Back in Touch with Contagion: Some Essential Issues

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ABSTRACT Since the introduction of contagion theory to the psychological literature in the 1980s and 1990s, research and interest in the topic have proliferated, especially as related to consumer perceptions and preferences. In this article we review current conceptual issues in contagion theory, including the nature of essence and its relation to conceptions of the soul and self, backward contagion, the process of transmission and whether contact is necessary or sufficient for it to occur, the relation between positive and negative contagion, the status of the eight originally proposed defining features of psychological contagion, and the companion "law of similarity." We conclude with a discussion of sustainability-relevant applications of contagion theory in the public interest, such as food and water supply and safety, ownership and the sharing economy, and health care. Future research should devote increased attention to cultural differences in psychological contagion and begin to explore emerging impacts of virtual environments on the extended sense of self, reality, and attendant contagion-based thinking.

We are deeply gratified that our work on contagion, primarily from the 1980s and 1990s, has formed a basis for very productive work in consumer psychology. This recent work, well summarized by Huang, Ackerman, and Newman (2017) and Morales, Dahl, and Argo (2018) has both enriched our understanding of the nature of contagion and demonstrated many situations where it is relevant in consumer decisions.

In recent decades, there has been a growing interest in psychology in the general area of magical thinking, of which sympathetic magic and the law of contagion, is one example. Historically, magical thinking was interpreted as pathology, immaturity, or based in scientific ignorance (e.g., Freud 1913/1950; Piaget 1929/1983; Malinowski 1955), but a major advance in understanding is that magical and "rational" thinking are not mutually exclusive ways of explaining phenomena but rather often coexist in the same minds as explanations for the same phenomena, as demonstrated by the cross-cultural work of Legare and colleagues (2012; see also Horton 1967a, 1967b; and Tambiah 1990). General theoretical approaches to magical thinking have introduced two theoretical frameworks, both originally raised in our 2000 review (Nemeroff and Rozin 2000). One is the idea that intuitive (type 1), as opposed to rational (type 2), thinking (e.g., Epstein et al. 1996; Kahneman 2011) generates magical beliefs (Nemeroff 2002; Kramer and Block 2011). Another is that magical beliefs result from misapplication of the features of one of the three core domains of knowledge (physical, biological, and mental; see, e.g., Carey 1996) to one of the other domains (Lindeman and Aarnio 2007). Increasingly, magical thinking is construed as a core feature of everyday, healthy, human functioning.

This article will (1) briefly review key principles of contagion from prior work; (2) discuss ongoing and emerging conceptual questions related to contagion, focusing particularly on the role of physical contact and the nature of essence; and (3) echo Vyse's (2018) call for a "transformative consumer research" approach, offering discussion of potential applications of contagion in the public interest.

CONTAGION IN THE 1980S AND 1990S

At the end of the twentieth century, building on the work of Tylor (1871/1974), Frazer (1890/1922), and Mauss (1972/1902), we hypothesized and documented a series of properties of contagion, based almost entirely on work with Americans, using surveys (Rozin et al. 1989), interviews (Nemeroff and Rozin 1994), and hands-on experiments (Rozin, Nemeroff, and Millman 1986; Rozin et al. 1999; reviewed in Rozin and Nemeroff 1990; Nemeroff and Rozin 2000; Rozin and Nemeroff 2002). Our work on reactions to persons with AIDS illustrated most of these principles (Rozin, Nemeroff, and Markwith 1992; Nemeroff, Brinkman, and Woodward 1994; Rozin, Markwith, and McCauley 1994). We begin with these principles briefly, in the belief that each should be considered

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when deciding whether a phenomenon of interest should be counted as contagion, and whether the conceptualization of contagion needs to be broadened. Key terms are defined as follows: the entity that is producing contagion is the *source*, the entity that is changed as a result of some kind of contact is the *target or recipient*, and the entity that may intermediate between them is the *medium*.

1. *Physical contact*.—We identified physical contact as necessary between the source and the target, whether direct or indirect, that is, transferred by a medium that has physically contacted both.
2. *Permanence*.—Once contagion has been transmitted, it is resistant to purification; indeed, the target may be permanently changed by the contact ("once in contact, always in contact").
3. *Dose insensitivity*.—Contagion tends to behave in an all-or-nothing fashion, such that only minimal contact is necessary to accomplish a substantial contagion effect, and more extended contact produces only a small additional effect. One account of this is that transmitted essence is holographic, such that each piece of a person, no matter how small, contains the full range of attributes of the source, much like the DNA in each cell (Nemeroff et al. 1994; Nemeroff and Rozin 2000).
4. *Negativity dominance*.—In all of our early work, negative contagion (transmission of negative effects from negative sources) was more potent than positive contagion (transmission of positive effects from positive sources) in two senses: (1) The magnitude of effects from "equivalently strong" negative and positive sources was much greater for the negative; and (2) the negative effect was manifested in almost all individuals over the age of 4 or 5 years, whereas many individuals did not show positive contagion effects. A simple illustration of "negativity dominance" is that a brief contact with a cockroach will render a very positive food inedible and disgusting, whereas there is no amount of the most positive thing imaginable that will render a pile of dead and sterilized cockroaches desirable or even neutral (or, alternatively, a drop of sewage spoils a barrel of wine, but a drop of wine does nothing for a barrel of sewage). This feature of contagion is an example of the general principle that negative events are more potent than comparable positive events (Baumeister et al. 2001; Rozin and Royzman 2001).
5. *Backward contagion*.—Contagious influence can be transmitted in a direction that is the reverse of the normal causal arrow. That is, taking action on a possession or part of a source, after it has been permanently separated from the originating source, can have an influence on the source (Rozin et al. 1989; Rozin, Dunn, and Fedotova 2018).
6. *Late onset*.—Contagion is a form of magical thinking that is grown into, rather than grown out of. It is not manifested in children less than 4 years of age and first appears in most children at ages 4 or 5 (Fallon, Rozin, and Pliner 1984; Siegal 1988; Hejmadi, Rozin and Siegal 2004). This has been demonstrated in American, Australian, and Hindu Indian children.
7. *Universality*.—Contagion is present in a great many ethnographies and has recently been demonstrated in both the Hadza, a hunter-gatherer group in Tanzania, and the Tannese, subsistence-agriculturalists of Vanuatu (Apicella et al. 2018).
8. *Different models of contagious "essence."*—While some conception of transmission of influence (broadly construed) based on contact (broadly construed) seems to be universal, the specific nature of what is transmitted appears to have several variants. Based on extended interviews with Americans, Nemeroff and Rozin (1994) identified five models of contagion (i.e., types of contagious entity), by comparing the perceived efficacy of different types of purification technique applied to targets that had contacted different types of contagious source (interpersonal-moral vs. physical; positive vs. negative). The models were physical material transfer of germs (model 1) or bodily residues (model 2); transfer of something akin to positive or negative personal/spiritual "vibes" (not impacted by most physical purifications but responding to opposite-valenced vibes; model 3); and two models potentially construable as outside the domain of contagion, strictly defined, but which nevertheless could successfully transmit influence: an associative model (model 4), and a model of symbolic, often public, meaning (model 5). We found that most individuals showed evidence of the operation of at least two models.

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CURRENT ISSUES IN CONTAGION THEORY

Three major issues have emerged primarily from the consumer psychology literature. One is the degree to which physical contact is a necessary condition for transfer of properties (Huang et al. 2017; Morales et al. 2018). The second is that contact is not sufficient to produce transfer of properties (Morales et al. 2018). And the third is that positive contagion is much more substantial and far reaching than had previously been realized, raising the attendant question of whether or not positive and negative contagion are two sides of the same process (Huang et al. 2017). Before examining these issues, we think it is important to first explore two basic features of contagion, the nature of "essence" and backward contagion, which have been addressed in the consumer psychology literature and may structure considerations on the nature of contagion and point to new directions for research.

The Nature of Essence

The Borders of the Contagious Self. Many of the effects of contagion are consistent with conceptions of the self as an extended entity that is not limited to the physical (bodily sheath) but also includes objects (possessions), loved ones, and fruits of one's labor or creative intent. As early as 1959, Gaster explicitly suggested that the concern underlying the law of contagion was the "primitive notion" of the extended self: "[Rather than saying] that one can use a man's garment in magic because of some property attaching to it materially because, having once been in contact with him, it can ever-afterward 'influence' him. . . . The truth is rather that the garment is itself a part of him" (Gaster 1890/1959, 176). Goffman (1971) described seven "territories of the self," including the sheath (the skin and clothing boundary of the body) and personal space (a projected envelope around the sheath); each of these is subject to different types of intrusion or violation. Belk (1988) also observed that "handcrafted pieces to the craftsperson, and artworks to the artist may become a part of extended self, because we have intentionally worked upon or created these things, investing both energy and self in them" (Belk 1988, 151). Consistent with this, Nemeroff and Rozin (1994) suggested that contagion maps extended identities, while Norton, Mochon, and Ariely (2012) reported that people value items they have created themselves more highly than identical items created by others.

In a significant conceptual advance, Stavrova et al. (2016) systematically explored "intention contagion," a newly coined term for the process whereby the act of creating a product results in contagion effects, even in the absence of actual physical contact between the creator and the product itself, theoretically because a created object is seen as part of the self and therefore as embodying the essence of the creator. Stavrova et al. (2016) demonstrated that intention contagion was indeed based on belief in transfer of essence, as evidenced by (1) subjects' stated belief in actual transfer of properties (items created by an evil source were perceived as evil themselves); (2) stronger effects among individuals who held stronger beliefs in transfer of essence, measured by a newly created scale; and (3) intention contagion effects could not be accounted for by association. They concluded that it is, in fact, an example of contagion, rather than a distinct phenomenon. For both negative and positive intention contagion, effects were bigger if physical contact occurred between the source and the object, but there was still a substantial effect when the source created or designed the object but never physically contacted it. They also showed an intention contagion effect for music. The fact that there was some specificity in what transferred (morality but not intelligence) directs us to the question of whether there are inherent limits on what types of things can be perceived as transmissible through contagion. We see this as unlikely given the extremely concrete nature of characteristics included in our early work on the "you are what you eat" principle, a widespread belief in traditional cultures. In interviews with Americans (Nemeroff and Rozin 1989) we showed that properties of the animal source of ingested foods were believed to manifest themselves in the person who eats them (e.g., regular consumers of wild boar meat were hairy and aggressive). Similarly, Huang et al. (2017) note that a wide array of properties seem to be transferrable. However, it is also possible that only self-relevant or very salient characteristics will transfer (Hood 2009), which could lead to specific predictions about the impact of tailoring products to suit aspects of consumer self-identity. Both salience and self-relevance are likely to be partially determined by transient factors such as situational cues and emotional states. Goffman's additional "territories of the self" (e.g., "stall," a temporary claim to a space) might also prove fruitful avenues for investigation.

Models of Essence. What then is being transmitted in contagion, and how? Early anthropological writings on sympathetic magic noted that a large number of societies had specific terms to depict whatever was thought to inhere within objects, places, people, and animals, and to transmit influence in the case of contagion. Mauss (1902/1972) described "mana" as the "essential nature or potency of things

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in their purest form," a combined concept of power, soul, and substance. Meigs (1984) presented a superbly detailed description of "nu," or vital essence, among the Hua of Papua, New Guinea. Nu is strikingly concrete, construed as a transferable substance that can be gained or lost by an individual. It is found in bodily emissions, which are "infused with a person's self, as carriers of the owner's essence" (111), as well as in "any living thing that the person has invested great effort into growing, for example, children, pigs, and special garden produce" (40). The effects of nu may be beneficial or harmful depending on the social relationship between source and recipient. Elaborate rules were developed pertaining to food and contact, to regulate the spread of nu. For instance, males at the onset of adolescence are segregated and protected from any contact with a fertile female's nu, including crops picked by such women, the idea being that fertile female nu will inhibit their masculinization.

Modern cognitive developmental psychology has established that children and adults (primarily American) are essentialists (see Gelman [2004] for a review). That is, particularly for biological kinds, they believe that "certain categories have an underlying reality or true nature that one cannot observe directly but that gives an object its identity and is responsible for other similarities that category members share. . . . In the domain of biology, an essence would be whatever quality remains unchanging as an organism grows, reproduces, and undergoes morphological transformations (baby to man; caterpillar to butterfly)" (Gelman 2004, 404). Along the same lines, Hood (2009, 24) says, "An essence is an underlying, invisible property that defines the true nature of something. It doesn't really exist, but we think and behave as if there were some inner stuff inside people that makes them who they are." Essences, the instantiation of essentialism, are indelible and form a necessary condition for category membership or individual distinctiveness. Because essences are psychological constructions, they may have properties that do or do not correspond to real world entities. There is much discussion of essences and essentialism in philosophy as well as psychology, and there are many contested areas and deep metaphysical issues involved (see, e.g., *Stanford Encyclopedia of Philosophy*, https://plato.stanford.edu/entries/essential-accidental/#FourWaysCharEsse).

Essence shares some important features with the widely believed human concept of "soul." Both are usually valenced, but essence, unlike soul, can be imagined as material, as well as spiritual. DNA, which is of course physically real, also has some of the features of essence: it represents both individuality and species membership, it is invisible, almost indelible, and it permeates the body. But unlike essence, it must be material.

What properties of the source is essence thought to contain? The most consistently salient effect of a transfer of essence is valence. A target that has been "contaged" usually becomes more negative or positive than it was previously. But, of course, the valence of the effect is not necessarily a property of the essence itself; it often depends on the relation of the source to the essence. And valence is far from the only essential quality of a source that may be salient. Though it is simplifying to decontextualize things, this just cannot be done with essence.

In a sense, essence can be partitioned, because when it is passed by contagion, it is also present in the source. But the parts seem to be in some type of (nonphysical) contact, because his seems necessary to account for backward contagion. Humans seem to conceive of essence as physically real and to generally follow the laws of physics, although obviously with some exceptions as in backward contagion. While spiritual essence or "soul-stuff" is explicitly described as nonmaterial, it behaves in many ways like a material substance, including its frequent mode of transfer by physical contact. But it is resistant to physical transformations such as washing or boiling (Nemeroff and Rozin 1994). In what other ways does essence act material? Is essence finite? Does it become diluted or depleted? Can it be replenished? And is this different for different types of contagion?

And what is the origin of belief in essence? We have suggested elsewhere that contagion is a preadapted or "prepared" cognitive heuristic, with adaptive significance in the form of protection from pathogens, and we have also drawn attention to several other mechanisms that might generate observed contagion effects, either individually or in combination (Nemeroff and Rozin 2000). It is possible that different types of contagion might represent different mechanisms or combinations of them. Lindeman and colleagues have explained negative contagion's mapping of microbial contamination onto the domain of morality as a conceptual blurring of categories that are ontologically distinct but emotionally related (Lindeman and Aarnio 2007; Lindeman and Svedholm 2012). Similarly, many contagious effects represent a mapping of social relationships onto the physical world (Nemeroff 1995; Nemeroff and Rozin 2000). An integrated account of contagion could begin with the notion of "embodied cognition" (e.g., Johnson 1990), in which the phenomenology of living in a human body provides the preconceptual structures that shape our abstract concepts. In this account, we make sense of things by metaphorically projecting "image schemata" onto

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a wide variety of domains. The contagion concept would represent a combination of schemata, for example, "container," "force," "vector," which can account for how the pathogen/disgust-based contact heuristic (Rozin, Haidt, and McCauley 2018) is extended and why mapping occurs across ontological domains.

It is also important to recognize that people may be inconsistent in terms of which model they apply and may blend models, treating physical germs as though they were spiritual essences and symbols as though they have physical reality (Nemeroff 1995; Legare et al. 2012; Uhlmann and Zhu 2013).

In summary, concepts of both essence and soul seem to be widespread, culturally evolved ways of making sense of the world. The virtually universal contagion principle is linked to the idea of essence.

Backward Contagion

From a conceptual view, backward contagion is of particular interest. In this case, when some "essence" passes from the source to the target, it is the source rather than the target that is affected. In this scenario, the targets generally do not absorb or incorporate the essence of the source, as happens in forward-acting contagion; rather, they obtain the essence and then may act on it (or have the potential to act) with intention to harm the source. In the most common form in the anthropological literature, the recipients are persons who have a negative relation to the source. They obtain a "piece" of the source, often hair or fingernail parings, and do something bad to it, whether physical, such as burning, or spiritual, like using it to direct a curse at the source. The effect is something negative happening to the source, most commonly bad luck or illness (Tyler 1871/1974; Frazer 1890/1922; Mauss 1902/1972). Backward contagion clearly violates the usual direction of the physical causal arrow. In a Western/developed context, backward contagion was first shown in a survey on Americans (Rozin et al. 1989), asking participants to rate scenarios, such as the following: "How would you feel about your thoroughly cleaned hairbrush being given to one of the following persons? Each would also be told your name. Assume you will never use the brush again." The persons were a friend, a lover, a disliked person, and an unsavory person, all selected by the subject (except for unsavory). Although about 25% of individuals showed discomfort at their thoroughly cleaned hairbrush falling into the hands of a disliked or unsavory person, for example, backward contagion was less common than forward contagion. It was stronger for negative sources than positive ones. A more extensive recent study (Rozin et al. 2018) offers many more examples of backward contagion, including situations characterized by both material and spiritual essence, and scenarios that cannot be fully explained by either association or plausible (i.e., nonmagical) harm. Kramer and Block (2011) also provide evidence for backward contagion in studies of Americans.

In their review, Huang et al. (2017) acknowledge the possibility of backward contagion but do not follow up on it, since it is weaker than forward contagion and may not have as much influence on consumers. Nevertheless, backward contagion could be at work in the reluctance of some people to donate clothing to used clothing stores and the much greater reluctance to donate organs.

The Process of Transmission

Is Contact Necessary? In our construction of contagion through the year 2000, we considered physical contact a defining feature. It is now clear, primarily from work in marketing, that many of the phenomena that contagion is invoked to explain can take place without physical contact. This idea emerges primarily from the work of Morales and Newman, and their colleagues, and is summarized in papers authored by each of them (Huang et al. 2017; Morales et al. 2018). Morales et al. (2018) specifically propose an amendment to contagion theory, proposing that physical contact per se be dropped as a defining feature of contagion: "The key issue is that essence is transferred by some means or other" (Morale et al. 2018).

The idea of physical contact is actually less clear than it seems. For instance, modern scientific knowledge provides us with a powerful physical model for airborne transmission; indeed, the majority of deaths from infectious diseases involve airborne pathogens (who.int/whr/1996/media_centre/press_release/en/index1.html). Morales and Fitzsimmons (2007) reported drops in valuation even in the case of two completely sealed packages touching each other (cookies and tampons), while other studies clearly demonstrate an influence of proximity on value, even when participants were explicitly told that no airborne particulates could have been transferred (Kim and Kim 2011). Also problematic for the physical-contact-as-critical claim are Stavrova et al.'s (2016) demonstrations of "intention contagion," in which some aspect (essence) of the designer or creator of a product is perceived as inhering in the creation, even if the product is nonphysical (e.g., a musical composition) or never had physical contact with the designer (e.g., an item of clothing manufactured by others from that source's design. There is even evidence that temporal contiguity without physical contact can produce property transfer (Smith, Newman, and Dhar 2015).

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Although we recognize that property transference (an apt term coined by Morales et al. 2018) can occur under many conditions, we caution that some of these demonstrations could be accounted for by our 1994 models of association or symbolism, which should not be grouped under the label of contagion, because the mechanisms of transference are very different. In associational "contagion," one object becomes a reminder of another, but there is no sense of essence transfer. Similarly, an object can symbolize another without being thought to share its essence; this is the difference between considering the communion host a symbol versus the Catholic transubstantiated host. It is therefore important to determine, given property transference, whether there is a psychological sense of essence transfer.

Fedotova and Rozin (2018) have done studies comparing physical contact transfer versus association and shown that for a range of contagion scenarios, association cannot account for the potency of contact effects. For example, more individuals are upset about holding Hitler's English dictionary in their hands than a brand new copy of *Mein Kampf*, although the association value of *Mein Kampf* is higher. Associational accounts have been ruled out as the primary cause of property transference in a number of nonphysical contact demonstrations (e.g., Newman, Giesendruck, and Bloom 2011; Stavrova et al. 2016).

Is Contact Sufficient? Contamination (negative contagion) is ubiquitous. In a restaurant, the chairs, plates, tables, silverware, are all "used." All the air on earth is "used." Almost all of our money is "used." All of these have contacted a wide range of individuals, some of whom we might find unsavory. All of our water is used.

We recognize, as do Morales et al. (2018), that uncontrolled negative contagion sensitivity would be crippling. Morales et al. (2018) suggest, in their second amendment to contagion laws, that many of the cues that remind us of the past history of the entities and substances in the world are "dormant," until activated (hopefully not too often) by cues. We are content to breathe in the air that the stranger sitting next to us in the theater has just breathed out, unless he or she leans over and exhales directly into our mouth, or coughs, or has halitosis (these would be "cues"). Also, if essences are holographic, then we would be continually exposed to massive numbers of features from all the contagious entities around us. The issue of an overwhelming set of "features" or properties in each essence also concerned the anthropologists who first described it. They were clear that contagion was not necessarily automatic, that is, all inclusive (e.g., Mauss 1902/1972, 67). Usually only one or a few properties are believed to be transmitted, those being the most salient, relevant, desired, or feared ones, either as socially defined or based on the current purposes of the practitioner. Presence or absence of contamination cues and self-relevance are two delimiting principles with strong support. Based on the anthropological literature, exploring intentionality may also prove fruitful.

"Dormancy" or "inattention" have a heavy burden to carry. Consider a vegetarian who is offered some string beans from a friend's plate that also has a hamburger on it. The hamburger may have previously touched the beans, and even if it didn't, the surface of the plate links the two. Are the string beans contaminated, and is this sufficient contamination (some dose sensitivity) to deter ingestion, and perhaps stimulate disgust? There are no generally accepted rules for this, and when inattention fails, individuals may develop their own set of limits of contamination, such as the "5 second" rule that some Americans apply (with no scientific basis): if something good to eat falls on the floor or touches something undesirable for less than 5 seconds, it remains edible. Sometimes, however, there are clearly defined, explicit rule systems to help. One example is the Hebrew dietary laws of Kashruth, in which Jewish Talmudic scholars carefully defined the limits of contamination. The problem is that one never knows if there are some pork particles, for example, in the air. The answer: the 1/60th rule: If something that is not kosher falls into a kosher food by accident and is less than 1/60th the total volume of the food, the food remains kosher (Grunfeld 1982). But the Talmudic rabbis realized that this was insufficient. Suppose multiple nonkosher contaminants accidentally fall into the food, each smaller than 1/60th? If we think of all the possible tiny microcontaminants summed together, who knows if they will exceed 1/60th? The rabbinic sages handled this potentially crippling problem by stating that one only has to count the largest contaminant; the rest can be ignored. These rules work well to limit contagion concerns for observant Jews within the domain of Kashruth, while their contamination sensitivity outside the kosher domain is unaffected (Nemeroff and Rozin 1992). Thus, explicit rule systems may be able to delimit contagion concerns even in the presence of activating cues.

In conclusion, there was an early need for precision and a narrow scope in delineating what was and was not "magical contagion." But we agree with Morales et al. (2018) that it is time to relax those boundaries to encompass the fuller range of extension of transfer of essence, allowing for different modes of "transmission," different contexts and framings, and different degrees of attention or salience. We still be-

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lieve that the properties of contagion we elucidate at the beginning of this article have some value, and we are not sure that we should think of associative links as the same category as essence transfer links. But as Morales et al. (2018) suggest, there are many things about the history of an entity that can affect its value, in any context, so long as there is some kind of link. It may prove helpful to distinguish conceptually between cases of contagious transmission, in which essence travels (through whatever means), versus cases in which it is the boundaries of the self that shift. Although transferring essence into something is one way to make it a part of the self, it is not the only way. This is not an unimportant distinction; for instance, if we attempt to explain backward contagion in terms of transmission, it violates the laws of physics. But if acting on the target simply is acting on the source, "backward" effects would seem inevitable.

The Relation between Positive and Negative Contagion: One Phenomenon or Two?

Many if not most instances of negative contagion are mediated by disgust; however, it is less clear what underlies positive contagion effects. In our early explorations we speculated that the opposite of disgust might be love or sexual attraction, hence our inclusion of a favorite "sex symbol" as one of the interpersonal-moral sources in the initial models-of-contagion study (Nemeroff and Rozin 1994). Just as negative contagion motivates avoidance, positive contagion motivates approach, and an evolutionary model positing adaptive significance for positive contagion effects would therefore focus on its role in bonding, whether for procreative, parenting, or kinship/community purposes (Nemeroff and Rozin 2000). So it is not completely surprising that individuals who see an attractive, opposite-gendered confederate try on a t-shirt are more likely to purchase that shirt (Argo, Dahl, and Morales 2008).

The relative spottiness of positive contagion effects in early work may have resulted from positive effects competing with negative ones given many of the examples used. For example, Mother Teresa's sweater is positive because of Mother Teresa's essence, but it may also carry some negativity because of the possibility of sweat, dirt, and germs (given the type of work she did, and where). Similarly, a music manuscript in Beethoven's own writing is probably an unambivalent source of positive contagion, but what about Beethoven's toothbrush or pajamas? And while the bones of Saints are holy and powerful, they are also human skeletal remains!

It has also been suggested (Stavrova et al. 2016; Huang et al. 2017) that positive contagion may follow a different model than negative contagion, being more interpersonal-moral-symbolic rather than physical and therefore requiring more specific self-relevance in order to be transmissible. Consistent with this, Fedotova, Rozin, and Brunwasser (2018; Fedotova 2013), using a contagion sensitivity scale they created, found that the positive and negative contagion factors were uncorrelated.

While self-relevance may well be a key feature that determines when positive contagion effects will and will not occur, it may also be relevant in some cases of negative contagion. Individuals with a poor self-concept with respect to moral goodness showed a shorter latency to remove a jacket that had belonged to an evil person compared to a neutral person. There was no difference in latency for individuals with a poor competence self-concept (Nemeroff et al. 2018).

The Status of Our Original Defining Features of Contagion Other than Physical Contact

Of the eight features of contagion laid out near the beginning of this article, almost all of the expansion and modification based on research in consumer psychology is relevant to the necessity of physical contact and the different models of essence. The late onset feature is not dealt with in the consumer psychology literature because it has to do with children, and the universality is not relevant, because almost all the consumer psychology research is with Americans. In general, the consumer psychology literature is consistent with negativity dominance. Backward contagion was only addressed in one study, with a suggestion of the existence of this type of effect (Kramer and Block 2011).

There are examples of gradations of potency with increasing amounts of contact, which may challenge the generality of dose insensitivity (e.g., Newman and Bloom 2014) or increasing distance, defined as "degrees of separation," from the source of essence. In the case of Catholic relics, for instance, the bones or other body part of a saint (first-order) are more potent than objects that have touched those bones (contact- or second-order relic), which are in turn more potent than objects that have touched the second order relics (third-order relic). Similarly, Smith et al.'s (2015) demonstration that there is less transfer of properties for later as opposed to earlier copies of a valued document, suggests some sort of gradation. The authors also included an explicit measurement of belief in essence in the objects, which mediated effects. We note that an alternative possible interpretation is that making copies is perceived as depleting the es-

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sence of the source, in the same way that printing a large number of copies eventually depletes a toner cartridge, resulting in less intense images.

Permanence was not directly manipulated in any study. Also, permanence would only hold if there were no post-contact relevant events. Thus, washing or opposite spiritual contagion exposure could neutralize what might have otherwise been a permanent effect.

Contagion and the Law of Similarity

In our investigations of the laws of sympathetic magic, we focused almost exclusively on contagion, as does the consumer psychology literature. However, as the field now delves more deeply into the realm of symbolism and representation without physical contact, it may be time to devote attention to the second law of sympathetic magic. The law of similarity, as originally described by Tylor (1871/1974), Frazer (1890/1922), and Mauss (1902/1972), basically holds that the image (representation) equals the object, or appearance equals reality. If it looks like a tiger, it IS a tiger. This was a very valuable heuristic before photographs and digital images flooded the world. The law also encompasses the idea that like causes like, that is, causes resemble their effects.

Importantly, similarity acts not through transmission per se but rather through the belief that essence is shared by entities that share more superficial features of resemblance. That is, the similar features themselves indicate that they are "made of the same stuff" at a deeper level. Replicas hold value because, as images of the original, they have the same essence—though not necessarily as much of it or as powerfully. However, based on Frazer's observations that the two laws frequently work in combination with each other, we did document instances of "contagion via similarity" (e.g., devaluation of chicken soup that had been stirred by a fake plastic pork chop, among observant Jewish participants; Nemeroff and Rozin 1992). Fedotova (2013) also showed that contact of a liquid with negative words or images can render the liquid more negative. This is contagion mediated by similarity. If the image or word was on the inside of a cup and thus touching the liquid, it was more potent than if the same image or word was on the outside of the cup.

CONTAGION IN THE PUBLIC INTEREST

Over the past decades of initiating, testing, and refining contagion theory, we and others have explored a wide array of phenomena related to contagion and identified a number of potential applications to improving health and well-being at both the individual and societal levels. We briefly review them here, since they expose potential applications of a marketing perspective.

Contagion and the World Food Supply

With almost a billion malnourished people in the world, and world population growth, the supply of food and water is challenged. Growing populations, climate change, and the shrinkage of natural land have all led many to be concerned about the future of the earth, roughly summarized under the sustainability movement. Technology is both worrisome, at least to a substantial part of the population, at the same time that it offers perhaps the best opportunities for a sustainable earth. Human attitudes related to contagion are often invoked in the various debates about the advance of technology.

Natural Preference. Contagion plays a role in the major preference for "natural" things in middle- and upper-class Americans. In recent decades, the word "natural" has taken on a particularly positive meaning in the industrialized world and is currently widely used in marketing of food and water products and nutritional supplements (Roman, Sanchez-Siles, and Siegrist 2017). It is important to understand the preference for naturalness if we are to help with the promotion of beneficial technologies, not natural by their nature. Natural items are thought of as healthier, more environmentally friendly, more appealing to the senses, and/or more effective, as compared with their non-natural (produced via human intervention) counterparts. In addition to these "instrumental" considerations, natural items appear to also be thought of as inherently superior, aesthetically or morally dubbed "ideational" concerns (Rozin et al.2004; Rozin 2005, but see Li and Chapman 2012). Applying Kramer and Block's (2011) concept of level of intentionality, instrumental explanations might mask or be used to rationalize unconscious/implicit ideational ones.

Definitions of "natural" by people in Europe and the United States center on two ideas: "not processed by humans" and "no additives" (Rozin, Fischler, and Shields- Argelès 2012). "No additives" is essentially a set up for contagion, because additives usually constitute a small percentage of the total entity and therefore qualify as contaminants. Since natural stands for a pure, benevolent state or entity for most people, a natural food becomes negative by addition of a small amount of another, usually nontoxic but often unnatural additive. However, it is not only the substantive departure from natural that is the issue but, more importantly, the process of adding something (Rozin 2005). Taking something out of a natural entity (e.g., the removal of fat from natural milk, resulting in skim milk)

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does not generate much negativity or reduce naturalness much (Rozin, Fischler, and Shields-Argelès 2009; Scott and Rozin 2017). The focus is on the contaminant and the process of adding (as opposed to subtracting) it.

If we assume that there is a sacred, essentialist nature of natural (for which there is evidence from the anthropological literature), then this can be contaminated by human contact or additives. Additivity dominance makes sense in that additions to essence are likely to contaminate, whereas removing something from essence should be less worrisome given that essence is "holographic" (unitary) and should not be fundamentally altered by separation.

Taken together, these patterns suggest that operations which alter the basic nature of essence are most damaging to naturalness. Thus, adding peanuts to peanuts, or grinding peanuts, is less problematic than adding salt or fat to the peanuts, because the former does not change the "peanutness" of the peanuts or result in a mixed (no longer pure) product, while the latter accomplish just that (Rozin 2005). Adding an unnatural ingredient should be worse still, and if this occurs through an unnatural process, effects should be most extreme.

This is exactly the case with genetically engineered foods. Research on opposition to genetically modified (GM) food suggests that for most opponents, nature is treated as a sacred or protected value (Baron and Spranca 1997; Tetlock 2003; Scott, Inbar, and Rozin 2016), and for the 70% of Americans surveyed who oppose genetically engineered foods, the opposition is moral and absolute, independent of the risks or benefits of the resulting food. The method of GM is as prototypical of essence transmission as one could possibly imagine: some of the "stuff" that comprises the very nature of one entity (DNA) is plucked out and inserted into another entity, specifically to bring about a change in the nature/expression of the receiving entity. The implication of this work (see Scott et al. 2018), is that moral contamination cannot be countered with amoral manipulations; it has to be countered by positive moral contagion. This was a conclusion from our study of what processes can neutralize different types of contagion, material versus spiritual (Nemeroff and Rozin 1994). Alternatively, reframing perceptions of the unnatural process as closely analogous or identical to natural ones may help.

Recycled Water for a Thirsty World

Water is the major source for gastrointestinal infections and is also by far the most important nutrient. Contaminated water, which often appears clear, is a major public health problem. Ideal, safe, and efficient use of drinking water is both aided and limited by contagion beliefs. Knowledge of contact between water and sources of infection can, via contagion, lead to rejection of this water. But unfortunately, people often treat water with a history of contamination as dangerous or disgusting, even after it has been purified (Rozin et al. 2015). The motto of opponents of recycled water in the American Southwest is "toilet to tap." If the concern were for material contagion, the negative response should be erasable by appropriate water processing. Yet even though boiling, evaporating, and condensing contaminated water purifies it physically, it does not psychologically. Either by association or spiritual contagion, this water is not drinkable for a subset of Americans (Rozin et al. 2015). Taken seriously, since all water on Earth is historically contaminated, this attitude would be fatal in a matter of weeks. In part, it is the fact that sewage water can be converted to safe water in one location over a short period of time in a modern recycled water facility that makes it hard to ignore its prior contaminated state; contagion cues are temporally and spatially salient, and our concerns do not remain dormant, although they should. In contrast, "raw water" products (not altered from their natural state) have recently come to market, to the horror of public health officials (http://time.com/5085792/is-raw-water-safe/). In this case, concerns do remain dormant, although they shouldn't.

We must find ways to get people to be suspicious of clear water with harmful potential but accepting of purified water with a recent contaminated history. Mapping from the naturalness literature, perhaps the processing itself is problematic, especially if that process is perceived as unnatural. Mapping from the consumer psychology literature, perhaps the identity of the water is at issue here and needs to be made new, discontinuous with the sewage.

Other Situations Where Contagion Can Interfere with Public Health or Peace

Our contagion concerns probably promote acceptance of modern packaging technologies, such as shrink-wrapping. But contagion concerns, if excessive, can lead to environmental pollution from plastics and other entities. Finding ways to cut down on packaging material without triggering safety and other concerns may be challenging, but prototype zero-waste supermarkets do exist and appear to be succeeding (e.g., https://www.bepakt.com/)

Similarly, sustainability considerations have given rise to the new "sharing economy," in which objects are cycled between owners, or even co-owned continuously (discussed further in Morales et al. 2018). Prior research on contagion has documented pervasive devaluing of previously owned

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or contacted objects as compared with new ones (e.g., Rozin et al. 1989; Argo, Dahl, and Morales 2006; Newman and Bloom 2014), as well as concerns related to passing on one's own objects (discussed under Backward Contagion, above). While financial necessity has always trumped contagion concerns for a subset of consumers in relation to resale and thrift stores, it would be interesting to examine how the growing Collaborative Consumption movement is managing to transform used clothing from a devalued and potentially contaminating commodity into a trendy, sustainability-conscious lifestyle choice. This transformation is in its early stages but gaining momentum. Morales et al raise an excellent question about whether simultaneous co-ownership is an entirely different model from individual prior ownership, in terms of contagion theory. Given the intimate relation between contagion and the extended sense of self, this seems very likely; an individual self must protect its boundaries from everyone else, while a communal self, by definition, includes others within its boundaries. As a corollary, this raises the question of whether a sharing economy based on liquid consumption might increase psychological sense of community in a way similar to the sharing of food in traditional societies.

Contagion theory is relevant to "health care" in ways that research on the behavioral immune system (Murray and Schaller 2016) has not yet explored. We have discussed elsewhere some of the ways in which intuitive contagion thinking can clash and therefore interfere with accurate processing of expert scientific models related to contagious illnesses (Nemeroff et al. 1994; Rozin et al. 1994). In many people, contagion-based fears block reasonable and safe interactions with people with AIDS. Furthermore, public resistance to vaccinations may be a case of contagion beliefs—the contamination of a child's pure essence with foreign agents linked to disease.

Magical contagion-based perceptions translate into perceptual and even physiological outcomes. The results of exposure to pathogens can be influenced by the source of the pathogens. People draw the microbes of an evil person more menacingly than the same microbes from a friendly source (Nemeroff 1995) and respond more negatively, both psychologically and physiologically, when they believe that microbes they have been exposed to come from an evil source (Nemeroff, Hoyt, and DeAngelo 2018).

Finally, another major world problem is ethnopolitical conflict. This often involves dispute over lands. Contagion is a factor that can bind one to one's land (Rozin and Wolf 2008). By living on land one exchanges substance with it, so that it may become part of the extended self. Some of the link to the land may behave as if spiritual essence has been transferred from one's group to the land (Rozin and Wolf 2008). When two groups have contagion claims on the same land (as Jews and Arabs for parts of Palestine/Israel), the stage is set for resistance to trading land (Rozin and Wolf 2008).

THE IMPORTANCE OF EXPLORING CONTAGION ACROSS A WIDE VARIETY OF CULTURES

Unlike the original anthropological work, which covered practices in many traditional cultures, most of the current work is on Americans. Since Americans constitute less than 5 % of living humans, and Western developed countries represent less than 20% of living humans, it will be important to extend the current work, including work from the consumer perspective, to the great majority of consumers in the world.

For example, Hindu cultures, including over 800 million Indians, are highly contagion sensitive in at least the food domain; the traditional caste system is well represented by and maintained by a set of prohibitions on food transfer upward in the caste orderings, and these prohibitions incorporate the principles of contagion (e.g., Marriott 1968). There is even a word in Hindi, "jhootha," which identifies what we would call "used food"—a utensil, dish, or food someone has eaten from, similar to leftovers but in a more negative context. On the other hand, food symbolically consumed by a deity through offering in a temple, to a priest who gives some to the diety and returns the rest, is enhanced in value ("Prasad," positive contagion). Different framings of contagion are also revealed in different cultural contexts. For example, the Japanese are very sensitive about bringing the filth of the world into the home with shoes and remove shoes before entering the house. On the other hand, they traditionally share foods from a common pot at the table and take their family bath in sequence, in the same large hot water "tub," after washing themselves. American contagion sensibilities seem to be opposite to those of the Japanese on these examples. While contagion beliefs may be universal, their expression is very much determined by culture, with ample room for variation in notions of "self," salience and valuing of specific characteristics, forms of "contact," and rule systems such as Kashruth.

CONCLUDING THOUGHTS: MAGIC IN THE WORLD OF VIRTUAL, IMMERSIVE, AND AUGMENTED REALITY

Magic has always been real in our minds, and the principles of magical contagion are not always false even in their most prototypically magical forms. With respect to contagion, mod-

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ern forensic techniques make excellent use of the contagious residues of ourselves through the collection of fingerprints, hair samples, and DNA analysis; our DNA-containing residues can be used to reconstruct our ancestry. Contagion beliefs about the transmission of personality characteristics are increasingly supported by evidence of infectious or food-related origins of mental disorders (e.g., toxoplamosis linked to schizophrenia, Fuglewicz, Piotrowski, and Stodolak 2017; gut microbiome linked to anxiety and depression, Foster and McVey Neufeld 2013). It is shortsighted to assume that science knows everything at any given moment in time. Indeed, to a lay person, modern quantum physics increasingly reads like a magical manual, and gravity, action at a distance, has some magical features.

But since the advent of convincing computer graphics and, especially, immersive environments and virtual reality, we are experiencing increasingly vivid worlds that function according to the principles of psychological, social, and more expansive magical realities. The ability to immerse ourselves in digital worlds may be facilitated by the magical principle of similarity: a two-dimensional digital figure looks like a person, so it IS a person. Humans have always engaged in imagination and storytelling, but now we can dwell in those realms in a tremendously enhanced and prolonged way—controlling whole worlds which operate by different principles—and increasingly our interaction with the virtual world can bring about effects in the real world, blurring the mental/physical distinction. People play to earn real money; they pay real money for virtual goods; they connect virtually with others; they map virtual worlds onto their daily life (e.g., the running app, "Zombie Run"; Pokemon Go). We can manipulate real-world objects through virtual interactions (e.g., drones, robotic medicine), and events in the virtual world have powerful psychological reality, as illustrated by the example of a divorce resulting from "cheating" via avatars in Second Life (https://www.theguardian.com/technology/2008/nov/13/second-life-divorce). Simply touching an object can increase perceptions of ownership, for both actual and imagined physical contact (Peck and Shu 2009; Peck, Barger, and Webb 2013), and this effect appears to extend to the virtual world: online product browsing using devices with touch-screens leads to both higher perceptions of ownership and higher product valuations (Brasel, Adams, and Gips 2014, as cited in Huang et al. 2017). (Technically this is an example of contagion via similarity, as that the touchscreen provides physical contact with images rather than the objects themselves.) Huang et al. (2017) suggest that these processes may also be operative for products that are customizable by consumers.

We know very little about potential psychological and behavioral impacts of blurring real-world and imaginal domains in this way, but it is happening in a major way in the latest generation in the Western-developed world. Do people feel polluted/contaminated when their avatar steps in dog poop? Might the sense of self become more communal through virtual hyperconnectedness? Less embodied? Perhaps supported in part by contagion and similarity, we will experience changing senses of the extended self and even the individual, skin-sheathed self. All of this would have major implications for marketing.

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