Understanding 'Why': How implicit questions shape explanation preferences

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Version	:	08/20/21 Preprint

Abstract

Adults and children 'promiscuously' endorse teleological answers to 'why' questions, a tendency linked to arguments that humans are natively theistic and intuitively unscientific. But what are people doing when they endorse a teleological answer? Here, we show that the endorsement of teleological answers need not imply unscientific reasoning (n=880). A series of experiments shows that (a) 'why' questions can be understood as a query for one of two distinct kinds of information, and (b) these 'implicit questions' can explain adults' answer preferences without appeal to unscientific worldviews. As a strong test of this view, we show that people endorse teleological answers that can answer relevant (implicit) questions about something's purpose, even when those answers are explicitly non-causal. Thus, we argue that endorsement of teleological answers does not necessarily equate to endorsement of teleological explanations—and that the study of explanation may benefit from further study of the questions that precede explanations.

Keywords

Imagine a child asks you the following question: "Why is the forest so quiet and pretty?" You might be tempted to give an answer like, "Well, the forest is quiet and pretty so that we can go on long walks and spend time together." However, to many scientists and philosophers who study explanation, that answer is deeply flawed: It tries to explain a part of the natural world via appeal to a *telos* (i.e., going on walks and spending time together) that played no causal role in its origin. Yet, in many ways, the answer feels perfectly natural—of the sort we encounter all the time. Here, we aim to understand why it is that ostensibly flawed explanations like this one *feel* like satisfying answers (and are frequently endorsed by adults and children alike).

This answer about the forest offers a *teleological explanation*—one that explains by appeal to purpose. Both children and adults appreciate such explanations, preferring them over comparable non-teleological explanations in a variety of domains (see e.g., Banerjee & Bloom, 2015; Kelemen, 1999; Schachner et al., 2016). Endorsement of teleological explanations in some domains is clearly reasonable: There is a straightforward sense in which we can say that hammers are explained by their purpose to drive nails. However, it makes less sense to say that a forest's existence is explained by its purpose. The forest was not designed to serve a purpose, nor did its purpose play a causal role in its evolution. Yet even adults are drawn to such explanations (e.g., Kelemen & Rosset, 2009; Kelemen et al., 2013), raising questions about how humans naturally understand the world (and explanations about it).

For example, teleological explanation preferences have been linked to theories like 'intuitive theism' (i.e., the idea that children are endowed with a natural belief in a designer, or God(s); Kelemen, 2004), as well as the 'agentive worldview' (i.e., the idea that humans naturally over-ascribe agency in virtually all domains of cognition; Rose, 2020). On such views, the reason that people ascribe teleological explanations for natural kinds is because they *do* perceive

those natural kinds as existing as a result of some purpose. The forest, for example, may have been designed by God to serve humans and animals. Thus, these views regard the endorsement of teleological explanations (in some domains) as inherently unscientific—revealing a deep-set conflict between our intuitive worldview and modern science (see also, e.g., Allen & Bekoff 1995). As such, understanding these explanation preferences and their origins is key to understanding not only how we are inclined to *explain* the world, but also how we come to make sense of it in the first place.

Current Study

Most prior work has (reasonably) focused on explanations; here, we focus on the *questions* that prompt them. Prior work often assumes that 'why' questions are ambiguous (see, Kelemen & Diyanni, 2005, p. 8; see also, e.g., Lombrozo et al., 2007; Lombrozo & Gwynne, 2014), but nevertheless also assumes that a 'correct' answer in response to such a question must offer a causal account (e.g., Kelemen, 1999; Schachner et al., 2016). We ask: (1) Are 'why' questions truly ambiguous, and (2) is it fair to assume that 'correct' answers must provide causal accounts?

Consider the implications of this first question. Figure 1 shows an innocuous 'why' question, two possible ways the question could be rephrased, and two possible ways the question could be answered. The red line shows how we typically think of the endorsement of teleological explanations—as stemming directly from 'why' questions. But suppose that "Why?" is *not* ambiguous. This figure shows that if people understand the initial 'why' question as specifically implying a 'purpose' question, it would not be strange in any way to prefer the teleological answer (as that answer is no longer meaning to causally *explain*). In this paper, we propose that

adults understand ambiguous 'why' questions as implying one of two more specific questions, and that these pragmatic inferences shape downstream 'explanation' preferences.
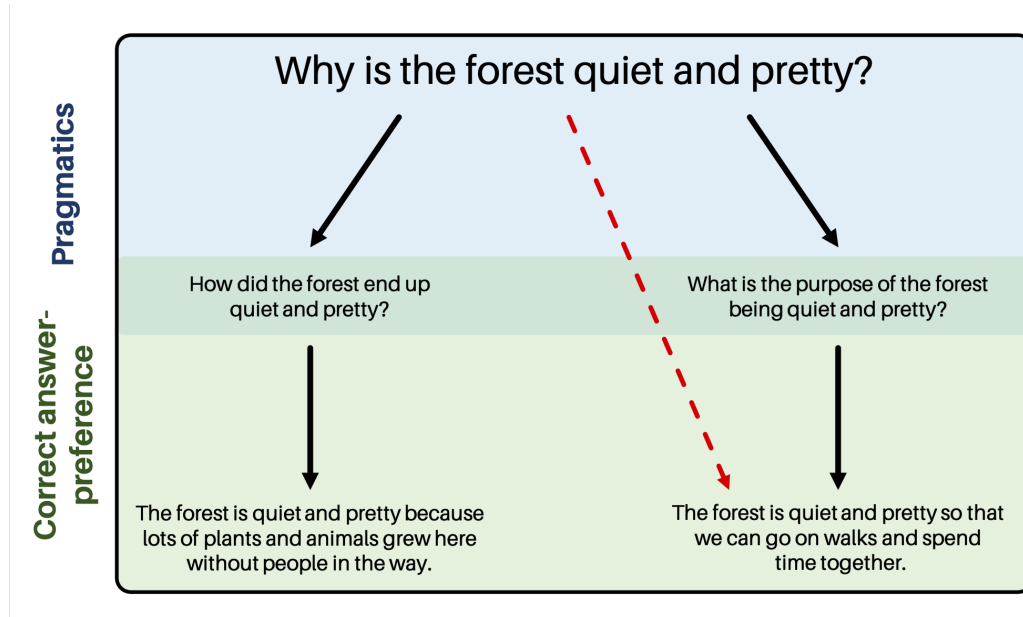

Figure 1. A depiction of how the pragmatics of 'why' questions influences the answers people prefer in response to those questions. Endorsement of teleological explanations is only unscientific if we imagine a direct link between 'why' questions and teleological answers (dashed red line). However, if we imagine that people understand certain 'why' questions as implying a 'purpose' question (right side), then people's answer preferences are understandable.

The majority of explanation studies ask people to evaluate different explanations that answer the same 'why' question. Here, we break down questions and answers separately and investigate people's assumptions about both (see Figure 2). First (Experiments 1a-b), we ask people to interpret ambiguous 'why' questions, and find that adults do have domain-specific expectations about such questions (mirroring known explanation preferences). Then (Experiments 2a-b), we have people play a 'jeopardy' game in which they must generate questions from answers. Using this approach, we show that people map specific answers (e.g., teleological vs causal) on to specific implicit questions ('purpose' vs 'how') to. In one final set

of experiments (Experiments 3a-b), we directly address a key prediction of this view: that people

will endorse teleological answers that cannot be straightforwardly causal.
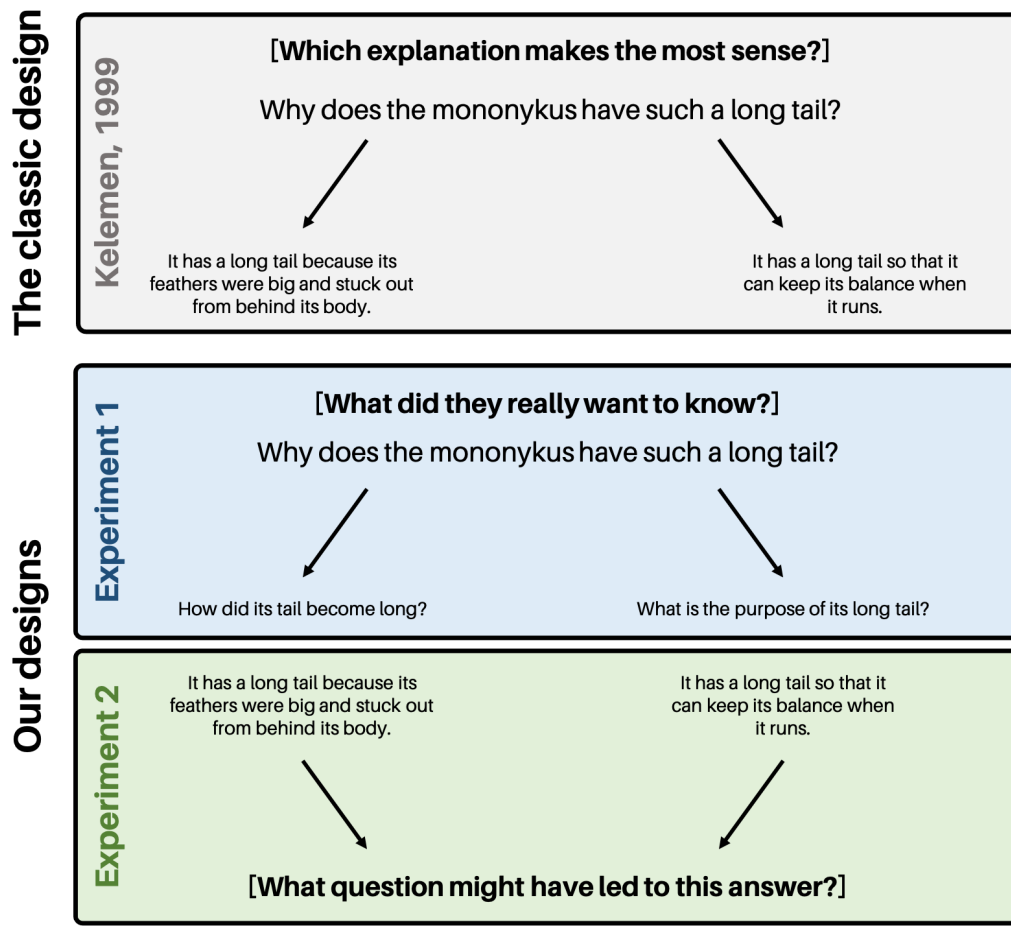

Figure 2. A depiction of our paradigms in comparison to prior work. While our stimuli are closely modeled after those used by Kelemen (1999), we use novel paradigms to examine underlying assumptions in people's explanation preferences. Instead of asking about explanation preferences directly, we break down the classic design into its component parts—asking (1) how people interpret 'why' questions (Experiment 1) and (2) how they understand the link between specific explanations and implicit questions (Experiment 2).

Experiments 1a-b: What do people really want to know?

Are 'why' questions (pragmatically) ambiguous? Here, we showed participants

ambiguous 'why' questions and asked them what the agent asking the question "really wanted to

know."

Method: Experiment 1a

<u>Participants</u> One hundred adult participants completed a survey online through Amazon Mechanical Turk. The sample size was chosen on the basis of independent pilot data and was preregistered. All participants lived in the United States. Data from an additional 39 participants were excluded for failure to follow directions or failure to generate interpretable questions (all data from excluded participants is also available on our OSF page).

<u>Stimuli</u> Participants were shown an ambiguous 'why' question and simply asked what the agent asking the question "really want[ed] to know." Total material consisted of twelve 'why' questions, four each in the domains of animals, non-living natural kinds (NLNK), and artifacts (see Table 1).

These stimuli (as well as the explanations in Experiments 2a-b) are based on those from Kelemen (1999) with a few modifications, including: (1) One additional domain (artifacts) was added; (2) The specific language of the stimuli themselves were changed to be in the present tense and refer to singular items; (3) Superfluous language was removed since only adults were tested; and (4) Stimuli were presented in a fully randomized order (rather than in pairs). Because these questions and explanations were designed to study children (or modeled after those original stimuli), they are linguistically simple. However, it is important for our view that we use stimuli that are representative of this field of study.

<u>Procedure</u> For each item, participants were presented with an ambiguous 'why' question and were asked to list either all of the questions that the agent "may want the answer to." They were specifically instructed to provide at least two questions and were able to list up to five. Participants were prompted to think of "more specific questions" and told that "it may help to

think about questions that don't contain the word 'why'." They were first shown a training item in which they were instructed to interpret the question "Why is the sky blue?".

Participants' freely generated questions were then coded into 'how', 'purpose', and 'other' categories of questions. A question was coded as a 'purpose' question if it contained the words "purpose", "for", "use", "function", or "advantage." A question was coded as a 'how' question if it contained the words "how", "cause", "made", and "led." Questions that asked "how come" or "the reason that" something was the way it was were treated as functional synonyms of 'why' questions and were thereby excluded from further analysis. All criteria for coding questions were preregistered. (There may be other questions that could have been categorized in further ways and/or different criteria for sorting between 'how' and 'purpose' questions. Our method in sorting questions was not exhaustive of all the possibilities nor a perfect system; however, (1) All of our data are publicly available, and we invite readers to analyze them in other ways as they wish, and (2) We are confident in the qualitative pattern we present regardless of the specific criteria used to code questions.)

Participants were assigned to one of two between-subjects conditions. Participants in each condition saw six 'why' questions, two from each domain (animals, NLNK, artifacts), presented in a random order. Pilot testing revealed that a fully within-subjects design resulted in an overly long task, given that each item requires participants to generate and type in at least two questions. Thus the purpose of these between-subjects conditions was simply to reduce task load; there were no meaningful differences between conditions.

Data, materials, and preregistration information for this experiment and all following can be found on the Open Science Framework (OSF) at

https://osf.io/xtdu9/?view_only=acea58b086994c00a79f86072e798820.

'Why' Question	Explanations
Animals	
Why does the **mononykus** have such a long tail?	The mononykus has a long tail because its feathers were big and stuck out from behind its body.
	The mononykus has a long tail so that it can keep its balance when it runs.
Why does the **cryptoclidus** have such a long neck?	The cryptoclidus has a long neck because the stuff inside got all stretched out and curved.
	The cryptoclidus has a long neck so that it can grab at fish and feed on them.
Why does the **macraucchenia** have such a big snout?	The macrauchenia has a big snout because its face muscles and bones pulled down and got longer.
	The macrauchenia has a big snout so that it can pull down leaves from trees and eat them.
Why does the **moeritherium** have such flat feet?	The moeritherium has flat feet because its toe bones got shortened and all smoothed out.
	The moeritherium has flat feet so that it can stand on wet ground without slipping.
NLNK	
Why are the **rocks** so pointy?	The rocks are pointy because little bits of stuff piled up on top of one another over a long time.
	The rocks are pointy so that animals won't sit on them and smash them.
Why is the **pond** so still?	The pond is still because no moving water ever ran into it.
	The pond is still so that it won't ever spill and lose all its water.
Why is the **sand** so grainy?	The sand is grainy because bits of shells got broken and mixed up making it that way.
	The sand is grainy so that it won't get blown away and scattered by the wind.
Why are the **stones** so green?	The stones are green because lots of colored stuff mixed together to make them that way.
	The stones are green so that they can't be seen in the grass and no one will pick them up and take them.
Artifacts	
Why is the **baking tool** full of holes?	The baking tool is full of holes because it was cut with something sharp.
	The baking tool is full of holes so that it can hook onto small parts on a hot oven rack.
Why does the **glassblowing tool** have empty loops?	The glassblowing tool has empty loops because its metal was bent into shape.
	The glassblowing tool has empty loops so that it can make circles in melted glass into spheres.
Why is the **roller** covered with ridges?	The roller is covered with ridges because some of the wood was carved out.
	The roller is covered with ridges so that it can press against even little muscles that are hurting.
Why does the **ostrich pillow** have a big hole?	The ostrich pillow has a big hole because the fabric wasn't sewn shut on one side.
	The ostrich pillow has a big hole so that it can fit someone's whole head inside when they sleep.

Table 1. "Why' questions and explanations. The far left column contains the three domains from which we draw our stimuli (animals, non-living natural kinds, and artifacts). The middle columns list items in each domain along with the 'why' question asked about one of its features. The far right column presents two explanations for each item. These explanations are meant to answer the 'why' questions that they follow. Of each pair, the top explanation is a mechanistic explanation, and the bottom explanation is a teleological explanation. The animal and NLNK items are adopted with minor adjustments from prior work (Kelemen, 1999). The 'why' questions are investigated in Experiments 1a-b and the explanations are investigated in Experiments 2a-b.

Method: Experiment 1b

All elements of the experimental design were identical to those of Experiment 1a, except as stated below. One hundred new participants completed the survey online through Amazon Mechanical Turk. This sample size was chosen to be identical to that in Experiment 1a.

Even if participants in Experiments 1a themselves generate a specific pragmatic questions for 'why' questions, we might wonder if this specific interpretation is truly the main way that 'why' questions are pragmatically interpreted—or if, instead, one question is simply what first comes to mind. Here, therefore, we offered participants a forced-choice. Participants were asked to choose between a 'how' question (e.g., "How did the mononykus' tail become long?") and 'purpose' question (e.g., "What is the purpose of the mononykus' long tail?"; a full list of these questions is available on our OSF page under Table S1). They were asked which question the agent asking an ambiguous 'why' question *really* wanted to know.

Results: Experiment 1a

Results for Experiments 1a-b are shown in Figure 3.

Participants' questions were not evenly distributed across categories ('how', 'purpose' and 'other') when asked to generate questions from an ambiguous 'why' question, $X^2(5, N=566)=64.50$, $p<.001$. We further broke down these results by simply counting the total number of 'how' vs. 'purpose' questions that were generated within each domain. We analyzed participants' likelihood of generating 'how' vs. 'purpose' questions by treating counts of participants' questions within each domain as an average. A total number of 'how' questions and 'purpose' questions was generated for each participant within each domain. Participants were more likely to generate 'how' questions ($M=1.29$, $SD=1.17$) than 'purpose' questions ($M=.45$, $SD=.72$) when asked about non-living natural kinds ($t(99)=6.62$, $p<.001$, $d=.66$). They were also

more likely to generate 'purpose' questions (M=1.44, SD=1.23) than 'how' questions (M=.74, SD=.86) for artifacts (t(99)=4.49, p<.001, d=.45). However, there were no significant differences between numbers of 'how' and 'purpose' questions generated about animals (Exp 2a: t(99)=1.19, p=.24).

As a secondary approach, we also analyzed questions by counting individual participants who generated all 'purpose' or all 'how' questions. In the first approach, one hypothetical participant generating one 'how' question and four 'purpose' questions would have skewed the question count toward 'purpose' questions (even though they were indicating that the 'why' question was ambiguous); this more fine-grained approach allowed us to account for discrepancies in the number of questions generated by different participants. More participants generated only 'purpose' than only 'how' questions for artifacts ($\hat{p}$=.70), p<.001 (binomial test). The reverse was true of NLNK: More participants generated 'how' than 'purpose' questions ($\hat{p}$=.81), p<.001 (binomial test). However, for animals, participants were not more likely to generate only 'purpose' questions than 'how' questions ($\hat{p}$=.58), p=.07 (binomial test)We also conducted an even stricter test of our results to further clarify the relationship between participants' preferred interpretation and the perceived ambiguity of the 'why' questions, by comparing the number of participants generating a single type of question to the number of those who ambiguously gave both 'purpose' and 'how' questions. For both animals and artifacts, participants were also more likely to generate only 'purpose' questions than to interpret 'why' ambiguously, animals: ($\hat{p}$=.60), p=.03 (binomial test); artifacts: $\hat{p}$=.60), p<.001 (binomial test), and for NLNK, (participants were more likely to generate only 'how' questions ($\hat{p}$=.74), p<.001 (binomial test).

(In Experiment 1a, we asked participants what an agent asking a 'why' question really wanted to know. Separately, we also ran a functionally identical study with a closely related question, asking participants what a 'why' question could "plausibly imply." These results are qualitatively identical and are available in full on our OSF page.)

Results: Experiment 1b

When presented with 'why' questions about animals and artifacts, most participants thought the agent was really asking a 'purpose' question (animals: $\hat{p}$=.86; artifacts: $\hat{p}$=.95), p<.001 (binomial tests). In contrast, most participants chose the 'how' question for NLNK, ($\hat{p}$=.87), p<.001 (binomial test).

We also analyzed participants' expectations by treating participants' responses across items in the same domain as an average. Participants' responses were scored as a 1 if they chose the 'purpose' question and a 0 if they chose the 'how' question. We then added these scores within each domain for each participant. We again found that participants thought that 'why' questions about animals and artifacts implied 'purpose' questions, (M=2.88, SD =2.04, t(99)=14.14, p<.001, d=1.41) and artifacts, (M=3.58, SD=1.28, t(99)=27.96, p<.001, d=2.80). For NLNK, participants instead thought that 'why' questions implied 'how' questions (M=-2.94, SD=1.79, t(99)=16.47, p<.001, d=1.65).

Finally, we also explicitly compared participants' expectations between domains by using a repeated-measures ANOVA. There was a significant main effect of domain, F(2,99)=434.21, p<.001. Post-hoc tests demonstrated that participants' were more likely to assume the 'why' question implied a 'purpose' question for animals than for NLNK, t(99)=20.67, p<.001, Bonferroni corrected, d=2.07. Similarly, participants were also more likely to assume the 'why' question implied a 'purpose' question for artifacts than for NLNK, t(99)=25.87, p<.001,

Bonferroni corrected, d=2.59. While participants were also more likely to expect the 'purpose'

questions for animals than for artifacts, these effects were much smaller, $t(99)$=3.78, p<.001,

Bonferroni corrected, d=.38.

(In Experiment 1b, we asked participants to identify what somebody else asking a 'why'

question really wanted to know. Separately, we also ran a functionally identical study with a

closely related question, asking participants what they themselves would want to know. These

results are qualitatively identical and are available in full on our OSF page.)

In order to establish people's explanation preferences for comparison, we also ran a

baseline experiment replicating the classic paradigm (i.e., presenting people with 'why'

questions and asking them to choose either the teleological or mechanistic explanation in

response). These results are included in Figure 3 and are also available in full on our OSF page.

As Figure 3 shows, participants' domain-specific expectations about 'why' questions (tested here

in Experiments 1a and 1b) reflected their explanation preferences (tested in our baseline

experiment and consistent with Kelemen, 1999).

Discussion: Experiments 1a-b

In domains where adults prefer teleological explanations, they also think that the agent

asking a 'why' questions is intending to ask a 'purpose' question. In practice, this means that the

endorsement of a teleological answer may not necessarily be an endorsement of a causal account;

people may instead be evaluating these answers as responses to a *different* question—one that

seeks information about something's purpose, regardless of whether that purpose explains. This

reframing implies that the endorsement of teleological answers is perfectly straightforward, and

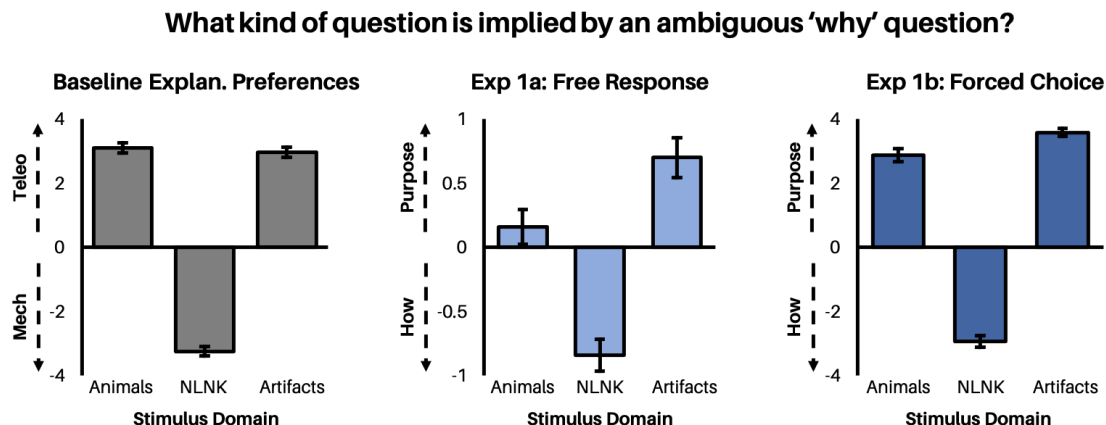need not demonstrate any fallacious or unscientific worldview (see Figure 1).

What kind of question is implied by an ambiguous 'why' question?

Figure 3. Results from experiments disambiguating 'why' questions. The x-axis represents chance performance, and explanation/question type is represented along the axis. In the leftmost graph, participants' explanation preferences (found in a baseline experiment replicating Kelemen, 1999) are represented along the y-axis. In the right two graphs, participants' coded (Experiment 1a) or scored (Experiment 1bc) responses are represented along the y-axis. In Experiment 1a, participants were asked to generate what question the agent asking the question really wanted to know. In Experiment 1b, participants were made to choose between a 'how' and a 'purpose' question in a forced-choice paradigm. Error bars represent +/- 1 SE.

Experiments 2a-b: Jeopardy

Do people understand teleological answers as necessarily explanatory? To find out, we have participants complete a 'jeopardy' game in which they must generate questions from answers (see Figure 2). If people tend to generate purpose questions for teleological answers, it would imply that they primarily understand those answers as a response to a a 'purpose' question rather than a causal question.

Method: Experiment 2a

Participants One hundred new adult participants completed a survey online through Amazon Mechanical Turk (data from 7 additional participants were collected but excluded for failing the training item; data from 5 additional participants were collected but excluded for failing to follow directions or produce interpretable questions; see the Procedure section). This

sample size was chosen to be identical to those in the previous experiments. This experiment was also preregistered.

Stimuli Total materials consisted of twenty-four explanations; twelve were mechanistic explanations and twelve were teleological explanations (see Table 1).

Participants first saw a training item that introduced the 'jeopardy' task. They were told that instead of being shown questions and answering them, they would be shown *answers* and be asked to generate the questions that led to those answers. As an example of the task, they were shown the answer "The book is over there, on top of the shelf but underneath the scarf" and asked to give a question that might have led to this answer. Participants who did not provide a question along the lines of "Where is the book?" were excluded and replaced for failing to understand the task (see the Participants section).

In each of the test items, participants were shown an image of the item and were told that somebody had provided an answer about that item (e.g., "Someone answered, 'The mononykus has a long tail because its feathers were big and stuck out from behind its body.'"). See Table 1 for these explanations. They were asked, "What question might have led to this answer?" and were explicitly prompted not to use the word 'why'.

If explanation preferences arise from pragmatic expectations, we should expect that participants expect mechanistic answers to have come from 'how' questions and teleological answers to have come from 'purpose' questions. Such a pattern of results would demonstrate a direct connection between explanation preferences and the implicit questions identified in the previous experiments.

Participants who either (1) systematically generated non-interpretable questions or (2) ignored the direction not to use the word 'why' were excluded and replaced (see the Participants

section). Participants' freely generated questions were then coded into 'how', 'purpose', and 'other' categories of questions using the same criteria as in Experiments 1a-b. All criteria were preregistered, and all of our data are publicly available.

Method: Experiment 2b

All elements of the experimental design were identical to those of Experiment 2a, except as stated below. One hundred new participants completed the survey online through Amazon Mechanical Turk (data from 1 additional participant was collected but excluded for failing the training item; see below). This sample size was chosen to be identical to those in the previous experiments. This experiment was also preregistered.

As in Experiment 1b, we wanted to replicate the free-response patterns of responses in a forced-choice task—in order to address the possibility that participants' were generating the question that first came to mind but that they did not think specific answers could address *only* one or the other implicit question. Participants were thus now asked which of two questions led to the explanation they were given. One was a 'how' question (e.g., "How did the mononykus' tail become long?") and the other was a 'purpose' question (e.g., "What is the purpose of the mononykus' long tail?"; a full list of these questions is available on our OSF page, under Table S1). The training item was also presented as a forced choice.

Results: Experiment 2a

The results for Experiments 2a and 2b are shown in Figure 4.

Participants' questions were not evenly distributed across categories of questions, X^2(5, N=923)=166.37, p<.001. The same was true when analyzing questions within each domain; whether thinking about answers regarding animals, (X^2(5, N=317)=35.26, p<.001), NLNK, (X^2(5,

N=286)=121.87, p<.001), or artifacts, (X^2(5, N=320)=116.58, p<.001) participants generated different kinds of questions for different kinds of explanations.

We also analyzed participants' likelihood of generating 'how' vs. 'purpose' questions (for both mechanistic and teleological explanations) by treating participants' questions across items in the same domain as an average. 'How' questions were scored as a -1, 'purpose' questions were scored as a 1, and 'other' questions were scored as a 0. We then added these scores for each participant across all teleological explanations and, separately, across all mechanistic explanations. When presented with mechanistic explanations, participants were more likely to generate 'how' questions, (M=-1.74, SD=2.35, t(99)=7.40, p<.001, d=.74). Conversely, when presented with teleological explanations, participants were more likely to generate 'purpose' questions, (M=1.42, SD=2.15, t(99)=6.60, p<.001, d=.66). The difference between participants' questions in these two different explanation types was significant, t(99)=10.13, p<.001, d=1.01. This pattern was independently true within each domain, all p<.001, all d>.5.

Results: Experiment 2b

We analyzed the results of this experiment in the same way that we analyzed Experiment 2b. When presented with teleological explanations, a significant proportion of participants thought that the explanation resulted from a 'purpose' question, ($\hat{p}$ =.95), p<.001 (binomial test). In contrast, a significant proportion of participants chose the 'how' question for mechanistic explanations, ($\hat{p}$ =.85), p<.001 (binomial test). This pattern was independently true for each domain, all $\hat{p}$>.75, all p<.001.

We also analyzed participants' likelihood of choosing the 'how' vs. 'purpose' questions (for both mechanistic and teleological explanations) by treating participants' questions across

items in the same domain as an average. 'How' questions were scored as a -1, and 'purpose'

questions were scored as 1. We then added these scores for each participant across all

teleological explanations and, separately, across all mechanistic explanations. When presented

with mechanistic explanations, participants were more likely to choose the 'how' question, (M=-

4.16, SD=2.65, t(99)=15.72 p<.001, d=1.57). Conversely, when presented with teleological

explanations, participants were more likely to choose the 'purpose' question, (M=5.44, SD=1.91,

t(99)=28.50, p<.001, d=2.85). The difference between participants' choice of question in these

two different explanation types was significant, t(99)=25.60, p<.001, d=2.56. This pattern was

independently true within each domain, all p<.001, all d>2.00.

Collectively, these experiments show a direct link between implicit questions and

teleological vs. mechanistic explanations. People thought that teleological answers were

responding to 'purpose' questions and that mechanistic answers were responding to 'how'

questions—regardless of whether they were generating the questions themselves or choosing one

over the other. This relationship between kind of question and kind of answer was also stable

across domains. Not only do people have specific expectations about implicit questions in 'why'

questions, but they then think that particular answers can address *only one* of these specific

questions.

Discussion: Experiments 2a-b

Why do people endorse teleological answers? We propose that people first have a

specific expectation about a particular 'why' question (e.g., for an artifact, people likely assume

that "Why?" is really asking a 'purpose' question). They are then faced with a choice of

explanations, each of which can only answer one (implicit) question. They therefore choose an

answer based on the implied *question* that they infer (see Figure 1). Thus, people may prefer

teleological answers regardless of whether they are reasoning about them as being causally

explanatory: A teleological answer may simply a better answer for the (implied) question at

hand.

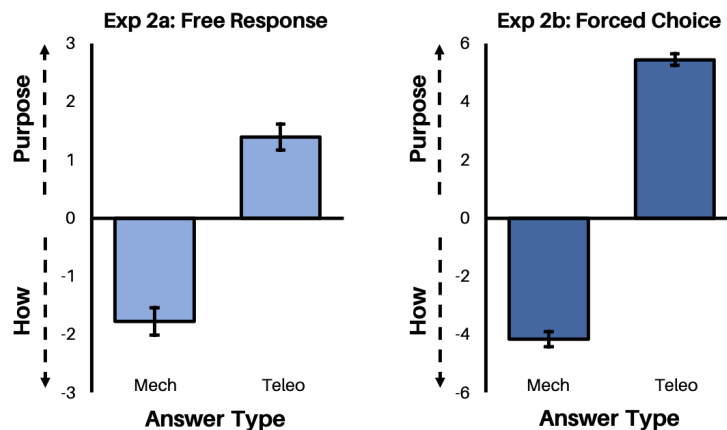**What kind of question is implied by different answers? (Jeopardy Paradigm)**

Figure 4. Results from 'jeopardy' experiments (Experiments 2a, 2b). The x-axis represents chance performance, and explanation type is represented along the axis. Participants' coded (Experiment 2a) or scored (Experiment 2b) responses are represented along the y-axis. In both cases, participants thought that mechanistic explanations implied 'how' questions and that teleological explanations implied 'purpose' questions. Error bars represent +/- 1 SE.

Experiments 3a-b: Implications of understanding 'why'

In introducing this paper, we suggested that people may sometimes endorse teleological

answers for reasons other than their ability to provide a causal account. So far, we have shown

that people do have pragmatic expectations about 'why' questions, such that it is plausible one

could answer a 'why' question without providing a causal explanation. Here, we test a stronger

prediction: that people will endorse teleological answers even when these purposes are explicitly

non-causal. We presented participants with artifacts that were clearly designed for one purpose

but were now being used for something else. This allowed us to offer a teleological 'explanation'

that referred to the artifact's *new* purpose but could not actually *explain* the existence of its

features. On the view that we are advancing, participants should still be drawn to the teleological

answer that refers to the object's new purpose—not because that purpose is explanatory, but

because it can answer the implied 'purpose' question.

Method: Experiment 3a

Participants Two hundred and forty new adult participants completed a survey online

through Amazon Mechanical Turk (data from 28 additional participants were collected but

excluded for failing the comprehension check; see the Procedure section). This sample size was

chosen to roughly match the number of participants per condition to prior experiments. This

experiment was also preregistered.

Stimuli Each item consisted of a vignette about an artifact that had been designed for one

purpose, but was now being used for a different purpose. These items were adapted from existing

work (Joo, Yousif, & Knobe, in press). Total materials consisted of four unique artifacts (straws /

wind chimes, blankets / towels, ice cube trays / organizers, and washboards / percussion

instruments). The order of the purposes was counterbalanced (e.g., for half of the subjects, one of

the artifacts was designed as a straw but used as a wind chime, and vice versa). An example

vignette is reproduced below:

> *These metal tubes were made as straws. That means that they were designed to*
> *move liquids from a cup to someone's mouth.*
> *But one day everyone in the town came together and agreed that the tubes*
> *shouldn't be used in drinking liquids and that they should all instead be wind*
> *chimes. They decided that all of the metal tubes would be used only to make music*
> *when the wind blows.*

Participants were then presented with a 'why' question (e.g., "Someone in the town asked, "Why

are the metal tubes hollow?") and were asked to choose between a mechanistic and a teleological

explanation. Importantly, the teleological explanation always referred to the artifact's *new*

purpose (and not the purpose for which it was originally designed), meaning this purpose clearly

could not be an explanation of the artifact's features. A full list of vignettes and explanations is available on our OSF page, under Table S2.

Our introductory example to this paper involved a non-living natural entity (a forest), while here, in a critical test of our view, we have opted to focus on artifacts. Using artifacts allowed us to manipulate cases both where purposes were clearly causal and when they were not. The goal of this study was to address a definitive case where people endorse explicitly non-causal teleological answers, regardless of domain. If people endorse non-causal teleological answers for artifacts, then we have reason to believe they may do so more generally—including in domains (like NLNK) where teleological answers are rarely causal.

Procedure Participants were assigned to one of eight between-subjects conditions, such that each participant saw only one vignette. Four possible artifacts were presented, and the order of purposes was counterbalanced to produce eight conditions. Participants were shown the vignette along with its corresponding 'why' question. They were asked to choose an explanation a teleological vs. mechanistic explanation based on "which explanation makes the most sense." This set up was designed to be closely matched with that in Kelemen (1999).

On a separate page after the task, participants were asked to provide an explanation of why they chose the answer that they did. These free-response answers were not part of any formal analyses, but we note that people most commonly referred to the importance of the item's current use when choosing the teleological answer. All of these responses are available on our OSF page. Finally, participants were asked a true or false question about the artifact's original design (e.g., "True or False: The metal tubes were originally designed as straws"); participants who failed this comprehension check were excluded and replaced (see the Participants section).

Method: Experiment 3b

All elements of the experimental design were identical to those of Experiment 3a, except as stated below. Two hundred and forty new adult participants completed a survey online through Amazon Mechanical Turk (data from 26 participants were collected but excluded for failing the comprehension check). Participants were now asked to choose between two teleological explanations—one which was the product of intentional design and one (also shown in Experiment 6a) could not be causally explanatory.

Results: Experiment 3a

We analyzed these data in the simplest way possible, by comparing the overall number of endorsements for the different answers types. We found that participants significantly preferred the teleological explanation over the mechanistic explanation, ($\hat{p} = .56$), $p=.03$ (binomial test) *despite* being shown vignettes that made it explicit that the teleological explanation in question was not a legitimate causal explanation.

Results: Experiment 3b

When offered two teleological explanations, participants preferred the explanation that could offer a causal explanation (i.e., that referred to the artifact's designed purpose) over the one that did not (i.e., that referred to the artifact's new purpose); ($\hat{p} = .60$), $p<.001$ (binomial test). Note, however, that a significant portion (40%) were still drawn to the teleological explanation which could not offer a causal account. These results suggest that multiple factors are at play in people's explanation preferences. On the one hand, people clearly understand causal accounts and will sometimes choose answers that can give causal explanations over those that cannot. Critically, though, while only *one* of the answers here could provide a causal account, *both* could potentially answer an implicit 'purpose' question. The fact that people remain drawn towards a

non-causal teleological explanation—even when a comparable teleological explanation is available—suggests that people's 'explanation' preferences cannot be entirely explained by their understanding of causal explanation.

Discussion: Experiments 3a-b

These experiments present straightforward instances where a possible teleological answer is clearly separable from a correct causal account of the features in question. Participants were systematically biased towards choosing a teleological explanation, even when that answer was clearly not a possible causal explanation. This does not meant that people's preferences are irrational. Quite the opposite, these results imply that people's endorsement of teleological answers in response to 'why' questions need not imply some broader theistic belief. Instead, as we show here, people likely understand these teleological answers as responses to implied 'purpose' questions.

General Discussion

What makes a good explanation? Most past research has addressed this question by focusing on the features of the explanations themselves. In contrast, our work has focused on the ways in which people interpret the *questions* preceding these explanations. We show that, over and above the explanatory virtues of a particular answer, people are drawn to those answers that address the relevant implicit (and sometimes non-causal) question.

Experiments 1a-b demonstrated that 'why' questions are *not* pragmatically ambiguous: People have clear, systematic expectations about implicit questions. Experiments 2a-b showed that people understand the relationship between certain kinds of 'explanations' (e.g., teleological vs. mechanistic' and certain kinds of questions (e.g., 'purpose' vs. 'how'). Finally, Experiments 3a-b showed that people endorse teleological explanations that address relevant implicit

questions but which *cannot* offer a causal explanation (i.e., because we explicitly offered an alternative causal account). Collectively, these results show that people endorse teleological answers for reasons other than their ability to provide a causal account.

Understanding 'Why'

Most studies on explanation preferences depend on 'why' questions (e.g., Banerjee & Bloom, 2015; Kelemen & Rosset, 2009; Liquin & Lombrozo, 2018; Schachner et al., 2016). Thus, this new insight into 'why' questions may change how we understand known 'explanation' preferences—and how we interpret them.

Our proposal is simple: Adults understand ambiguous 'why' questions as one of two possible implied questions; preferences for teleological answers are primarily explained by an inference about an implied 'purpose' question. Thus, a teleological answer can be satisfying without necessarily providing a causal account, insofar as it responds to a question that was not seeking such an account. In this case, a teleological answer is an appropriate answer to the inferred 'purpose' question—indeed, the *only* appropriate answer to such a question.

This reframing has important consequences for many of the theories built around people's teleological preferences. For instance, much debate in both philosophy and psychology has centered around adults' endorsement of teleological explanations about animals and whether these explanations require intelligent design (e.g., Lombrozo & Carey, 2006; Ruse, 2000). Our view would suggest that people's preferences have more to do with implicit questions than any causal beliefs. Even outside of the context of teleology and natural selection, our view offers a way to understand people's (sometimes very broad) teleological preferences without needing to classify them as "scientifically unwarranted" (c.f., e.g., Kelemen et al., 2013; Rose, 2020). While teleological answers sometimes *do* provide a causal account, and people may be especially likely

to endorse such answers in those cases, it does not mean that all endorsement of teleological answers implies causal reasoning.

What is teleology *for*, if not explanation?

If the appeal of teleological answers encompasses cases where teleology *isn't* being treated as a straightforwardly causal answer, then what explains their appeal?

Several intriguing possibilities exist. First, teleology may be useful in contextualizing objects in a larger world. For instance, learning that an animal's tail is good for keeping its balance may help place the tail in the context of the whole animal, and learning that a tree serves the function of removing carbon dioxide from the atmosphere may help illustrate a wider ecosystem (see ojalehto et al., 2013). Teleological explanations may also help individuals to make predictions about unfamiliar entities. Consider, for example, a child encountering a microwave for the first time. Learning that the microwave is for heating food tells them when it is likely to be used and how to interact with it meaningfully in the future (see also Lombrozo & Gwynne, 2014). Moreover, teleology may also help carve up the world into meaningful categories and objects. We know, for example, that teleology plays a key role in judgments of category membership (Matan & Carey, 2001); object constitution (Rose & Schaffer, 2017); and persistence (Rose et al., 2018).

Conclusion

Here, we show that perhaps our simplest, most fundamental, and perhaps most ubiquitous question, "Why?", is not a single question at all. "Why?" refers to at least two distinct (and more specific) questions, each of which seeks a unique form of information. This simple insight may reshape our understanding of explanation preferences, raising questions about the broad theories

on which such preferences are based. We argue that in order to better understand the nature of

explanations, we must begin by understanding the questions that precede them.

Acknowledgements

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