Differences in Deference: Essences and Insights

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Abstract

If people have essentialist beliefs about natural kinds, it follows that when an entity's identity is uncertain, we should defer to experts knowledgeable about its hidden inner nature. In two experiments we presented students and lay adults with scenarios involving ambiguous-looking natural kinds, artifacts, and hybrid animal-artifacts and examined whether they would choose to defer to an expert about its identity, and if so, whether they would choose someone knowledgeable about its internal structure or its function. Results indicate differing patterns of deference for natural kinds and artifacts and support an essentialist model of deference overall, though deference was clearly affected by factors such as artifact complexity and sample population. Implications for essentialism, theories of artifacts, and an essentialist bias when reasoning about living kinds are discussed.

Keywords: essentialism; deference; natural kinds; artifacts

Introduction

Considerable recent research on concepts has focused on the notion of psychological essentialism, the belief that concepts refer to entities with a true underlying nature, an essence, that determines category membership and causes observable properties. Yet, despite extensive research on this idea, one of the underlying tenets of essentialism laid out by Putnam (1975), deference, has received little attention.

Putnam (1975) noted that societies have a division of linguistic labor, in which only a subset of speakers actually has knowledge of a particular essence. Thus, although everyone can use the word 'gold', we do not all have exact knowledge of its structure and properties; if in doubt about identification, we can readily confer with those experts in the linguistic community who do know, such as chemists. The division of linguistic labor therefore predicts that if people have intuitive essentialist beliefs about categories, when membership is uncertain they should defer to those experts who know a category's essence. Moreover, since essences are given privileged status in explaining category members' features, deference to essence experts might be expected to trump deference to experts on other sorts of properties and relations.

Of course not all categories have or are believed to have essential properties. Different domains are essentialized to varying degrees (Gelman, 2003); membership in natural kind categories tends to be absolute and unchanging despite surface transformation (indicative of an inner essence), while artifact categories are more graded and malleable (Keil, 1989). Deference might therefore be expected to be greater for natural kinds and less for artifacts, for which there is still debate as to whether they have essences at all (e.g., Bloom, 1996; Sloman & Malt, 2003).

Similarly, the identification of essence experts is easier for natural kinds, where there are well-established scientific authorities on their identification and anatomy. And even though such experts might not always know an essence completely, people believe experts can make a definitive classification (Coley & Luhmann, 2000). In particular, the idea that DNA determines the characteristics of natural kinds has permeated popular culture for decades, thus genetic experts clearly represent essence experts on living kinds, despite the imperfect nature of their actual knowledge.

Although the essentialist construal of deference assumes that we consult biological experts about living kinds due to beliefs in essences, other work suggests the influence of more pragmatic factors. Some have argued that natural kind categories have a graded non-absolute membership, with category distinctions being a matter of convention (e.g. Kalish, 1995; 2002, though see Diesendruck & Gelman, 1999; Estes, 2003 for conflicting findings). Consultation with biological experts according to this view may be merely because they are the authority on the most widely used conventions of classification.

Such a position, both on concepts and on deference, implies few domain differences for artifacts and natural kinds, and evidence has been mixed. People are more likely to believe experts can make absolute category judgments for natural kinds than for artifacts (Coley & Luhmann, 2000) and, moreover, when given specific scenarios with ambiguous kinds, participants act on these beliefs, endorsing options to "ask an expert" or "investigate" (examine the entity further to discover essential properties) for natural kinds more than artifacts (Malt, 1990; Kalish, 2002). For artifacts, participants judged either classification as appropriate or favored "legislating" (establishing a rule to make the classification). A notable exception was a particular subgroup of artifacts, scientific instruments, which both fall within the dominion of scientists and are

also more internally complex than other artifacts used in the study. Deference to artifacts may thus be largely due to pragmatic reasons: for commonplace artifacts whose structure is simple and familiar, an expert's additional authority might be minimal and thus categories are regarded as less objective and more open to legislation.

Other work has more explicitly measured what experts people trust in categorization decisions. In such studies, biological or chemical kinds (e.g., an apple or soap) that had been substantially genetically or chemically modified so their identity was unclear were described and participants were told how essential experts ("biologists" or "chemists") or laypeople with little essential knowledge ("shoppers") had classified them. When asked for their own categorization judgments, participants showed deference in their decisions to *both* groups, though the tendency to conform their categorizations to those of shoppers was much weaker (Braisby, 2001, 2003).

Thus, although the tenets of psychological essentialism suggest that people should defer to experts on essential properties, science experts might sometimes be chosen for conventional reasons. In addition, the opinions of people with more practical experience in a domain might also be selected. In the wake of such conflicting evidence, the purpose of the following two experiments is to make a more careful assessment of what domains we defer to experts on, what experts we choose, and what external or pragmatic factors can affect this process.

Prior work on deference has also only been done with undergraduate as participants. However, as students are immersed in an educational culture, they might not offer the most representative sample of the everyday use of expertise and deference. In fact, different deference patterns between students and laypeople may well be a rough indicator of what pragmatic factors are normally at work in such decisions. If essence experts are being consulted because of their privileged and absolute knowledge about kind identity, then one should expect equal deference among students and laypeople who share the same intuitive notions of essence. However, if biological experts are consulted merely as arbiters of the most useful classification convention, deference to biological experts might be lower in laypeople, as they are not as invested in the culture of scientific authority and might have other practically-oriented conventions for determining kinds that involve experts with more functional or otherwise useful knowledge. In an attempt to investigate this, our experiments compared the responses of students to those of a sample more representative of members of the general public.

Experiment 1

In Experiment 1 we examined patterns of deference in scenarios with ambiguous-looking natural kinds, pitting the opinion of an essence expert against that of an expert with more practical, use-oriented expertise. For comparison purposes, we also included scenarios that featured hybrid animal-artifact organisms. These were living kinds that were not "natural" but instead were designed and engineered by people, created with the specific intention of having certain functions – just like artifacts. Given that these biological kinds were "artifactualized" and designed for a specific purpose, we expected that participants would choose to defer to an expert with knowledge relevant to that purpose, while in line with essentialism and the division of linguistic labor, they would choose to defer to the essence expert for regular natural kinds.

Method

Participants Twenty students were recruited at a campus library and 20 adults (19-73 years, M = 35.2) were approached in a shopping mall and participated in exchange for a chocolate bar. Only 25% of the mall participants had completed a college degree and none were in school.

Materials The paper survey consisted of 15 questions, each about a new biological kind described as appearing to be halfway in between two biological categories. Two scenarios were made for each biological kind, one depicting the organism as being a pure natural kind discovered in the wild, the other as an artifactualized natural kind created by human efforts with intent for it to have particular properties and serve a specific function. In order to make the functional expert a credible source for resolving the kind's identity in either condition, all the described organisms had functional properties, but in the natural kind case, this property was incidental, while in the artifactualized kind case the function was its reason for being. For example:

Natural Kind Scenario:

> A wildlife artist camping on the remotest of the uninhabited islands north of Scotland discovered a colony of birds living in the area that she couldn't find described in any of her bird books. It just so happens this kind of bird has…

Artifactualized Natural Kind Scenario:

> Insula, a company that produces down jackets and sleeping bags is trying to make the warmest camping and outdoor equipment possible. To do this they have combined different varieties of bird to produce one whose…

Both of these scenarios were completed by a description of the same functional property:

> … down feathers [that] trap as much heat as possible. The new bird has some of the properties of a duck and some of a goose: it looks about halfway in between the two types.

Participants then read that an essence expert and a functional expert had both examined the creature and disagreed about its categorization. Subjects were instructed to indicate which expert they were more likely to believe and how confident they were on a one to seven Likert scale. The essence expert was always described as knowing about DNA and genetics while the functional expert was described as knowing about the practical uses and purposes of the

living kind (similar to the knowledge exhibited by "shoppers" in earlier studies). For example:

> Klaus, who knows all about the genetic code of birds and what genes differ between different species of birds and which they have in common, says it is a duck.
>
> Hans, who buys the equipment for government projects at the North and South Poles and knows all about what provides the best insulation, says it is a goose.

In this way, we set up a minimal pairing; in each condition the same creature with the same properties and experts was presented, only the origin of both the animal and property were different. This design rules out other potential confounds such as differences in materials, symmetry, and complexity that commonly plague comparisons of human and man-made entities and is a novel method for studying domain differences. Two versions of the questionnaire were made such that subjects saw either the discovered or the artifactualized scenario for each item, but not both, and the presentation of the experts was counterbalanced**.**

Results and Discussion

The main dependent measure was each participant's mean proportion of selecting an essence expert. In all the following relevant analyses, proportions were transformed using the root-arcsine function to correct for non-uniform residuals, though for ease of reading, means reported in the text and tables are the untransformed percentages. A 2(subject type) × 2(scenario type) repeated measures ANOVA on the mean percentage expert choice did not find a significant effect of scenario type, $F(1,38) = .22$, *ns*, $\eta_p^2 = .006$ or a significant interaction, $F(1, 38) = .001$, *ns*, $\eta_p^2 < .001$. As expected by essentialism and seen in Figure 1, participants overwhelmingly chose to defer to a DNA expert for the discovered natural kind scenarios ($M = 81.37\%$). This was also the case, unexpectedly, for artifactualized kind scenarios ($M = 78.68\%$) despite cues in this condition that the functional expert was an appropriate authority.

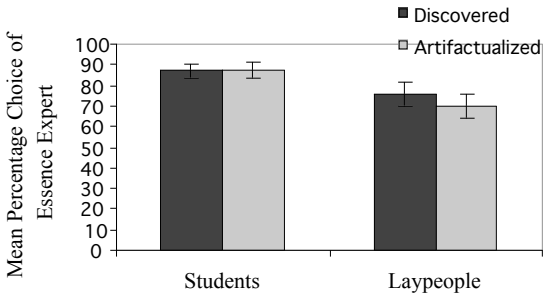

Figure 1: Choice of essence experts among students and laypeople in Experiment 1

Although this robust tendency to defer to biological experts is consistent with the essentialist theory of deference, there was also evidence of the influence of practical cues, as laypeople ($M = 72.83\%$) were overall less likely to choose a biological expert $F(1, 38) = 5.61$, $p < .05$, $\eta_p^2 = .13$ than students ($M = 87.22\%$) – suggesting they are more concerned with the practical uses and classification of an object than its esoteric hidden nature. There was no indication of any tendency to respond randomly to these types of questions in either sample, however, as all these results were significantly different from chance (50%). Experiment 2 was conducted to examine whether deference to artifacts follows similar patterns to those seen here, and also to improve upon the two-option forced-choice design, which might have masked participants' more nuanced approach to deference.

Experiment 2

Experiment 2 used a similar design as Experiment 1 but employed a number of methodological improvements to clarify how decisions of deference are made. One possible concern is that participants might have realized the relevance of both experts' knowledge, but the forced-choice design favored the biological expert because he or she appeared superficially smarter, and also employed the science buzzwords "genes" and "DNA". In Experiment 2 we attempted to reduce the impact of these factors in two ways: when selecting experts we included a third option in which subject could indicate that both experts would know the object's identity equally well, and we also described the essence expert in more layman's terms as someone who knew about the smallest internal parts of an item and how they interact.

Another potential concern about our initial findings might lie in our selection of experts; although prior work on essentialism implies DNA experts are suitable authorities for the categorization of animals (Putnam, 1975; Gelman, 2003) our assumption that a person knowledgeable about the functional properties of an object would be an appropriate expert for artifacts or artifactualized kinds is not uncontroversial. In some tasks, people are unlikely to ask an expert at all about this domain (Malt, 1990; Coley & Luhmann, 2000); yet, in other tasks with ambiguous cases, design history and intended function are important factors in artifact identity (e.g., Chaigneau, Barsalou & Sloman, 2004) implying that experts knowledgeable about function might be an appropriate alternative.

Across all tasks, the extent to which artifact categories are regarded as being suitable for expert judgment may depend on the extent to which they are unfamiliar, complex or fall under the cultural authority of experts (Kalish, 2002). Such artifact authorities need not have knowledge about essential features, they may just have a larger reservoir of facts about certain objects, or greater experience with a specific domain. Antique dealers, for example would likely have privileged information about historical items, though this knowledge might be stored in a family resemblance type of structure as opposed to strict essence-based categories.

To investigate deference in this domain, in Experiment 2 we developed new scenarios involving ambiguous-looking artifacts and asked participants whether they would consult an expert at all, and if so, which of several options they

would select. Artifact items were compared to our artifactualized natural kind items from Experiment 1 in order to ensure deference patterns would replicate given our design improvements. We hypothesized that for the artifactualized natural kinds, participants would choose to defer, and as in Experiment 1, would prefer the essence expert. Given conflicting findings in the literature, we did not make many specific predictions about patterns of deference for artifacts. However, based on evidence of the role of function in artifact categorization, we did expect some degree of deference to these kinds, and a preference for functional experts over ones knowledgeable about internal makeup.

Method

Participants Twenty undergraduates participated in exchange for five dollars and 20 adults (18-56 years, M = 30.4) responded to a posting on Craigslist.org and participated in exchange for a free pass to a museum.

Materials Seven artifactualized natural kind items were taken from the previous experiments (see bird example in Experiment 1) and seven artifact items were constructed in a similar manner, with a new product being created from parts of two existing types to meet a specific functional need. An example is below:

> An agricultural company is trying to create a fan that is best able to circulate and clean air in large barns. They have designed the new fan using elements from existing fan types that are used for differing purposes. Their new product has some of the properties of a centrifugal fan and some of an axial flow fan: it looks about halfway between the two fan types

To assess whether people would choose to defer to an expert at all about the kind's identity, participants were first asked to choose between "Well I guess you can call it whichever type you want" and "We'd have to ask an expert to tell us which type it is". Participants that chose to defer were then presented with two experts, and indicated whether they thought both experts would know equally well what the item was, or, if not, which expert they would be more likely to believe. For both artifactualized kinds and artifact items similar expert options were provided: one expert was knowledgeable about the smallest interacting parts and the other about the larger overall function of the entity. For example, for the fan scenario:

> Daryl knows all about the smallest internal constituent parts of fans and how they interact with each other.
>
> Eugene knows all about ventilation systems and which fans work best in different environments.

Two version of the survey were created, the order of presentation of the deference choice options and experts were counterbalanced within each, and across the two surveys the names of experts and their knowledge were counterbalanced to prevent response bias based on the experts' names alone.

Student completed a paper version of the survey while lay adults completed on online version that was identical in content, but administered with an interactive design. Piloting with the paper version used in Experiment 1 revealed problems with lay participants not following stated directions, such as choosing not to ask an expert but then selecting one. To minimize such problems, the online version had an if-then design that presented subjects with the appropriate next question contingent on their responses. Several studies have found little or no difference between questionnaires administered in person and on the web (e.g. McGraw, Tew, & Williams, 2000).

Results and Discussion

A 2(scenario: artifact vs. artifactualized kind) × 2(sample: student vs. laypeople) repeated measures ANOVA on participants' mean deference to experts revealed two main effects and no interaction, $F(1,38) = .11$, *ns*, $\eta_p^2 = .003$.

As seen in Experiment 1, there was overall decreased levels of deference for laypeople (M = 53.57%) than students (M = 73.93%), $F(1,38) = 4.80$, $p < .05$, $\eta_p^2 = .11$. Also, as before, deference for artifactualized natural kinds was high (M = 73.57%) confirming that even when given the option not to, participants continued to treat artifactualized kinds as if they were natural ones and consulted experts about their identity. Deference for artifacts was significantly lower (M = 53.93%), $F(1,38) = 9.98$, $p < .05$, $\eta_p^2 = .21$, but closer examination of the artifact stimuli revealed that there were actually two subgroups with different patterns of deference.

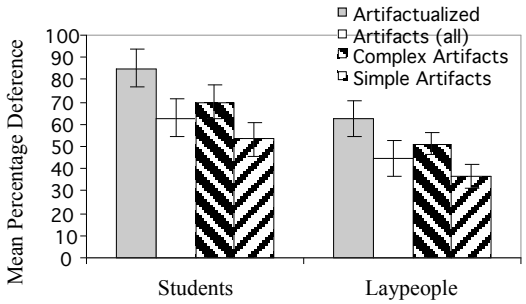

Figure 2: Mean percentage deference to *any* expert among students and laypeople in Experiment 2

Four of the artifact items had intricate interacting parts, such as a fan or an arc welding system, while the other three were simpler artifacts with fewer – as well as static – components, such as fishing lures or tires. An artifact type × sample ANOVA revealed that artifact deference is sensitive to differences in complexity: the choice to consult an expert on simple artifacts was understandably low (M = 50.00%), while participants were significantly more likely to consult an expert about the more complex artifacts, M = 60.25%, $F(1,38) = 10.84$, $p < .01$, $\eta_p^2 = .22$. There was also a non-significant trend towards greater deference in the student population, $F(1,38) = 2.32$, p = .14, $\eta_p^2 = .06$ and no interaction, $F(1,38) = .11$, *ns*, $\eta_p^2 = .003$. Thus, in contrast to the conclusions of Coley and Luhmann (2000) and Malt (1990), deference to experts for artifacts occurred, though to

a lesser extent than for natural kinds, and was sensitive to pragmatic factors such as complexity.

Next, for those items on which people chose to defer we examined expert choice using non-parametric analyses[1]. Subject population, condition, and expert choice were entered into a 2×3×2 contingency table. Log-linear analysis revealed independent effects of subject population, $G^2(4, N = 356) = 42.12$, $p < .001$, and condition, $G^2(4, N = 356) = 80.62$, $p < .001$, on expert choice, but these were qualified by a significant interaction between all three variables, $G^2(7, N = 356) = 120.32$, $p < .001$ (see Figure 3).

Breaking the analysis down by subject population, separate 2×3 chi-square analyses show that condition had a significant effect on expert choice for both laypeople, $\chi^2(2, N = 149) = 33.09$, $p < .001$, and students, $\chi^2(2, N = 207) = 43.13$, $p < .001$. The most popular expert choice for artifactualized natural kinds was, as hypothesized and seen in Experiment 1, the insides parts expert – though also as seen previously, this preference was stronger in students. For artifacts, as predicted, both groups indicated they believed functional information was relevant to the identification of artifacts: the students' modal choice was the functional expert alone while the laypeople overwhelmingly chose that both experts would know, with a minority equally choosing between function and essence experts. Thus, function plays an important role in the categorization of artifacts and function experts are an appropriate alternative to the essence expert for artifactualized kinds, validating the results of Experiment 1.

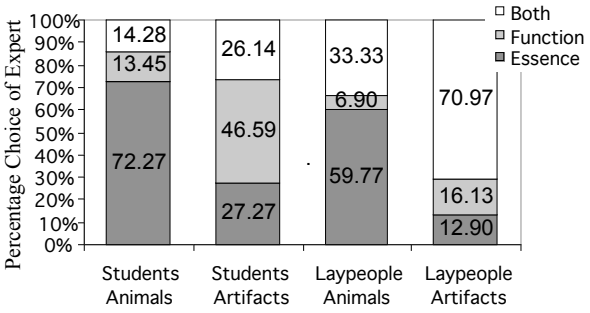

Figure 3. Percentage choice of experts in Experiment 2

General Discussion

We have examined patterns of deference in both students and laypeople to natural kinds, artifactualized natural kinds, and artifacts. In Experiment 1, acting in accordance with essentialist predictions, participants preferred an essence expert over a functional expert for natural kinds and even extended this preference to hybrid organisms specifically crafted for a particular purpose about which the other expert was created to be knowledgeable. Experiment 2 replicated this tendency to consult essence experts and confirmed it was not due to a lack of an "ask-no one" alternative or because the functional expert was an unacceptable option. The addition of artifact stimuli showed that – though participants are far less likely to consult an expert about simple artifacts – functional experts were regarded as an acceptable, and sometimes preferred, choice for this domain.

The choice of function expert, particularly by students, illustrates that participants are not always choosing the expert that might be construed as being "smarter" because of their knowledge of internal structure; instead, they recognize that different problems require different expertise. Laypeople, however, may not make this expertise differentiation as strongly, as they are more likely to indicate that both experts would know equally well. Across both experiments, we also found that laypeople were significantly less likely to choose essence experts and defer in general than students. In fact, in Experiment 1, lay adults were willing to consult pragmatic experts for natural kinds discovered in the wild almost 30% of the time. Given that the division of linguistic labor implies that consultation with experts on genetics or internal structure should always be the preferred option, do these discrepancies represent a major problem for essentialist accounts of natural kind categories and of deference? Not necessarily: there are some methodological factors that may be able to account for these unexpected results.

First, given the use of specific real world scenarios and descriptions of specific experts, some variation in participants' confidence in experts is to be expected due to individual differences in background knowledge or experience with such authorities. Secondly, although it is necessary to present ambiguous cases and alternative expert opinions in order to test essentialist claims, these scenarios also encourage participants to think of the creature as a truly unusual and exceptional instance, one for which regular beliefs about animals might not necessarily apply. Other experiments in which participants have had to state whether atypical instances were full or partial members of a kind, or indicate whether legislation or investigation are appropriate means of resolving a dispute have found stronger evidence for absolute natural categories (Diesendruck & Gelman, 1999; Estes, 2003).

These other experiments on natural kinds have usually used artifacts as a contrast category and in Experiments 2 we did the same. The greater deference to complex artifacts is consistent with the idea that there is not a strict border, but a continuum between artifacts and natural kinds (Keil, 1989) with complex artifacts taking on many of the properties of natural kinds, such as the importance of hidden internal structure, preservation of identity across surface transformations, and also, as seen here, reliance on experts for disambiguating identity. Closer examination of previous work that seemingly failed to find indications of deference to experts for artifacts reveals two patterns. Stimuli were either simple, common artifacts (Malt, 1990) or averaging results for all artifacts obscured important differences. In particular, participants viewed experts as highly likely to

[1] As deference for artifacts was low, there was insufficient power to conduct analyses comparing expert choice for simple versus complex artifacts.

make an absolute determination of category membership for many items, especially complex machines (Coley & Luhmann, 2000).

Those participants who were willing to consult an expert on artifact items in our Experiment 2 believed an expert on function was an appropriate authority. Although this may seem to lend support to functional theories of artifacts, both this, and the opposing view that artifact categorizations are unstable and context-dependent (Sloman & Malt, 2003) make claims about the entire domain of artifacts. Such global claims are undercut by the effect of complexity seen here. In fact, the domain of artifacts is extremely large and far more diverse than that of living things, a pattern that is often not taken into account in experimental studies. Although living things may vary widely in anatomy, they all have the same biological building blocks, while man-made objects combine natural materials adding layers of complexity to meet a huge diversity of human needs – from simple hand tools to passenger jets.

The general pattern of responding in deference experiments provides support for the tenets of psychological essentialism (Malt, 1990; Coley & Luhmann, 2000; Kalish, 2002). People seem to view natural kind categories as having essences, for which they may not have direct knowledge, but for which they clearly believe that biological experts do. Moreover, they think such authorities on essence are appropriate arbiters for the categorization of hybrid creatures that are on the border between living kinds and artifacts. Such artifactualized kinds may seem obscure on first glance, but in fact most living things we interact with today are not strictly natural, as we have shaped them through selective breeding or genetic modification to suit our needs and purposes.

The ability to understand how artifacts can be co-mingled with natural kinds may be one of the latest to emerge in children (Keil, Greif, & Kerner, in press), so it is not unexpected to find some vestigial difficulty with this dual status notion even in adults. Although it is clear that organisms such as hunting dogs and genetically-modified corn have been transformed for human purposes, a cognitive conflict arises when people try to reclassify these things as artifacts, which we are unaccustomed to considering as living. The biological characteristics of living kinds (that they develop, reproduce, share internal parts etc.) may be too salient to ignore, and thus are used in categorization judgments in preference over their less obvious functional properties that indicate artifacthood. There are also far more of those essence-related properties for engineered living kinds than there are functional properties.

This intuitive tendency to categorize and defer based on essences has strong implications for the current debate over genetically modified organisms. With current science and technology blurring the lines between natural kinds and artifacts, people's tendency to defer to geneticists and biologists may lead them to ignore the practical and functional consequences of these products. Important questions remain concerning how people reason about these novel organism-artifacts and how this reasoning affects political and scientific policy.

Acknowledgments

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