

# Teleological Essentialism: Generalized

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## Abstract

Natural/social kind essentialism is the view that natural kind categories, both living and non-living natural kinds, as well as social kinds (e.g., race, gender), are essentialized. On this view, artifactual kinds are not essentialized. Our view—teleological essentialism—is that a broad range of categories are essentialized in terms of teleology, including artifacts. Utilizing the same kinds of experiments typically used to provide evidence of essentialist thinking—involving superficial change (study 1), transformation of insides (study 2), and inferences about offspring (study 3)—we find support for the view that a broad range of categories—living natural kinds, non-living natural kinds, and artifactual kinds—are essentialized in terms of teleology. Study 4 tests a unique prediction of teleological essentialism and also provides evidence that people make inferences about purposes which in turn guide categorization judgments.

*Keywords:* Essentialism; Teleology; Natural kinds; Artifacts

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## 1. Introduction

One of the most important ideas about concepts—one that revolutionized the field—is that certain concepts cannot be fully characterized in terms of observable features. Instead, at least for some categories, the category is represented in terms of an essence. On this view—psychological essentialism—essentialized categories are represented as having a true nature which is assumed to be shared among category members and responsible for similarities among members of a category.

Psychological essentialism raises at least two questions. The first concerns how essences are represented. The second concerns which categories are essentialized.

The leading view, concerning the first question, is that essences are represented as *scientific* essences. This view is Lockean: An essence is the underlying property that causes

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observable features, and though we may not always know what that underlying property is, the presupposition is that the property is a scientific essence; for example, H<sub>2</sub>O is the scientific essence of water (Gelman, 2003; Keil, 1989; Medin & Ortony, 1989).

The dominant view concerning the categories that are essentialized—what we call *natural/social kind essentialism*—is that natural kind categories, both living and non-living natural kinds, as well as social kinds (e.g., race, gender), are essentialized (Gelman, 2003). Artifactual kinds are not essentialized on this view (Gelman, 2003; see also Atran, 1998; Keil, 1989, 1994). As Gelman (2013) notes, “artifacts clearly do not possess essences based on DNA or birth parents” (p. 450). More explicitly: “essentialism . . . is found in people’s categories of natural kinds (both living and non-living) and many social kinds (including races, ethnicities, and traits), but not artifact categories” (Gelman, 2003, p. 12).

We offer a very different answer to the two questions raised by psychological essentialism. First, we suggest that essences are represented as purposes or *tele*. This view—*teleological essentialism*—is Aristotelian (Rose & Nichols, 2019). Second, natural kinds, both living and non-living natural kinds, as well as artifactual kinds, are essentialized in terms of tele. In other words, our view is that teleological essentialism is general, applying to a broad range of categories.

Recent work indicates that people think the telos of a bee is to make honey and pollinate flowers while the telos of a spider is to make webs and catch insects. If a bee is operated on to look like a spider, people categorize the thing as a bee when it has the bee telos and a spider when it has the spider telos. Preservation or change in telos also trumps inferences about innate potential and people even think the telos can be transmitted to offspring (Rose & Nichols, 2019). This suggests that we do indeed associate essence with a kind of telos. But this work only concerns living natural kinds.

Previous work shows that teleological thinking applies broadly. A wide range of research suggests that we naturally default to accepting teleological explanations for both living and non-living natural things (e.g., Bloom, 1996, 2007; Kelemen, 1999; Kelemen & Rosset, 2009; Piaget, 2017). This tendency toward promiscuous teleological thinking emerges early and is never fully outgrown or replaced (e.g., Casler & Kelemen, 2008; Kelemen, Rottman & Seston, 2013). Other work indicates that teleological thinking applies broadly when making judgments about whether some parts compose a whole object (Rose & Schaffer, 2017a). Regardless of whether people consider artifacts, organisms, or non-living natural things like rocks, they tend to think that composition occurs when the result has a purpose. The same tendency is displayed in persistence judgments. People tend to think that an object persists through part alternations provided it preserves its purpose. This pattern is found across artifacts, living and non-living kinds as well as social kinds, such as institutions and rock bands (see e.g., Rose, 2015; Rose, Schaffer & Tobia, 2019). In light of these findings, if people do indeed operate with a teleological conception of essence, then we should expect that they should essentialize both artifacts and non-living natural kinds in terms of teleology. Thus, our claim is that in addition to living natural kinds, artifacts and non-living natural kinds are essentialized in terms of a telos. And our goal was to provide evidence that teleological essentialism is general.

Natural/social kind essentialists maintain that artifacts are not essentialized. By contrast, teleological essentialism makes a bold prediction: Insofar as artifacts have tele they should be essentialized.

One of the most important sources of evidence for essentialism involves judgments of stability. If people think a thing can remain a category member despite radical transformation, such as complete inside replacement, provided it preserves its telos, then that suggests that essence is associated with a kind of telos. And if people think living and non-living natural kinds as well as artifactual kinds can retain category membership despite radical transformation, provided they preserve their telos, then that provides good evidence that teleological essentialism is indeed a general and genuine form of essentialism.

Our goal was to provide evidence that essences for living natural kinds, non-living natural kinds, and artifacts are associated with a kind of telos. To accomplish this, we used the same kind of strategies that are typically used to provide evidence for essentialist thinking. In our first study, we utilize cases where a thing undergoes a change in superficial features (see e.g., Gelman, 2003; Keil, 1989). We vary both (a) whether the thing preserves or changes its telos and (b) whether the thing is an artifact, living natural kind, or non-living natural kind. Despite the radical superficial change, preservation and change in telos affects category judgments in every case. Our second study, inspired by work by Gelman and Wellman (1991), extends this to cases where a thing undergoes a different kind of radical transformation: complete inside replacement. Here again we find that preservation or change in telos affects categorization judgments for artifacts, living and non-living natural kinds, despite radical transformation. Study three involved an offspring study. We told people about a special machine that works just like fertilization in animals—two things go into the machine and a new thing comes out; using such scenarios, we find that, across artifacts, living and non-living natural kinds, when the telos of the original thing changes, people are more inclined to think that the new thing that will come out of the machine will be a member of the category that has that telos. Our fourth and final study tests a unique prediction of teleological essentialism. If preservation of telos plays an important role in retaining category membership, then one way telos can be preserved is by taking in the same kind of telos from a different thing. We show that, across artifacts and living and non-living natural kinds, if a thing takes in the same kind of telos from a different thing, then people are more inclined to view the thing as retaining category membership than when the thing changes its telos. Moreover, we also show that people make inferences about preservation and change of telos on the basis of inside replacement and that judgments about the extent to which a thing preserves or changes its purpose play a role in generating category judgments.

## 2. Study 1: Superficial change

Our first study addresses whether, across kinds, essence is associated with a kind of telos, despite the fact that the thing has undergone a radical change in superficial features. And our strategy for addressing this is to simply manipulate whether a thing preserves or

changes its telos and see whether that affects categorization judgments. Instead of simply stipulating the telos of a thing, we decided to run a pilot study and ask people what they think the purpose of a given kind is. So we asked:

1. What is the true purpose of vultures?
2. What is the true purpose of hummingbirds?
3. What is the true purpose of coal?
4. What is the true purpose of magnetite?
5. What is the true purpose of clocks?
6. What is the true purpose of hot plates?

We recruited 40 participants for our pilot study. Each participant received all six items in random order and was given an open-ended response. We found that 78% of participants said the purpose of vultures is to eat dead animals; 63% of participants said the purpose of hummingbirds is to pollinate flowers; 73% said the purpose of coal is to produce energy; 65% thought the purpose of magnetite is attracting objects; 90% said the purpose of clocks is to tell time; and lastly, 88% of participants said that the purpose of hot plates is to heat things up. The results from our pilot study will thus serve as a guide for manipulating preservation and change in telos.

Four-hundred participants (aged 18–70 years,  $M_{\text{age}} = 32$  years; 217 females; 96% reporting English as a native language) were recruited from Amazon Mechanical Turk and tested in Qualtrics. Participants were randomly assigned to one of six conditions in a 2 (Telos: Preserved, Changed)  $\times$  3 (Kind: Hot Plate, Vulture, Magnetite) design. Below are the cases with variations marked by brackets:

Some very talented and skilled scientists, Suzy and Andy, decide that they are going to perform a special procedure on [a hot plate/a vulture/some magnetite]. [Hot Plate: They decide to remove its square base, paint the top white, add numbers and hour, minute, and second hands./Vulture: They decide to stretch its beak, shorten its wings, legs, and body and paint it with bright colors./Magnetite: They decide to make it rectangular shaped, smooth over its jagged surface and paint it dark black.] Here is an image of the [hot plate/vulture/magnetite] that they perform the special procedure on:



After the special procedure, it looked like [a clock/a hummingbird/coal]:



[Telos Preserved: After running some tests, they found that the thing after the special procedure did not [tell time/pollinate flowers/produce energy]. Instead, it only [heated up/ate dead animals/attracted objects].

[Telos Changed: After running some tests, they found that the thing after the special procedure did not [heat up/eat dead animals/attract objects]. Instead, it only [told time/pollinated flowers/produced energy].

After reading one of the six cases, participants responded to two comprehension questions:

Comprehension Check: Suzy and Andy performed a special procedure on [a hot plate/a vulture/some magnetite]. (Yes/No)

Comprehension Check: The thing after the special procedure only [heats up/eats dead animals/attracts objects]. (Yes/No)

They were then asked the key test question:

Category: To what extent do you think that the thing after the special operation is [a hot plate or clock/a vulture or hummingbird/magnetite or coal] (1 = it is definitely [a hotplate/a vulture/magnetite], 7 = it is definitely [a clock/a hummingbird/coal])

We also included a question about whether the thing retained the true purpose of hot plates, vultures, or coal, which served as a manipulation check:

Purpose: To what extent do you think that the thing after the special operation retains the true purpose of [hot plates/vultures/magnetite]? (1 = it definitely does not retain the true purpose of [hot plates/vultures/magnetite], 7 = it definitely retains the true purpose of [hot plates/vultures/magnetite])

Twenty-eight participants failed one or more of the comprehension checks and were excluded from analysis. Data were analyzed for the remaining 372 participants.

Table 1  
Descriptive statistics for purpose

Kind	Telos	<i>M</i> ( <i>SD</i> )	95% CI
Hot plate	Preserved	5.58 (1.89)	[5.12, 6.03]
	Changed	1.53 (1.43)	[1.16, 1.89]
Vulture	Preserved	5.77 (1.55)	[5.39, 6.15]
	Changed	1.75 (1.20)	[1.44, 2.06]
Magnetite	Preserved	5.02 (1.95)	[4.53, 5.51]
	Changed	2.62 (1.67)	[2.19, 3.05]

First, our manipulation was highly successful. A  $2 \times 3$  ANOVA indicated that there was no effect of Kind on purpose judgments  $F(2, 366) = 0.875, p = .418, \eta_p^2 = 0.005$ , but there was main effect of Telos on purpose judgments,  $F(1, 366) = 418.44, p < .001, \eta_p^2 = 0.533$ . There was also an interaction between Kind and Telos on purpose judgments,  $F(2, 366) = 10.10, p < .001, \eta_p^2 = 0.052$ . Descriptive statistics for purpose judgments are in Table 1.

Importantly, a  $2 \times 3$  ANOVA indicated that there was no effect of Kind on categorization judgments  $F(2, 366) = 2.36, p = .096, \eta_p^2 = 0.013$ , but there was a main effect of Telos on categorization judgments,  $F(1, 366) = 309.41, p < .001, \eta_p^2 = 0.458$ . There was also an interaction between Kind and Telos on categorization judgments,  $F(2, 366) = 15.97, p < .001, \eta_p^2 = 0.080$ . The results are shown in Fig. 1.

The important finding here is that across kinds—artifacts, living and non-living natural kinds—preservation and change in telos had an effect on categorization judgments. This pattern occurred across each kind, despite the fact that the thing underwent radical superficial changes, which included changes in size, shape, and color. The fact that preservation and change in telos had an effect across kinds, even when a thing undergoes superficial transformation, suggests that teleological essentialism might be general.

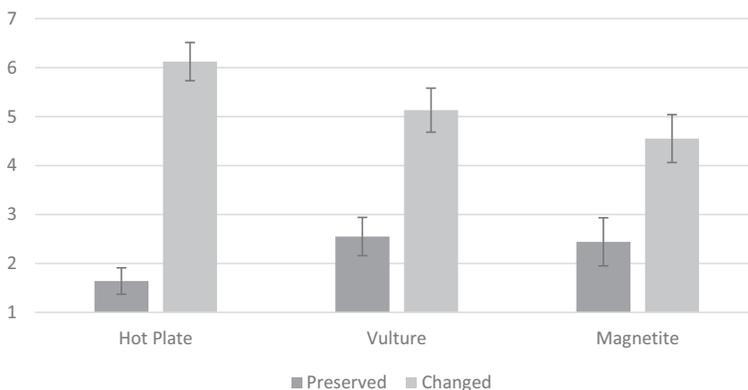


Fig. 1. Effect of telos (preserved, changed) across kinds (hot plate, vulture, magnetite) with 95% confidence intervals.

We noted above that one of the most important sources of evidence for essentialist thinking emerges when participants judge that a thing retains category membership despite radical transformation. But the kinds of changes that things underwent in our first study—changes in size, shape, and color—might not be all that radical. A more radical change would be if a thing underwent complete inside replacement. We investigate this in our next study.

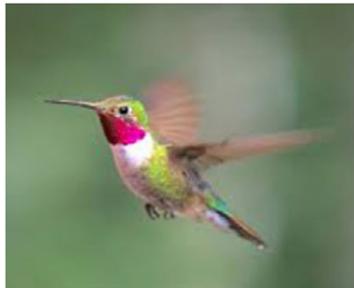
### 3. Study 2: Inside replacement

A total of 400 participants (aged 18–72 years,  $M_{\text{age}} = 35$  years; 227 females; 97% reporting English as a native language) were again recruited from Amazon Mechanical Turk and tested in Qualtrics. Participants were randomly assigned to one of six conditions in a 2 (Telos: Preserved, Changed)  $\times$  3 (Kind: Clock, Hummingbird, Coal) design. Below are the cases with variations marked by brackets:

Some very talented and skilled scientists, Suzy and Andy, decide that they are going to perform a special procedure on [a clock/a hummingbird/some coal]. They decide to remove the insides of the [clock/hummingbird/coal] and replace them with the insides from [a hot plate/a vulture/some magnetite]. Here is an image of the [clock/hummingbird/coal] that they perform the special procedure on:



After the special procedure, the insides were changed but it still looked like this:



[Telos Preserved: After running some tests, they found that the thing after the special procedure did not [heat up/eat dead animals/attract objects]. Instead, it only [told time/pollinated flowers/produced energy].

[Telos Changed: After running some tests, they found that the thing after the special procedure did not [tell time/pollinate flowers/produce energy]. Instead, it only [heated up/ate dead animals/attracted objects].

After reading one of the six cases, participants responded to two comprehension questions:

Comprehension Check: Suzy and Andy performed a special procedure on [a clock/a hummingbird/some coal]. (Yes/No)

Comprehension Check: The thing after the special procedure only [heats up/eats dead animals/attracts objects]. (Yes/No)

They were then asked to make a categorization judgment:

Category: To what extent do you think that the thing after the special operation is [a clock or hotplate/a hummingbird or vulture/coal or magnetite] (1 = it is definitely [a clock/a hummingbird/coal], 7 = it is definitely [a hotplate/a vulture/magnetite])

Lastly, we again included a manipulation check:

Purpose: To what extent do you think that the thing after the special operation retains the true purpose of [clocks/hummingbirds/coal]? (1 = it definitely does not retain the true purpose of [clocks/hummingbirds/coal], 7 = it definitely retains the true purpose of [clocks/hummingbirds/coal])

A total of 41 participants failed one or more of the comprehension checks and were excluded from analysis. Data were analyzed for the remaining 359 participants.

As in our first study, our manipulation was highly successful. A  $2 \times 3$  ANOVA indicated that there was a main effect of Kind on purpose judgments  $F(2, 353) = 5.12$ ,  $p < .01$ ,  $\eta_p^2 = 0.028$  and a main effect of Telos on purpose judgments,  $F(1, 353) = 294.13$ ,  $p < .001$ ,  $\eta_p^2 = 0.455$ . There was also an interaction between Kind and Telos on purpose judgments,  $F(2, 353) = 14.89$ ,  $p < .001$ ,  $\eta_p^2 = 0.078$ . Descriptive statistics for purpose judgments are in Table 2.

But the important question is whether preservation or change in telos affects categorization judgments. A  $2 \times 3$  ANOVA indicated that there was a main effect of Kind on categorization judgments  $F(2, 353) = 5.12$ ,  $p < .01$ ,  $\eta_p^2 = 0.028$  and a main effect

Table 2  
Descriptive statistics for purpose

Kind	Telos	<i>M</i> ( <i>SD</i> )	95% CI
Clock	Preserved	5.39 (1.84)	[4.90, 5.88]
	Changed	1.35 (.78)	[1.16, 1.54]
Hummingbird	Preserved	5.33 (1.52)	[4.95, 5.71]
	Changed	1.87 (1.38)	[1.51, 2.23]
Coal	Preserved	3.97 (1.88)	[3.40, 4.34]
	Changed	2.24 (1.38)	[1.90, 2.58]

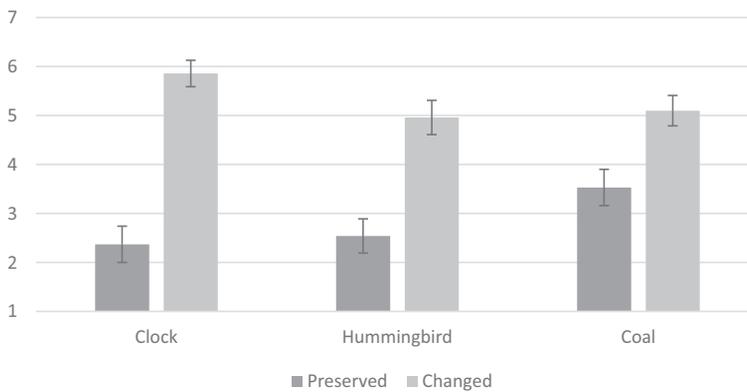


Fig. 2. Effect of telos (preserved, changed) across kinds (clock, hummingbird, coal) with 95% confidence intervals.

of Telos on categorization judgments,  $F(1, 353) = 294.13$ ,  $p < .001$ ,  $\eta_p^2 = 0.455$ . There was also an interaction between Kind and Telos on categorization judgments,  $F(2, 353) = 14.89$ ,  $p < .001$ ,  $\eta_p^2 = 0.078$ . The results are shown in Fig. 2.

The crucial finding is this: Across kinds, preservation and change in telos have a similar effect. When a thing preserves its telos, people are significantly more inclined to think the thing retains original category membership; when it changes its telos, people are more inclined to view the thing as changing categories. And this pattern obtains across kinds despite radical transformation (i.e., inside replacement). This suggests that teleological essentialism is general, applying to artifacts, living natural kinds, and non-living natural kinds. And it also suggests that tele are viewed as preserved, as stable, across radical transformation, such as complete inside replacement.

So far we have used the same kind of experimental procedures—superficial change, inside replacement—typically used to provide evidence of essentialist thinking. But a very different, and important, test of essentialist thinking involves testing whether

essence is transmitted to offspring. Rose and Nichols (2019), for instance, found that when a bee had its telos changed to conform to that of a spider, regardless of whether the eggs of the post-transformation thing were fertilized by a bee or spider, participants were more likely to say the offspring would be spiders. This finding suggests that teleological essences can be transmitted to offspring. But how might we test this for artifacts and non-living natural things?

Our strategy was to follow the same procedure used in Rose and Nichols (2019, study 4). But instead of telling participants that the post-transformation thing had its eggs fertilized, we decided to tell people that the scientists devised a special machine that works just like fertilization in animals. Two things go in and a new thing comes out. This enabled us to examine whether people think teleological essences can be transmitted to “offspring” across kinds.

#### 4. Study 3: “Offspring”

A total of 800 participants (aged 18–73 years,  $M_{\text{age}} = 35$  years; 429 females; 96% reporting English as a native language) were again recruited from Amazon Mechanical Turk and tested in Qualtrics. Participants were randomly assigned to one of 12 conditions in a 2 (Telos: Preserved, Changed)  $\times$  3 (Kind: Hot Plate, Vulture, Magnetite)  $\times$  2 (Fertilized: Same Thing, Different Thing) design. The materials were the same as in study 1. People were asked the same two comprehension questions and then made a categorization judgment. Since the same manipulation of preservation and change of telos used in study 1 was used here, we omitted the purpose manipulation check. So after making the categorization judgments, participants read the following, which varied in whether the thing was fertilized by the same or different kind of thing:

Suzy and Andy have devised a special machine that works just like fertilization in animals. Two things go into the special machine and a new thing comes out. They place the thing they performed the special procedure on and a [hotplate/clock or vulture/hummingbird or magnetite/coal] inside the machine.

They were then asked:

Offspring: To what extent do you think that the new thing that will come out of the machine will be [a hotplate or clock/a vulture or hummingbird/magnetite or coal]? (1: it will definitely be [a hotplate/a vulture/magnetite], 7: it will definitely be [a clock/a hummingbird/coal])

A total of 50 participants failed one or more of the comprehension checks and were excluded from analysis. Data were analyzed for the remaining 750 participants.

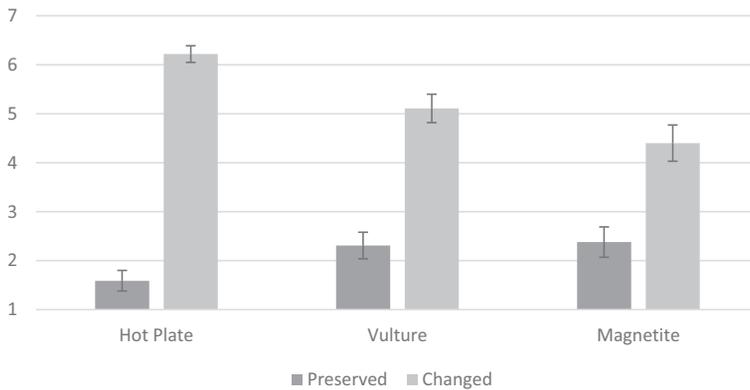


Fig. 3. Effect of telos (preserved, changed) across kinds (hot plate, vulture, magnetite) with 95% confidence intervals.

First, for categorization judgments, we replicated our results from study 1 (see Fig. 3). A  $2 \times 3$  ANOVA indicated that there was an effect of Kind on categorization judgments  $F(2, 744) = 6.132, p < .01, \eta_p^2 = 0.016$  and there was main effect of Telos on categorization judgments,  $F(1, 744) = 672.78, p < .001, \eta_p^2 = 0.475$ . There was also an interaction between Kind and Telos on categorization judgments,  $F(2, 366) = 41.03, p < .001, \eta_p^2 = 0.099$ .

More important, a  $2 \times 3 \times 2$  ANOVA indicated that there was no effect of Kind on offspring judgments  $F(2, 738) = 1.22, p = .294, \eta_p^2 = 0.003$  and no effect of Fertilized on offspring judgments,  $F(1, 738) = 3.14, p = .077, \eta_p^2 = 0.004$ . But there was a main effect of Telos on offspring judgments,  $F(1, 738) = 124.31, p < .001, \eta_p^2 = 0.144$ . There was also an interaction between Kind and Telos on offspring judgments,  $F(2, 738) = 5.34, p < .01, \eta_p^2 = 0.014$  and an interaction between Fertilized and Telos,  $F(1, 738) = 100.81, p < .001, \eta_p^2 = 0.120$ . The interaction between Fertilized and Kind was not significant,  $F(2, 738) = 1.01, p = .364, \eta_p^2 = 0.003$ . And the three-way interaction was not significant,  $F(2, 738) = 0.03, p = .972, \eta_p^2 = 0.000$ . The results are shown in Fig. 4.

Here is the crucial finding: Categorization judgments for offspring are driven by telos. For instance, when the mutant combined with a hotplate has the telos of a hotplate, people are more inclined to say it will be a hotplate than if it has the telos of a clock; when the mutant combined with a clock has the telos of a clock, people are more inclined to say it will be a clock than if it has the telos of a hotplate. And similarly for the other mutants.

Our findings indicate that telos plays a crucial role in the kind of categorization we see in essentialist research: Studies 1 and 2 show that people rely on the telos to make judgments about persistence through both outer and inner transformations; study 3 shows that people think a telos can be transmitted to “offspring.” The fact that we find that people rely on telos to make categorization judgments for artifacts, living and non-living natural kinds, when using the same procedures used to provide evidence of

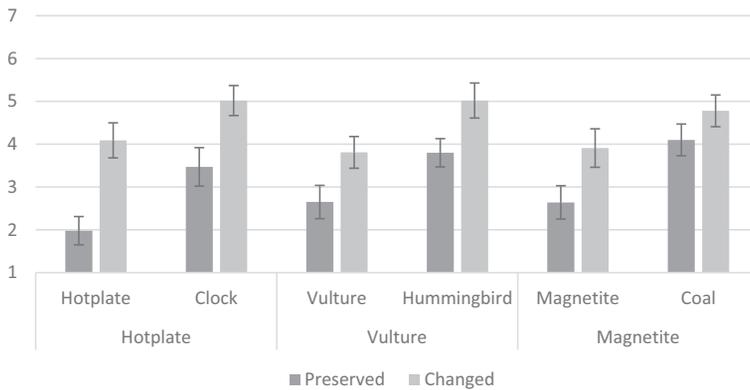


Fig. 4. Effect of telos (preserved, changed) across kinds (hot plate, vulture, magnetite) and fertilized (hot plate or clock, vulture or hummingbird, magnetite or coal) with 95% confidence intervals.

essentialist thinking suggests that teleological essentialism is a general and genuine form of essentialism.

In our fourth and final study, we wanted to test a unique prediction of teleological essentialism: If preservation of telos plays a role in retaining category membership, despite radical transformation, then one way a thing can preserve its telos is by taking in the same kind of telos from a different thing. Thus, if a thing takes in a similar telos from a different kind of thing, people should be more inclined to think the original thing retains membership in the original category than when the thing takes in a different kind of telos. In addition to testing this prediction of teleological essentialism, we also wanted to test both whether people will infer, without being told, that a thing either preserves or changes its telos and whether inferences about preservation and change in telos generate category judgments.

## 5. Study 4: A different way to preserve telos

One question we wanted to address in our final study was whether people would infer that a thing preserves or changes its telos without being explicitly told so. Our strategy in addressing this was to utilize the same cases as in our second study, where a thing undergoes complete inside replacement, but not explicitly vary whether the thing preserves or changes its telos. The guiding idea was that if a thing has its insides replaced with the insides of a thing that has the same kind of telos, then people would be more inclined to view the original thing as preserving its purpose than when its insides were replaced with insides from a thing that has a different telos.

What we need, then, are things that people tend to think have similar and different purposes. Then we can replace the insides of a target thing with insides of things that have the same or different tele and see if that affects purpose judgments. So we ran another pilot study, again with 40 people, and asked them:

1. What is the true purpose of watches?
2. What is the true purpose of sparrows?
3. What is the true purpose of finches?
4. What is the true purpose of granite?
5. What is the true purpose of limestone?

As in our first pilot, each participant provided an open-ended response to each question which was presented in random order. The results from our pilot study indicated that 88% of people said that the purpose of watches is to tell time; 48% said the purpose of sparrows is to spread seeds, eat insects, or both; 45% said the same thing about finches; 63% said the purpose of granite is to build or support things; and lastly, 55% of people said the same thing about limestone as they did granite. The items here, along with clocks, hot plates, vultures, and coal, from our first pilot study, will be utilized in varying preservation and change in telos via inside replacement.

A total of 450 participants (aged 18–70 years,  $M_{\text{age}} = 33$  years; 242 females; 98% reporting English as a native language) were recruited from Amazon Mechanical Turk and tested in Qualtrics. Participants were randomly assigned to one of six conditions in a 2 (Insides: Same Telos, Different Telos)  $\times$  3 (Kind: Clock, Sparrow, Granite) design. Below are the cases with variations marked by brackets:

Some very talented and skilled scientists, Suzy and Andy, decide that they are going to perform a special procedure on [a clock/a sparrow/some granite]. They decide to remove the insides of the [clock/sparrow/granite] and replace them with the insides from [a watch/a hot plate/a finch/a vulture/some limestone/some coal]. Here is an image of the [clock/sparrow/granite] that they perform the special procedure on:



After the special procedure, the insides were changed but it still looked like this:  
Participants were asked two comprehension questions after reading one of the six cases:



Comprehension Check: Suzy and Andy performed a special procedure on [a clock/a sparrow/some granite]. (Yes/No)

Comprehension Check: The [clock/sparrow/granite] had its insides replaced. (Yes/No)

They were then given the following two questions presented in random order:

Category: To what extent do you think that the thing after the special procedure is [a clock or hot plate/watch/a sparrow or vulture/finch/granite or coal/limestone]? (1 = it is definitely [a clock/a sparrow/granite], 7 = it is definitely [a hot plate/a watch/a vulture/a finch/coal/limestone])

Purpose: To what extent do you think that the thing after the special procedure retains the true purpose of [clocks/sparrows/granite]? (1 = it definitely does not retain the true purpose of [clocks/sparrows/granite] 7 = it definitely retains the true purpose of [clocks/sparrows/granite])

A total of 48 people missed at least one comprehension check and so data were analyzed from the remaining 402 participants.

Between-subjects univariate tests indicated that there was an effect of Kind on Category,  $F(2, 396) = 22.631$ ,  $p < .001$ ,  $\eta_p^2 = 0.103$  and Purpose  $F(2, 396) = 15.995$ ,  $p < .001$ ,  $\eta_p^2 = 0.075$  and an effect of Insides on Category  $F(1, 396) = 28.860$ ,  $p < .001$ ,  $\eta_p^2 = 0.068$  and Purpose,  $F(1, 396) = 65.382$ ,  $p < .001$ ,  $\eta_p^2 = 0.142$ . There was no interaction for Category  $F(2, 396) = 2.127$ ,  $p = .121$ ,  $\eta_p^2 = 0.011$  but there was an interaction for Purpose,  $F(2, 396) = 18.519$ ,  $p < .001$ ,  $\eta_p^2 = 0.086$ . The results are shown in Fig. 5.

Lastly, to determine whether purpose judgments generate category judgments in a context where people make inferences about whether the thing has preserved or changed its telos, we tested for mediation. We found that a regression model with Insides as a predictor of Category was significant,  $t(401) = 5.06$ ,  $\beta = -0.246$ ,  $p < .001$ , a regression model with Insides as a predictor of Purpose was significant,  $t(401) = 7.49$ ,  $\beta = -0.351$ ,  $p < .001$ , a regression model with Purpose as a predictor of Category was significant,  $t$

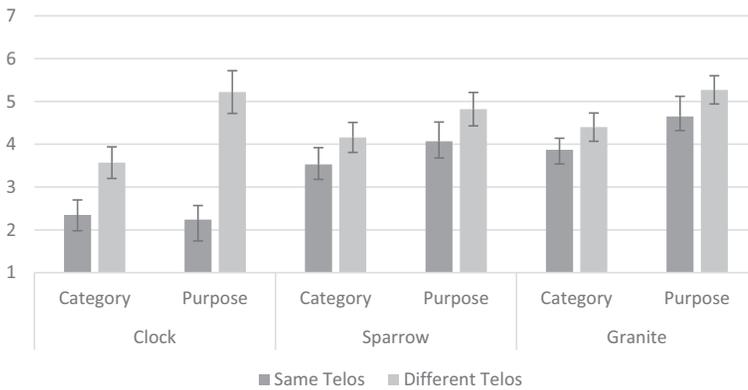


Fig. 5. Effect of insides (same telos, different telos) on category and purpose (reverse coded) judgments across kinds with 95% confidence intervals.

(401) = 14.51,  $\beta = 0.587$ ,  $p < .001$ , but that in a multiple regression model with both Insides and Purpose as predictors of Category, the effect of Insides on Category was no longer significant,  $t(401) = 1.05$ ,  $\beta = 0.045$ ,  $p = .295$ . We also tested an alternative mediation model with Category as a mediator of Insides on Purpose, but the effect of Category was still significant in the multiple regression model,  $t(401) = 5.44$ ,  $\beta = 0.220$ ,  $p < .001$ .<sup>1</sup> The mediation model is shown in Fig. 6.

These results indicate three things: First, when insides are replaced, people infer, without being told, that a thing either preserves or changes its telos. Second, when the insides transfer a similar telos, people are more inclined to think the original thing retains its original category membership and purpose than when the telos is different. Lastly, purpose judgments generate category judgments in a context where people infer that the telos has been preserved or changed.

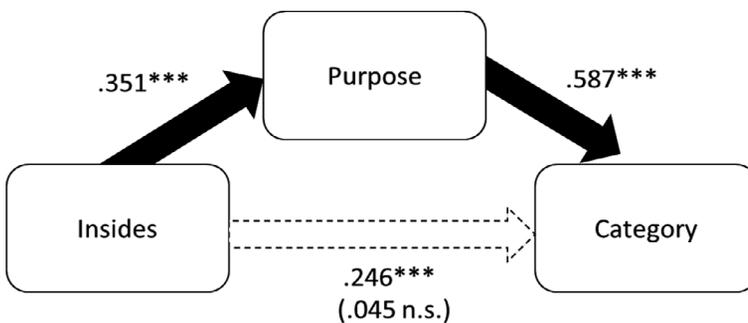


Fig. 6. Standardized regression coefficients for the relationship between insides and category mediated by purpose. \*\*\*  $p < .001$ .

## 6. Conclusion

Our focus was on generalizing and expanding teleological essentialism. On our view, essences are represented by a kind of telos, not by scientific essences (Rose & Nichols, 2019). Importantly, in contrast to natural/social kind essentialism, our view is that a broad range of categories, including artifactual categories, are essentialized in terms of a teleology. And our findings support this.

In our first study, we found that, despite radical superficial change, preservation and change in telos have a similar impact on categorization judgments for artifacts (e.g., a hot plate), living natural kinds (e.g., a vulture), and non-living natural kinds (e.g., magnetite). Our second study took this one step further. Despite an even more radical change—complete inside replacement—preservation and change in telos had a similar impact on categorization judgments for artifacts (e.g., a clock), living natural kinds (e.g., a hummingbird), and non-living natural kinds (e.g., coal). Third study provided evidence that teleological essences can be transmitted to “offspring.” Regardless of whether people considered artifacts, living natural kinds or non-living natural kinds, and regardless of what “fertilized” the thing, when the telos of the original thing changed, they were more inclined to think the new thing that would emerge from the “fertilization” machine would be a member of the category with that telos. Our final study replicated the same basic pattern found in second study in a context where preservation and change in telos were not explicitly manipulated. There we found that people make inferences about whether the thing preserved or changed its purpose when its insides are replaced. We also found that when the insides of the original thing were replaced with the insides from a thing that people thought had a similar telos, people were more inclined to think the original thing retained its purpose and retained category membership. And we provided evidence that inferences about the purpose of a thing play a role in generating category judgments.

Together, this suggests that teleological essentialism is general, that essence is represented by a kind of telos for a broad range of categories. Teleological essentialism puts pressure on natural/social kind essentialism and also provides a general and unified view of essentialism across a range of kinds. That said, we want to conclude by considering a different view of essentialism, one that may have a similar kind of generality to teleological essentialism.

Inspired by work on “dual-character” concepts (e.g., Knobe, Prasda, & Newman, 2013; see also De Pinal & Reuter, 2017), it has been suggested that while natural kinds have Lockean essences, value-laden kinds (e.g., *rock band*, *scientist*) have Platonic essences. Both kinds of essences involve representing an abstract structure that is taken to explain how category members are related (Newman & Knobe, 2019). This offers a general view of essentialism. And it is supported by work indicating that we represent value-laden kinds in terms of Platonic essences (e.g., De Frijetas et al., 2017; Newman et al., 2015; Strohminger et al., 2017) and natural kinds in terms of Lockean essences (e.g., Tobia, Knobe, & Newman, forthcoming). Perhaps this view, what we will call Lockean/Platonic

essentialism, fares just as well, or perhaps even better, than Aristotelian essentialism in offering a general view of essentialist thinking.

One of the main reasons for favoring Aristotelian essentialism over Lockean/Platonic essentialism is that Lockean/Platonic essentialism is bifurcated while Aristotelian essentialism is unified. So while the Lockean/Platonic view explains essentialist judgments regarding natural kinds in terms of Lockean essentialism and essentialist judgments regarding value-laden kinds in terms of Platonic essentialism, Aristotelian essentialism replaces Lockean essences for natural kinds with teleological essences. And when it comes to value-laden kinds where Platonic essences seem to explain essentialist judgments, we think Aristotelian essentialism provides a good explanation of our essentialist inclinations.

To take one example, consider *scientist*. Knobe et al. (2013) suggest that, in thinking about this, we might think of the following features: developing theories, running experiments, considering opposing views, and conducting statistical analyses. The question then is whether there is some deeper thing that all of these features serve to realize. The Platonic answer is that what unified these various features is some deeper value. But, for Aristotle, the ideal is to realize one's telos. It is thus natural to think that the deeper ideal here is teleological.

There is some suggestive evidence supporting the idea that teleology is the ideal. Casler, Terziyan, and Greene (2009) taught children the function of both familiar and unfamiliar artifacts. What they found was that when a puppet used the objects in ways that were inconsistent with the thing's function, children responded by either protesting or tattling on the puppet. The fact that these reactions occurred for both familiar and unfamiliar artifacts suggests that children rapidly map function information onto artifacts and form normative expectations about the thing's proper use. In other work, Casler et al. (2011) found that the tendency of children to make scale errors for artifacts, such as trying to enter a miniature, toy car, is explained by their deep-seated focus on purpose. Indeed, even brief exposure to the function of a novel artifact leads children to focus on it to the point of attempting to use it under impossible circumstances (e.g., when it is way too small or large). In fact, children even favor function over appropriately scaled objects for the task at hand. Moreover, Casler, Hoffman, and Eshelman (2014) found the same basic pattern in adults. For adults, just like children, function sometimes trumps size.

Together, what these findings suggest is that we are deeply sensitive to information about function. It is natural to think that this tendency has an Aristotelian, as opposed to Platonic, explanation. The ideal is realization of the telos. To focus on the telos, then, is to focus on the ideal. And in doing so, we end up forming normative expectations.

Aristotelian essentialism puts pressure on Lockean/Platonic essentialism though it leaves open whether Aristotelian essentialism might integrate with some combination of Lockean or Platonic essentialism. We add that while Aristotelian essentialism looks to be better positioned to provide a general theory of essentialist thinking, it also puts pressure on views that deny that we do essentialize categories. One prominent view that denies that we essentialize categories is "causal minimalism" (Strevens, 2019). On this view,

what appear to be essentialist beliefs are actually beliefs of the form “There is something about category C that causes X, Y and Z.” And this clearly falls short of essentializing a category. But our findings indicate that there is more to categorizing than causal minimalism suggests. Tele provide a substantive account of what is distinctive about the representation of essentialized categories.<sup>2</sup>

We conclude by flagging some limitations and further questions. First, our pilot studies were aimed at uncovering what people think the purpose of a thing is. But our pilot questions, for example, “What is the true purpose of a hotplate?” presuppose that people do think the thing has a purpose, and future studies might first ask participants whether they think the thing has a purpose before asking what that purpose is. Even so, we note that people had no trouble answering this and crucially, varying the features people identified with the thing’s telos affected categorization judgments and purpose judgments in our experiments which involved different participants.

Second, demand characteristics might have had some effect on our findings. For instance, participants were asked two comprehension questions where one of these was related to the thing’s purpose (e.g., “The thing after the special procedure only [heats up/eats dead animals/attracts objects].”). That might have primed some people to rely on this information when responding to test questions. But we note that this comprehension questions did not explicitly mention purpose. More generally, similar effects of teleological thinking are found even when no such comprehension questions are asked (e.g. Rose, 2015).

Third, it would be useful to see whether participants think these kinds of transformations are possible, and whether such judgments have effects on categorization. For instance, perhaps people do not think it is possible that vulture insides can be stuffed into a hummingbird. And perhaps that affects their categorization judgments. If so, future research could investigate whether participants think the candidate transformations are possible and whether that affects the kind of categorization judgments they make. Participant explanations, which tend to be underutilized, might provide useful data in this regard and also give insight into the kind of information participants import into the task (see e.g., Rose, Buckwalter & Nichols, 2017 on importing).

Fourth, our experimental design departs in some ways from that of Keil (1989). Keil gives people cases where a thing undergoes transformation and then asks what the thing is. Since essence is immutable, people should be inclined to think that the transformation did not change what the thing was. And this is what Keil finds. Our experimental design is similar in that it features cases where a thing undergoes transformation but its telos is preserved. But our experimental design has the addition that we include cases where a thing changes its telos. And that is to determine whether change in telos leads to changes to people’s categorization judgments. An additional way to test for teleological essentialism, and one that is closely related to study 4, would be to give people cases where a thing undergoes superficial transformation (e.g., a vulture made to look like a hummingbird) and then ask whether it would change category membership and whether its teleological features would change. Although we did not run such cases, we do expect that people’s category judgments would track their teleological judgments once again.

Fifth, we have been focused on providing support for teleological essentialism and in doing so put pressure on natural/social kind essentialism. Natural/social kind essentialism denies that artifacts are essentialized, so the fact that we do essentialize artifacts, and do so in terms of teleology, suffices to threaten natural/social kind essentialism. Still one might wonder whether we do essentialize natural kinds in terms of scientific essences. A useful test would be to pit preservation or change of, for example, genes, against preservation or change in telos to see if either of these alone or in combination affects categorization judgments. Moreover, further research should focus on whether it is simply behavior and not teleology that plays a role in categorization (e.g., Hampton et al., 2007). Although our fertilization machine study suggests that it is not simply behavior but rather teleology that plays a role in categorization, contrasting teleological features with scientific features or even other characteristic features of things will be useful in further examining teleological essentialism.

Lastly, there are further, independent questions related to artifacts. Our findings cohere with those of Rips (1989), who found that people categorize a thing that looks like an umbrella as a lampshade when it is described as having the intended function of a lampshade. And they also cohere with findings by Rose and Schaffer (2017b), who find that both intended function and success play a role in composition judgments about artifacts. Malt and Johnson (1992), however, provided results which appear to put pressure on the idea that function plays a central role in categorization judgments for artifacts. What they found is that physical features impact categorization judgments for artifacts. For instance, people think the function of a sweater is to provide warmth yet are more inclined to think something is a sweater if it is made of wool as opposed to rubber, even when both are described as providing warmth. This appears to conflict with what we have found here concerning artifacts. But it could be that information about material interacted with people's view of whether the thing successfully fulfilled its function. Participants might have been less inclined to think that rubber, as opposed to wool, provides warmth. This is plausible, especially in light of Rose and Schaffer's (2017b) findings indicating that successfully fulfilling a function matters in composition judgments about artifacts. Since Malt and Johnson (1992) did not ask participants whether the thing successfully fulfilled its intended function, this remains a possibility. But another option is that categorization involves a constellation of features that receive different weightings (e.g., Hampton et al., 2007). So categorization might include more than just information about category essence. If so, it is a further question how teleology and other features work together to render categorization judgments, especially concerning artifacts.

We acknowledge that further work should be done on the issues raised by this work. But at this point we think we have provided evidence that we do essentialize a broad range of categories in terms of teleology. How broadly this goes (e.g., do we essentialize gender and race in terms of teleology?) remains to be seen. The current work, however, indicates that a surprising range of kinds are essentialized in terms of teleology and thus provides reason to suspect that yet other categories will be found to be essentialized in terms of teleology.<sup>3</sup>

## Notes

1. For more on testing alternative models, see e.g., Iacobucci, Saldanha, and Deng (2007), Rose and Nichols (2013), Rose et al. (2011), Rose and Nichols (2019), Rose (2017), and Turri et al. (2016).
2. We would like to thank an anonymous referee for raising this point.
3. We would like to thank Iris Berent, Joshua Knobe, Jonathan Weinberg, an Editor of *Cognitive Science*, and three anonymous referees for helpful comments and discussion.

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