

# How then shall we eat? Insect-eating attitudes and sustainable foodways

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**Abstract** Negative attitudes toward invertebrates are a deep-seated, visceral response among Western peoples. These internalized aversions toward insects and other terrestrial arthropods, both in general and specifically as a food source, subtly and systemically contribute to unsustainable global foodways. Insect cuisine is, for Westerners, emblematic of the alien, a threat to our psychological and cultural identity. Yet failure to embrace entomophagy prevents us from seeing the full humanity of those of other classes, races, and cultures, and leads to agricultural and food policy decisions that fail in their objectives to improve nourishment for all people. Key to enabling the world's peoples to live sustainably with the land are: (1) awareness of the psychological and cultural barriers to a more insect-positive perspective (2) embracing insects as a desirable food resource, (3) understanding the processes by which those barriers are constructed, their negative consequences, and (4) identifying strategies for transforming our attitudes.

**Keywords** Entomophagy · Edible insects · Food · Attitude change · Culture · Sustainability · Disgust · Invertebrates

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## Introduction

Voices of happy children erupt as they dart in and out of tall clumps of grass chasing after grasshoppers, hoping to grab a tasty treat. Encouraged by their parents, they carefully put them in self-made hunting sacs, then dash home to roast and eat them, sharing among themselves and younger siblings. Here in Sanambele, a village in the West African country of Mali, children have foraged for grasshoppers for generations. The rest of their diet consists mainly of millet, sorghum and maize, with some peanuts and fish, making the grasshoppers a crucial and wholesome seasonal protein source. Recently, smallholder Malian farmers have switched from growing extra food to sell in the local market to cotton as a cash crop. Now, parents discourage their children from eating grasshoppers out of fear that the grasshoppers are contaminated with the chemicals used to protect the cotton. The raw cotton is shipped elsewhere for processing, giving the Sanambele farmers minimal economic benefit at a high dietary cost to their children. The result is an increase in protein-energy malnutrition.<sup>1</sup>

In Edmonton, a mid-sized city in western Canada, two professors wind up a presentation on insects as human food by unveiling an array of roasted mealworms and cricket-filled spring rolls. As the first volunteer raises a handful of mealworms to her lips, horrified expressions pass over

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<sup>1</sup> Although wild foods are a “significant portion of the total food basket for households from agricultural, hunter, gatherer and forager systems,” they are typically undervalued and often threatened by development processes (Bharucha and Pretty 2010, p. 2922). Such losses are not an isolated event, nor limited to less developed countries, as two other insect examples show. The decline of grasshopper species also occurred when unregulated insecticides were commonly applied to paddy fields in Japan (Mitsuhashi 2003) and South Korea (Pemberton and Lee 1996). Once regulations were established, a small commercial edible insect market returned.

many faces, and someone in the audience bursts out, “Eew, she’s really going to *eat* that!”<sup>2</sup>

Back in Sanambele, one of us (Florence Dunkel, FD) and a Malian colleague, Keriba Coulibaly, speak with the village women about traditional ecological knowledge. Not until Keriba mentions eating grasshoppers in his home village, and FD talks of insect-eating at her home university in the US (Montana State University) is a code of silence around food insects broken. Suddenly the villagers, with whom she has interacted for 12 years, relax and begin sharing stories from their local tradition and childhood of eating grasshoppers and other insects.

These stories illustrate a large and stubborn blind spot in the attitudes and understanding of many in the Western<sup>3</sup> world regarding the place and value of invertebrate animals, especially insects and other terrestrial arthropod relatives,<sup>4</sup> in our environments and in our diets. This blind spot, coupled with the global impact of Western culture and agriculture, unintentionally but negatively affects the development of sustainable local foodways. Fear and disgust of food insects in particular have been identified as barriers to the maintenance and restoration of traditional local foods (Illgner and Nel 2000; Yen 2009a; Young 1999). In this paper we argue that Western attitudes toward insects in general and as human food reveal with particular clarity the unconscious complicity of this culture in “coloniz[ing] the imagination” (Young 1999) and maintaining unsustainable approaches to agriculture and food supply. In a context in which there is an urgent and growing desire to ensure global food security, social scientists can provide insights to help transform our attitudes toward insects as human food, thereby illuminating our unconscious values around food, hospitality, and consideration of ‘the other’.

### Attitudes toward terrestrial invertebrates

Deeply embedded in the Western psyche is a view of insects as dirty, disgusting, and dangerous. As Stephen Kellert (1993) has shown, the majority of Westerners appear to lump terrestrial arthropods into one large

<sup>2</sup> We described this and other stories involving the complex dietary challenges that edible insects pose in greater detail in Wood and Looy 2000.

<sup>3</sup> Most Western nations are societies consisting of a number of cultural groups. Our focus is on cultures of European derivation, what we call in this paper “Western.” We also use the words “we” and “our” in this paper to refer to Western people because the authors of this paper are all of Western society and are speaking to a primarily Western audience.

<sup>4</sup> It is estimated that there are over 2,000 species of edible insects alone (van Huis 2013). To distinguish them from other edible invertebrates we use the term “insects” throughout this paper in its general sense to refer to groups of species such as true bugs, beetles, and termites as well as lifeforms such as grubs, caterpillars, and maggots.

homogeneous category of “bugs” and treat almost all as potential threats. He found that the general American public, including American farmers, view most terrestrial invertebrates “with attitudes of fear, antipathy, and aversion” (Kellert 1993, p. 851). Although invertebrate attitudes are more complex than Kellert proposed (Franklin and White 2001), nonetheless these broad stereotypes influence our imaginations and practices.

Much of our contemporary media—books, television, movies, videogames—reflects and teaches this aversion. Insect metaphors are widely used to dehumanize the “other,” usually in relation to ethnicity and to peoples with whom we are in conflict (Haslam 2006; Steuter 2010; Steuter and Wills 2009). Cognitive scientists have shown that powerful implicit negative associations and attitudes toward insects affect our responses and preferences for neutral objects, events, and people even when we are unaware of the presence of insect-related stimuli (Greenwald et al. 1998). Rarely are we encouraged to view insects as vital players in the ecology that sustains us all or as engaged in relationships that enable other plant and animal species to thrive. We are fairly indifferent to invertebrate extinctions, despite the fact that their loss would be catastrophic on a scale orders of magnitude more significant than the loss of many vertebrate species (Kellert 1993; Wilson 1987).

Insects and related species are frequently viewed as pests. Much of the demand and funding for entomological research comes from the medical and agricultural sectors that are mainly concerned with insects that carry disease, or reduce crop yields and actual or perceived crop quality. While entomologists recognize the enormously important distinctions among insect and other arthropod species and actively promote education about their critical place in ecosystems and agriculture, the majority of funding, and therefore the emphasis, leans toward eradication and control. There has been a recent surge of interest among entomologists on the topic of insects as a food source, as evidenced by the presence of two articles on the topic in the 2013 issue of the *Annual Review of Entomology* (Raubenheimer and Rothman 2013; van Huis 2013). Nevertheless there is a history of public, political, and scholarly resistance to serious consideration of insects as human food in the US (DeFoliart 1999, 2012).

The Western aversion to invertebrates includes the belief that these species are disgusting and are largely inedible for humans except under the most desperate of circumstances (i.e., so called “starvation food” Bukkens 1997; DeFoliart 1999; Yen 2009b). This attitude is unique both historically and cross-culturally (Illgner and Nel 2000; Yen 2009a).<sup>5</sup> However, insects have been an important

<sup>5</sup> We note, citing Morris (2004), that “as with other ‘cultures’ Western attitudes towards insects are diverse, complex and multifaceted.”

food source for virtually every human society, and this practice has persisted to the present in most non-Western cultures (DeFoliart 1999; Hinz 2001, cited in Schiefenhövel and Blum 2007). Insects are a vital source of nutrients and calories, and highly prized as pleasurable elements of a meal (Menzel and D'Aluisio 1998; Ramos-Elorduy 2009; Raubenheimer and Rothman 2013; Schiefenhövel and Blum 2007). There is also a growing realization in academic and agricultural discourse that food insects are a key element of food security in many regions (Gahukar 2012; Sileshi and Kenis 2010; Yen 2009a).

The source of this negative attitude to terrestrial invertebrates, both in general and as a viable human food source, is a historical mystery. When Vincent Holt (1885/1967) published *Why Not Eat Insects?* he referred to disgust about entomophagy as “a long-existing and deep-rooted public prejudice” (p. 5), especially among the middle and upper classes. A bias was already well established in 1885 and predates knowledge of insects as disease vectors.<sup>6</sup> Supporters of the ‘optimal foraging’ theory of food preferences suggest that entomophagy might never have arisen in Europe because insects are a relatively difficult food to gather and easier options were widely available (Bennett and Zeleznik 1991; Harris 1985). However, edible insects do live in these regions (Ramos-Elorduy 2009), and Holt (1885/1967) comments on the use of insects as food and medicine among the peasantry. Evidence also exists that Aristotle and the Romans were familiar with entomophagy (Harris 1985). Nevertheless whether or not entomophagy was historically a viable option in Europe, it remains unclear why insects came to engender such an *aversion*.

A few species among wasps, bees, scorpions, and spiders are actually dangerous to humans, and a sting even if not deadly is certainly unpleasant, so that insect fears and phobias are high in the public imagination (Berenbaum 1995). It has been suggested that we may be ‘biologically prepared’ to fear this type of animal as an adaptive mechanism. And since urbanized Westerners make few meaningful distinctions among “bugs,” this easily generated anxiety may have generalized to include most insect species (Öhman 1986; Ulrich 1993). It may also be the case that invertebrates are, to our human perception, ‘monstrosities’, alien in form, movement, size, lifecycle, and ecological role. This notion is supported by the previously mentioned social scientific literature that reveals the

widespread use of insect metaphors to distance and dehumanize ‘the other’ (Haslam 2006; Steuter and Wills 2009). “While such ‘otherworldliness’ can provoke curiosity and even wonder in some people, the more typical human response to the unknown is that of fear and disdain. For most people, insects, and other invertebrates, remain largely alien and unfathomable” (Kellert 1993). However, none of this adequately explains why attitudes are so much *more* negative in the West than in other regions of the world.

### Why are negative invertebrate attitudes a problem?

While knowledge of the source of negative attitudes toward terrestrial invertebrates remains elusive, what is clear is that this negativity has subtle and far-reaching consequences for global food availability and cross-cultural relationships. The Food and Agriculture Organization of the UN estimated that nearly a billion people worldwide, mainly in Asia and sub-Saharan Africa, are malnourished (FAO 2011), yet the planet can supply all our food needs. It is well recognized that the reasons why so many today go hungry or experience malnourishment are primarily economic, cultural, and political—not scarcity (Berry 2009; Freidberg 2004; George 1990; Lappé and Collins 1986; Pollan 2009, 2006; Schlosser 2001; Schut 2010; Smith and Mackinnon 2007). This means that the solutions will require the wisdom of those in the social sciences, as well as those in agriculture and related fields.

Insects and other terrestrial arthropods are good food. They can provide ample bio-available proteins, fats, vitamins, minerals, and fiber. While many of the 2,000 documented food insects are gathered from wild populations, intensive breeding systems are emerging. Early research on such ‘minilivestock’ operations suggests that the feed conversion ratios for edible insects are significantly more efficient than for poultry, swine, and beef; they are less demanding of water; and, because insects are so dissimilar to humans, have less risk of producing pathogens threatening to human health (Raubenheimer and Rothman 2013; van Huis 2013). The challenge is to persuade an insect-phobic culture to recognize these creatures as a legitimate food resource. This is not because insect-phobic Westerners are themselves in need of *more* food. Rather, ignorance of the value of insects in sustainable ecosystems and for the food supply means that implementation of Western-based intensive agricultural practices globally can result in loss of ‘wild foods’ such as insects (Bharucha and Pretty 2010; Pemberton and Sook Lee 1996; Yen 2009a). This ignorance also means blindness to the possibility of actively *cultivating* insects as a food resource (van Huis 2013).

<sup>6</sup> Pasteur published theories about germs as the source of disease beginning only 25 years earlier, and Carlos Finlay first proposed mosquitoes as a carrier of yellow fever in 1881. Bilewicz et al. (2011) assert that anti-insect bias is located in the Enlightenment. Morris (2004) says that this reading of history is likely “simplistic” and the roots are more complex. The food histories we have consulted seldom mention edible insects, covering only their products such as honey (Wood and Looy 2000).

This challenge of identifying the barriers to food insect literacy and acceptance is one the social sciences are well positioned to address. However, even within these fields recognition of the insidious impact of the Western bias against insect species, both generally and as potential food sources, is only just emerging (DeFoliart 1999; Eidelson et al. 2011). Anthropologists, for example, expressed puzzlement at the apparent health and vigor of peoples whose food sources seemed to lack essential amino acids, vitamins, and minerals. It took many years before some realized these nutrients were supplied through entomophagy (Harris 1985; Schiefenhövel and Blum 2007). Even today relatively few studies of cultural foodways include recognition of entomophagy, and this lack is attributed more to the bias of the researchers than the infrequency of the practice (Harris 1985; Schiefenhövel and Blum 2007). We also find it telling that Western researchers give the practice of eating insects a distinctive term—entomophagy—that to our students in class sounds more like a disease than a descriptor, and that an important anthropological article on entomophagy is published in a collection entitled *Consuming the Inedible* (Schiefenhövel and Blum 2007).

One consequence of insect aversion is that, concurrent with the increasing global reach of Western culture, eating insects is on the decline. For example, while the people living in Sanambele, Mali, have a wealth of traditional ecological knowledge, the pressures of a global economy now do not permit them to practice sustainable living based on that local knowledge. Within the past 5 years Sanambele villagers have deliberately stopped teaching their children to hunt, gather, and roast insect snacks from the fields where crops are grown on the perimeter of the village. Western models of agriculture, which may work reasonably well in the vast grasslands of the prairies, do not necessarily translate well to other regions (George 1990). There are well-known issues involved in the application of high-intensity agricultural practices when the particulars of a region and traditional knowledge of local peoples are ignored (Berry 2000). Pesticide use is often necessary to ensure crop productivity, but can decimate local, naturally thriving species that may be significant elements in a complex local ecosystem (Gurung 2003).<sup>7</sup> Further, pesticides can bioaccumulate in other species in the food chain, potentially poisoning some of the local food resources (Pemberton and Sook Lee 1996). Hence, Sanambele parents now warn their children, “Don’t eat the grasshoppers.

They are bad for you.” Yet *not* eating the grasshoppers is bad for them too. A wholesome, complete, locally available, and free protein source has been removed from their diets. The risk for protein-energy malnutrition and its associated negative physical and mental consequences, especially for developing children, has now considerably increased. It is occasionally possible to use pesticides in sustainable ways (Devine and Furlong 2007), but this requires integration of pesticide use and effects with deep local ecological knowledge (Gurung 2003). Because the idea of insects as a vital food resource is simply not contained in the worldview that shapes Western agricultural practices and thus decisions about pesticide use do not take this into consideration.

Abhorrence or ignorance of entomophagy also obviously narrows the range of possible foods on the menu. It compromises nutrition by designating a shrinking and thereby uniform group of substances as “authentic food,” thus reducing access to a much fuller range of nutrients, vitamins, and trace minerals (Pollan 2006; Stiles et al. 2011). Encouraging the adoption of large mammalian sources of protein, such as beef, chicken, and pork, and discouraging the use of small-animal protein sources such as rodents and insects, whether explicitly or implicitly, is an unsustainable practice (Eidelson et al. 2011).

Another important dynamic is reflected in the reluctance of the Sanambele people to tell those of Western origin of the traditional practice of entomophagy. This may be due in part to a Malian recognition that such practices are viewed by Westerners with revulsion and could lead to prejudice against them. One does not tell potential friends or business partners personal stories that might diminish one’s status in their eyes. This phenomenon has been reported by anthropologists elsewhere (Meyer-Rochow 1973; Ramos-Elorduy 2009; Schiefenhövel and Blum 2007), and is evident, too, among the women of Sanambele. North American universities welcome students from all around the world, and in our experience students from various parts of Africa and Asia often hide aspects of who they are, including insect-eating practices, until we make it clear that it is safe to do so. One of our colleagues was born in Eritrea to missionary parents. He reports that as a youngster he happily caught, roasted, and ate locusts with the local children. However, when he and his parents returned to the US, he was asked to hide this activity from their American support base. Suppression of knowledge and experience in response to perceptions of Western hegemony can lead to refusal to eat traditional food insects, which ultimately leads to loss of knowledge and cessation of sustainable practices that might enhance their availability. If there were fully adequate and sustainable replacements for local food insects these dynamics would be less of a concern.

<sup>7</sup> The use and regulation of pesticides, their continuing efficacy, and the desirability (or not) of alternative agricultural systems (multi-cropping, inter-cropping, etc.) are related issues. However, here we simply point to the need for maintaining knowledge of and capacity for the utilization of wild foods alongside the development of contemporary agriculture (e.g., Bharucha and Pretty 2010).



Another consequence of our internalized aversion to insects is to blind us to the presence and value of the ‘other’. Insect cuisine is emblematic of the ‘other’, the alien, and the stranger. Those who consume insects are often viewed as “primitive, barbaric, or desperate” (Forsyth 1994). To embrace even the idea of entomophagy is to embrace in our bodies, as well as our minds and souls, the full humanity of those of other classes, races, and cultures. Until we can do that, we cannot fully understand, let alone change, Western cultural hegemony and its negative impact on a hungry world.

There is renewed enthusiasm among Western researchers and agricultural organizations for “minilivestock” which includes primarily food insect species. There is an extensive literature on minilivestock. Especially applicable in this context are DeFoliart’s “Edible Insects as Minilivestock” (1995), Paoletti and Dreon’s chapter on “Minilivestock, Environment, Sustainability, and Local Knowledge Disappearance” (2005) in the major review *Ecological Implications of Minilivestock: Potential of Insects, Rodents, Frogs and Snails* (Paoletti 2005), as well as “Forest Insects as Food: Humans Bite Back” (Durst et al. 2010). Most of this enthusiasm focuses on the mechanics of raising, processing, and transporting food insects, integrating them into the global food system. Very little attention is given to the perceptions and marketing of insects as human food or to the willingness of people, particularly those in Western cultures, to consider adding insects to their diet, and the social and psychological barriers to this consideration. This is the unique and critical contribution social scientists can make.

### The psychological dynamics of entomophagy avoidance

Persuading people in the Western world to accept and value entomophagy has been treated mainly as a *rational* problem to be solved through education (Looy and Wood 2006; Wood and Looy 2000). While these efforts have made Westerners increasingly aware of the existence of entomophagy, they appear to have done little to genuinely alter attitudes (Looy and Wood 2006). This is because attitudes are not merely rational mental frameworks, but also have *emotional* and *cultural* dimensions. Solutions must address all of these aspects, as well as the underlying values that shape them (Clark 1995; McKenzie-Mohr and Oskamp 1995).

There is considerable knowledge about the ways in which food preferences and aversions are formed (e.g., Fallon and Rozin 1983; Pliner et al. 1998; Pliner and Mann 2004). However, this literature is focused almost exclusively on substances that are already recognized as edible, albeit in different forms or combinations. For example,

sushi was until recently a novel food to North Americans but its acceptance was facilitated by the fact that the main ingredients—fish and rice—were already recognized as ‘real food’ (Quinn 2007). Acceptance of insects as human food faces additional barriers that few other novel foods share.

We theorize two converging psychological dynamics supporting Western aversion toward and blindness about entomophagy. Understanding these is a first step toward strategies to effectively alter these attitudes and the related values and beliefs. One dynamic involves the role of food choices in cultural identity. The other involves a perception of insects as alien, reminders of our animality, and generators of disgust. They converge through a process known as ‘contamination’ or ‘sympathetic magic’ through the belief that ‘you are what you eat’. To eat insects, then, is in a sense to become contaminated, subhuman, truly ‘other’.

First, we explore the role of food in cultural identity. We do not eat merely to survive physically, we give *meaning* to our eating. Food—what we eat, how and when we prepare it, when and with whom we eat it—takes on symbolic significance and is hedged about with often complex rules (Douglas 1972; Messer 1984, 2007; Meyer-Rochow 2009). This process, which occurs in every human culture, is one means by which we develop a sense of self, navigate the complexities of living in community, and define our place in the universe (Douglas 1966).

Every child is enculturated into a particular community with its distinctive beliefs and values. Food is foundational to this process. From birth, in receiving nourishment from others the roots of psychological attachment, identity, and social place are laid down (Rozin 1996). Children learn what is safe to eat and what is dangerous, and also to distinguish between self and not-self, friend and foe (Burriss and Rempel 2004). Food, which is ‘not-self’ but becomes ‘self’ through ingestion, then plays an important symbolic role. As we consume food, it *literally* becomes us, and, as we are enculturated, what we eat also *symbolically* becomes us. It is not surprising that deep in the human psyche is the belief that we take on the characteristics of our food sources, that quite literally “we are what we eat” (Nemeroff and Rozin 1989). The Hua of Papua, New Guinea, for example, believe that fast-growing plants promote growth, and that males should be wary of ingesting red hairy foods that resemble the female vulva as such foods may inhibit their strength (Meigs 1984, cited in Nemeroff and Rozin 1989). But in this context we note that Western people are not exempt from the implicit belief that “we are what we eat” (Nemeroff and Rozin 1989; Pollan 2009, see especially footnote on p. 57).

Beyond conferring certain desirable traits through ingestion, food choices also enable members of a culture to reiterate and reinforce their identity as *distinct* from other

cultures. Anthropological studies show that distinct cultural groups living in the same ecological region nevertheless select a subset of the edible substances available (Pyke 1968). For example, in the Amazon basin, the Mayorana and Parakana eat tapir, while the Arana eat monkey (Milton et al. 1991). These distinctions in food choice have historically involved elevating one's own group and looking down upon others as 'primitive', more animal-like, subhuman. The British and French in western Europe, and the Yassa and Mvae in Cameroon, and many other neighboring cultures ridicule each other's food habits (de Garine 1997). It is telling that the name most tribes have given themselves is some variant of 'the people', meaning the 'real human beings' (Diamond 1992). Food choice is a way to symbolize this belief and strengthen the identity of the community. Thus, we are what we eat, and *we* are not *them*. We are the 'real' people.

Enculturation involves implicit, visceral associations as well as emotions that reward us for conforming and also punish us for violations of the cultural rules (Greenwald et al. 1998; Rozin 1990). Various objects and acts are deeply associated with emotional reactions that reflect their value for that individual in the context of their culture (Kitayama and Park 2010). The function of all these emotions is to motivate behavior. As we contemplate an action, internal emotional responses signal whether that action will produce desirable or undesirable consequences. People who lack this internal emotional 'censor' consistently fail to act in socially acceptable ways, and ultimately become deeply isolated from the community (Adolphs and Damasio 2001).

### That's disgusting!

In learning a culture's foodways, the emotion of disgust is primary. Disgust signals that the object or action we are contemplating, such as eating a particular food, will have physically or culturally threatening consequences and therefore should be avoided or rejected. It supports the belief that 'we are what we eat' by ensuring that we avoid foods that will confer undesirable characteristics.

Disgust has its roots in the sensation of distaste, an innate rejection response to bitter-tasting substances (Fallon and Rozin 1983; Steiner 1979). But disgust is elaborated through enculturation to motivate rejection of several categories of objects or events including food (Haidt et al. 1994). Thus, what we find disgusting is primarily learned.<sup>8</sup>

<sup>8</sup> Apart from unpleasant tastes, there are no universal elicitors of disgust except perhaps feces, and even feces disgust is learned (Rozin and Fallon 1987). Learning which objects, events, and acts engender disgust is a complex process involving personal and cultural values, beliefs, norms, and practices (Bilewicz et al. 2011; Haidt 1997).

Sometimes it seems rational to be disgusted by certain foods. Avoiding the consumption of rotten food, for example, is an excellent survival strategy. However, most disgusting objects or acts are culture-specific and arbitrary. Westerners happily eat organisms strongly associated with decay such as fungi and marine scavengers such as lobster,<sup>9</sup> crab, and shrimp. Yet we conflate herbivorous insects that feed on fruit, leaves, and crops with those involved with death, decay, parasites, or pain, and treat them all as objects of revulsion and fear—food only for the primitive and desperate.

Despite the acquired and arbitrary nature of most disgust triggers, Haidt (1997) argues that they all ultimately serve the same function: to separate ourselves psychologically from reminders of our animal nature. We are *people*, not animals; we are human, not subhuman. This desire to separate from our animal nature is a particularly strong concern in Western culture, where human rationality, understood as the highest capacity of our disembodied mind, has historically been enshrined as our unique heritage, evidence of our superiority to and distinction from all other creatures (Damasio 1995). Because food inevitably serves as a reminder of our animality and physicality, it is not surprising that it is particularly hedged about with ritual and symbol, and that food boundaries are protected through disgust.

Disgust works well to defend food boundaries by motivating a profound and violent rejection of whatever triggered the disgust (Haidt 1997; Haidt et al. 1993). Disgust can also be generalized from one object to another through association because objects that have become disgust triggers also carry the power of contamination. By what anthropologists refer to as the 'law of sympathetic magic', anything that contacts a disgusting object, either literally or figuratively, becomes disgusting by association (Rozin and Fallon 1987). Because Westerners tend to have a vague and undifferentiated knowledge of insect and other arthropod species, the association of *some* insects with feces and decaying matter may lead to psychological contamination of *all* insects, rendering the entire category disgusting. However, this alone would be insufficient to explain why we find insects revolting as potential food, as we have always eaten food that has fed on, or been produced through, decaying matter, including fungi, marine arthropods, and even crops fertilized with human and livestock manure (Harris 1985). Another, perhaps more powerful, negative association is that of insects and the alien: the subhuman, threatening beast. Fearing our animality, and motivated to develop an identity as a member

<sup>9</sup> Interestingly, lobster was considered a "low-class food" up through the early 1800 s (Wallace 2007) fit for prisoners, and then only in limited quantities.

of Western culture, we are taught that the epitome of alienness is the insect (Haslam 2006).<sup>10</sup> Disgust and fear can support and reinforce all of these associations in a manner that ultimately produces an unconscious equation of insect-eaters with animality and threat.

For many Westerners, it may therefore be that insects cannot be simply an exotic, ‘ethnic’ food as was sushi until very recently. If ‘we are what we eat’, then all the alien, dirty, disgusting, dangerous characteristics we attribute to insects will accrue to us should we eat them. Many Western people really do view insect eating as “perverse, barbaric or desperate” (Forsyth 1994), “the stuff of nightmares” (Menzel and D’Aluisio 1998), something they would do only under duress as a disgusting act (Looy and Wood 2006).

### Changing attitudes toward entomophagy

The causes of the Western aversion to entomophagy are complex, but its impact is subtly pervasive. Changing this aversion is no magic bullet for dealing with systemic problems in agriculture and food systems, but is a significant element. Promoters of entomophagy advocate for the insertion of food insects into the global food system as yet another form of livestock, to be mass-produced, preserved, processed, and widely distributed. While small agri-business and minilivestock practices have their place (Ghaly 2009; Gracer 2009; Yau 2010), and there may be a positive role for insects in future urban agriculture and biotechnology (Dzamba 2010; Verkerk et al. 2007), the uncritical commercialization of food insects can also run the risk of further contributing to reductions in food- and bio-diversity and malnutrition (Gondo et al. 2010). One of the key lessons from Sanambale and other regions is that respect for and knowledge of local ecosystems is vital for using insects as a sustainable food supply (Morris 2004; Ramos-Elorduy 2009). This respect for the potential of insects as human food and for the local knowledge that will enable us to realize this potential can only be built on a willingness to examine closely some of our most cherished and unconscious assumptions about food and eating.

Changing food preferences and aversions is the focus of a rich literature that examines individual, social, micro-environmental, and macro-environmental dimensions

(Aldridge et al. 2009; Barker 1982; Krebs 2009; Larson and Story 2009; Rozin 1990). Research into attitudes, values, norms, and behavior is also relevant in understanding food-related choices (Millar and Millar 1990; Petty et al. 1997; Wood 2000). More recently, some scholars have begun to focus specifically on ways to facilitate the development of more sustainable ways of living (McKenzie-Mohr and Oskamp 1995). Insights from all of these areas are needed to effectively counter negative Western views of insects as food.

The primary source of food preferences is the social environment (Larson and Story 2009). In the home, adults provide foods to children, and model and teach what, when, and how to eat. If adults could be convinced of the value of entomophagy, they would powerfully influence the next generation to view food insects as a normative part of the diet. However, they would need to do so in a clear, responsive, and authoritative manner. Coercing children to “eat bugs; they’re good for you” may produce short-term results but backfire over the longer term (Galloway et al. 2006; Patrick et al. 2005). Repeated exposure facilitates food preferences, and prior positive experiences with novel foods increases willingness to try additional novel items (Loewen and Pliner 1999; Pliner 1982).

The challenge to get adults to accept entomophagy themselves involves the attitudes of peers and descriptive norms (Burger et al. 2010; Conner et al. 2011; Lally et al. 2011; Woodward et al. 1996) and this is no small challenge. Another obstacle is the lack of availability of insect food and lack of knowledge of how to prepare it. While some of this information is available online and in specialized cookbooks (DeFoliart et al. 2009; Dennis 2009; Dunkel 2013; Gordon 1998; Gracer 2009; Ramos-Elorduy 1998; Yau 2010), it remains marginal and does not resolve the problems of marketing and reliable, safe supply. Insect dishes rarely appear in restaurants, certainly not on fast-food menus. Food marketing and agricultural and food policies also make food insects invisible and unavailable.

The very possibility of using insects as human food was introduced to the Western world decades ago by entomologists and their ‘bug banquets’ (Looy and Wood 2006; Wood and Looy 2000) and more recently through ‘reality’ shows such as *Fear Factor* and *Survivor*. However, both entrenched the idea that eating insects was a novel, exotic, and marginal activity. We need to normalize entomophagy so that the answer to the question “What’s for dinner?” might also include not merely chicken, beef, pork, or vegetables, but also crickets, mealworms, or locusts. This may well require some careful marketing and re-branding. For example, Westerners now generally accept sushi, sashimi, or steak tartare. But if these foods had instead been called ‘raw fish’ or ‘raw beef’ it is less likely that they would have been accepted. Proposing the consumption of

<sup>10</sup> The ever popular science fiction and horror film genres have reinforced the idea of insects as either the enemy in nature or the agent of destruction, often at the tampering hand of some misguided scientist (Berenbaum 1995). Andrew Nikiforuk develops (and challenges) this theme in his chapter “The War Against the Insect Enemy” (2011).

escamoles or nsenene may be perceived more positively than if they were referred to as ant larvae or katydids.<sup>11</sup>

Several cultural forces are converging in the West that may well support a move to accepting entomophagy. First, there is the peculiar and historically recent Western obsession with food and nutrition (Pollan 2006). Numerous and frequently changing food fads mean that entomophagy has the potential to be viewed as merely the latest, if somewhat more exotic, fashion. Targeting those who like to be on the leading edge of social change and fashions may result in a snowball effect whereby social pundits attempt, then share, often online in extensive social networks, their experiences with entomophagy (Dennis 2009; Yau 2010). If those experiences are positive, demand for food insects may increase, creating pressures on market forces and government food policies to make space for this new alternative. A second cultural force is the rise, especially among the younger generation, of a concern for living sustainably. This concern is centered in part around community gardens, community-supported agriculture, and the local food and slow food movements. Providing subcultures and organizations involved in sustainable living initiatives with information about food insects may generate a grassroots transformation. Indeed, we have been contacted repeatedly over the last several years by young adults who are seriously seeking sustainable food alternatives and through web searches have discovered our research into food insects. They inquire about local supply and information about preservation and preparation. A third cultural force, related to the first two, is a growing concern to educate children about food, to reconnect them to the sources of their food, and to develop in them competencies for food production, preservation, and preparation (Rivage-Seul 2011).

Many elements of a successful move to promote acceptance of edible insects in the West are similar to those involved in acceptance and normalization of novel foods from a variety of ethnic groups in the past decades: marketing, availability, exposure, information about preparation, positive modeling of attractive taste and post-ingestion experiences, and so forth. The special challenge is that insects present an additional barrier. They are not viewed as merely another exotic food, but rather as inedible and actively disgusting one. Despite the educational efforts of entomologists and an increasing awareness that

insects *are* food for some people, in our experience the vast majority still expresses disgust, disbelief, and an adamant refusal to even consider this option. Thus the case for entomophagy needs to be made at multiple levels, through multiple means, and across multiple disciplines. People will need to be educated about the unsustainability of our current food choices and practices and the ways in which food insects can move us closer to a more just and sustainable food system. This flattened cultural perception of ‘insects as harmful or useless’ needs to be differentiated in order to dissociate *food* insects from species that actually do carry disease, are otherwise inappropriate for consumption, or actually cause harm. If this does not occur, insect disgust will remain a significant barrier. Advocating changes in significant structural barriers is also critical: food safety policies have not yet been widely developed or applied to food insects, as they have for other novel foods such as sushi, making clean healthy supplies difficult to obtain. In parallel with these strategies, restaurants, celebrity chefs, bloggers, and other public figures will need to continue modeling insect food preparation and enjoyment until this food source becomes normalized (Gordon 1998; Menzel and D’Aluisio 1998; Ramos-Elorduy 1998). We can draw on the rich knowledge of edible insects still present in the traditional foodways of many cultural groups and increase our appreciation for genuine cultural diversity as a key step in maintaining the wellbeing of both the human and the nonhuman world (Morris 2004).

## Conclusion

In the end, do Western peoples really need to *eat* insects in order to support global food sustainability? Our answer is no—and yes. We argue that before attempting to insert insects into global food systems, we must begin by bringing knowledge of our negativity toward insects and its impact to consciousness. This does not necessarily imply that we must include insects in our diet. Unless they are locally available, adding food insects to an already overflowing dinner menu is not necessary, realistic, nor likely to lead to direct improvements in the poor eating habits of people whose diets are currently inadequate. However, we are reminded that “the way we dine has enormous impacts not only on our personal health but also on nature, animals, other people, and the distribution of power. In eating even the simplest dish we tap a chain of events linking people and places across the globe, past, present and future” (Belasco 1997). As we seek ways to eat sustainably, learning to value insects as human food is a challenging and profound test case. It is difficult but perhaps not impossible to view insects as legitimate foods without being willing to eat them ourselves. For instance, we might

<sup>11</sup> Escamoles are a traditional dish of the Aztecs and are still considered a delicacy in Central Mexico, sometimes referred to as ‘insect caviar’ and served in fine restaurants in Mexico City. They are ant larvae, have a slightly nutty flavor, and are served alone or in omelets or tacos. Nsenene is the local name for a type of grasshopper known to North Americans as the katydid, and is a popular delicacy and economic resource in Uganda, Kenya, and Tanzania. They are usually fried, sometimes with onions, and eaten warm or cold.



readily acknowledge that Greeks can dine on olives and couscous, or Russians on borscht, even if we have never personally tried such foods. But whether or not we add insects to our own diets, we must rethink our values and attitudes and the underlying worldviews that give them shape.

With the help of social scientists we can get in touch with these deep predispositions that prevent us from recommending and supporting sustainable foodways both at home and abroad. While many scholars in these diverse fields have addressed aspects of eating sustainably, and a few have explored entomophagy directly, a truly cross-disciplinary conversation is necessary to move forward. We need to address entomophagy from emotional, cultural, agricultural, entomological, marketing, and social policy perspectives.

We have considered a cultural blind spot that has a global impact on agriculture. Embracing entomophagy is a concrete way of literally becoming the stranger, and in so doing, embracing them as our neighbor—fully authentic, fully human, and fully acceptable. It is a deeply hospitable act that welcomes without obliterating the other. Not until people of Western culture can freely do this will we know, in a deeply embodied way, how to help one another find ways to live and nourish ourselves sustainably on this planet. So, how then shall Western cultures eat bugs? With gusto, a glass of wine or cup of tea, and an open heart and table.

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