain vocabulary differences between philosophers, which hinder them from reading one another's work" (Ryle 1938, 189). Those words were published more than sixty years ago, but the situation has only got worse, especially since Ryle added to existing usage, and later psychologists and cognitive scientists, almost certainly influenced by Ryle, began to use the word "category" in their own way, related to common usage and to Ryle's usage, and yet different from both.

One use of the word is derived, in however altered a form, from Aristotle's little book *Categories*. A second has developed from Ryle himself. His idea was refined by Fred Sommers, who used two words, "type" and "category". That is convenient, for it enables us to reserve the word "category" for items in a list given by Aristotle himself, and to use the word "type" for the idea articulated by Sommers. Sommers' types may correspond not to Aristotle's categories but to another Aristotelian notion. A third usage of the word "category" is to be found in a good deal of recent cognitive science and developmental psychology: any class that is picked out by a word or phrase in common speech is called a category. If we are to invite metaphysicians and psychologists to sit at the same table, we must clear away these merely verbal impediments, the multiple usages of the word "category".

1.3. *Organisation of this Paper*

Few readers are at home in both cognitive science and Aristotle, so we shall have to explain both. That leads to a paper of some complexity, jumping back and forth between different fields of research. Hence a prospectus will be useful. This paper has eight parts to follow. Sections 2–5 are a continuous development. The synthesis between Aristotle and psychology is stated in Sections 5.4 and 5.5. Sections 6, 7, and 8 examine three distinct matters arising: the two oddest Aristotelian categories (an aside), Sommers' types

(a proposal), metaphysical or psychological? Section 9 is a summary of conventions and theses.

2. USES OF THE WORD "CATEGORY"

Philosophers traditionally use the term "category" far more narrowly than cognitive scientists and developmental psychologists. The *Cambridge Dictionary of Philosophy* defines as follows: "Category. An ultimate class. Categories are the highest genera of entities in the world" (Melland 1995, 108). Contrast psychologists of cognition, who, at their most liberal, use the word "category" to refer to virtually any class for which there is a common name ("lexical entry") in English.

2.1. *Philosophers' Categories*

Aristotle listed ten categories. Kant had twelve, which he claimed to be exhaustive. In common speech, categories may be classes, or types, or principles of classification, but they tend to be the most general classes relative to what one is talking about. *The Oxford Companion to Philosophy* gets the idea right. "*Categories*: The most fundamental divisions of some subject matter" (Lacy 1995, 125).

For an example of the usage thus commended by the *Companion*, when we are negotiating free trade, *apple* may be a relevant category, whereas *McIntosh* and *Granny Smith* are just kinds of apple. When we are discussing the food groups, *fruit* may be the relevant category, contrasting with the category of dairy products. In that context, apples and kiwi are kinds of fruit, but not categories in their own right. Likewise in one conversation, *laptop* may be a category, while *pc* and *Macintosh* are the two kinds of laptop; in another conversation *pc* may be a category, of which there are many kinds, perhaps sorted by manufacturer as Toshiba, IBM Thinkpad, etc.

Only fundamental classifications get called categories in traditional philosophy, and ordinary English has tended to follow suit, although as the *Oxford Companion* makes plain, "fundamental" is context-dependent. In some philosophical contexts it may be sensible to ask whether there is a set of fundamental classifications of absolutely everything, and, if the answer is "Yes", to ask how many there are. Ten? (Possibly Aristotle). Twelve? (Definitely Kant). Hundreds? Ryle (1954, 9) spoke of an "indefinite expansion" of Aristotle's ten interrogatives that characterise the ten categories. It may be sensible to ask whether there is a unique set of categories, and if so, as Kant asked, who decides? It may be sensible to ask

whether categories, uniquely characterised or not, are determined by how the world is, a relatively contingent matter, or whether they are determined by how any world must be, or at any rate, must be described (absolute and unconditional priority). It also makes sense to ask whether they are in some way part of our innate mental make-up (psychological priority), or whether they are acquired from experience, reflection, and communal living in the world, as was so powerfully urged by Hobbes and Locke. Nelson Goodman is the canonical modern opponent of both metaphysical and psychological priority. He disdained any talk of natural categories or kinds, and wrote simply of relevant kinds. He rejected what is implicit in the notion of a so-called natural kind, the idea that the kind has some absolute or psychological priority (Goodman 1978, 10).

2.2. *Psychologists' Categories*

Cognitive psychology, psychological linguistics, and similar disciplines have come to use the word "category" in a much more generous way than Aristotle or Kant. It has come to mean any class that has been distinguished by some people for some purpose, and to which a common name is assigned. This usage has become so entrenched that it is seldom explained. Medin's classic paper already quoted does sketch a definition:

> Roughly, a concept is an idea that includes all that is characteristically associated with it. A category is a partitioning or class to which some assertion or set of assertions might apply. (Medin 1989, 1469)[1]

There are some slight ambiguities in the description "class to which some assertion might apply". One trouble comes from the different ways in which we employ the word "class". Take for example terriers. Medin undoubtedly intended that *terrier* should count as a category. The assertion "terriers are short-legged dogs" might and indeed does apply. This is an assertion about terriers, and, if we like to speak in a high-falutin' way, we can say it is an assertion that applies to the class of terriers (as required by Medin's explanation). Contrast an assertion about the class of terriers, *qua* class, such as, "the class of terriers is a subset of the class of dogs". That is an assertion about the class, certainly, but if we allowed assertions like that to determine what is a category, then any class whatsoever would count as a category. Think of any arbitrary class, say the class that includes just four-year-old terriers and size 9 men's shoes in Utah. If I say that this is a subset of the class that includes just terriers and shoes in Utah, I've made a true assertion, but assuredly the arbitrary class is not what Medin means by a category.

To avoid ambiguities, I shall use the noun (or noun phrase), for example "terrier", or "bay leaf" as the name of what the psychologists call

the category. “Most bay leaves are aromatic” is an assertion that not only might but does apply to bay leaves. “Bay leaf” is thus a category, on my reading of Medin’s definition. It is not a category in the sense of Aristotle or Kant. What about ordinary English? To recall the *Oxford Companion*, is there any subject matter in which “bay leaf” could be one of the most fundamental divisions? It takes some ingenuity to construct one. We need some *less* fundamental divisions in order for *bay leaf* to be a *most* fundamental division. Cooks and botanists can probably think of several sorts of bay leaf if the subject of discussion is flavourings or leaves of evergreen non-coniferous trees. But in the common manner of speaking, *bay leaf* would not easily count as a category outside of such recondite culinary or botanical discussion.

On my reading of Medin’s account, thus far, all too many descriptive phrases would pick out categories. For example, “bay leaf freshly picked from a specimen in Kew gardens”. Certainly some assertions might apply. “They have been under the watchful eye of the Kew gardeners, fearful of the advance of the imported Bay Budworm”. But the categories used as examples by psychologists and cognitive scientists are usually picked out by a common name, such as “bay leaf” or “terrier”, and not by descriptions, such as “freshly picked bay leaf” or “indolent terrier”.

The quotation from Medin speaks of concepts as well as categories: “a *concept* is an idea that includes all that is characteristically associated with it”. Perhaps some of the things that are “characteristically associated” with bay leaves by off-duty philosophers and psychologists include: aromatic, sold in packages or bottles on spice stands, shiny, pointed and shaped like a laurel leaf, flexible when fresh, brittle when dry, suitable for flavouring soups but not strawberry shortcake, can be kept in a bottle to put insects to sleep, and if fed to cows they would produce indigestion. An idea that includes all these associations, and more, would be the concept of a bay leaf. So Medin might say that this idea of a bay leaf is the concept of a bay leaf.

Although concepts play little role in what follows, it is well to distinguish Medin’s usage from the way in which many analytic philosophers use the word “concept”. Their usage is idiosyncratic English, patterned on Frege’s German word *Begriff*. Hence analytic philosophers talk of what falls under a concept (something we do not say in standard English). A Fregean *Begriff*, or concept, is usually thought of as an almost Platonistic abstract object. It is quite distinct from what Frege called the *associated idea*, the idea that an individual associates with a word (Frege [1892]/1952, 59). Medin’s concepts lie half way between what Frege called a *Begriff* and

what Frege called an associated idea. They are something more than ideas in the mind of a single individual, but something less than Platonistic.

2.3. *Kinds*

The word "kind", later used in the philosophical jargon-phrase "natural kind", became a philosophical term of art only in 1840, when William Whewell published his *Philosophy of the Inductive Sciences*. In Book VIII, Ch. I, where he created this technical usage of the word "kind", he wrote that the condition for the use of a term denoting a kind "*is the possibility of general, intelligible, consistent assertions*" about items of that kind (Whewell 1840, I, 473, his emphasis). That is remarkably close in meaning to Medin's account of a category as a "partitioning or class to which some assertion or set of assertions might apply".

John Stuart Mill cemented Whewell's usage of "kind" in 1843, in his *System of Logic*, but he wrote not of natural kinds but of "Real kinds" with a capital *R* (Mill [1843]1973, Bk. 1, Ch. 7). I do not find the exact phrase "natural kind" before John Venn (1866, 247).[2] Mill, Venn, and those who followed in their footsteps, including Russell (1948, 461) and Quine (1969), were in their various ways nominalists who wanted to distinguish arbitrary classes from the classes that we find useful in scientific life, the natural kinds. Incidentally, all those philosophers opposed essences, and would have had little enthusiasm for Kripke (1980), one of the two the most famous recent works on natural kinds. The other most famous work, Putnam (1975), which on reflection turns out to be essence-free, but which is otherwise similar to Kripke, would have posed no problems for the tradition of natural kinds.

2.4. *Not Made by Definition*

Whewell, who gave us "kind" as a term of technical philosophy, is by modern lights pretty good on kinds. Medin and many other present-day students of classification refer to what they call the classical view "that all instances of a category have some fundamental characteristics in common". It is often thought that Wittgenstein was the first to demolish this idea. For example, the theoretical linguist George Lakoff, who uses the word "category" as the psychologists do, writes that:

> from the time of Aristotle to the later work of Wittgenstein, categories [i.e., kinds] were thought to be well understood and unproblematic .... Things were assumed to be in the same category [i.e., of the same kind] if and only if they had certain properties in common. And the properties they had in common were taken as defining the category. (Lakoff 1986, 6)

"One glaring problem with the classical view", writes Medin, "is that even experts cannot come up with defining features" (1989, 1470). Smith and Medin (1981, 22–60) devoted a long chapter to refuting the "classical" view. Whewell would have agreed with them, as did many other authors long before the birth of Ludwig Wittgenstein. Baker and Hacker (1980, 320) mention, in addition, Nietzsche, John Stuart Mill, and William James as precursors of the idea. Whewell himself was at least as sceptical about definition by necessary and sufficient conditions as Lakoff or Medin, but he was more succinct. "Anyone can make true assertions about dogs, but who", he scathingly asked in a section headed *Not Made by Definitions*, "can define a dog?" (1840, I, 475). Lakoff was off the mark when he wrote that "the first major crack in the classical theory is generally acknowledged to have been noticed by Wittgenstein".

Whewell was plain that by kinds he meant classes picked out by lexical entries: "Kinds are such classes as are indicated by common names" (p. 469).[3] Nowadays this is a useful qualification. Whewell had not been introduced to logician's tricks, such as disjunctive kinds (terriers-or-shoes) or philosophical conundrums (grue), and so he had no theory on how to exclude them. A present-day Whewell would have to deal with such difficulties. In what follows, I shall use Whewell's word "kind" where psychologists use the word "category". This is entirely a matter of convenient convention; it is not the "correct" use of the word "kind", even if it does give first-users the owners' rights. I shall restrict the word "category" to the more Aristotelian notion of high-level divisions within some subject matter. I apologise to the psychologists for preferring the philosophical tradition. I do so in order to return to Aristotle. Only "category" will do there; so I need another word for what psychologists call categories. The usage, established over a century and a half ago, of "kind" will do. It does not commit me to any current philosophical theory about so-called natural kinds.

3. ARISTOTELIAN CATEGORIES

The body of scholarship on the text named *Categories* (but not, it seems, so named by Aristotle) is sumptuous. That itself is remarkable since the book was quite possibly intended as a mere primer, preparing students in an informal way to begin work on *Topics*. It has been argued that the distinctions made in *Categories* are peculiar to the grammar of ancient Greek, and hence not relevant to other languages, or any more universal logic or metaphysics (Benveniste 1966).[4] Nevertheless Aristotle's words

got us going on categories and still set the parameters for many debates. So here goes.

3.1. *The Two Primary Texts*

When Aristotle first discussed categories (Categories 4:1$^{a/b}$) he spoke as if there are exactly, or at least, ten of them. Or rather he wrote that "Of things said without any combination, each signifies" one of ten items. The standard English version, due to J. L. Ackrill (1963, 5) translates these as: substance, quantity, qualification, a relative, where, when, being-in-a-position, having, doing, being-affected. Ackrill notes that the word "substance" is the usual translation, although the Greek word is a nominal form of the verb "to be", so that "being" or "entity" might be more apt. As we shall see, one English translation of the name for the first category in the corresponding list in the *Topics* is simply "what a thing is".

Why do we call this list a list of ten categories? Not because the book was first named *Categories* – this "title seems to gain the upper hand" among various ways of referring to the book "near the end of the second century A.D." (Frede 1987, 18). The name results from the fact that *Topics* I.9 calls the items in much the same list (the only other explicit list of ten) "the classes of predicates". In *Topics* the first of these is named "what a thing is", which I shall write as *What-it-is*. In the Oxford Translation by Pickard-Cambridge (1927) we have: What a thing is, Quantity, Quality, Relation, Place, Time, Position, State, Activity, Passivity. It is not at all obvious that the first entry in *Categories*, namely "substance", is the same as the first entry in *Topics*, namely "what a thing is". The situation with the other nine is different; the entries in the two lists may reasonably be held to be identical.

3.2. *Substance: What a Thing is*

The first item listed in the *Categories* is usually translated as "substance". Aristotle gives man and horse as examples. In the next chapter he speaks of "that which is called a substance most strictly, primarily and most of all . . . e.g., the individual man or the individual horse". The species in which such individuals fall "are called *secondary substances*, as also are the genera of these species" so that . . . "both man and animal – are called secondary substances". Assuming that chapters 4 and 5 are composed by the same hand at much the same time, then the first item in the *Categories* would, strictly, be secondary substance, and examples would be animal, man, and horse.

Michael Frede (1987, 39–42) has provided powerful reasons, based on detailed textual analysis, for holding that the first category should not be

thought of as substance in the sense of the book called *Metaphysics*. Certainly the *Topics* list seems to have a more inclusive first category, namely what a thing is, than the *Categories*. In *Topics* I.9, shortly after listing the categories, Aristotle writes,

> the man who signifies what something is, signifies sometimes a substance, sometimes a quality, sometimes one of the other types of predicate. For when a man is set before him, and he says that what is set there is a man or an animal, he states what it is and signifies a substance, but when a white colour is set before him and he says that what is set there is white or a colour, he states what it is and signifies a quality. Likewise, also, if a magnitude of a cubit be set before him and he says that what is set there is a cubit or a magnitude, he will be describing what it is and signifying a quantity. (103^b28–34)

It looks as if the first category in the *Topics* is logically different from that in the *Categories*. I do not mean that the two lists are inconsistent. I mean only that in the case of the *Topics*, examples of the first item may be associated with ("signify") other items in the list of categories. White is an example of what a thing is, and signifies quality or qualification, the third category. On the other hand, man is also an example of what a thing is, and signifies substance, which is not another category listed in the *Topics*.

There is ample room for scholarly debate in reconciling the two first categories. Did Aristotle change his mind about the first category? Or should we regard *Categories* as a mere sketch for beginners, with *Topics* as a more thorough exposition of the same ideas. Henceforth, when I speak of *Aristotelian categories* I shall mean the list of ten given in *Topics*, but using the examples given in either *Categories* or *Topics*. The first category, for short, will be written *What-it-is*. However, this is often terribly cumbersome. So I shall follow common usage, and, when brevity or grace demands it, I shall also use the word "substance" to refer to What-it-is. Whenever I so use it, I shall also have "What-it-is" nearby, usually in the same paragraph, as a reminder that "substance" is just a short way of referring to the What-it-is. I never use it to refer to substance as explained in *Metaphysics*.

3.3. *List with Examples*

Here then are the categories with Aristotle's examples, using What-it-is as the name of the first, and otherwise using the names translated from *Categories*:

What-it-is: man, horse, animal, (other examples from the *Topics* are quality, colour, white, magnitude, cubit)
quantity: four-foot, five-foot
qualification; white, grammatical
relative: double, half, larger
where: in the Lyceum, in the market place
when: yesterday, last-year
being-in-a-position: is-lying, is-sitting
having: has-shoes-on, has-armour-on
doing: cutting, burning
being-affected: being-cut, being-burnt

"Man" of course denotes person or human being. "The labels Aristotle uses for his ten categories are grammatically heterogeneous. The examples he proceeds to give are also heterogeneous" (Ackrill 1963, 78). Yes indeed. Some examples we can clear up. "Grammatical" itself is meant in the sense in which it applies to a person. Indeed the standard French translation renders the word as "grammairien", which unequivocally applies to people (Tricot 1997, 6). We have to go to *Nichomachean Ethics* ($1105^{a}23$) for a full explanation. "It is possible to produce something grammatical by chance or by following someone else's instructions. To be a grammarian, then, we must produce something grammatical and produce it in the way in which the grammarian produces it, i.e., expressing grammatical knowledge that is in us". To deserve Aristotle's predicate "grammatical", a person must not only speak grammatically, but also know that and even why some utterances are grammatical while others are not.

When is not so easy to sort out. In English, answers to the question "When?" tend to be adverbial or to apply to events. They do not apply to men, such as Socrates. We readily say that Socrates was in the Lyceum, but not that Socrates was in 431, even if we can quickly guess what would be meant by saying he was in or at 431, although he never made it through to 430 B.C.E. Our resistance to talking that way may be due to English tense structure, which reflects the fact that Socrates was to some extent free to move about in space, but had no choice about what time he was at or in. That admirably parochial regimentation, first-order logic, allows "in" as a relation that may relate Socrates and the Lyceum, but not as a relation that may relate Socrates and 431. Other formalisms fit better with Aristotle's meaning. Science fictions in which people move about in time have no trouble with the thought that the half-alien Goizal is in 2361, after having been projected from 2290. *When* and *where* could easily come to seem more symmetric than modern European languages and the logic derived from them make out. Socrates was in the Lyceum (When? High

noon, midsummer's day, 441). Socrates was at high noon, midsummer's day, 441 (Where? In the Lyceum). Nevertheless, we may take the example of the category, *when*, as an example of how Aristotelian category structure may be sensitive to specific languages – without going anywhere near the language-dependent pronouncements of Benveniste.

Aristotle's examples in the category of relatives is also difficult for us, in English, who are heirs to a comparatively recent logic of relations. Aristotle countenances free-standing relatives such as *half* and *larger* although in his discussion of relatives, he is very clear that someone who knows that something is half or larger, knows what it is half of or larger than. It may be even harder for us to make this move in the case of quantity (size), to free-standing *four-foot*.

Whether it is because he first settled on man and horse as examples of What-it-is, or for other reasons, Aristotle's own examples make us think immediately of what can be said about a person such as Socrates. As an exercise we should vary his examples, thinking of another person, Joan of Arc, say. Among the distinct questions about her are: What? A woman. How big? Four-feet (tall). How? Ungrammatical (in Latin). Relative: smaller (than her followers). Where? In Rouen. When? 1431. In what posture? Upright. Having what (on)? A sack (over her head). Doing what? Praying. Being-affected how? Being burnt (at the stake).

3.4. *What is Being Listed?*

Terence Irwin (1988, 498, n. 5) remarks that Simplicius, in his Neoplatonist commentary on *Categories* written in the 530s, gave the four basic types of answers to that question: words, things (beings), thoughts, or words insofar as they signify things. Ackrill translates so that the list of categories is a list of different types of being, viz. things signified by what is "said without any combination". Even if that is what the categories are, there will be parallel lists, for example, one of the categories themselves, namely different types of being, and one of words, or words insofar as they signify beings (names for each fundamental type of being). There will also, as Ackrill and many others mention, be a parallel list of questions, "What is it?" "How big?" (viz. quantity). "Where?" "In what posture?" etc.[5] Even if we settle on one of Simplicius' four possible answers, as to what the categories is a list *of*, we are still a bit in the dark. What was the point of Aristotle's list?

3.5. *The Minimalist Reading*

One suggestion about what Aristotle was up to when he first introduced the categories makes easy sense to start with, even though it falls short of

complete explication. Aristotle's first point (argues Gillespie [1925]/1979, citing numerous German predecessors) was to defeat tricky arguments that started with the premise that a person cannot both be the same, and yet two things at once. Yes, goes the retort, a person can be several different "things" at once, but things from different categories. This is not just a logical point, an easy triumph over tricksters. You can defend a list of different kinds of answers only if you argue that in some principled way they are different in character. That is an invitation to ontology (cf. Irwin, 1988 501, n. 13).

3.6. *What is it? What-it-is*

Quite aside from the point of the list, there is a further question. Is the first category on a par with the other categories, or, as many texts suggest, is it in some way prior to the rest? Don't you have to know what Joan of Arc is, namely a person, or a woman, or a saint, before you can start asking where, let alone, in what posture? We can understand "What is it?" as a first question which, when answered, tells which other categories are germane. We could imagine Aristotle not as having given a list of ten categories, with examples of each. On the contrary, he might be suggesting a categorical inquiry, that is, a sequence of questions. First question, What is it? Answer, man, or horse. Having settled on *person* (or *horse*), other basically different types of question naturally arise, including those posed by the other nine categories. Let us say that each fundamental sort of answer T to the question, "What is it?", generates a set of categories. Predicates that fall into any of the categories generated by T make sense when predicated of something that is T. For example "horse" is an answer to "What is it?" that generates, among others, the categories "qualification" and "having-on". In turn it makes sense to predicate "white" and "has armour on" of something that is a horse. On this view, What-it-is is a truly first category, the one that determines which other categories (and hence which other predicates) are applicable.[6]

A sort of flow chart would be:

> What is it? $\rightarrow$ T = What-it-is $\rightarrow$ A set of categories $\rightarrow$ A set of sets of predicates

Every predicate in any of the relevant categories can apply to a thing that is T.

Each of the ten categories implies a set of predicates. Thus What-it-is is a category under which fall various kinds of basic answer to the question, "What is it?" *Living thing, animal, man, horse, plant, artefact, shirt, automobile, virtue*, even the universal, *whiteness*. Here I follow Frede, who

insisted that What-it-is is far more general than anything we commonly regard as substance. If the answer to "What is it?" is a secondary substance, as with Aristotle's initial examples, either "a man" or "a horse", then all of the other nine categories are relevant. Under the category of place fall various answers to "Where?" such as "in the Lyceum" and "in the market place". Under the category of being-in-a-position, or posture, fall various kinds of posture, sitting, lying-down, upright. But perhaps we should say, posture appropriate to people. Had we answered the "What is it?" question not with "a man" or "a horse", but with "a fish", there might still be a category of posture (goldfish have a feeding posture) but sitting would not be germane, as no fish is either sitting or not-sitting. And if the answer to "What is it?" is "virtue" or "a virtue" (such as courage) then the category of posture does not arise at all. In fact none of the nine subsidiary categories seems to apply.

Notice that even when we think of familiar (secondary) substances, possible answers to "What is it?" may be arranged in a taxonomic way from more general to more particular. *Living thing* is more general than either of *animal* or *plant*. Animal is more general than either of *human* or *horse*. Hence there may be different, consistent, answers to one question "What is it?" asked of some specified "it": for example, "a living creature", "an animal", and "a human being" are all true answers to the question, "What is Joan of Arc?" There is an obvious circularity here, which I hope is not vicious. How do we secure that "Joan of Arc" names the maid of Orléans, if we have not specified that the name names an animal, a person, a woman, a saint, or some such?

3.7. *Nine Categories as Co-Ordinates*

One regularly hears that categories are mutually exclusive (and some readers argue that Aristotle thought that his list of ten was exhaustive). Yes, but be careful. We may think of the categories as picking out mutually exclusive classes of predicates, so that (arguably) no predicate falls under more than one category. But predicates in one category by no means exclude predicates from other categories. *Having-armour-on* does not exclude *sitting*. We listed ten attributes of Joan of Arc, each from a different category. Thus a kind from each of the ten categories may truly apply to the same individual. Indeed on the minimalist reading urged by Gillespie (3.5 above), that was precisely Aristotle's point. A thing can have many distinct types of attribute at one and the same time.

We may draw an analogy between categories and orthogonal geometrical co-ordinates. In a specific context, where is Joan of Arc located in the category of time? (1431, such and such a day, and time of day). Where is

she located in the category of posture? (upright). Time and posture are like the x-axis and the y-axis, and Joan has a co-ordinate on each. The analogy with a geometrical system does not quite work, because in the category of having, she has a sack (over her head), and she has bare feet (no boots on). Presumably in the category of quantity (size) she has four-feet (tall) and 26 inches (around the waist). Nevertheless this much remains of the analogy: each category, corresponding to a different type of question, also corresponds to a way in which something definite may be asserted. Each of the co-ordinates indicates one of "the kinds of information that can be expressed predictatively" (Loux 1997, 8). The category of What-it-is can thus be made to look like a family of co-ordinate systems. Each answer to "What is it?" determines the co-ordinates along which an item may be placed.

From this vantage point, the first category is fundamentally different from the other nine categories. What-it-is, an answer to "What is it?" determines what kinds of things may be said about "it".

3.8. *Kant*

In addition to Aristotle's categories we have kinds, which psychologists call categories. Towards the end of this paper we shall examine the types that Sommers sometimes indifferently referred to as "types or categories". There are more piers on the categorical waterfront than that. Immanuel Kant docked at yet another jetty. He had twelve categories. There is a great tradition, primarily argued in German, of squaring the intentions of Aristotle and Kant, but I am going to leave Kant on one side. He was fully aware of the problem of proliferating categories. He called Aristotle's list "that ancient rhapsody that proceeded without any principle" (*Prologomena* §39). His own twelve categories look very different from Aristotle's. He himself thought his arrangement of 12 categories was based on principles. My excuse for staying away from Kant is that the categories that are importantly connected with the cognitive domains of present-day psychology are more Aristotelian than Kantian.

We can nonetheless see that Kant may have been making a right move. Suppose we think of Aristotle's categories as associated with disjoint sorts of question, each one answered in a fundamentally different way, along a different co-ordinate. A question determines a class of possible answers. Possible answers are possible judgements. Let us then consider the most general possible types of judgements that can be made, and contemplate the conditions under which it is possible for them to be judgements. Even if we doubt the details of Kant's table of judgements, taken from his vision of logic, his strategy may be fundamentally right, as has been argued, for

example, by Jonathan Bennett (1966, §25), who says that he got the idea from Ryle's (1938). Kant took his table of twelve categories to be a table of concepts (*Begriffe*) of pure understanding. One way to understand his project is to take his categories as indicating indispensable abilities that must be exercised if any judgements are to be made at all.

4. COGNITIVE DOMAINS AND DOMAIN-SPECIFIC KNOWLEDGE

4.1. *Modules*

The idea of cognitive modules has been much talked about in theories of cognition. They originate with Chomsky's conjecture that language competencies are modular. Thus for example we can represent aspects of syntax and semantics by distinct devices which fit together to form a language processor, rather in the way in which the pre-fabricated modules of a modular house fit together to form a house. Chomsky (1980) was both realist and innatist about certain linguistic modules. He was realist, holding that these devices are psychologically real and not mere formal representations of abilities, and physiologically realist in the conjecture that correctly limned modules correspond to neurological structures. He was innatist, holding that such real modules can emerge in humans only if these fundamental neurological characteristics are inherited.

These ideas rapidly transferred to other branches of psychology. David Marr (1982) and others argued that human and animal perception result from the use of a number of distinct built-in abilities. These may mature at different times in the development of an organism. Their functioning is hierarchically structured, so that some perceptual modules may be subsidiary to others. Fodor (1983) generalised the modularity idea, proposing that there are many distinct modules for different cognitive abilities. But he was still cautious. He did not want to extend the notions of modules to the whole range of more intellectual operations of the mind. That would, he suggested, be "modularity gone mad" (1987, 27).

There are two distinct issues here. How far should we extend the modularity idea? And, when we conjecture that there is such and such a cognitive module, to what are we committing ourselves? There are at least two grades of commitment (Montgomery 1998 distinguishes three). Low commitment implies that modularity is a useful way in which to model, or represent to ourselves, perceptual competence and achievement. There is no outright assertion of physiological reality of modules. High commitment is the expectation that different modules will be identified with distinct physiological processes in the brain, so that ultimately mod-

ules will be studied as part of neurophysiology. With the lower grade of commitment, inquiry is psychological. With the higher grade, it strives for neurology. In a great deal of neurological writing, the idea of modules in the brain connected with psychological function is deemed to be self-evident. For an example taken almost at random, Young and Piggott write under the title, "Neurobiological Basis of Consciousness". Rejecting the picture of what they call a "Cartesian theater" for what they call "cognitive awareness", they write that "a more plausible model involves a network of numerous interconnected modular processors across vast regions of the cerebral cortex" (Young and Piggott 1999, 156).

4.2. *Domain Specificity*

Several groups of cognitive and developmental psychologists have moved modularity beyond perception and into the conceptual realm. I have already mentioned Karmiloff-Smith's (1991, 174) reference to *domain-specific* "innately specified knowledge about persons, objects, space, cause-effect relations, number, language, and so forth". That looks like quite as heterogeneous a list as Aristotle's list of categories! She titled her paper "Beyond Modularity" but we could equally think of these domains not as "beyond" modules but as being processed by cognitive modules. Hirshfeld and Gelman's *Mapping the Mind: Domain Specificity in Cognition and Culture* (1994) is a representative collection of papers about domain specificity by anthropologists, cognitive scientists, ethologists, and developmental psychologists. The project is to "map the mind". The implication is that this enterprise is parallel to the more recognised, nay institutionalised, enterprise of mapping the brain. But the contributors to this set of collected papers vary a great deal in their level of neurological commitment. All support the ideal that we shall sometime connect psychology and neurology, but not all think that specific mechanisms proposed have psychological, let alone neurological, reality. In the case of some domains there is at least the open question implied by the subtitle, *Cognition and Culture*, which in turn is reminiscent of the old duet of nature and nurture.

4.3. *Innateness*

The ancestry of the domain-specific research programme in cognitive developmental psychology is curious. On the one side is Chomsky, but on the other is Piaget. That would once have seemed impossible. Some twenty-five years ago there was a head-on meeting to discuss the contributions which each of these great innovators could make to cognitive psychology (Piattelli-Palmerini 1980). Many participants came away with the feeling

that the two research ideas had nothing in common. But as modularity ideas took hold, it became increasingly clear that Piaget and his students could be seen as studying different domains of knowledge and ability – space, number and all the rest. The Geneva school, then, was investigating the appearance and rate of maturation of each type of skill. On the other hand it was entirely appropriate to regard the potential for developing each specific ability as part of an innate endowment. We are to some extent reminded of Locke and Leibniz, with Piaget (despite his Kantian leanings) playing the part of Locke, and Chomsky the part of Leibniz.

Leibniz marked a distinction between an idea being innate and present in actuality, and an idea being innate but merely potential. He said that his concern was with an innate disposition to manifest an idea and the knowledge appropriate to that idea. He gave the analogy of a sculptor looking at a block of raw marble, a better analogy than Locke's blank slate. The grain of the marble encourages hewing some shapes from it, and discourages others. For a more physiological analogy to the brain, one can turn to his picture of structures – he calls them folds –"representing items of innate knowledge" in what we might now call a neurological "membrane" that receives perceptions (Leibniz [1765]/1981, 144). I have to add that although the "innateness" of the Enlightenment rationalists was an important rallying cry for Chomsky's school, the concept needs more precision than Leibniz gave to it. Paul Griffiths has discussed the question of innateness of types of expressions of human emotions, but his analysis readily extends to human cognitive abilities (Griffiths 1997, 55–64). It is useful to use his distinctions to separate the claim that an ability is innate, from the claim that there is an evolutionary explanation of that ability, and from the claim that the ability is a human universal, a claim that must in turn be broken down according to whether it is, as Griffiths puts it, monomorphic or polymorphic. In the case of language, human beings have linguistic abilities, but they are polymorphic, since we speak different languages; if there really are deep grammatical structures characteristic of and shared by all human languages, then those structures and the ability to use them is monomorphic. Note that Leibniz's sculpture analogy suggests polymorphism, not monomorphism, of knowledge and ideas.

This is not the occasion to examine innateness. It is fair to say that most cognitive psychologists who work in the tradition of domain-specific knowledge take for granted that some knowledge that is specific to some domains is innate (where "innate" may be given further explanation) while other knowledge, although widespread or universal, may require a cultural account. For example Hirschfeld (1995), writing about classification of human beings by race, holds that humans have an innate propensity to

sort their fellows into what Hirschfeld calls "human kinds" such as races. He argues experimentally that these kinds are, psychologically, treated by children as essential, necessary, attributes of the people to whom they apply. However he suggests that culture probably determines which race-like "human kinds" will develop in a child. In Griffiths' terminology, the race concepts investigated by Hirschfeld must be polymorphic.

For a quite different aspect of "innateness", one of the leading workers in the field, Susan Carey (1985), has long argued that maturation in a domain is not simply a matter of switching a device on after it has lain idle through so many months or years of infancy or childhood. Not only is there what she calls "conceptual change" in childhood, but also conceptual revolutions may be destined to occur in the course of development – a deliberate addition of the revolution-model of Thomas Kuhn to the brew of Chomsky and Piaget. None of these variations on the innateness theme is material to the remainder of this paper.

4.4. *Domains*

The root meaning of the word is "A territory over which rule or control is exercised" (*American Heritage Dictionary*). What do psychologists and their colleagues mean by a domain? The idea of domain-specific knowledge implies knowledge specific to a domain. Objects, space, language, number, and so on might be examples of domains. This usage conforms pretty well to entry 3 for the word "domain" in the *Shorter Oxford Dictionary*, "a sphere of thought or operation; the situations where a particular science, law, etc. is applicable". Science and law are a little highbrow, but they usefully remind us how the metaphor works: the laws need not be laws enacted by a legislature, exercised over a terrain (a chunk of land and its people). They may be laws of nature, about which science and technology provide information and through which scientists and engineers exercise control.

A developmental psychologist writing about knowledge is likely to be interested in something less polished than sciences, or laws. She may mean something more like what Ryle called knowing-how, at least for some domains, rather than the knowing-that which characterises sciences and laws. We can easily modify the Dictionary definition to allow for this: *A domain is a sphere of thought or operation; the class of situations where a particular sort of knowledge or ability is applicable*. For example, abilities to think about, or interact with, or relate to, or calculate with, or simply use, persons, objects, . . . language, . . . numbers. The idea is that such abilities, knowings-how as well as knowings-that, are specific to their domains.

Thus far a domain is, well, a domain. But I shall have to call it, for the nonce, a 0-domain. Why? Because "the notion of domain varies considerably across researchers"(Keil 1990, 139). The word "domain" has come to be used in a number of ways, in one of which it is not far off from "module" itself. In their introduction to the collection of papers just mentioned, Lawrence Hirschfeld and Susan Gelman offer what they call "a fairly uncontroversial characterisation" of domains.

> A domain is a body of knowledge that identifies and interprets a class of phenomena assumed to share certain properties and to be of a general type. A domain functions as a stable response to a set of recurring and complex problems faced by the organism. This response involves difficult-to-access perceptual, encoding, retrieval, and inferential processes dedicated to that solution. (Hirschfeld and Gelman 1994, 21)

The "class of phenomena" mentioned seems to be pretty much a 0-domain, as just explained – a class of phenomena about numbers, objects, or whatever. But then the authors appear to define a domain as a "body of knowledge" *about* a 0-domain, rather than the 0-domain itself. Hence we may recognise a second possible use of the word "domain" as meaning a body of knowledge about a 0-domain, where of course the knowledge need not be theoretical knowing-that, but practical knowing-how. Call this a 1-domain. Some such 1-domains might be innate while others might be culturally inculcated (viz. learned or acquired) as is implied by the subtitle, *Domain Specificity in Cognition and Culture*.

That is not the end of the matter. The second sentence of the above definition shows that Hirschfeld and Gelman may not have been intending to define a 1-domain, because they say that a domain "functions as a stable response ...." It makes no literal sense to say that a body of knowledge functions as a stable response. We may be better served if we attend to what they say domains are for, or do. Here I shall extract from their useful summary, distilled from the writings of psychologists whom they identify as "domain researchers". Domains, they write:

> 4.4.1 Act "as guides to partitioning the world". "Domains function conceptually to identify phenomena belonging to a single general kind, even when these phenomena fall under several concepts".
> 4.4.2 Provide "explanatory frames". "Domain competence systematically links recognised kinds to restricted classes of properties".
> 4.4.3 Are "functional and widely distributed devices". "Even if a domain skill is unevenly distributed within a population, it must be a solution to a repeatedly encountered problem".
> 4.4.4 Are "dedicated mechanisms". "Domain operations generally involve focused, constrained, and involuntary perceptual, conceptual, or inferential processes". (Hirschfeld and Gelman 1994, 21–3, original italics)

In addition, the authors go on to mention various items that domain researchers would be loath to count as domains, and give as an example

"strictly motoric competencies such as riding a bicycle". A motoric competency is presumably a skill or ability, so that some skills could be domains too, although the ability to ride a bike does not count as a domain.[7] Yet in 4.4.1–4.4.4 we are told that domains are "devices" or "mechanisms" which "can act as guides". Knowledge, abilities, skills, competencies, devices, mechanisms, guides: these are different sorts of things, but we can accommodate them all in a simple scheme.

Knowledge bearing on a 0-domain will be called a 1-domain, as above. A set of abilities or skills "dedicated" to a 0-domain will be called a 2-domain. One of these abilities is the competence that systematically links recognised kinds to restricted classes of properties". What about domains as mechanisms or devices? As remarked in Section 4.1 above there are at least two grades of commitment. We can think of a device in a functionalist way, as a model of something that would perform certain tasks or achieve certain goals. Or we can think of it in a literal way, as a flesh-and-blood neurological structure that in fact performs the described tasks. A device, mechanism, or processor thought of in a functional way will be called a 3-domain. It provides a model of how the knowledge (1-domain) and "domain skills" (2-domain) can be brought into play, for example, "to identify phenomena belonging to a single general kind" – where the single general kind of phenomena constitutes a domain (a 0-domain). The operations of this device will involve "perceptual, conceptual, or inferential processes". When it is conjectured that in the brain there is a process, mechanism, or structure corresponding to such a model, it will be called a 4-domain. To recapitulate, we find in this introductory article a number of different ideas, which I distinguish by numerical prefixes:

> 0-domain: a sphere of thought or operation; the class of situations where a particular sort of knowledge or ability is applicable.
> 1-domain: knowledge about a 0-domain.
> 2-domain: the skills or abilities dedicated to a 0-domain, and displayed in the knowing-how or knowing-that of the corresponding 1-domain.
> 3-domain: a device or mechanism that enables one to exercise these skills or abilities. The device may be taken in a functional rather than literal way, as a model that would account for these skills or abilities.
> 4-domain: a neurological module modelled by such a device.

There is a certain inevitable circularity here, because 0-domains are partially explained in terms of abilities or knowledge, while a 1-domain of knowledge is explained in terms of the 0-domain that it is knowledge of,

and a 2-domain of abilities is explained in terms of the 0-domain to which the ability is dedicated. Cognitive scientists often like to ascend, then, to the device or mechanism which may seem to define 0, the sphere, and 1, the knowledge, and 2, the skill. But since the device is only a model of abilities, or knowledge, or spheres that have been independently identified, this escape from circularity may well be spurious. My own preference would be to backtrack, and speak only of domains, that is to say, of 0-domains, and to speak of knowledge, abilities, models, and neurological mechanisms in turn. But we see from Hirschfeld and Gelman's already classic exposition of the domain idea that such a proposal would seem sheer antiquarianism to some workers in the field.

4.5. *Metonymy*

At first it looks as if there are many metaphorical uses of the word "domain", all somehow stemming from the original meaning, "a territory over which rule or control is exercised". The relation among *n*-domains is, however, not one of metaphor but of metonymy. Metonymy is the trope in which an attribute of a thing is used for the thing itself, when the name of a part is used for the name of the whole, or, by analogy, when one word or phrase is used for another with which it is closely associated. A standard example of metonymy is the use of "Washington" to refer to the government of the United States. How is "domain" used metonymously? One of the primary dictionary meanings of "domain" is what I have called a 0-domain. The word "domain" is then (1) used for knowledge of a domain. Then (2) for an ability or skill peculiarly appropriate to a domain. Then (3) for a device that models that ability, and (4) for something material in the brain that in fact functions according to the specifications of that device.

Keil rightly observed that "the notion of domain varies considerably across researchers". I suggest that the variation is less great than appears. It is not that researchers have different notions of a domain. On the contrary, their notions reflect metonymous variations on the core notion of a 0-domain. The core notion does not appear to be at all technical. A 0-domain is a domain in pretty much the ordinary English use of the word.

5. CLASSIFICATORY DOMAINS

5.1. *Learning words*

After this long excursus on the domain idea, we turn to a specific application. It is already suggested in Hirschfeld and Gelman's 4.4.1 above, "partitioning the world" and 4.4.2, "linking recognised kinds to restricted classes of properties". Their discussion was already, if only implicitly, directed at classification. Studies of classification have always lain at the intersection of philosophy and psychology. When Locke discussed the origin of ideas, was he writing as philosopher or psychologist? Hume held that his doctrine of the association of ideas was his greatest contribution to the republic of letters. Is it philosophy or psychology? In the nineteenth century German writers referred to the British empiricists as the British psychologists. Once psychology became the name of an experimental discipline, it could count Hume and Locke among its honorary predecessors.

Developmental psychologists commonly assert that the traditional empiricist philosopher-psychologists took for granted that there was an all-purpose processor – a mechanism or device, a universal 3-domain ranging over a 0-domain of all experience – with which human beings noticed similarities and were able to begin to form concepts, by abstraction. In later life, reason and reflection enable us to develop new concepts. This story offers a simple way to understand what Locke was up to. It provides a tidy contrast with a domain-specific point of view, in which right from the start infants have a number of distinct processors (3-domains) appropriate for different fields of experience (0- domains). Moreover, whatever Locke intended, Quine really did seem to start with an all-purpose property selector, and so represents the "traditional" view.

5.2. *Quine on similarity*

The most influential twentieth-century brief contribution to the philosophy of classification is Quine's (1969) paper "Natural Kinds". Its opening pages can be construed as formulating, or an any rate inviting, a conjecture in empirical psychology. After some introductory reflections on Goodman's new riddle of induction, Quine proposed that we are born with an innate "quality space". There is a metric over this space determining which points in the space are nearer to or further from each other. The points represent experiences of qualities such as an experience of yellow. Experiences of qualities may be called qualia. Nearness constitutes resemblance among qualia. We group together experiences of qualities that are near each other in the quality space, and give them a name, such as "yellow". In

domain terminology, Quine suggested a single innate device or 3-domain. The unique quality space, with its measure of resemblance between points in the space, is in effect a device that ranges over a 0-domain (qualia), and which accounts for our ability to acquire and use some names for qualities.

Quine proposed that evolutionary selection formed the initial quality space which in turn gave us a few "intuitive kinds" such as *yellow*. After that, Quine told an elaborate and very interesting story about how we, individually and as a species, form notions of other and more sophisticated kinds. Although his paper is titled "Natural Kinds", the adjective "natural" disappears after the fourth page. Quine, in the spirit of Goodman, was really discussing relevant kinds. In Quine's paper we have a superb articulation of precisely the "traditional" all-purpose processor view that contrasts with the idea of innate domain-specificity.

Keil (1981) treated Quine's proposal as a testable conjecture. Is there an all-purpose similarity relation, which is adequate for a human infant to begin to sort? One great merit of Quine's paper was that it put the initial universal similarity relation up front, as a central doctrine. Keil enjoyed calling this conjectured relation Original Sim. In the light of his experimental studies, he argued that the hypothesis does not account for the phenomena of concept acquisition by infants and children. There must be specialised systems that are used in the formation of different concepts in different domains. This has become a central thesis of those branches of cognitive science that concern themselves with classification.

5.3. *Classificatory Domains*

I have been using the open-ended list of cognitive domains given by Karmiloff-Smith: "persons, objects, space, cause-effect relations, number, language, and so forth". These should be thought of as 0-domains. According to the modular hypothesis, there will be one or more modules or devices (3-domains) that serve at least as functional models of skills and abilities (2-domains) used in understanding and using the items in a 0-domain, and which may involve innate knowledge (1-domain) concerning those items. That is excessively general – but perhaps that is all right, since the idea of domain-specific knowledge is very general. We now restrict ourselves to a particular type of knowledge manifested in our ability to classify, and to speak intelligibly about what is classified. In Whewell's terminology this knowledge is none other than the ability to sort things into "kinds" and to make "general, intelligible, and consistent assertions" about items of different kinds.

We classify *and* say things about what is classified. This "and" is not "and then". Occasionally when we have acquired a language we first pick

out or define a number of classes and then investigate them. But in general, and especially when working our way into our first language, we do not first come to recognise different kinds of items and then begin to talk about what we have sorted. To classify is to know at least in a rough and ready way what can sensibly be said about items from different classes. In the language that some psychologists and philosophers have adapted from Nelson Goodman (1954), to classify is to know how to project the classification. My own way of stating what we learned from Goodman's "new riddle of induction" – for it was in that context that he coined his neologism "projectible" – is that "to use a name for any kind is (among other things) to be willing to make generalisations and form expectations about individuals of that kind" (Hacking 1994, 193).

Let us address an enormous inchoate group of stuff, anything that can be sorted. Quine postulated an innate similarity space that would get us into a position of being able to distinguish different kinds of things within this group. For him there was an implicit emphasis on "things", but let us be as imaginative as Aristotle, and allow this inchoate group to include *anything* worthy of sorting, virtues as well as potted plants, traits of character as well as fistfuls of dollars. Within the inchoate group there are, to use the domain language, different 0-domains, the domain of living creatures, perhaps, or the domain of virtues, perhaps. One important type of knowledge that we have of such domains is, what can sensibly be said about items in those domains.

Let us call such 0-domains classificatory domains. To know that women (such as Joan of Arc) can be courageous and spiritual, while bacteria, magenta (the colour) and courage (the trait) cannot, may be expressed as domain-specific knowledge-that, but should better be thought of as knowledge-how: knowledge of how to use the ideas and our names for them. The domain-specific ability to do so is a 2-domain. A domain-specific device or processor that provides a functional model of this skill is a 3-domain. It may be that some of these domains are better thought of as cultural, while others are better thought of as innate. The conjecture that some are innate will prompt a conjecture about the existence of a 4-domain of neurological modules that make it possible for infants so quickly and almost unerringly to distinguish living creatures from soft-toy bunnies, plastic GI-Joes, and metallic tricycles.

5.4. *Synthesis: Aristotle Meets Cognitive Science*

Finally we can put our apparatus together. Recall our doctrine of categories and substances (What-it-is): Every substance generates a set of categories. How are distinct classificatory domains to be distinguished? That is now

easy. *Each substance (in the sense of What-it-is) characterises a classificatory domain.* Notice how this fits into the terminology of Hirschfeld and Gelman 5.4.1: "Domains function conceptually to identify phenomena belonging to a single general kind". That general kind is the What-it-is.

One important thing to know about a classificatory domain is what it makes sense to say about items in the domain. We postulated that each substance, each What-it-is, is associated with a set of categories. We should think of a substance/category structure. *Each classificatory domain is characterised by a substance/category structure.* Recall Hirschfeld and Gelman 4.4.2: "Domain competence systematically links recognised kinds to restricted classes of properties". That is, substances determine a set of categories. The "restricted classes of properties" are precisely the categories (in the sense of Aristotle) generated by the substance, the What-it-is that characterises the domain.

5.5. *Modes of Construal*

Frank Keil has added a helpful metaphor that enriches these ideas. He discussed "modes of construal" that go along with domains. These, he wrote, give us "immediate intuitive feelings not only for how and why things are the way they are, but equally important, of what sorts of things there are" (Keil 1994, 252). A philosopher will be glad to leave talk of intuitive feelings to psychologists, but we are now able to say what is intuitively felt. A substance, a What-it-is with its set of categories can well be thought of as a mode of construal. When we construe an indeterminate something as a substance, a What-it-is, we construe it in such a way that predicates from appropriate categories can intelligibly be predicated of it. It is not surprising that if we can do this, we have an "intuitive feeling" about how and why it is as it is, and, that we should have an intuitive feeling about what sorts of things there are.

This concludes the basic set of analogies that connects Aristotelian categories, substance in the sense of What-it-is, domains, domain-specific knowledge, domain-specific abilities, and, finally, modes of construal.

6. THE TWO ODDEST ARISTOTELIAN CATEGORIES (AN ASIDE)

There is a danger to such panoramic conclusions. Viewing the grand adjacent forests, we lose sight of the undergrowth. Let us return to one nagging question about Aristotle's list of categories. What are we to make of the odd categories (7) and (8), being-in-a-position, and having(-on)? Few Aristotelian scholars make a return visit to this anomalous pair.

6.1. *Ketches and Toyotas*

Although *Categories* discusses many of Aristotle's ten categories in some detail, it does not help us with either (7) or (8). It is a widespread scholarly opinion that the ten categories are intended as fundamental or ultimate. For all ten, Aristotle's examples are of predicates that apply to people. The secondary literature is rather unimaginative in providing non-human illustrations for categories (7) and (8), but we can improve on that. Being-in-a-position is clearly not position in the sense of place – category (5) – for it is internal to the subject, a relation between the subject's body parts.[8] That is why many scholars call it posture. When we say that a pine tree is bent, as by the wind, are we predicating of the tree something in the category of "being-in-a-position"? What of a half-open pocket-knife? What if a ketch is heeling in the wind? Are those beings-in-a-position? If the ketch is jury-rigged is "having jury-rigging" in the category of having, predicated of the ketch? My Toyota is now in third gear, is that an instance of its being-in-a-position? The car has airbags in something like the way that Achilles going into battle has armour on; does that instantiate the category of having? No scholar has advanced this sort of example, but the various "options" offered by a car salesman (airbags, radial tyres, CD sound system, etc.) might be various kinds of havings that your basic Toyota can have.

6.2. *People and Horses*

Well, that is one attempt to generalise categories (7) and (8) beyond the human. There is precious little direct textual evidence for such liberality. Without making any historical claims about what Aristotle intended, I shall stick to the examples explicitly given, and take being-in-a-position to involve the posture of humans and similar creatures, and having(-on) to refer to having what will loosely be called apparel on or about one. Notice that Aristotle is consistent in his examples. We have two examples of What-it-is, namely man and horse. Horses, like men, can have shoes on, and they can have armour on. They may, like men, stand, lie down, or sit. Had we chosen body-parts ("kidney") or virtues ("goodness") as examples of What-it-is, posture and apparel would not have appeared among the categories. On our view, this looks fairly straightforward. The answer to the "What is it?" question matches a list of categories, and the list will vary from answer to answer. The answers may make problems, nevertheless. Does a kidney in dialysis, attached to a kidney machine, have-on the machine? What about a kidney in a steak-and-kidney pie?

We should note that Aristotle's examples for posture, namely standing, sitting, or lying down, can verily serve as instances of a human universal.

The sculptor Henry Moore wrote that "There are three fundamental poses of the human figure. One is standing, the other seated and the third is lying down". Moore went on to say that human bones are stronger than stone, so you cannot make a standing statue; the Greeks solved this problem by having standing figures propped against "silly trees" or, later, by draping them in clothing. It is perhaps characteristic of Aristotle's thinking that his list of examples of categories all apply not only to men and horses, but also, metonymously, to statues of men and horses. We can imagine Aristotle lecturing in the Lyceum, pointing to a statue to illustrate his point.

I have no intention of arguing that Aristotle's list of categories should be thought of as definitive. I am sure that it isn't. But that does not entitle us to dismiss his list, or to ignore its more florid members. I have valiantly attempted to have predicates from categories (7) and (8) apply not only to people, but also to ketches, Toyotas, pine trees, and pocket-knives. Scholars advise us to be generous like that, although their offerings seem more timid than my own. Let us, however, think in the opposite direction, and take Aristotle at his word, or at least at his examples, since his words are so sparse. Suppose he did intend apparel and posture, that is human raiment and internal bodily position, to be categories, just like that. These do not look in the least fundamental.

The psychologist who has followed me this far will have a particular repugnance to these two cases. The categories, I suggested, were part of the mode of construal of items in a domain. The domain-specificity research programme has quite a strong bias towards innate abilities, designed on the modular plan. Can the psychologist make anything out of the idea that we inherit the makings of a posture-module or apparel-module?

6.3. *Amateur Infant Psychology*

A mere kibitzer and grandfather of babies can make something out of this idea. I have been noticing how quickly infants in our culture learn words for both posture and apparel. Crass empiricists (like myself) are not surprised. In cool climes and prudish times like the present, dressing and undressing babies take up a lot of parental energy. The parent talks about clothing all the while when so doing, and the child mimics. Clothing makes for difference, baby is cute with a ribbon; phew! baby needs changing. Having-on is a surprisingly central category for the young, when you come to notice it. Likewise we much enthuse when baby can stand up, walk, sit in a high chair, on the potty, and so forth. Young parents talk about the being-in-a-position of their offspring all the time, praising, despairing, or boasting.

Cognitive psychology, so far as I know, has not addressed clothing or posture, but perhaps the imprimatur of Aristotle will lend some cachet to this topic. Clothing has been relegated in part because psychology has been surprisingly fixated by middle-aged philosophy, and in particular by the nineteenth-century doctrine of natural kinds, combined with its geriatric opposite, the scholastic theory of essences. (I say opposite because the doctrine of natural kinds originally became entrenched as a way of evading essences.) Psychologists have tended to accept the background picture of a world that comes in natural kinds. Evolutionary psychology adds that we have adapted to stay alive in the world, therefore we have evolved modules for dealing with natural kinds. Each module is accompanied by central knowledge or learning strategies suitable for its 0-domain of natural kinds. Posture and clothing appear extraneous to such a metaphysics. Are they?

6.4. *Posture and Apparel Domain-Specificity*

I do not want seriously to conjecture that human beings have an innate clothing or body-position module, but, in a slight spirit of provocative irony, let us pause to contemplate the possibility. Aristotle was not thinking of clothing itself as one of his ten categories, but, to repeat his examples, predicates such as is-sitting and having-armour-on. Would it make plausible sense to look for an innate being-clothed module? There would hardly have been time, it will be said, for it to evolve. What if we dressed before we talked, both to keep warm or out-of-the-sun, and to cover our private parts? If there was enough time to evolve language modules, there was plenty of time to evolve a clothing module too.

What about is-sitting? Some postures seem less culturally ordained than dress. Is-lying, is-standing, and is-sitting (Aristotle's examples) seem, as Henry Moore taught, to come naturally to the human body, although the ways in which a person sits or lies are matters of local custom. Perhaps those who believe in modules should not be too fazed by the thought of a posture module having evolved. Standing upright has been offered as the first evolutionary move towards humanity. (Or was it swimming in a certain caring way, as some feminist theoreticians have speculated?)

We do notice that in many of the drawings used by psychologists for studying children's discriminations and inductions, clothing plays a surprisingly large role. Dress is a silent actor that is seldom mentioned. In picture books and cartoons, people as well as many other humanoid creatures are commonly distinguished by posture and apparel (although in the reading-aloud of bedtime stories, and in TV cartoons, voice is also of great importance). Maybe Aristotle was on to something. Maybe posture

and how-clad are psychologically important categories, not so far removed from cognitive domains as first appears.

7. SOMMERS' TYPES (A PROPOSAL)

This segment of the paper is tentative. It is about certain core features of a theory advanced by the philosopher Fred Sommers, and taken up the developmental psychologist Frank Keil. Although they present it as a theory of categories, it is not a theory of Aristotelian categories. Yet it has connections with Aristotle, for it is perhaps a theory of Aristotle's first category in the *Topics*, What-it-is. But as I said, this segment of the paper is conditional. *If* the apparatus of Sommers and Keil can be put in satisfactory order, then it would bear a valuable relation to not to Aristotle's categories, but to his first category. This conditional is of sufficient interest and novelty that it is worth exploring, but since the antecedent of the conditional may be false – the Sommersian theory might not serve us well, in the end – I must also insist that previous segments of the paper do not depend upon the present one.

7.1. *Ryle's Categories*

Once we have got to apparel and posture, it sounds as if we can go on producing categories at will. Why stop at ten? Even the schoolmen asked why the predicables should not count as lesser categories. Or as we might say today, if to every category corresponds a question, won't any question do? What state of mind was Joan of Arc in? (scared). What was her spiritual state? (blessed). What was she thinking about? (salvation).

This issue became critical in recent times with Ryle's "Categories" (1938), adumbrated in and made common knowledge in *The Concept of Mind* (1949). Ryle proposed a test for whether two words are from the same or different categories. He used it to recognise and explain the fundamental philosophical mistake of co-predicating two terms from different categories. The test relied on a not quite specified sense of absurdity. If it was absurd to say of W that it was X, but made sense to say it was Y, then X and Y must be of different categories. Increasingly many words appeared to be from different categories. With a sufficiently generous sense of absurdity, it came to look as if the list of categories would run rampant. This point was made by Strawson (1970).

Ryle was not talking about Aristotelian categories. Learned in Greek though he was, his model was not Aristotle but Bertrand Russell. Russell loomed large in 1938, to an extent that philosophers now tend to forget.

Without attempting to explain the logical conundrums, we should recall the debates that had been going on when Ryle entered philosophy. Russell's types, devised as a solution to the logical antinomies, are rigorously exclusive. It does not make sense, in Russell's system, to apply predicates of different logical types to the same entity. But then there was the ramified theory of types. Next there was an axiom of reducibility, needed to crank the machinery of *Principia Mathematica* into action, generating a predicative function which would do the work higher mathematics required of functions that broke type restrictions. Then Ramsey asserted that this apparatus became redundant when one thought only of functions-in-extension. Ramification collapsed. With these problems in mind, it is hardly surprising that when Ryle thought of categories he modelled them on types, and assumed they were mutually exclusive all the way down. But if categories had to be mutually exclusive, then, with a generous test for absurdity, Rylean categories seemed to proliferate without end. Fred Sommers (1959, 1963, 1965) devised a theory that cut down on this proliferation, and proposed a systematic structure for what was left.

Unfortunately philosophers have found much to criticise in Sommers' theory. The first wave of criticisms, presented up to 1970, seems devastating enough to many readers. These difficulties, especially those of Nelson (1964) and de Sousa (1966) were succinctly summarised and annotated by Jonathan Bennett (1967, 1971). I nevertheless believe that a core of Sommers' theory might be stated in ways that meet most of the objections. I shall argue that on another occasion. Here I shall see what would result *if* the theory were roughly correct in these essentials. This is not essential to my account of Aristotelian categories or cognitive domains, but Sommers' theory would fit so tidily *if* it were roughly correct, that it is worth the excursion to explain its fundamentals.

Sommers applied his theory to many philosophical issues: the Cartesian distinction between mind and body (correct, according to Sommers), Strawson's theory that a person needs to be characterised by both mental and physical predicates (incorrect, according to Sommers), and Russell's paradox (avoided or evaded, says Sommers). I doubt that these applications of Sommers' theory would be sound, even if his theory were correct. They form no part of what follows.

7.2. *Sommers and Aristotle*

Some psychologists were more keen on Sommers' theory than most philosophers. The cognitive psychologist Frank Keil (1979, 11) may have been the first to observe in print that one aspect of Sommers' adaptation of Ryle goes back to certain passages in Aristotle. But not to Aristotle's

list of categories! On the contrary, Sommers' idea is presaged in other passages in Categories and Topics. In Categories Chapter 3, 1b16, before the introduction of the ten categories, we read:

> The differentiae of genera which are different and not subordinate one to the other are themselves different in kind. For example, animal and knowledge: footed, winged, aquatic and two-footed, are differentiae of animal, but none of these is a differentia of knowledge; one sort of knowledge does not differ from another by being two-footed.[9]

To put the matter in terms of language rather than things, "knowledge" and "animal" are "different in kind" (as Ackrill translates) because "this animal is two-footed" can on occasion be said sensibly, even if not truly, "knowledge" and "two-footed" cannot be co-predicated in the same way. When two predicates (or similar verbal items) are thus shown to be "different in kind", we shall, following Sommers, say that they are of different *types*.

Although, following Keil, I see this idea in Aristotle, it is essential, in what follows, not to confuse the idea of a type with what Aristotle called categories. Sommers sometimes speaks of "types or categories", as if they were virtually equivalent names for the same concept (namely the concept I am calling *type*). He also sometimes uses "type" or "*A*-type" to refer to a class of predicates, or less solemnly, words: I shall instead call them *W*-types, word-types. Sommers then uses "category" to refer to a class of things, or objects, that fall under the predicates in a *W*-type. We could call these *O*-types, object-types. Sommers may call *O*-types categories, but such classes of things are not Aristotelian categories. Recall from the start of Section 3.4 above, Simplicius' first two readings of Aristotle's notion of category: words and things (or objects). We could have called those *W*-categories and *O*-categories, so there is something analogous to Sommers' way of talking. We could even use "type" equivocally between words and things, just as Aristotle's "category" can be treated as ambiguous between two or more of Simplicius' readings. Now let us see how types and categories differ.

7.3. *Detecting Ambiguity*

Keil writes that "in a separate work, the *Topics*, where Aristotle elaborates on the notion of differentiae, Aristotle brings up another important point about predicability that figures crucially in modern theories … Aristotle notes that if a differentia appears to apply to objects in different genera, then the differentiae must be ambiguous: Thus, in English, 'rational' is ambiguous" (Keil 1979, 12). This is shown by the fact that people and numbers may both be rational, but only in different senses of the word.

Keil was probably alluding to Chapter 15 of *Topics*, some six chapters after the discussion of the categories; more specifically I think he was referring to 107^a 3–30. For an out-of-date example analogous to Keil's "rational", take the Oxford translation of *Topics*, which was made at a time when donkey-engines (viz. auxiliary engines as for example on a ship, dock, or logging site, and sometimes simply called donkeys) were common knowledge. At 107^a18–20 we read: "Look also at the genera of the objects denoted by the same name, and see if they are different without the one falling under the other, as (e.g.) donkey is both the animal and the engine". This provides a formal criterion for showing that "donkey" is potentially ambiguous in the shanty, "I've been working on the donkey". This Aristotelian criterion of ambiguity is central to Sommers' analysis, and, perhaps, its strongest selling point. It is, on first encounter, elegant and appealing.

Here is how it goes. Some terms can, without metaphor, readily be co-predicated without absurdity. It makes sense to say that this table is hard, so that "table" and "hard" can be co-predicated. Now arrange terms on trees, which by convention branch downwards, in such a way that it makes sense (not truth) to co-predicate any one term on a tree, with any other term at that point on the tree or lower down. An idea called *spanning* conveniently conveys this notion. "Various related definitions of spanning have been put forth" by Sommers and others, writes Keil (1979, 11). "A simple and accurate summary would be: a predicate spans a term if and only if that predicate-term combination makes sense and can be assigned a truth value, which can be either true or false".[10] Thus "hard" spans both "table" and "question", because both "that question is hard" and "that table is hard" make sense; on a particular occasion of utterance and successful reference, each is either true or false. On a tree of predicates, "hard" would be placed above "question" and "table".

Likewise "expensive" spans both "table" and "dinner at the Ritz" (Sommers does not restrict his inquiry to lexical entries), thus generating a second tree. There is no ready way in which "question" can be put on this tree. But "hard" can be placed between "expensive" and "table", while not being on the same branch as "dinner at the Ritz". Sommers took this to show that "hard" must be entered on two different subtrees, one with "question" but not "table" below it, and one with "table" but not "question" below it. He argued that this fact provides a formal criterion according to which the adjective "hard" has two senses, one for hard questions, and another for hard tables. This systematisation of Aristotle's notion, *if* it worked, would be quite the most ingenious test of difference in meaning that has ever been proposed.

Yet we also notice one of the chief defects of Sommers' theory. Like Ryle, he offered no clear account of what it makes sense to say, or of what is absurd. Like Ryle, he relied on an intuitive sense of absurdity. On a broad understanding of what is absurd, we generate a lot of implausible ambiguous words, while on a narrow understanding, we generate too few words that are ambiguous. I am here proceeding as *if* there is some fairly readily recognised sense of absurdity whose difficulties can be minimised. The aim is not to vindicate Sommers but to show what might follow *if* he could be vindicated.

7.4. *Ontology*

Sommers (1963) is titled "Types and Ontology". For Keil's (1981) it is less the noun "ontology" than the adjective "ontological" that does the work. He cautiously follows Sommers. First of all he draws a tree of predicates (his examples include "is at the corner", or "is wilted") such that each entry in the tree can be co-predicated with any entry below it in the tree. "Is at the corner" stands above both "is wilted" and "is day-dreaming about his beloved" because (a) it makes sense to say that what is at the corner is wilted (it is the sick geranium plant my neighbour has cast out). (b) It makes sense to say that what is at the corner is day-dreaming about his beloved (it is Romeo). (c) It does not make literal sense to say that what is wilted is dreaming about his girlfriend. When a predicate is forced to appear at more than one node in such a tree, it is ambiguous. Such trees are trees of predicates cleansed of ambiguity.

Corresponding to any such tree there is what Keil calls an ontological tree (tree #2, p. 16; cf. #15, p. 48 and #35, p. 160). This is an arrangement of what Keil called "ontological categories", such as the class of things with spatial location, or the classes of plants, of men, of artefacts, or of temporal structures. This tree is isomorphic to the tree of predicates. Things with spatial location are at the node corresponding to "at the corner", and plants are at the node corresponding to "is wilted". "Person" (or perhaps "animal") corresponds to "is dreaming about his beloved". In each case we try to find a most general name for the class of objects to which the predicates in a node on the predicate tree may sensibly apply. (We may not always have such a name in English, but a more grave problem is to determine which names are most general). When we have a name for an entry in Keil's ontological tree, it furnishes a possible answer to Aristotle's question "What is it?" Although Keil and Sommers use the word "category" for an entry in an ontological tree, those entries are not Aristotelian categories. But they are something Aristotelian. If the analysis can be made

to work, the items in Keil's ontological tree are (secondary) substances, or, better, instances of What-it-is.

There are a great many obscurities in the exposition of Keil and Sommers. *I say only that* IF *their apparatus can be put in order, then the types, (O-types) which Sommers and Keil call categories are not Aristotelian categories at all but instances of What-it-is, often loosely referred to as Aristotelian substances*. Here we have a happy analogy spanning millennia. Aristotle's first category could have been thought of as the category of "being". General sorts of items in that category are rather naturally arranged in a taxonomic tree. This tree is what Keil calls an ontological tree.

7.5. *Experiment*

Keil takes great pains on the philosophical side, but his chief interest lies on the side of developmental psychology. When, as they grow up, do children learn to make the distinctions, into what makes sense and what does not make sense, that allows adults to arrange predicates on Sommersian trees of predicates or ontology? To what extent are the adult distinctions shared within Keil's linguistic communities? Or among English speakers the wide world over? Or among speakers of different languages? His initial results were extraordinarily interesting, but his subsequent work developed in a slightly different way, connected with cognitive domains. Keil (1994, 252) is titled "The Birth and Nurturance of Concepts by Domains". The ontological flavour remains intact, but the Sommersian theory of types is no longer emphasised. In the present segment of the paper, I have been suggesting that types and domains may be associated, in that the O-types are none other than the substances (in the sense of What-it-is) that determine a set of relevant categories; the resulting substance/category structure, I suggested in Section 5 above, characterises a domain.

8. METAPHYSICAL OR PSYCHOLOGICAL?

Douglas Medin suggested that questions about what he calls categories, and what I call kinds, "may be psychological questions as much as metaphysical questions". The same may be said about the entire gamut of concepts which, in my terminology, are named kinds, categories, substances, domains, modes of construal, and even types. Medin nicely says "psychological as much as metaphysical". That implies *both* metaphysical and psychological. That is surely right. Aristotle's book called *Categories* is commonly taken to be some blend of grammar, logic, and metaphysics.

But our speculative discussion of his categories (7) and (8) quickly moved to amateur psychology. It could have continued in a more metaphysical vein, inquiring whether the idea of essence is helpful in discussing posture and apparel. But then developmental psychologists, as I have noted, quickly psychologise the very idea of essence, asking not whether essentialism is true, but whether it is an innate learning strategy for small children.

So let us not examine whether questions about categories (et cetera) are psychological or metaphysical. They are both. Ask instead whether they are primarily psychological, or primarily metaphysical? Or, to be more bellicose, are the inquiries of psychologists parasitic upon metaphysics? Or is our metaphysics parasitic upon our psychological make-up?

We must first say what we mean by metaphysics. Let us venture only the most banal of distinctions, between absolute and descriptive metaphysics. An absolute metaphysics states what there is, and what kinds of things there are, in absolute terms. A true absolute metaphysics could never be secondary to psychology, because the facts that it reveals are prior to and independent of any other science. We may tend to associate absolute metaphysics with previous epochs in philosophy, but it remains current. For example E. J. Lowe (1997, 29) maintains that there are "a priori categorial distinctions of ontology". The actual and natural kinds (for example, geraniums) that fall under any given fundamental classification (for example, plant, or living thing) are the "a posteriori deliverances of observation and scientific theory", but we cannot determine the natural kinds found in the world without first having a sound ontology that determines which kinds could possibly be natural. We need first the category of What-it-is, and then (what I call) the substances that fall under it (viz. plant, or living thing) before we can sort things out as geraniums or foxgloves. On such a view, What-it-is, categories, and domains appear to be absolute, prior to psychology or any other body of observation or science, and that is the end of the matter.

A second sort of metaphysics was called "descriptive" by P. F. Strawson. It endeavours, he wrote, "to describe the actual structure of our thought about the world". It aims "to lay bare the most general features of our conceptual structure" (Strawson 1959, 9). Strawson took Aristotle and Kant to be exemplary descriptive metaphysicians.[11] It should be no surprise that the project of describing "the most general features of our conceptual structure [. . . of . . .] our thought about the world", should lead into psychology. Descriptive metaphysics is not directly concerned with what there is, but with how our thoughts are structured.

One might still argue that the metaphysics derives from psychological facts. There just are (it might be contended) innate domain-specific abilities. Philosophers from Aristotle on dimly recognised this, but thought that the domains which they could make out were fundamental features of what there is or must be in the world, rather than facts about how we cognise the world and recognise what is in it. Our languages fit with our psychological abilities, adding to the impression that we were dealing with matters of logic. And so philosophers thought they were doing logic and metaphysics, when in fact they were engaged only in a veiled psychology. The metaphysics, in short, is parasitic on our innate psychological makeup.

Conversely, one might argue that the psychology derives from logic and metaphysics. The domains discovered by cognitive psychologists are (it might be contended) answers to questions that have been organised by a substance/category structure. The apparently empirical discoveries are constrained by the ways in which our thought is ordered.

Neither of these two positions is clear. How does one proceed to discuss them? What evidence bears either way? Even that question may be misplaced, for it suggests we have two autonomous inquiries, psychological and metaphysical. In fact they interact, and will continue to interact. Surely they interacted in the mind of that one man, Aristotle, metaphysician and psychologist.

We should refrain from departmental dogmatism. We should beware of pedants on either side who say things such as either: (a) "Cognitive developmental psychology is an empirical discipline; finally we are finding out facts about the human mind, free at last of metaphysical dogma". Or (b) "The basic conceptual structure of our thought can be investigated without attending to empirical work on how people actually classify and sort". Both (a) and (b) sound more territorial than reflective. Collaboration, not turf-claiming, is what is called for. It is in that spirit that I have written the present paper. Its methods are grammatical, logical, metaphysical, and interpretative. There is nothing empirical about it. Yet the contemporary author most often cited is Frank Keil, an experimental developmental psychologist, who refers even more often to logicians and metaphysicians than I do to experimenters.

9. A SUMMARY OF CONVENTIONS AND ANALOGIES

9.1. *Conventions*

The term "category", and its cognates in other languages, has been used in a great many ways since Aristotle lectured on the *Topics*. Hence I

have somewhat arbitrarily had to assign specific meanings to it and to other technical terms. In general I have followed historical precedent, so that "category" fits in with a tradition of Aristotelian commentary, "kind" follows Whewell and Mill, while "type" is taken from Sommers. This does not mean that my conventions are somehow right, or better than others. There is absolutely nothing wrong with Sommers giving the name "category" as an alternative to his word "type" (which was taken from Bertrand Russell). There is nothing much wrong with the widespread practice among psychologists of using the word "category" very generously, to mean pretty much what Whewell meant by "kind". But we do need an unambiguous terminology. I design mine to give usage-rights by a sort of primogeniture. Aristotle gets "category", Whewell gets "kind" and Sommers gets "type".

Category refers to Aristotelian categories, as sketched in *Categories* 4 and *Topics* 9.1.

What-it-is is used as the primary name for Aristotle's first category, which in *Categories* 4 is translated as "substance", but in *Topics* 9.1 is called *What-it-is*.

Kinds are "functional groupings" (Quine) for which there are common names and about which it is possible to make true, general, and intelligible assertions (Whewell).

A *domain* is a sphere of thought or operation; the class of situations where a particular sort of knowledge or ability is applicable. This notion may be extended by metonymy.

A *0-domain* is a domain. A *1-domain* is knowledge about a 0-domain. A *2-domain* is the set of the skills or abilities dedicated to a 0-domain, and displayed in the knowing-how or knowing-that of the corresponding 1-domain. A *3-domain* is a device that enables one to exercise these skills or abilities. The device may be taken in a functional rather than literal way, as a model that would account for these skills or abilities. A *4-domain* is a neurologically real module modelled by such a device.

A *classificatory domain* is in the sphere of classification, a class of situations where knowledge of how to classify, or ability to classify, is applicable.

Type refers to what Sommers calls "types or categories", more particularly to *W-types*, which are classes of predicates, words. They correspond to what Sommers called *A*-types. Then there are *O*-types, classes of things, objects, and what Sommers sometimes called categories.

9.2. *Theses*

T1 Every What-it-is (secondary substance) generates a set of categories.
T2 The categories generated by a substance, or What-it-is, define what it makes sense to say about instances of that substance.
T3 A pair consisting of a substance and a set of categories it generates constitutes a substance/category structure.
T4 Aristotle's *Categories* 4, gives a narrow example of a substance/category structure, where the secondary substance is "animal" (or "man", or "horse"), and the other nine categories are the categories generated by this What-it-is. The list of nine need not be thought of as exhaustive.
T5 The corresponding list in *Topics* 1.9 is broader, because it generalises the narrow examples of substance to the full first category, What-it-is.
T7 A classificatory domain is characterised by a substance/category structure. For every classificatory domain there is a "fundamental mode of construal" (Keil). This is characterised by the What-it-is and the set of categories that defines the domain.
T6 The "immediate intuitive feelings . . . for how and why things are the way they are" in a certain domain (Keil) are best understood as the knowledge of what sorts of things can sensibly be said about items in the domain, and that is given by the set of categories appropriate to the domain.
T7 Sommers' types may correspond to Aristotle's secondary substances, or What-it-is.
T8 We may think of the Aristotelian substance/category structure, as metaphysical, and the domains of developmental cognitive science as psychological, but they are not independent. To paraphrase Kant: psychology without metaphysics is blind, but metaphysics without psychology is empty.

NOTES

[1] Most of Medin's paper is an excellent summary of Smith and Medin (1981) – except that the latter, discussing concepts in great detail, and also speaking of categorisation, does not systematically use the word "category" in its present psychologist's sense. Perhaps this change in Medin's writing during the 1980s (1981 to 1989) illustrates the way in which the new use of the word invaded psychology.

[2] That is, the phrase "natural kind" seems not to be found in print in anything like its current sense before Venn. For a usage that goes right back to early English, see Wordsworth's ode usually called *Intimations of Immortality*, line 98: "yearnings she hath in her own natural kind".

[3] This shows that Whewell may have meant by "kind" what psychologists mean by "category". Possibly Goodman meant much the same by "relevant kind". But most natural-kind philosophers, in contrast, mean something different by natural kinds, because they believe there may be some natural kinds that we do not know about, or may never know about, and hence we may not have common names or lexical entries for such kinds. Note, however, that many natural-kind philosophers, such as Hilary Putnam, practised semantic ascent, and wrote about "natural-kind terms" all of which are, of course what Whewell and Mill would have called common names.

[4] "Benveniste shows that Aristotle's ten categories encompass nominal and verbal categories that are peculiar to the Greek language" (Gernet 1985, 240). This sentence , from a book about first contacts between the West and China, is quoted by Robert Wardy (1992, n. 29), who calls Benveniste "largely outmoded and highly criticised". Wardy has a fascinating discussion of the translation of *Categories* into Chinese – it was virtually the first Western book to be translated – or rather a Latin translation and commentary hailing from Portugal was the first such book. Myles Burnyeat introduced me to Wardy's work.

[5] Michael Loux has recently argued that a great deal of contemporary Aristotle scholarship falls into not four but two groups. One, which he takes to include Ackrill's work, holds Aristotle to have aimed at "a finite list, a mutually exclusive and collectively exhaustive inventory of kinds, the most general kinds, under which things fall . . . an inventory of items that are candidates for status as *summa genera*" (Loux 1997, 5). The other type, which Loux takes to be represented by Michael Frede (1987), emphasises what is said in *Topics*, where the ten items are called "categories of predication". Unlike Frede, Loux spends little time on the first category, but settles on the other nine, the list of which "represent[s] the attempt to catalogue the kinds of information that can be expressed predictatively" (Loux 1997, 8). Loux argues that there is less conflict between the two views than appears, and suggests a "Sellarsian myth" (27) to make sense of his synthesis.

[6] This mode of expression is perhaps too asymmetric. It implies (and perhaps an Aristotelian would insist on this) that first comes What-it-is, and then come the rest of the categories. Perhaps we should be more symmetric, and consider that a set of secondary categories might determine an answer to "What is it?" In a formal presentation of these matters, it will be easiest to proceed from What-it-is to the other nine categories, but just possibly the preference for beginning at What-it-is is more a matter of convenience or custom than metaphysics.

[7] That does not exhaust the kinds of items considered and rejected as domains, for Hirschfeld and Gelman next discuss what they call single concepts (their example is "hot") or pairs (such as hot/cold). They write that "we would not want to call single concepts domains. Similarly pairs of concepts . . . are too narrow to be domains although they fit most of our criteria".

[8] The category is being-in-a-position. At $6^{b}11$ Aristotle writes, "Lying, standing, and sitting are particular positions; position is a relative. To-be-lying, to-be-standing, or to-be-sitting are themselves not positions, but they get their names paronymously from the aforesaid positions. ($1^{a}12$: "When things get their name from something, with a difference of ending, they are said to be paronymous.") Strictly, we should say that sitting is the posture, not Aristotle's predicate is-sitting, but I shall speak homonymously, and use posture as the name of the category.

[9] The passage continues: "However there is nothing to prevent genera subordinate one to the other from having the same differentiae. For the higher are predicated of the genera

below them, so that all differentiae of the predicated genus will be differentiae of the subject also".

[10] Sommers does indeed have other definitions, for example, a predicate spans anything to which it can be applied "either truly or falsely but not absurdly" (Sommers 1963, 329). I shall follow Keil and work at the level of co-predictability, rather than in Sommers' mixed mode of predicates and things to which they apply.

[11] For Strawson, the contrary of descriptive metaphysics is "revisionary metaphysics [which] is concerned to produce a better structure". Descartes, Leibniz, and Berkeley furnish examples of revisionary metaphysicians. Although one understands Strawson's reading, it is also natural to take those three men as absolute metaphysicians. They wanted to tell the truth about what there is, for instance that there are two radically different substances, mind and body, or that there is no such being as matter. Conversely, one may question Strawson's take on Kant and Aristotle. Not every reading of those two philosophers would agree with Strawson. Recall Simplicius' four interpretations of Aristotle on categories: words, things (beings), thoughts, or words insofar as they signify things. On the second interpretation, favoured by many classical scholars, categories are fundamental types of being. On such a reading, Aristotle looks more absolute than descriptive. One also wonders about Strawson on Kant. The first *Critique* is directed not only at the "actual structure of our thought about the world", but also at the structure of any possible thought about the world which is remotely like our conceptions of experience and objectivity. This is itself the vision of Kant that we tend to find in some of Strawson's later work. Hence descriptive metaphysics seems to include some transcendental reasoning.

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