

Idea Habitats: How the Prevalence of Environmental Cues Influences the Success of Ideas

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Abstract

We investigate 1 factor that influences the success of ideas or cultural representations by proposing that they have a *habitat*, that is, a set of environmental cues that encourages people to recall and transmit them. We test 2 hypotheses: (a) fluctuation: the success of an idea will vary over time with fluctuations in its habitat, and (b) competition: ideas with more prevalent habitats will be more successful. Four studies use subject ratings and data from newspapers to provide correlational support for our 2 hypotheses, with a negative factoid, positive rumor, catchphrases, and variants of a proverb. Three additional experimental studies manipulate the topic of actual conversations and find empirical support for our theory, with catchphrases, proverbs, and slang. The discussion examines how habitat prevalence applies to a more extensive class of ideas and suggests how habitats may influence the process by which ideas evolve.

Keywords: Culture, memory, retrieval, social representations

Why do some ideas succeed and spread but others fail? Some catchphrases propagate and others languish, some rumors circulate extensively but others die quickly. As Sperber (1996) notes, some ideas “propagate so effectively that, in different versions they may end up durably invading whole populations. ... To explain culture, then, is to explain why and how some ideas happen to be contagious” (p. 1).

But what separates contagious ideas from those that are less contagious? Some research has explored the success of ideas (or cultural representations; Sperber, 1996) based on cognitive principles, particularly those of memory. David Rubin (1995) wrote a brilliant account of how the cognitive structure of memory affects the substantive content of oral traditions such as epic ballads or counting-out rhymes. He argued, for example, that epic ballads tend to focus on concrete, visualizable actions because people find it easier to remember events that are concrete

and visualizable. Homer is filled with concrete action, not because the Greeks had trouble with abstraction but because, based on the operation of human memory, concrete actions are more likely to survive generation after generation of oral transmission.

Other authors have explored how counterintuitive features affect the memorability of beliefs (Barret & Nyof, 2001; Boyer & Ramble, 2001; Kelly & Keil, 1985). Norenzayan and Atran (2004) argued that a smattering of counterintuitive features (e.g., supernatural agents or talking animals) may make folklore more memorable. Although mundane details help a story make sense, a small (but not overwhelming) proportion of minimally counterintuitive features add spice to a narrative and make it more memorable as a whole.

Miller and Taylor (1995) noted that many superstitions, such as the Spanish belief that it is bad luck for a matador to substitute for another matador in a bullfight, can be viewed as cultural adaptations to the psychology of counterfactual thinking (Kahneman & Tversky, 1982; Roese & Olson, 1995). Bullfighting fans may not remember matadors who are injured in facing their “own bull,” but counterfactual reasoning makes them likely to remember matadors who are injured after trading places with another matador. Here, a cultural representation has evolved to reflect the probabilities that bullfighting fans have encoded in their counterfactually biased memories. For other examples of research on the psychological foundations of cultural practices, see Schaller and Crandall (2004).

The research reviewed previously has explored features that lead ideas to be recalled readily. But while recall is one aspect of the process that makes some ideas more successful than others, for an idea to be recalled, it must first be cued by the environment, and previous research has little to say about this process of environmental cueing. Studying the structure of the environment is a distinguished, but somewhat rare, approach within the cognitive sciences (Anderson & Schooler, 1991; Brunswik, 1944; Gigerenzer, Todd, & the ABC Research Group, 1999). However, understanding the environment seems fundamental for assessing the likely success of cultural ideas; an idea may be recalled quite readily, but if it is cued only rarely by the environment, it may remain quite rare. For example, in the United States one cultural tradition holds that it is permissible for women to make marriage proposals on February 29 of leap years. This is a counterintuitive twist on typical romantic rituals, so it may be remembered quite accurately; but because leap years are relatively infrequent, it has few opportunities to be retrieved and used. By assessing the fit between ideas and environmental cues, we hope to shed additional light on the question of what ideas succeed and when.

1. Habitat approach and two predictions

We define an idea’s *habitat* as the set of environmental cues that prime people to think about an idea and cause them to believe it may be relevant to pass along (Sperber & Wilson, 1986). In biology, the concept of habitat can be used in a less or more restrictive sense. In the less restrictive sense, a habitat is a geographic region; Webster’s Dictionary (1994) defines a habitat as “the native environment of an animal or plant; the kind of place that is natural for the life and growth of an animal or plant.” Thus the habitat for Canadian geese is certain regions of North America, particularly Canada. In the more restrictive sense, biologists use habitat to refer to specific characteristics that make an environment suited for the needs of a given species. Cana-

dian geese, for instance, eat a variety of grasses and require open water with low banks to build nests.

In relation to ideas, we use the concept of habitat in more and less restrictive senses. In the most restrictive sense we define a habitat as the set of cues that prime the idea and make it relevant. The “set” aspect is key; a habitat is rarely just a single prime, signal, or prompt. But in the less restrictive sense, an idea may have broad domains of social life where its associated cues are more likely to be present. Consider the cultural idea that “football Player Z is weak on defense.” The less restrictive habitat for this idea is conversations about sports; the more restrictive habitat is conversations about Player Z’s team, especially its potential at stopping offensive drives. Just as the prevalence of an animal or plant varies with availability of the features it needs for survival, we suggest that an idea’s success will vary with the prevalence of its habitat.

External habitats affect the success of ideas by providing cues to help people retrieve records they have stored in memory. Many models of human memory assume that long-term memory consists of a set of records that can be activated by cues that are either self-generated or encountered in the environment (e.g., Anderson, 1995, chap. 5; Gillund & Shiffrin, 1984). We assume that each idea or cultural representation exists as such a record. When more of a record’s associated cues are present in the environment, people may retrieve it successfully; when its associated cues are not present, people may fail to retrieve it (Estes, 1955; McGeoch, 1932; Tulving & Psotka, 1971). The work of McGeoch and Estes is particularly relevant for ours because they argued that forgetting could be explained by cue drift in the environment; even if a memory trace has been encoded and stored successfully in long-term memory, the cues that would allow people to retrieve it might disappear as the environment shifts or changes. Thus their model assumes that people forget, not because their memories decay, but because the cues they use to retrieve a given memory have disappeared. We borrow their focus on environmental cues and suggest that the usage of a particular cultural representation will fluctuate along with fluctuations in the environmental cues that help people retrieve it.

Our emphasis on retrieval differs from other research on how memorability affects the diffusion of cultural ideas; previous work has focused on factors such as concreteness (Rubin, 1995) or counterintuitive features (Noranzayan & Atran, 2004) that seem to operate more at the encoding phase. Regardless of how well an idea is encoded, if the environment does not cue people to retrieve it regularly, that idea is unlikely to persist and spread in culture.

To illustrate our habitat approach, consider the proverb, “April showers bring May flowers.” This cultural representation may be retrieved because of many different cues—for example, seeing, hearing, or experiencing a light rain shower in the early spring, particularly in April, or seeing or smelling spring flowers, particularly in May. Although this proverb may be cued by direct sensory experience, most cultural representations are likely to also be cued by semantic associations during social interaction (e.g., a conversation about, rather than a direct experience of, April rain). Cues may differ in associative strength; discussing the previous day’s light rain (i.e., “shower”) might trigger someone to think of the proverb, whereas discussing the previous day’s thunderstorm might not. If expectations are sufficiently strong, then even the absence of expected cues might prompt people to think of an idea; a conversation about the unusually low rainfall in April might prompt someone to worry that this year’s flower crop will be slim.

Ideas may be evoked by underlying symbolic meaning as well as surface semantics. The proverb, “Birds of a feather flock together,” is more likely to be cued by people who have the

same habits, attitudes, or dress than by birds who have the same feathers. The ideas that are cued by a habitat need not be believed. People may be cued to think of “witches,” even if they do not believe in them, by a variety of cues: visual (a pointed black hat or old-style broom) or auditory (hearing the phrase, “bubble, bubble, toil and trouble”); this idea may also be cued by conceptually related ideas (e.g., discussions of Halloween; Salem, Massachusetts; or religion in the Middle Ages). Cues may be psychologically effective whether or not they are accurate descriptions of the environment (the line “bubble, bubble, toil and trouble” is misquoted from Shakespeare’s *Macbeth* where it begins as “double, double ...”).

Habitats can be measured using any method that allows one to gauge the prevalence of cues at a given time; one must (a) identify environmental cues that are likely to trigger an idea, (b) develop measures for the cues, and (c) examine the prevalence of these measures. Although there are many ways to identify what cues might compose a habitat, perhaps the most straightforward is to ask people to list the cues that might prompt them to think of a particular idea. But, although habitats are defined in terms of cues, researchers may not have direct access to the cues themselves and so may be forced to measure proxies. For example, to predict the usage of “April showers bring May flowers” we might ideally want a database that contains all conversations about spring showers during the month of April, but this database is unlikely to exist. We might, however, have a database of the number of minutes of television news devoted to the weather, and it might allow us to identify Aprils with more rain and thus more conversations about rain. Given that ideal databases are unlikely to exist for most environmental cues, one of the major empirical questions we try to resolve in this article is whether we can find appropriate proxies for idea habitats.

To summarize our argument so far, habitats are composed of associations to cues that are widely shared within the culture of interest. A particular cue will only be a part of an idea’s habitat if it prompts many people to think about and use an idea; because we are interested in the large-scale diffusion of cultural representations, our definition of habitat excludes cues that have an idiosyncratic effect on a small number of individuals. People may be the best source of information about what cues compose habitats, but habitats can be measured by proxies that are related to the underlying cues.

There are two important predictions that follow from the notion of idea habitats. First, we predict that the success of cultural ideas will vary with fluctuations in their habitat (fluctuation hypothesis). Whenever an idea’s habitat becomes more common, it will be used more frequently, and when its habitat becomes less common, it will be used less; usage of “April showers bring May flowers” should vary with the number of discussions of weather in April or flowers in May.

Second, we predict that habitat prevalence may help determine which ideas succeed in competition (competition hypothesis). Although habitats may fluctuate over time, certain cultural representations may consistently have more cues, and thus more prevalent habitats, than others. Holding other factors constant, ideas with larger habitats should be more successful. Consider the following information about two mythical creatures: Witches make potions and trolls are stupid. The information about trolls may be less widely distributed than the information about witches because trolls have a more limited cultural habitat. Although witches have been featured in numerous television shows, movies, and children’s bedtime stories, trolls have experienced relative discrimination. There were witch crazes, but not troll crazes, in American

and European history, and there are modern people who claim to practice witchcraft but not trollyery. In sum, there are many more environmental cues that would allow us to rehearse and exchange information about the behavior and attributes of witches, so the habitat for witches is larger. In measuring habitat prevalence for a test of competition, we could try to list common contexts in the social environment and determine whether witches or trolls are more likely to arise in each; alternatively, we could ask people to summarize implicitly across all environmental contexts and specify which habitat is more common; we use both methods in the studies that follow.

In this article, we examine the success and propagation of relatively simple cultural ideas such as catchphrases, rumors, proverbs, and factoids. We have chosen to begin our investigation with such ideas because they, and their cues, are easier to delimit and measure. Although these cultural ideas are simple, there is no reason to believe that the psychology that cues an individual to apply an appropriate idea from pop culture (e.g., recognizing that someone who is careless with numbers might be using “fuzzy math”) is fundamentally different from the psychology that cues psychologists to apply their own, presumably more complex, ideas (e.g., “schemas” or “attention” or “encoding”). We suggest that the success of the ideas we study depends on a similar cueing mechanism to that which underlies the success of more complex ideas.

The habitat approach, of course, is most valuable within certain boundary conditions. Very rare ideas, for instance, may fall below a threshold for diffusion, even if their potential habitat is broad. Similarly, once an idea has become widely used, its success may be limited by such things as boredom (once a catchphrase or fact has become widely distributed), or the diffusion of a contrary idea debunking the original (e.g., for rumors or questionable factoids). As such, our notion of habitats, and consequently our empirical demonstrations, focuses on ideas that fall within such boundaries.

2. On the nonobviousness of the habitat approach

In this article, we demonstrate that the diffusion of cultural ideas can be predicted by the prevalence of their habitats, and develop some generalizable empirical methods for examining habitats and their influence on the success of ideas. We hope our seven studies illustrate the value of the habitat approach, but because some may regard the concept of habitat prevalence as a truism—obvious and self-evident—we thought it would be useful to address this concern up front.

Although we agree that the concept of a habitat is quite basic, we could find no previous work empirically testing such an approach, so it is not obvious that the effect of habitats can be empirically documented. Indeed, the one literature that has heavily studied cultural representations such as those we study—the literature on folklore (e.g., Brunvand, 1996; Taylor, 1931–1934/1985; Thompson, 1946)—is primarily qualitative, and there have been no efforts to predict the success of ideas based on systematic measurable aspects of the environment. Thus, even if the concept of habitats is obvious as a theoretical principle, it is not obvious that it can be operationalized and studied empirically.

More important, not all theoretical approaches would acknowledge that general, measurable aspects of the social environment would have predictable effects on the transmission of ideas. In folklore studies, for instance, the contextual approach (Ben-Amos, 1995) and performance approach (e.g., Baumann, 1977; Fine, 1995) place a heavy emphasis on the performative nature of folklore—that folklore acquires meaning through subtle interactions between teller and audience, and situational features such as time and place that leave each performance a “unique, integrated whole” (Ben-Amos, 1995). These theoretical approaches would presumably dispute whether it is possible to predict fluctuations in a particular item of folklore based on general, measurable characteristics of the social environment as opposed to idiosyncratic characteristics of a particular highly textured performance situation.

To summarize, we postulate that ideas have a habitat, or a set of environmental cues that prime their use and make them relevant, and we test two key hypotheses:

1. *Fluctuation hypothesis:*

Ideas will fluctuate over time as their habitats fluctuate; a cultural representation will be more successful and appear more frequently whenever its habitat is more prevalent.

2. *Competition hypothesis:*

The success of ideas will depend on the prevalence of their habitats; a cultural representation with a more prevalent habitat will be more successful than one with a less prevalent habitat.

Two field studies test the fluctuation hypothesis, exploring how habitat fluctuation predicts fluctuation of a negative policy factoid (Study 1) and a positive rumor (Study 2). Two additional field studies test the competition hypothesis, examining competition between two catchphrases from the 2000 presidential election (Study 3), and broader competition among variations of a modern proverb (Study 4). Finally, three experimental studies test both hypotheses, examining how habitat prevalence predicts fluctuation of and competition between two catchphrases (Study 5), versions of a modern proverb (Study 6), and positive and negative slang (Study 7).

3. Study 1: Fluctuation hypothesis: Variations in a policy factoid

Beginning in the 1980s, various public figures quoted a sobering comparison between major school problems listed by teachers during the 1940s and 1980s. According to the supposedly factual comparison, the major problems listed by teachers surveyed in the 1940s were charmingly innocent—talking out of turn, chewing gum, making noise, running in the halls—whereas the problems listed by teachers during the 1980s were shockingly serious—suicide, assault, rape, drug abuse, and pregnancy. This sobering “factual” comparison turned out to be bogus—a product not of two actual surveys separated by 4 decades, but of armchair observation by a single individual—yet it was consistently used by prominent individuals involved in important policy decisions (O’Neill, 1994). This “folklore of the eminent and powerful” (O’Neill, 1994, p. E1) was quoted by both sides of the political spectrum and reprinted in news sources ranging from “Dear Abby” to *The New York Times*.

After examining how this policy factoid was used in practice, we suspected two types of situations might compose its habitat. One set of situations, emotional crises such as the wave of school shootings in the late 1990s, would be consistent with the rumor literature's traditional argument that rumors are often cued by anxiety-provoking situations (Allport & Postman, 1947; Shibutani, 1966). The other set, however, is less anxiety related and more policy oriented—attention to reform efforts in public schools. If fluctuations in this policy factoid can be predicted not only by anxiety-provoking cues (school shootings) but also by more cognitive ones (education reform, attention to the problems of public schoolteachers), it suggests our notion of habitats goes beyond previous theories of rumors, which have focused primarily on anxiety.

3.1. Method

To track the appearance of this cultural representation and possible cues, we used Dow Jones Interactive, an online news database (now known as Factiva.com [<https://global.factiva.com/>]) that allowed users to track how a topic, word, or phrase appears in the news media over time. On a quarterly basis, we recorded the number of articles mentioning the school problems comparison in all publications in the database from first quarter 1985 to third quarter 2001. We also recorded the number of Top 50 newspaper articles that referenced three phrases, one anxiety related (“school shootings”), and two policy related (“education reform” and “public schoolteachers”), and computed 3-month moving averages to smooth fluctuations in the underlying data.

3.2. Results

We are interested in whether fluctuation in the appearance of an idea can be predicted by fluctuations in its habitat. The results of an ordinary least squares (OLS) regression (see Table 1) suggest it can. Although controls indicate that appearances of the school problems factoid rose and then fell over time (significant linear, $\beta = .89$, $p < .01$, and quadratic trends, $\beta = -1.04$,

Table 1
OLS regression predicting fluctuation in the school problems factoid on habitat prevalence

Variable	β
Time	.89**
Time ²	-1.04**
Education reform (3-month average)	.36*
School shootings (3-month average)	.04
Public schoolteachers (3-month average)	-.06
Adjusted R^2	.09

Note. The dependent variable is the number of newspaper articles per month mentioning the school problems factoid from 1985 to 2001 ($N = 204$). Independent variables are 3-month moving averages (from month $t-1$ to $t-3$). OLS = ordinary least squares.

* $p < .05$. ** $p < .01$.

$p < .01$), what is more important is that this legend fluctuated in sync with its habitat. Consistent with our hypothesis, it appeared more frequently when the nation was paying greater attention to education reform ($\beta = .36, p < .02$).

3.3. Discussion

These findings support the fluctuation hypothesis—the school lists legend covaried with fluctuations in its habitat. In addition, this result cannot be explained by previous theories of rumor; educational reform is a fairly nonemotional topic (e.g., 68% of articles on this topic discuss how educational reform will be financed) and does not exemplify the anxiety-provoking situations on which prior literature has focused.

This result was not produced because of an explicit overlap between articles containing the policy factoid and its predictors, as there was no case in which a single article used either phrase (“education reform” or “school shootings”) and also cited the factoid. It is important to note that although we used specific phrases to measure habitat prevalence, we regard these phrases as proxies for environmental cues and not the actual cues themselves. In this study, we used the search string “educational reform” to proxy the number of situations where the public was considering changes in schools that might cause someone to remember and use this bogus comparison of school problems then and now.

4. Study 2: Fluctuation hypothesis: Fluctuation in a positive rumor

Study 1 provided support for our theory with an emotionally negative factoid. In Study 2, we investigate a cultural representation the rumor literature has difficulty explaining—an emotionally positive rumor. Starting in 1997 a rumor circulated via e-mail that Microsoft would reward people for forwarding a message to test their new e-mail tracing program. The e-mail (supposedly authored by Bill Gates) promised \$1,000 to all forwarders if the e-mail reached a certain number of people.

Because this rumor is emotionally positive (windfall \$1,000 gains are good), previous theories of rumor provide little guidance about why it propagates. We suggest, however, that attention to this positive idea should fluctuate in the same manner as a negative one: It should appear more frequently when its habitat is more prevalent. Because the policy factoid used in Study 1 was somewhat complex, it required close examination of usage situations to select potential environmental cues. But to demonstrate that the selection process can be straightforward and intuitive, in this study we used a naive audience to select potential cues.

4.1. Method

To track the success of this rumor on the Internet, we used Deja News (now part of Google), a searchable 20-year archive of postings to Usenet discussion forums. We recorded the number of postings of this representation that appeared each month from August 1995 (slightly before the rumor surfaced) to December 1999 (after the rumor stopped circulating) by searching for

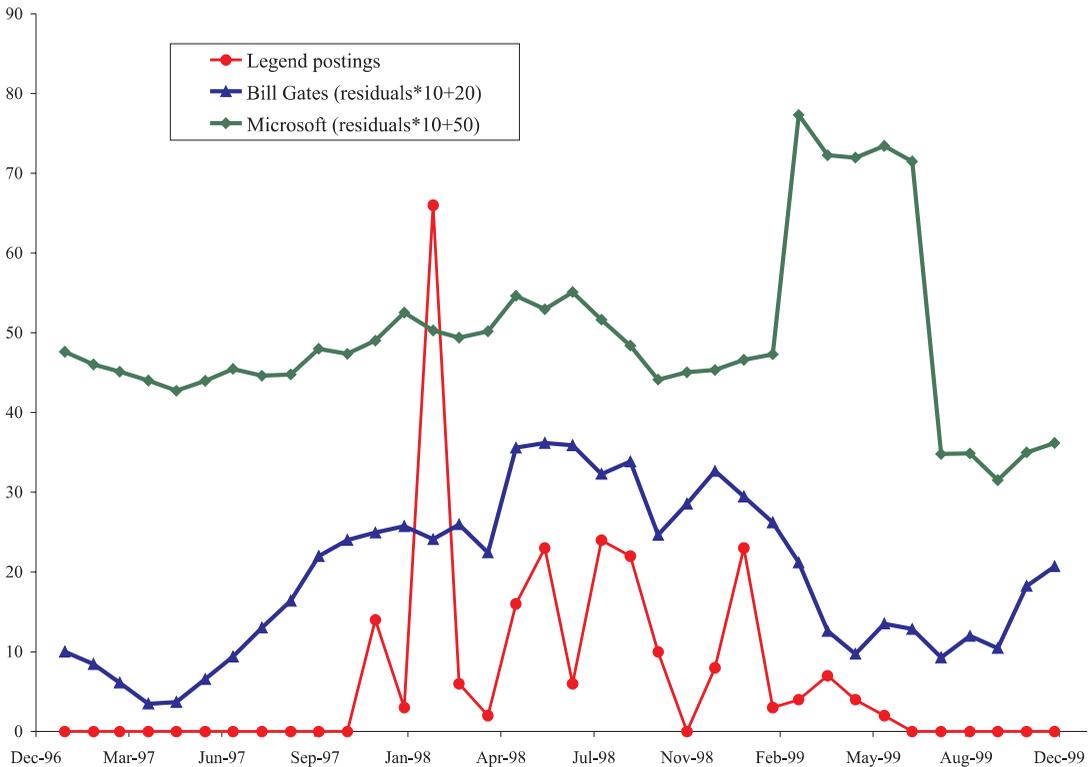


Fig. 1. Appearance of e-mail tracing rumor on newsgroups and habitat predictors in Top 50 newspapers.

the exact phrase “e-mail tracing” with the words *Bill* and *Gates* and without the words *hoax*, *legend*, *rumor*, and *fraud*.

To select the cues proxying for habitat prevalence, we gave American undergraduates ($N = 10$) whose native language was English the version of the rumor that circulated most widely on the Internet and asked them to think of topics that might predict its appearance. They were told that a content search would be performed among Top 50 newspaper articles and asked them to suggest search topics (key words or phrases for newspapers) that would predict the amount of attention to the rumor in Internet chat groups.

Two topics were listed by at least 80% of the respondents (Microsoft and Bill Gates), and no other topic was nearly as common. We used Dow Jones Interactive to track the appearance of each of these strings in Top 50 newspaper articles over the same time period as the rumor. Because attention to these topics fluctuated a great deal, we used a 3-month moving average to smooth month-to-month fluctuations. For the display in Figure 1, we removed the overall time trend by taking the standardized residuals after regressing each independent variable on time.

4.2. Results

We performed an OLS regression to predict the number of times this rumor was posted on Internet discussion groups (see Table 2). Controls suggested that this rumor appeared signifi-

Table 2
OLS regression predicting fluctuation in e-mail tracing rumor based on habitat prevalence

Variable	β
Time	2.34*
Time ²	-2.17*
Bill Gates (3-month average)	.42*
Microsoft (3-month average)	.01
Adjusted R^2	.35

Note. Unit of analysis is the number of rumors appearing per month ($N = 64$) in the Deja News search engine from August 1995 to December 2000. Column entries represent standardized betas from OLS regression. OLS = ordinary least squares.

* $p < .01$.

cantly more frequently as time progressed ($\beta = 2.34, p < .01$) and slightly less frequently with the square of time ($\beta = -2.17, p < .01$). As in Study 1, we predicted that fluctuation in this rumor would be correlated with fluctuation in its habitat. Supporting our hypothesis, attention to Bill Gates in Top 50 newspapers ($\beta = .42, p < .01$) significantly predicted appearance of the rumor on Internet discussion groups. The other potential habitat cue suggested by our raters, Microsoft, did not provide additional predictive power ($\beta = .01, ns$).

4.3. Discussion

Although one might have predicted that this rumor succeeded largely because of its inherent cleverness (something that should stay constant over time) or the greed of Internet citizens (something that should stay constant or perhaps increase), such explanations provide little insight into why this rumor fluctuates. The notion of habitats provides such insight.

In this study even naive participants were able to select a cue that predicts fluctuation in the rumor; granted this is not a complicated task and the set of useful cues is limited, but that is our point. For most cultural representations, selecting the cues that compose a habitat is likely to be simple and intuitive

As in Study 1, it is important to note that this result is not due to explicit overlap between the idea and its predictors; media attention to Bill Gates rarely focuses on the e-mail hoax that is circulating on the Internet (only 2 of over 20,000 articles on Bill Gates discuss the rumor). We find it interesting that newspaper articles about Gates on a variety of topics (his wealth, his activities as CEO of Microsoft, his new 30,000 square foot house) predict circulation of an e-mail rumor that relates to him.

So far we have shown that it is possible to define a plausible set of cues that proxy for an idea's habitat and then measure the prevalence of those cues (and the idea itself) in the environment over time. In addition, we have shown that fluctuations in habitat can predict the prevalence of ideas as diverse as a policy factoid and an Internet e-mail rumor. The next two studies consider the competition hypothesis—that habitat prevalence can be used to predict which ideas will be more successful in competition.

5. Study 3: Competition hypothesis: The spread of political catchphrases

The best possible test of the competition hypothesis would be to create two ideas, introduce them at the same time with equal force, and then measure their success. We were fortunate to come across a natural experiment that met these conditions. In the first debate of the 2000 presidential election in the United States, the phrases *fuzzy math* and *lockbox* were introduced to the American public with novel meanings. Prior to the debate, these phrases appeared relatively infrequently and were obscure references in specific policy areas. *Fuzzy* (or whole) *math* had been used to describe the new type of math that emphasized the process of computation more than the specific answers; *lockbox* had been used by both parties to portray themselves as guardians of the budget surplus. The debate gave them new meanings and boosted them into the spotlight. We suggest that after this initial boost, the phrase with the more prevalent habitat should be more successful.

In the debate, each candidate adopted one of these terms to concisely communicate his message to the American people. Al Gore used *lockbox* six times during the debate, saying he would “put Medicare and Social Security in a lockbox” to protect it from being spent elsewhere. George W. Bush used *fuzzy math* four times to criticize the calculations underlying Gore’s plans.

Both phrases were regularly used in articles about the debate, and they also began to diffuse outside the election context into articles about everything from sports to transit strikes: they became pop culture catchphrases. *Lockbox* was used to signify putting things away for safekeeping, for example, a football “touchdown run that slammed the lockbox shut on Minnesota’s 29-17 victory” (Sanders, 2000), and *fuzzy math* began to be used in any situation where the math was not exactly right, for example, one party in a strike accused the other of “*fuzzy math* . . . about how they are counting their money” (Shuit & Rabin, 2000). Both phrases benefited from their debate exposure: Even if we consider only articles that were outside the election context, a 1-month comparison before and after the debate showed that usage of both increased substantially (more than doubling).

Although the debate primed people to think of both phrases, we suggest their relative success after this initial prime depends on which phrase has a more prevalent habitat. To compare the habitat prevalence of the two terms, we asked one group of people to generate, and another group to rate, potential habitats for both phrases. In general, research has shown that people who are asked to consider various options rarely consider a wide range of alternatives (Fischhoff, Slovic, & Lichtenstein, 1978). To ensure that respondents considered a number of potential habitats for both phrases, we asked one group of participants to list common newspaper topics and asked a second group to rate how easily they could imagine using *fuzzy math* and *lockbox* in a discussion about each topic. If, say, participants found it easier to imagine using *lockbox* relative to *fuzzy math* in a discussion about crime, it suggests this topic is more likely to cue the concept of *lockbox* than *fuzzy math*. By considering which newspaper topics are more prevalent, we should be able to discover which phrase will be cued more frequently and, thus, have a more prevalent habitat.

5.1. Establishing habitat prevalence

We asked a small group of adult volunteers at a local coffee house ($N = 10$) to list the 10 most common topics for newspaper articles. After removing duplicates we were left with 16 unique

Table 3
Usability ratings for fuzzy math and lockbox in newspaper topic areas

Variable	Domain Frequency	Fuzzy Math	Lockbox
Most discussed topics (business/economy, sports, money/stocks, crime, entertainment, international affairs, editorials)	5.99	4.67*	4.25
Least discussed topics (war, weather, science/technology, health, environment, education, reviews, travel)	4.35	4.00**	3.05

Note. The first column reports respondents' average ratings of how frequently each domain was discussed in the newspaper. Remaining columns report average usability ratings for fuzzy math and lockbox.

* $p < .05$. ** $p < .001$.

topics (e.g., weather, business/economy, sports, wars). A second group ($N = 20$) rated the frequency with which each topic appeared in the newspaper (1 = *rare*, 7 = *frequent*), and read a random selection of newspaper articles that included one of the phrases to familiarize themselves with the way newspapers had used the concepts. We then asked this group to rate how easy it would be to use *fuzzy math* and *lockbox* in a newspaper article about each of the 16 topics (1 = *very difficult*, 7 = *very easy*). We refer to these ratings as *usability* ratings.

Averaging across the usability ratings for the 16 topics, *fuzzy math* was significantly more usable than *lockbox*: (4.31 versus 3.61, $t[20] = 4.34$, $p < .001$). Of the 16 topics, *fuzzy math* was rated as significantly more usable in 10 (e.g., business/economy, sports, weather), whereas *lockbox* was marginally more usable in 2 (crime and travel, $p < .10$; see Table 3). We also performed a median split on the topics based on how frequently each appeared in the newspaper. *Fuzzy math* was seen as significantly more usable across the 7 most frequent topics (4.67 versus 4.25, $t[20] = 2.11$, $p < .05$), as well as the 8 least frequent topics (4.00 versus 3.05, $t[20] = 5.86$, $p < .001$).

This analysis suggests *fuzzy math* has a more prevalent habitat than *lockbox*; thus we would predict it should be more successful: it should be used more frequently.

5.2. Results of field test of catchphrase success

To provide a general test of success, we used Dow Jones Interactive to track mentions of both catchphrases in Top 50 newspaper articles during two time periods: before the winner of the election was confirmed (October 4, 2000–December 12, 2000) and after (December 13, 2000–August 28, 2001). Because we were most interested in the success of these terms as general catchphrases (i.e., outside the election context), we omitted articles that mentioned the words *Bush*, *Gore*, or *election*. (This has the advantage of avoiding confounds due to election coverage—e.g. if one candidate were mentioned more than the other, his phrase might be mentioned more).

We regard the debate as providing an exogenous boost,¹ priming people to think of both phrases. But based on our competition hypothesis, we predicted that the success of each term after this boost would depend on the prevalence of its habitat; thus the catchphrase *fuzzy math*

Table 4
Top 50 newspaper articles not related to the election mentioning fuzzy math and lockbox (average/week)

Variable	Articles Not Related to Election	
	Fuzzy Math	Lockbox
Election (10/4–12/13/00)	11.20 ^a	4.50 ^b
Post-election	3.81 ^c	1.84 ^d

Note. Means in the same row with different superscripts are significantly different from each other at $p < .01$.

should be more successful. The results support this hypothesis: comparing weekly averages in nonelection contexts, *fuzzy math* was used more in nonelection newspaper articles (see Table 4): *Fuzzy math* was more successful than *lockbox* even before it had become clear who had won this extremely close election (election period, 11.20 versus 4.50, $t[9] = 3.97, p < .01$). In addition, even after the election was over, *lockbox* returned to pre-election levels of attention (1.84 versus 1.51, $t[72] = -.773, ns$, *fuzzy math* was used 4 times more frequently than it had been prior to the debate (3.81 versus 0.78, $t[72] = 7.13, p < .001$).

5.3. Discussion

Comparing these two catchphrases, *fuzzy math* was clearly more successful (Figure 2). Greater habitat prevalence can explain this relative success, and our study rules out a number of alternative interpretations. Both terms were initially rare and received a comparable boost in election contexts (in articles that mentioned Bush, Gore, or the election), so it is difficult to at-

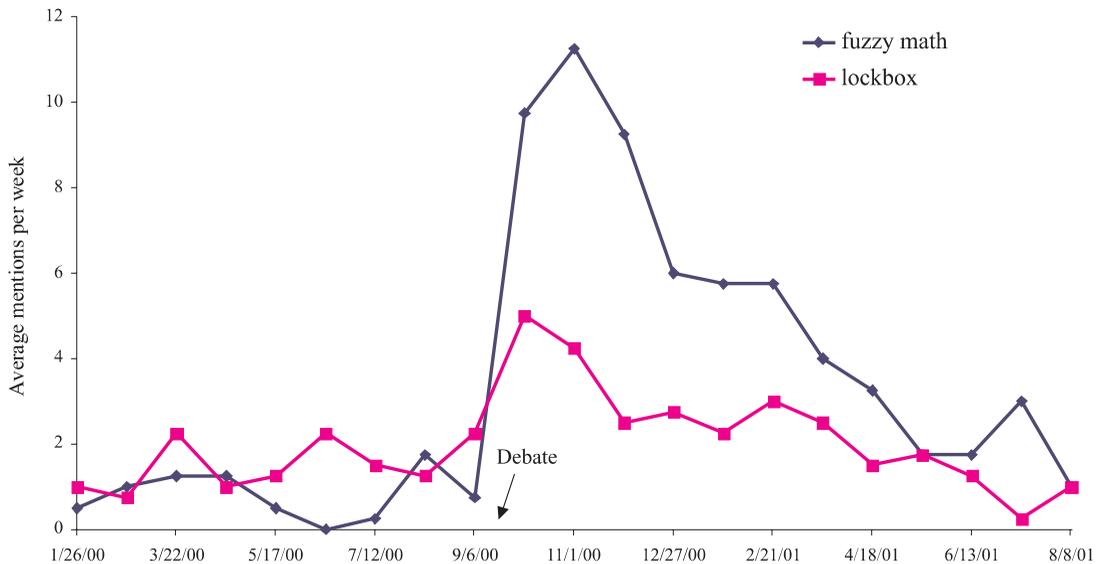


Fig. 2. Top 50 Newspaper articles not related to the election mentioning *fuzzy math* and *lockbox*.

tribute *fuzzy math*'s success to prior familiarity or greater attention during the election. Furthermore, although the phrase with the most prevalent habitat was also used by the candidate who eventually became president (a possible confound), this phrase was more successful than *lockbox* even before it had become clear who had won this famously close election.²

Focusing on the fit between ideas and the environment provides insight into why ideas succeed, but without the habitat notion people tend to ignore this aspect of fit. When asked to predict the success of these phrases, people typically focus either on the association of the phrases with Bush or Gore (this does not explain why they differed in success for nonelection topics in the period before the election was decided), or the inherent cleverness of the phrases themselves (here *fuzzy math* is generally regarded as more clever, so this is a confounding explanation we try to eliminate in Study 4). However, people rarely articulated the notion of habitats—that *fuzzy math* might win because it is more useful in more environmental contexts.

Study 3 supports the notion of idea habitats, but a stronger and more precise test would examine competition among various versions of one idea that have varying levels of habitat prevalence. Study 4 performs such a test by examining the success of various versions of Murphy's Law.

6. Study 4: Competition hypothesis: Differences in success among variants of a modern proverb

To test our theory in larger scale competition, we chose to examine the success of various versions of Murphy's Law ("If anything can go wrong it will go wrong"). The basic insight of Murphy's Law has been rephrased a number of different ways (e.g., "Left to themselves, things tend to go from bad to worse") and applied to various domains such as technology (e.g., "The faster a computer is, the faster it will reach a crashed state") or the military (e.g., "Friendly fire ain't"). We randomly selected a number of these versions and measured their success by determining how widespread their use was on the Internet.

Our theory suggests that success varies with habitat prevalence, so versions of this idea that have more prevalent habitats should be more successful. To measure habitat prevalence, we asked raters to rate the generality of each version (i.e., how many situations it would apply to). Because all the ideas used in this study were rephrasings of the same idea, it should follow that more general versions—those that are cued by and relevant to more situations—have larger habitats.

We also controlled for a number of other factors. For example, perhaps ideas succeed because they are especially clever or entertaining, or because they have been heard more often (Hawkins & Hoch, 1992). Ideas may also be less likely to persist or succeed when they are more complex (Allport & Postman, 1947; Rogers, 1983). We predict that even controlling for these factors, habitat prevalence will significantly affect the success of these modern-day proverbs.

6.1. Method

We used the Google search engine to find the most frequently cited Murphy's Law page (<http://dmawww.epfl.ch/roso.mosaic/dm/murphy.html>) and selected 46 versions of Murphy's Law from this page. We took every variant in a section on "General Murphy's Law" and ran-

domly sampled variants from two of the three large specialty categories (technology and military; we omitted “romantic relationships” because we were concerned our raters might find some of the proverbs to be sexist or raunchy).

The 46 versions of Murphy’s Law were broken into two sets of 23 (to make the rating task easier), and respondents (undergraduate students, total $N = 119$) rated each phrase in one of the sets on one experimental measure (1 = *not very*, 7 = *very*). One group rated variants on our key measure of habitat prevalence (i.e., its general applicability, or how many situations it could apply to, Cronbach’s $\alpha > .90$), whereas other groups rated our two control variables—cleverness ($\alpha > .72$) or how often it had been heard ($\alpha > .89$). Each variant was given a score for each measure equal to its average across raters. As another control, we also computed the length of each variant in characters. Our measure of success was the distribution of each variant on the Internet, calculated by typing each variant into the Google search engine and recording the number of sites on which it appeared.

6.2. Results

As in Study 3, we suggest that ideas with more prevalent habitats should be more successful. We used an OLS regression to predict the number of times a version appeared on the Web (see Table 5). The results of the regression support our hypothesis; versions of Murphy’s Law appeared on the Internet more frequently if they were more general and thus had a more prevalent habitat ($\beta = .57, p < .001$). Not surprisingly, phrases rated as being heard more often were also more common ($\beta = .28, p < .05$). Neither length nor rated cleverness influenced success.

6.3. Discussion

Study 4 confirms and expands the results of Study 3; ideas with more prevalent habitats were more successful. Controlling for many other factors, generality was the strongest predictor of success. If we had not controlled for phrase length, our results might have been biased because longer phrases might experience more mutations, making them less likely to be transmitted reli-

Table 5
OLS regression predicting appearance of Murphy’s Law variations based on various predictors

Variable	β
Cleverness	.06
Generality	.57**
How often heard	.28*
Number of characters	-.05
Adjusted R^2	.69

Note. Unit of analysis is the frequency with which versions of Murphy’s Law ($N = 46$) appear on the Web. Column entries represent standardized betas from OLS regression. OLS = ordinary least squares.

* $p < .05$. ** $p < .01$.

ably across people (or—from a methodological perspective—they might be less likely to be identified consistently by the search engine). If we had not controlled for how often phrases had been heard, one might assume that the effect of generality merely indicated that people assumed a phrase was more general if it had been heard more often. The results of the regression, however, suggest these two effects can be shown independently. Thus Study 4 shows that ideas with more prevalent habitats will compete more effectively than ideas with less prevalent habitats.

So far, all of our studies have been of a correlational nature. To provide experimental tests of our theory of habitat prevalence, we conducted three additional studies in which we brought participants into the laboratory and had them converse on a variety of topics (the war in Iraq, dating on campus, etc.). By measuring the habitat prevalence for various ideas and then manipulating the topics of discussion, we were able to manipulate habitat prevalence. Based on the fluctuation and competition hypotheses, we predict (a) an idea should appear more frequently at times when the discussion topic provides a more prevalent habitat for the idea, and (b) across all topics of conversation, ideas with more prevalent habitats overall should appear more frequently.

7. Study 5: Fluctuation hypothesis: Empirical study of fluctuation of political catchphrases

We decided to link the first laboratory experiment to our previous demonstration studies by studying use of the phrases examined in Study 3, *fuzzy math* and *lockbox*.

The method of data collection in Studies 1 to 4 (using Web-based news and newsgroup archives) allowed us to easily examine huge numbers of articles and conversations so that even though the incidence of our target phrases was low, it was easy to compare usage in different time periods and domains. But limited access to respondents forced us to construct a laboratory procedure that would encourage participants to use as many cultural representations as possible. We told people we were interested in “catchphrases, idioms, proverbs, etc.” and asked them to use these devices whenever they could. We gave them a list of catchphrases and proverbs that included our two phrases of interest (*fuzzy math* and *lockbox*) as well as eight matched control phrases and asked them to try to use at least one of these phrases per conversation period. Thus, our instructions were designed to increase the usage of all catchphrases (especially the 10 listed), but aside from our hypotheses about habitat prevalence, there were no other a priori reasons that our instructions should increase the use of one particular phrase relative to another.

For this study, we measured the habitat prevalence of our two target phrases (*fuzzy math* and *lockbox*) and then, in a laboratory setting, manipulated the topic of conversation so that certain discussion periods provided a more prevalent habitat for *fuzzy math* than others. Our fluctuation hypothesis predicts *fuzzy math* should be used more frequently in conversations that provide a more prevalent habitat. In addition, across the set of conversations, our competition hypothesis predicts the term whose habitat is more prevalent should be used more frequently.

7.1. Establishing habitat prevalence

Our next three studies made use of American college students (all of whom were native speakers of English) as both participants and independent raters. In this study, we measured

habitat prevalence by asking raters to rate the appropriateness of various conversation topics as habitats for *fuzzy math* and *lockbox*. Respondents ($N = 8$) read examples of how each phrase was used in newspaper articles and considered the concept behind each phrase that allowed it to be used across various topics. They then read a variety of conversation topics that we provided for them (war in Iraq, college dating scene, college football rankings, etc.), along with a short newspaper article about each topic (none of which mentioned either phrase), and rated how easy it would be to use each target phrase in a conversation on that topic (1 = *very difficult*, 7 = *very easy*).

Ideally we would have found an equal number of domains that provided a better habitat for *fuzzy math* and *lockbox*, but consistent with our results from Study 3, we found it much easier to locate topics that were superior habitats for *fuzzy math* (*lockbox* was rated as slightly more usable in a few topics, but none significantly so). In the end we selected four conversation topics for the study, two in which one of the phrases (*fuzzy math*) was rated as significantly more usable (the war in Iraq and college football rankings, 5.38 versus 2.13, $t[7] = 9.19$, $p < .001$), and two in which the terms were of equivalent, but low, usability: a recent movie and dating on campus (1.44 versus 1.94, $t[7] = 1.87$, *ns*).

Our fluctuation hypothesis predicts the success of an idea will vary with habitat prevalence, so *fuzzy math* should appear more frequently in periods in which its habitat is more prevalent. Comparing the usability of *fuzzy math* between the two sets of topics, *fuzzy math* was rated as significantly more usable in the first set (5.38 versus 1.44, $t[7] = 8.26$, $p < .001$), thus relative to other topics, *fuzzy math* should be used more frequently when these topics (Iraq and college football) are discussed. Usability ratings for *lockbox* did not differ enough between topics to allow for a fluctuation test for this term.

Our competition hypothesis predicts that ideas with more prevalent habitats will be more successful; because *fuzzy math* was more usable across the set of topics (3.41 versus 2.03, $t[7] = 6.21$, $p < .001$), compared to *lockbox* it should be used more frequently overall.

7.2. Experimental test of success

We brought participants into the laboratory in groups of 6 to 8 for a study on “conversations,” and had them conduct online, computer-mediated conversations using instant messaging software (something all participants had used before). In each period of the experiment, each participant conducted a conversation with a different, anonymous partner (total $N = 44$ conversations).

We told participants we were interested in documenting the use of expressions, catchphrases, and slang, and we asked them to use as many of these kinds of speech as possible while maintaining the realism of the conversations (i.e., we asked them to use the phrases if they had the opportunity to do so but not to stretch and use phrases where they were not appropriate). As examples, we gave them a broad list of expressions, including slang (“cool”), proverbs (“A day late and a buck short”), and catchphrases (“Where’s the beef?”), and asked them to try to use at least three of these sorts of expressions every conversation period. We also provided them with a list of 10 “target” phrases (including *fuzzy math*, *lockbox*, and eight matched-control phrases, randomly selected and pretested for equivalent length and familiarity) and asked them to try to use at least one of these target phrases each period. To ensure that

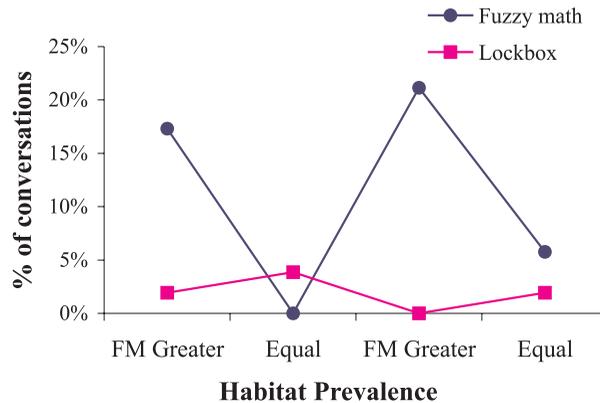


Fig. 3. Catchphrase use (percentage of conversations) by period of discussion.

participants were familiar with each phrase, we provided two usage examples of each phrase, randomly selected from the Factiva newspaper database.

During each conversation period all respondents read a short article about the conversation topic (the articles did not include any catchphrases), and then discussed the topic over instant messenger with another participant. Transcripts from the conversations were then saved for later analysis.

7.3. Results

7.3.1. Results for fluctuation hypothesis

The results supported our fluctuation hypothesis; as shown in Figure 3, *fuzzy math* appeared more frequently in periods in which its habitat was more prevalent: ($\chi^2 [1, N = 23] = 12.57, p < .001$).

7.3.2. Results for competition hypothesis

Results of a chi-squared test support the competition hypothesis; compared to *lockbox*, *fuzzy math* was used more frequently across the set of all conversations: ($\chi^2 [1, N = 27] = 13.37, p < .001$).

7.4. Discussion

The study supports both our fluctuation and competition hypotheses in a controlled setting. It is also instructive to consider a more nuanced test comparing the relative success of *fuzzy math* and *lockbox* in the set of topics that provided a more effective habitat for *fuzzy math* (war in Iraq and college football ranking) versus topics that were rated as equally effective for both terms (recent move and dating on campus). Indeed, *fuzzy math* was used more frequently than *lockbox* during topics that favored it: $\chi^2 (1, N = 21) = 17.19, p < .001$, but equivalently in periods with topics that provided equivalent habitats: $\chi^2 (1, N = 6) = 1.00, ns$. Even in side-by-side comparisons over a specific set of domains, ideas respond to the presence of their habitats.

One potential problem with this study is that we proposed the specific topics that were discussed. In the next study we took advantage of a natural variation in habitat to remove any potential confounds of our choosing topics for discussion. We asked people to consider variants of Murphy's Law, and reasoned that conversation about any negative conversational domain will provide a more effective habitat for Murphy's Law than any positive domain. We left the selection of specific conversation topics entirely up to our participants.

8. Study 6: Fluctuation and competition in Murphy's Law

We selected six variants of Murphy's Law: "Things get worse under pressure," "Matter will be damaged in direct proportion to its value," and so on, from Study 4. For the fluctuation hypothesis, we reasoned that because the habitat of Murphy's Law is any situation where something is going wrong, our variants should be used more often when people were talking about negative topics. Furthermore, to test competition, we chose half of our variants from those previously rated as having high generality (e.g., "Things get worse under pressure") and half from those rated as having lower generality (e.g., "Matter will be damaged in direct proportion to its value"). We reasoned that high-generality variants would be used more often than low-generality variants, no matter the topic of conversation.

8.1. Methods

Respondents were brought into the laboratory for a variety of experiments and had computer-mediated online conversations ($N = 44$) with a variety of partners on a variety of topics.

At the beginning of the experiment, we asked each participant to suggest potential topics that were either positive (participants suggested topics such as "approaching 3-day weekend") or negative (participants suggested topics such as "no job offers"). We took the top two positive and negative topics and interspersed them during the experimental session.

We gave participants a list of 10 phrases (6 variants of Murphy's Law and 4 other proverbs, all of equivalent familiarity and length) and asked them to try and use one of the phrases each conversation period. The six Murphy's Law variants were broken in two sets (high and low generality), which differed in their rated generality, 5.31 versus 3.31, $t(4) = 4.40$, $p < .012$, but not in length (55.33 versus 45.33, $t[4] = .71$, *ns*), or the number of times they had been heard (2.09 versus 1.53, $t[4] = 1.42$, *ns*).

8.2. Results

8.2.1. Results for fluctuation hypothesis

Our test of fluctuation predicted that Murphy's Law variants should appear more frequently when the conversation topic was negative. Indeed as indicated by Figure 4, this was the case; variants of Murphy's Law appeared more frequently for negative as opposed to positive topics ($\chi^2 [1, N = 44] = 7.64$, $p < .007$). This result is made more interesting by the fact that conversations were only lightly determined by the initial topic; they often migrated in tone and content after a few initial interchanges. For example, one conversation about the

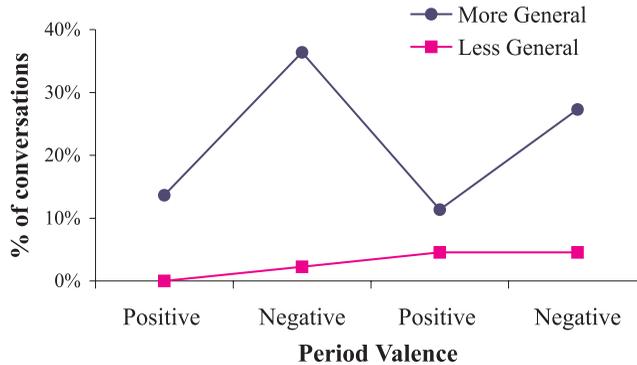


Fig. 4. Variant usage (percentage of conversations) by valence of conversation topic discussed.

negative domain of final exams ended up being heavily devoted to the positive topic of the university band.

8.2.2. Results for competition hypothesis

The competition hypothesis predicts that variants that are more general should be able to be used more frequently. Supporting our hypothesis, the set of high-generality variants was used more frequently across the set of conversations: ($\chi^2 [1, N = 44] = 26.27, p < .001$). In addition, an OLS regression predicting individual variant use found that whereas phase length had a marginally negative impact on use ($\beta = -.30, p < .10$, usage likelihood significantly increased when variants were more general ($\beta = .83, p < .01$).

8.3. Discussion

This study supported both fluctuation and competition hypotheses. In addition, because our high- and low-generality variants were of equivalent length and rated as equally familiar, our results are hard to explain as arising from dimensions other than habitat.

Taken together, Studies 5 and 6 support the importance of habitats. Use of catchphrases and modern proverbs varied, depending on the prevalence of their habitats, but both experiments asked participants to use target phrases from a list we provided. It is not clear how an explanation other than habitats would predict which phrases would be used from the target list and when—e.g., people could have used any of nine target phrases in Study 5 other than *fuzzy math*, and in Study 6, they could have used a low-generality version of Murphy's Law instead of a high-generality version. Nonetheless, to address this potential concern, we ran a final study that completely removes this experimental constraint.

9. Study 7: Unconstrained fluctuation and competition

In Study 7, participants had conversations about various topics without any target list of phrases to use. To test fluctuation, we manipulated the valence (positive or negative) of conver-

sation topics (the specific topics were chosen by participants) and predicted that a variety of positive (e.g., *cool*, *awesome*, *tight*, etc.) and negative (e.g., *bogus*, *sucks*, *crappy*, etc.) valenced slang would appear more commonly in conversations that shared an emotional resonance with their topic. To test competition, we asked independent raters to rate all the valenced slang that had appeared once or more in Studies 5 and 6, and we predicted that in this new study, the slang that was rated as more general would appear more frequently.

9.1. Methods

Similar to the previous study, we brought respondents into the laboratory and had them use instant messaging software to conduct online, computer-mediated conversations ($N = 52$). As in Study 6, participants chose the specific topics to be discussed within the broad category of “positive” and “negative” topics, and we interspersed conversations about the top two positive and top two negative topics.

To gauge the habitat prevalence for each term, we created a list of all the positive and negative slang adjectives ($N = 16$) used by respondents in the previous two studies. We then gave this list to a separate set of respondents ($N = 10$) who rated each term on generality—that is, “the number of situations in which it could be used” (1 = *not very general*, 7 = *very general*), $\alpha = .81$.

9.2. Results

9.2.1. Results for fluctuation hypothesis

As Figure 5 suggests, consistent with the fluctuation hypothesis, positive slang appeared more frequently in positive than negative domains ($\chi^2 [1, N = 106] = 14.71, p < .001$), and negative slang more frequently in negative than positive domains ($\chi^2 [1, N = 50] = 5.09, p < .05$).

9.2.2. Results for competition hypothesis

Consistent with the competition hypothesis, slang terms with more prevalent habitats were used more frequently. Even controlling for length ($\beta = -.30, p < .09$), slang terms that were rated as more general appeared more frequently in laboratory conversations ($\beta = .83, p < .001$).

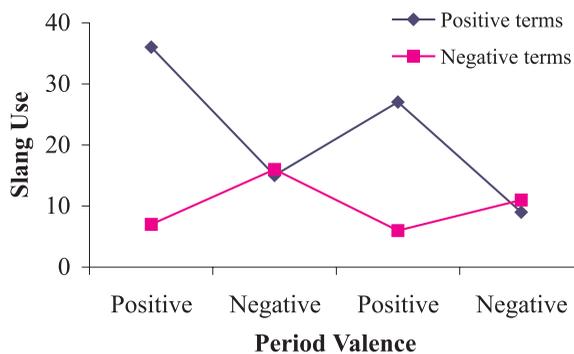


Fig. 5. Slang use by valence of conversation topic.

9.3. Discussion

This study supports both fluctuation and competition hypotheses in an unconstrained conversation environment. As can be seen in Figure 5, both positive and negative terms fluctuated in keeping with the affective valence of the conversational domain. However, negative slang did not significantly out-compete positive slang even in negative domains. In part this may be because positive slang was generally rated as having a more prevalent habitat than negative slang. Also, as we mentioned before, participants often strayed from the initial topic of conversation, and participants often strayed to positive aspects of otherwise negative topics.

10. General Discussion

Although there are obviously many factors that may influence the success of an idea, our theory of habitat prevalence suggests one key factor is the fit between an idea and its environment. Our fluctuation hypothesis proposed that the success ideas would fluctuate with fluctuations in their habitat. Consistent with this hypothesis, Study 1 found that attention to education reform predicted appearance of the school problems factoid over time, and Study 2 found attention to Bill Gates predicted attention to a positive rumor about windfall gains. In addition, Studies 5 through 7 provided experimental support for the fluctuation hypothesis in a controlled laboratory setting, using representations such as catchphrases and proverbs.

Our competition hypothesis suggested that ideas with more prevalent habitats will be more successful in competition. The results of Study 3 supported this notion with competition between two catchphrases from the 2002 presidential election. *Fuzzy math* was rated as having a more prevalent habitat than *lockbox* and was found to be more successful over time. Study 4 replicated these results in competition among many versions of a proverb. Even when controlling for cleverness, length, and how frequently the proverb had been heard, habitat prevalence was the best predictor of success. Furthermore, Studies 5 through 7 found experimental support for the competition hypothesis. For example, Study 6 supported the competition hypothesis with two sets of Murphy's Law variants that did not differ in how often they had been heard. Across a variety of conversation topics, variants with a more general habitat were used more frequently than variants whose habitat was rated as less general.

These studies suggest some empirical methods for assessing questions about habitats and the success of ideas. To understand habitats, we needed some way to identify and measure the cues that were available in the general social environment. It is easy to imagine perfect but unobtainable databases (e.g., a searchable database of all conversations), so it is reassuring to know that media mentions may often serve as reasonable proxies for environmental cues. Indeed, in Study 2, mentions of Bill Gates in top newspapers predicted the diffusion of an e-mail legend on the Internet, so the easily searchable database of newspapers served as a reasonable proxy for the cues that caused a rumor to spread in a different domain of social life. In addition, we have illustrated several different ways of measuring a habitat—by asking people what associations cue it (Study 2), by presenting them with environmental contexts and asking them how likely the context is to cue a particular idea (Studies 3 and 5), and by asking people to assess in general how many contexts are likely to cue an idea (Studies 4, 6, and 7). By showing that even

naïve observers can do these tasks successfully, we hope to encourage sophisticated researchers to pursue them.

Although asking people to list cues for an idea may capture many relevant associations, it does favor conscious ones. To verify less conscious associations, researchers could expose people to cues and see if the cues enable or speed the recognition, recall, and use of a particular representation. Researchers could also measure empirical frequencies in the environment (e.g., how often pictures of witches contain a broom or black cat, or how often discussions of religion in the Middle Ages mention witches), assuming that people learn over time the relations they see in the environment (e.g., Anderson & Schooler, 1991).

11. Our approach and other approaches to cultural ideas

We think there is much more to be done to systematically investigate the psychological foundations of cultural ideas and practices (see Schaller & Crandall, 2004). Boyd and Richerson (1985) distinguished two mechanisms that influence cultural transmission: Indirect biases occur when people infer the utility of an idea by attending to social aspects of the adoption process (e.g., the number of other people who have adopted it, or their relative status), whereas direct biases arise from the content of the idea itself. Although it would be useful to know more about both indirect and direct biases, our habitats work falls under the category of direct biases (e.g., Dawkins, 1976; Sperber, 1996).

Although there is a lively theoretical debate about the right ways to conceptualize direct biases (Aunger, 2000; Dawkins, 1976; Farr & Moscovici, 1984; Sperber, 1996), relatively little empirical work has been done. Theoretical controversies are generally easier to resolve when researchers have a few shared empirical touchstones to focus their debates. Researchers can make important contributions by describing and documenting specific psychological mechanisms that cause particular ideas and practices to succeed. Much of the research we summarized in the introduction has described specific mechanisms that favor content that takes better advantage of shared psychology (e.g., Noranzayan & Atran, 2004; Rubin, 1995). Our approach is similar, but we have described a mechanism that depends not only on shared psychology, but also on the shared environmental and cultural context that provides the habitat for ideas.

Some reviewers asked whether the collective cultural phenomena we predicted are a straightforward sum of individual effects. The answer depends on whether cues are exogenous—outside the social system—or endogenous. If cues are entirely exogenous, then the collective response would be a straightforward aggregation of independent individual responses to those cues. For example, if drivers responded only to the setting sun in deciding when to turn their car lights on during the early evening, then all car lights in a city would flicker on almost in unison—the sum of individual effects due to an exogenous cue. But if drivers only turned on their lights, say, once a certain fraction of other drivers had done so, then cues arose endogenously and individuals both responded and contributed to the environment that drove their behavior. Knapp (1944, pp. 30–31) observed that rumors in World War II tended to come in “clusters dealing with a single subject”—for example, a cycle of positive followed by negative rumors, or a cycle of anti-Semitic followed by anti-British rumors. Here the clustering seems

to arise from interdependent cueing—one rumor about a particular subject provides cues and thus serves as a habitat for other rumors about the same subject. Although thorough understanding of how collective phenomena aggregate from individual phenomena in the case of endogenous interdependent cues would require modeling beyond the scope of this article, the main contribution of habitats is to remind us that it is important to focus on the idea as a unit of analysis. *Fuzzy math* became a more important term than *lockbox*, not because there was a different process mediating between individual and aggregate responses in the two cases, but because one of those ideas had a more prevalent habitat.

Our approach here also has implications for related social sciences. Traditionally, cultural sociologists saw culture as a seamless web of tightly interconnected ideas, values, and practices. More recently they have come to see it as a tool kit of disconnected elements that people can draw on to solve specific problems (DiMaggio, 1997; Swidler, 1986). Although seeing culture as a tool kit fits naturally with our emphasis on tracking individual representations, for sociologists it has complicated another long-standing tension in sociology—the debate over institution versus agency. Institutionalists highlight how culture constrains thought (e.g., by constraining people’s ability to imagine alternatives to existing arrangements), whereas those who emphasize agency highlight how culture gives active agents the means to pursue their own goals. The tool kit view naturally favors the agency pole of the debate, but perhaps too much because it does not specify how active agents decide which tool to use from their large, disconnected tool kit. In the words of one sociologist, the view that culture is “an indiscriminately assembled and relatively unorganized collections of odds and ends imposes a far stronger organizing burden on actors” than the view of culture as a seamless web (DiMaggio, 1997, p. 268).

Our focus on habitats helps resolve this paradox. The habitats approach assumes that each element of the cultural tool kit has a set of situations that will cue its use. This cueing will in most situations happen relatively automatically (Bargh & Chartrand, 1999), making it easier for individuals to “decide” among cultural elements. In this article, we have studied cultural tools in the form of fairly discrete knowledge structures (e.g., stories, proverbs, catchphrases), but recent research suggests that it is possible to cue broader cognitive processes such as choice procedures (Briley, Morris, & Simonson, 2000; LeBoeuf & Shafir, 2005), attributions (Hong, Morris, Chiu, & Benet-Martínez, 2000), or behavior (Cohen, Nisbett, Bowdle, & Schwarz, 1996). Our habitat approach suggests that to understand the prevalence of these patterns of thought and behavior—how frequently they are exercised and passed along—researchers might want to do more to understand the distribution of cues in the environment. Interestingly, sociologist DiMaggio (1997, p. 274) speculated that environmental cues may exert selection pressures among cultural schema, a speculation that we have made concrete in this article with the fluctuation and competition hypotheses.

12. Extensions and related literatures

The notion of habitats may also be extended to consider hypotheses other than the fluctuation and competition hypotheses we have examined. For example, it is likely that more prevalent habitats may support more variation in particular classes of cultural representations. In a study of ethnophaulisms (i.e., pejorative terms for ethnic groups), Irving Allen (1983) showed

that larger demographic groups support a larger collection of distinct ethnophaulisms. Across 42 different ethnic groups in the United States, Allen demonstrated that there is a very high correlation between the number of basic terms and the population size of the ethnic groups (see Allen, 1983, Table 4.3). Population size is presumably a good proxy for the frequency of environmental cues that might compose a habitat for these prejudicial terms. Another aspect of habitat is the visibility of particular ethnic groups. In subsequent analyses using his data, we can show that even after controlling for population size, ethnic groups who are more easily recognizable by their physical appearance accumulate more than their share of ethnophaulisms. Both population size and physical appearance represent different cues that may constitute the habitat for these pejorative ideas (see Schaller, Conway, & Tanchuk, 2002, for related evidence that stereotypes are more likely to persist over time for groups with large populations).

On a final note, although this article has focused on ideas that transmit in relatively stable form, many ideas change as they diffuse. We suspect the success of ideas not only fluctuate in response to their habitats, they may also evolve in ways that allow them to take advantage of larger habitats. One example of adaptive evolution is the famous quip, “Nice guys finish last,” which *Bartlett’s Familiar Quotations* attributed to baseball manager Leo Durocher. Durocher actually said something quite different: In 1946, his team was leading the league, whereas their archrivals, the New York Giants, were in seventh place—next to last. Durocher was making fun of the Giants to a group of sportswriters, and one of them scolded him, saying “Why don’t you be a nice guy for a change?”

Durocher pointed at the Giants, saying, “Nice guys! Look over there. Do you know a nicer guy than [Giant’s manager] Mel Ott? Or any of the other Giants? Why they’re the nicest guys in the world! And where are they? In seventh place!” He waved contemptuously toward the other team. “The nice guys are all over there. In seventh place” (Keys, 1992, pp. 142–143).

Within a year, Durocher was quoted in the *Baseball Digest* as saying “Nice guys finish in last place in the second division,” and before long the quote evolved to “Nice guys finish last” (Keys, 1992). For years, Durocher denied saying the phrase (which he did not say), but he eventually gave in and adopted it as the title of his autobiography.

Many factors may have influenced the evolution of this phrase, including poetics. (“Nice guys finish last” has a better rhythm and sound than alternatives such as “Nice guys don’t do so well.”) But an analysis of habitat prevalence readily suggests the disadvantages of “Nice guys finish *seventh*.” Although this original phrase is limited to competitions with at least seven competitors, the evolved quote has a much more prevalent habitat. By understanding how habitat prevalence influences the success of ideas, we may be in a better position to understand not only why ideas succeed, but also how they evolve.

Notes

1. In the election context (i.e., articles that mention Bush, Gore, or the election) both words received an equivalent boost in the weeks between the first debate and the election, $t(9) = 1.43$, *ns*. In part this is because the media works very hard to provide balanced coverage of both candidates; the number of articles mentioning Bush or Gore is large and essentially identical.

2. We also ran an additional test to rule out the possibility that *lockbox* was less successful because it faced more competition for its usage situations. We asked respondents ($N = 12$) to write down synonyms that could be used to replace each term and found no significant difference for the number of synonyms provided for *lockbox* or *fuzzy math*: 2.5 versus 2.7, $t(9) = -.45$, *ns*.

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References

- Allen, I. L. (1983). *The language of ethnic conflict*. New York: Columbia University Press.
- Allport, G. W., & Postman, L. (1947). *The psychology of rumor*. New York: Russell & Russell.
- Anderson, J. R. (1995). *Learning and memory: An integrated approach*. New York: Wiley.
- Anderson, J. R., & Schooler, L. J. (1991). Reflections of the environment in memory. *Psychological Science*, 2, 396–408.
- Aunger, R. (2000). *Darwinizing culture: The status of memetics as a science*. Oxford, England: Oxford University Press.
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist*, 54, 462–479.
- Barret, J. L., & Nyhof, M. A. (2001). Spreading nonnatural concepts: The role of intuitive conceptual structures in memory and transmission of cultural materials. *Journal of Cognition and Culture*, 1, 69–100.
- Baumann, R. (1977). *Verbal art as performance*. Prospect Heights, IL: Waveland.
- Ben-Amos, D. (1995). Contextual approach. In J. H. Brunvand (Ed.), *American folklore: An encyclopedia* (pp. 158–159). New York: Garland.
- Boyd, R., & Richerson, P. J. (1985). *Culture and the evolutionary process*. Chicago: University of Chicago Press.
- Boyer, P., & Ramble, C. (2001). Cognitive templates for religious concepts: Cross-cultural evidence for recall of counter-intuitive representations. *Cognitive Science*, 25, 535–564.
- Briley, D. A., Morris, M. W., & Simonson, I. (2000). Reasons as carriers of culture: Dynamic versus dispositional models of cultural influence on decision making. *Journal of Consumer Research*, 27, 157–178.
- Brunswik, E. (1944). Distal focusing of perception: Size-constancy in a representative sample of situations. *Psychological Monographs*, 56(1), 49–55.
- Brunvand, J. H. (1996). *American folklore: An encyclopedia*. New York: Garland.
- Cohen, D., Nisbett, R. E., Bowdle, B. F., & Schwarz, N. (1996). Insult, aggression, and the southern culture of honor: An “experimental ethnography.” *Journal of Personality & Social Psychology*, 70, 945–960.
- Dawkins, R. (1976). *The selfish gene*. Oxford, England: Oxford University Press.
- DiMaggio, P. (1997). Culture and cognition. *Annual Review of Sociology*, 23, 263–287.
- Estes, W. K. (1955). Statistical theory of spontaneous recovery and regression. *Psychological Review*, 62, 145–154.
- Farr, R. M., & Moscovici, S. (1984). *Social representations*. Cambridge, England: Cambridge University Press.

- Fischhoff, B., Slovic, P., & Lichtenstein, S. (1978). Fault trees: Sensibility of estimated failure probabilities to problem representation. *Journal of Experimental Psychology: Human Perception and Performance*, 4, 330–344.
- Fine, E. C. (1995). Performance approach. In J. H. Brunvand (Ed.), *American folklore: An encyclopedia* (pp. 554–556). New York: Garland.
- Gigerenzer, G., Todd, P. M., & the ABC Research Group (1999). *Simple heuristics that make us smart*. New York: Oxford University Press.
- Gillund, G., & Shiffrin, R. M. (1984). A retrieval model for both recognition and recall. *Psychological Review*, 91, 1–67.
- Hawkins, S. A., & Hoch, S. J. (1992). Low-involvement learning: Memory without evaluation. *Journal of Consumer Research*, 19, 212–225.
- Hong, Y., Morris, M. W., Chiu, C., & Benet-Martínez, V. (2000). Multicultural minds: A dynamic constructivist approach to culture and cognition. *American Psychologist*, 55, 709–720.
- Kahneman, D., & Tversky, A. (1982). The simulation heuristic. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases* (pp. 201–208). Cambridge, England: Cambridge University Press.
- Kelly, M. H., & Keil, F. (1985). The more things change. ... Metamorphoses and conceptual structure. *Cognitive Structure*, 9, 403–416.
- Keys, R. (1992). *Nice guys finish seventh: False phrases, spurious sayings, and familiar misquotations*. New York: HarperCollins.
- Knapp, R. H. (1944, Spring). A psychology of rumor. *Public Opinion Quarterly*, 8, 22–37.
- LeBoeuf, R., & Shafir, E. (2005). *Alternating selves and conflicting choices: Identity salience and preference inconsistency* (Working paper). Gainesville: University of Florida.
- McGeoch, J. A. (1932). Forgetting and the law of disuse. *Psychological Review*, 39, 352–370.
- Miller, D. T., & Taylor, B. R. (1995). Counterfactual thought, regret, and superstition: How to avoid kicking yourself. In N. J. Roese & J. M. Olsen (Eds.), *What might have been: The social psychology of counterfactual thinking* (pp. 305–322). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Norenzayan, A., & Atran, S. (2004). Cultural transmission of natural and nonnatural beliefs. In M. Schaller & C. Crandall (Eds.), *The psychological foundations of culture*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- O'Neill, B. (1994, March 13). The trouble with kids ... according to T. Cullen Davis, born-again Christian. *Seattle Post-Intelligencer*, p. E1.
- Roese, N. J., & Olson, J. M. (Eds.). (1995). *What might have been: The social psychology of counterfactual thinking*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Rogers, E. M. (1983). *Diffusion of innovations*. New York: Free Press.
- Rubin, D. (1995). *Memory in oral traditions: The cognitive psychology of epic, ballads, and counting-out rhymes*. Oxford, England: Oxford University Press.
- Sanders, N. (2000, December 28). Factoring in Tellis. *The Fort Worth Star-Telegram*, p. A7.
- Schaller, M., Conway, L. G., & Tanchuk, T. L. (2002). Selective pressures on the once and future contents of ethnic stereotypes: Effects of the communicability of traits. *Journal of Personality and Social Psychology*, 82, 861–877.
- Schaller, M., & Crandall, C. (2004). *The psychological foundations of culture*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Shibutani, T. (1966). *Improvised news: A sociological study of rumor*. New York: Bobbs-Merrill.
- Shuit, D. P., & Rabin, J. L. (2000, October 17). MTA, lawmakers trade barbs over strike's savings. *Los Angeles Times*, p. A1.
- Sperber, D. (1996). *Explaining culture: A naturalistic approach*. Oxford, England: Blackwell.
- Sperber, D., & Wilson, D. (1986). *Relevance: Communication and cognition*. Oxford, England: Blackwell.
- Swidler, A. (1986). Culture in action: Symbols and strategies. *American Sociological Review*, 51, 273–286.
- Taylor, A. (1985). *The proverb, and, An index to The proverb*. New York: Lang.
- Thompson, S. (1946). *The folktale*. New York: Dryden.
- Tulving, E., & Psotka, J. (1971). Retroactive inhibition in free-recall: Inaccessibility of information available in the memory store. *Journal of Experimental Psychology: Human Perception and Performance*, 87, 1–8.