

Biochemistry of Desire: The Biosemiotics of Advertising to Bacteria



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Abstract The identification of human agency with our desires often comes at the price of overlooking the entourage of agents that draw us to our moods, feelings, thoughts, and behavior. This essay attends to the interactions between our symbionts – mutualistic, commensal, and parasitic – that through their secretions, create microbiome ecologies prone to respond to certain inputs and repel others, investigating forms of non-symbolic advertising that directly hook into human biochemical receptors. Although commercial food advertising is normally considered a branch of cultural semiotics aimed at the human superorganism rather than at our endosemiotic constituents, I argue that biochemical stimuli, especially the alkaloids in scents, are sought by specific groupings of bacteria, fungi, amoebas, viruses, and other microorganisms, by extension becoming philic or phobic to the human host. The biosemiotic economy of desire and affect which advertising engages, precipitates use and ingestion of physical materials feeding and reconfirming the responses of certain microbiota, rather than playing on human sociological anxieties alone. In many ways such advertising responds to, creates, and maintains biochemical ecologies sought by our micro-inhabitants – often to our detriment.

Keywords Microbiome · Advertising · Agency · Biosemiotics · Supernormal Stimuli · Olfactory

Introduction

We simultaneously love and hate the fact that we can be manipulated into doing things we otherwise would not have done had we thought about it rationally. The compulsion to eat a well-placed treat, or to splurge on a rich dinner both titillates

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because of the intense if fleeting pleasure, and engages our sense of danger or shame creating a blushed sense of secrecy or transgression. The limits of human autonomy elicit both our most fierce defenses of denial – that every choice has been our own – and our most understanding admissions of being human, all-too-human animals subject to the myriad exigencies of the flesh.

Yet, what does it mean to give in to temptation? Who is giving in to whom? Where lies the agency in such an equation? And what does it mean to be guided, though not ruled, by our instincts – the evolutionary triggers and reactions that have helped offload our neocortex's burdens? Using cognitive ethology and human ethological frameworks, this essay explores the ways human beings act according to engineered environmental stimuli, especially related to food and food smells. I argue that the bacteria and other microbial co-agents dwelling in and with us, are in fact responsible, in a formal sense, for many of the decisions we make surrounding food consumption. Along with myriad cultural elements influencing our dietary decision-making, a host of biological mechanisms are also at play, based on biochemical signals, creating a biochemistry of desire.

Shades of pleasure, exultation, suffering, shame, and stupor, combine promiscuously in our justifications for our actions; especially around food. This contribution assesses some of the ways in which contemporary advertising strategies aim to bypass rational processes to directly prime, influence, and exacerbate certain biochemical responses. Social mimicry is part of the puzzle of unravelling the determinants of human habits and behavior. Yet, where the social ends and the biological begins is itself a muddled and contested area, rather than a clean distinction. This chapter is limited as far as possible to the biochemical aspects, focusing on how the engineering of smells has become a major marketing tool.

In the spirit of Michael Pollan's (2002) *Botany of Desire*, which examines how human decisions to favor certain plants with widespread dissemination and cultivation comes about through plants' biological incentivizing of humans with the promise of sweetness, beauty, inebriation, or control, I similarly approach the junk food and retail industry from a biosemiotic perspective. Pollan's view of plants maneuvering humans adopts a model of reverse causation from typical anthropocentrism. Here, I also subordinate symbolic advertising and memes to their indexical and iconic forms of signaling, the reverse of Deacon's (1997) reading of the Peircean framework. Contrary to Deacon, who views symbols as emergent in a strong sense from other sign types, the symbolic forms of advertising in the model constructed here – restricted to immediacies such as taste and smell – are weakly emergent: epiphenomena of communicative forms not primarily cultural but biological, with the symbols doing the work of more indexical and iconic motivations. This occurs, I claim, as a result of symbols fulfilling wills situated in specific ecologies of symbionts constructing ecological niches in other humans and hence in the larger environmental landscape. While untethered symbolic orders certainly tend to take on lives of their own (Bennett 2015), in recent decades the importance of symbols in westernized cultures has led to an underappreciation of the role of biological

processes in generating the desires and drives for which symbols are employed as means, justifications, and proxies.

Put differently, instead of interpreting the scheming of advertising – both its contents and desiderata – as the product of nefarious or opportunistic profit-maximizing human individuals or corporations (though of course this plays a role), I instead conjecture that advertising behaviors and habit formations counter-indicated for the flourishing of human organisms is the product – at least partly – of a disrupted biotic ecology, both inside and outside of the human organisms in question. Dysbiosis in the larger endo- and exo-semiotic ecosystems (the biochemical *Umwelt*)¹ precipitates the conditions affording (further) predatory/parasitic conspecific behavior amongst humans and their bacteria.

Engineering the Human Condition

Concern over the human condition, the stock of our humanness, in part revolves around the question of how human practices and designs on controlling the bodies and behavior of other humans as well as our environments, changes our biology. What is at stake in this question of our humanity, in many ways is a biological-ecological question regarding the characteristics our species take. This framing already presupposes a certain biological homogeneity and a standardization of effects, however; and as Arendt (1958) pointed out in *The Human Condition*, our (political) environment is just as crucial as our biological ontology in determining the actions we take and how we regard ourselves and others. (Contemporary nomenclature would interpret this as the supervening forces of epigenetics against the once-thought determinism of genetics.) Identifying the *plurality* of human beings as key to understanding our most human activities of acting together in concert, “from the vantage point of our newest experiences and our most recent fears” (Arendt 1958, p. 5), I am inspired by this charge to redistribute the agency of human activity into the biological world that composes us.

Indeed, the shaping of human biology through the careful reading of signs, as in medicine, and in the patient attention to food combination and subjective physical experience in traditional food ways, gestures at our species’ intentional intervention in the universal experiences of all organisms seeking food for sustenance and negotiating the types and frequency of food and other stimuli to foster health. If artificial selection *prescribes* according to some predetermined measurement or

¹A subset of the organism’s *Umwelt* in Uexküllian terms, the biochemical *Umwelt* consists of the active and reactive chemical substances (including biochemicals) in a given organism’s environment. It excludes other organisms, elements, and non-reactive or unremarkable geological phenomena, but includes all chemicals for which the organism has receptors for, or to which it could be vulnerable (or exploit).

desired outcome, natural selection *proscribes* the almost infinite evolutionary options, giving rise to constrained emergence (to paraphrase Myrdene Anderson (2018)). The difference between these two forms of selection, in keeping with Deacon's (2013) thesis in *Incomplete Nature*, configures the core questions of a biosemiotics of food and medicine.

Exemplifying the genetic distortions and narrowing of prescriptive selection which reduces genetic diversity and allows faulty recessive genes to be expressed, Haraway (2008) discusses in *When Species Meet* the overbreeding of dogs for specific breed characteristics. Inbreeding of dogs can lead to premature cancers, hip dysplasia (as in Great Pyrenees herd dogs), or epilepsy (in Australian Shepherds). Certainly these artificial selection-derived dysmorphias don't only occur in dogs, tulips, or other organisms humans breed, but in anthropogenically-induced exposures humans experience as well. Human stubbornness to achieve a given genetic or behavioral outcome as the primary desideratum, often leads to ignoring actively or passively the unintended negative consequences of such a program.

Eugenics has a long and odious history. From a biosemiotic perspective informed by ecological evolutionary developmental biology as evidenced in the emerging Extended Evolutionary Synthesis paradigm, however, genes, organisms, and environments constitute a continuum rather than siloed, separable phenomena. Thus, to discuss the intended consequences of ways of engineering shared *Umwelten* – as we must when we confront the unintentional artificial selection of advertising – we cannot help but touch on each of these dimensions, both within a specific species population and the interspecies interactions between their overlapping *Umwelten*. In the long-term, at least, the project of eugenics could be read as fundamentally mistaken; where our health and genes result more as a consequence of *eutopias* – favorable topographies or ecologies in which organisms create habitats – than wasted effort engineering (and policing) individual organisms. Instead of worrying about the salvation of individual gene destinies (which often creates other distortions beyond our knowledge), the science of public health (a crucial link between the biosemiotics of food and medicine) suggests that locating interventions in population health through shoring up social and environmental commons, is a much more effective tack than attempting to “improve” individuals who fall into contrived *post hoc* discriminatory categories which measure discriminatory social practices rather than ethnic or other grouped ontologies.

Determining precisely the original or optimal compositions of bacteria and other symbionts that inhabit us, is a topic for another time. How this composition ebbs and flows, however, I contend is at least in part a function of external stimuli, including in the last century or so those biochemical priming agents directed by businesses to sell food products.

Biochemical Versus Audiovisual Advertising

Focusing on the applied biosemiotics of advertising and its effects on different levels of human biosemiosis is warranted both because of its ubiquity and its embeddedness. Online digital advertising alone reached 273 billion dollars globally in 2018 (Frederik and Martijn 2019), which overtook television ad revenue in 2016. Some recent critics have heralded the rise of internet and personalized targeted advertisements as “the end of free will” as big tech companies with their extension lines of wearable and eventually implantable, connective devices aim to hack our brain and nervous system (Harari 2016; Zuboff 2019). Such psychographically microtargeted claims on our attention would undoubtedly constitute a severe loss of semiotic freedom, including collective and individual agency. Yet, there is a more subtle, but equally effective method in which various forms of analog advertising hack not our brain but (primarily) our belly and its co-constitutive microbiota. Point-of-sale, billboard, and other visual ads, as well as olfactory, aural, and free sample forms offer a less symbolic yet more directly biological effect on the human superorganism (Table 1).

Ads have always acted upon bodies, as well as minds. What distinguishes directly biological advertising, however, is the actual changes in the composition of air, or ingestion (in any form – food, drink, airborne volatile organic compounds (VOCs), dermal, etc.). In these cases, the traditional biosemiotic cascade of advertising from symbolic to indexical to iconic becomes shortened from indexical to iconic, or in some cases, precipitates a direct iconic form of semiosis for the body, endocrine system, and the bacteria and other microflora that live us. This chapter focuses on the latter forms of advertising, those that more directly hook into biochemical receptors with less mediation than symbolic forms.

We can provisionally divide up signs into their identical or iconic aspect, the referential (denotative) or indexical aspect, and the representational (connotative) or symbolic aspect. Deacon (2012, p. 18) notes, “indexicality depends on immediate correlation and contiguity, and is transitive.” This transitivity of indexical signs Deacon explains as “a pointer pointing to another pointer pointing to some object,” which “effectively enables the first pointer to also point to that object” (2012, p. 21). That is, the chain of reference of indexical signs also allows the original mediated

Table 1 Differences between visual and biochemical advertising

Traditional interpretations of advertising	Directly biological advertising
Symbol: Status drives cognitive-emotional changes which create physiological changes which create cellular changes (“top down” cravings or aversions)	Symbol: Not applicable
Index: Selling with alluring or suggestive imagery (e.g., ear-worms/jingles)	Index: Scent engineering (when evocative of a memory, situation, or place)
Icon: Enhanced images of food products themselves (often aided by indexical status referents or pleasure evocations)	Icon: Free samples for oral consumption; scent engineering (when directly representing the food item or alkaloid replacing the food item)

sign to (in)directly point to the intended object. Medical symptoms pointing to the underlying disease are a classic example of this transitivity. Volatile organic compounds (VOCs) inhaled can also index the stimulation of certain biochemically active stimuli that they mimic synthetically from the perspective of cell receptors, indicating the presence of a certain class of nutrients or threats in the environment. Thus, “advertising” through stimulating biochemical expectations of a certain type of receptor through precursors – signs of the thing which lead glands and organs to expect, say, a certain type of protein molecule, and thus releasing hormones gearing up for receiving the predicted stimulus through upregulating certain hormones or neurotransmitters – is a bait-and-switch activity with mimics which never quite fulfill the needs and assumptions of the awaiting receptors and cell metabolites, while bombarding an activated endocrine system with other foreign substances it is unprepared to deal with.

The evolutionarily-keyed expectations of idiotypes and molecular receptors reinforce the goal-directedness of realist explanations of evolution (Levesque 2019). Nonetheless, biologists and theorists sometimes misinterpret this goal-directedness as fixity – that somehow a genetic program is spinning itself out irrespective of the ecology and web of relations in which the organism finds itself. Thus, I contend that stimuli – and especially supernormal stimuli, defined as concentrated anthropogenic stimuli which override native biological circuit breakers – can re-track (or hijack) the directedness of organisms’ goals. If organisms from the single-celled to humans and beyond simultaneously operate on many semiotic channels with interwoven processes (Hendlin 2016), most of which are largely deterministic and precious few which allow for agency and novel meaning making (in humans, see Barrett 2010; Kahneman 2013; McGilchrist 2009; Sapolsky 2017; Tinbergen 1951), then the quality and composition of lived environments is pivotal for determining the directedness of their teleologies and maximizing opportunities for agency.

Since composite organisms’ endosemiotic processes are sometimes keyed to stimuli predicated on addictive short-termism – which short-circuits the interflow of other endosemiotic processes essential for the well-being of the host or superorganism they compose – then it is possible that the larger teleodynamics (reciprocal self-regulating tendencies vis-à-vis environmental feedback) of the constituent organisms will be transferred to fulfilling other acquired goals which may compete with, or foreclose sustainable mutualistic goals of overall organism health.

Artificial Selection Prescribes, Natural Selection Proscribes

Deely (2009, p. 116) suspects that the “true measure of semiosis is the influence of the future upon the present in constantly reshaping the past.” In examining the active and passive elements of advertising on biosemiosis, I ask indirectly: How do memes interact with genes? Or, better: How do cells respond to symbolic stimuli? What are the processes through which our social cues are transcribed into and onto endosemiotic processes in our glands, cells, symbionts, and parasites? Instead of focusing

exclusively on the symbolic elements of advertising, we can also investigate more immediate forms of advertising, and how the symbolic forms themselves are in many ways displacements (*Ersätze*) of indexical and iconic semiosis. Just as people and organisms rely on a portfolio of heuristics to simplify complex decision-making, so too do bacteria, fungi, protists, amoebas, viruses, archaea, and other microbiota. In order to make use of proteins, RNA, or other means of sustenance and replication, these microorganisms rely on biochemical approximations. Operant conditioning to supernormal stimuli are methods that short-circuit the use of the original objects that the signs of these heuristics are evolutionarily habituated to select for.

“Tones” as used technically in biosemiotics, such as search tones (or “images”) (Tønnessen 2018), resemble remarkably the “play system” and “seeking system” discussed in psychology in reference to the mammalian brain’s limbic system (Panksepp 2016). These drives in their historical states describe highly collaborative activity, working with others to find, achieve, or enjoy coordinated action. The primary emotional systems, according to neuroscientist Jaak Panksepp (2004), hold trans-species patterns of meaning and engagement. Panksepp claims that human emotions can best be understood through analyzing animal emotions. Probing the instinctual emotional types that emerge through subcortical brain activity, Panksepp grasps the importance of endogenous drug receptors, hormones, and how these are stimulated by activity and substances. Discovering the high degree to which emotional urges and needs are conserved evolutionarily across mammals including humans, Panksepp views the symbolic indexes of the neocortex as a *tabula rasa* onto which environmental stimuli processed in more basal primary emotional brain centers are mapped (Panksepp 2004; Sur et al. 1988). Perhaps not ironically, Panksepp’s investigation into the pan-mammalian characteristics of the emotions based in the nervous system was initially spawned by an interest in psychopathology. The fact that search tones or seeking systems, amongst other tones and systems such as play, lust, or rage, can be mapped onto symbols and experiences quite mediated from their original evolutionary gearing or proximate cause, has not been lost on twentieth and twenty-first century marketeers.

A large body of literature throws into question the liberal notion of personal sovereignty which claims that individuals in some strong way are responsible for their financial, political, health, and social decisions (e.g., Kahneman 2013; Thaler 2016). To be able to choose is often exaggerated as an autonomous, rather entangled action. And in many cases, the designation of choice is a post-hoc rationalization based on the alibi of self non-contradiction rather than a genuine commitment to the logic of past actions.

How Bacteria Create Desires

Toxoplasma gondii, which humans can pick up from pet cats or from eating infected meat, is a parasite that controls humans in subtle, but noticeable (and documented) ways, likely contributing to hundreds of thousands of car accidents annually (Flegr

2008; Flegr et al. 2002). Jaroslav Flegr and his colleagues found that humans with *Toxoplasma gondii* protozoa cysts embedded in their nerve and muscle tissue react more slowly to simple stimuli (Havlíček et al. 2001). Likewise our bacteria, viruses, amoebas, nematodes, and other endosymbionts in their parasitic forms can niche construct beyond their immediate semiosphere as a result of creating the environmental conditions conducive to their reproduction and thriving.

Host manipulation occurs across the microsemiotic foodchain. Akin to a different form of rabies, “many experts think *T. gondii* may be far from the only microscopic puppeteer capable of pulling our strings” (McAuliffe 2012, p. 3). Stanford neuroscientist Robert Sapolsky further states, “My guess is that there are scads more examples of this going on in mammals, with parasites we’ve never even heard of” (McAuliffe 2012, p. 3). So, who’s really running the show here? Without having to resort to exo- and endo-bacterial determinism, we can relinquish a good deal of the baggage that comes from notions that humans are autochthonous, autonomous individuals. Everything about us is emergent, co-created, and porous, rather than a result of single authorship (including this essay).

Nonhuman endosymbionts, especially parasites, have evolved varying adaptive mechanisms to control and manipulate host phenotypes, including human behavior (Flegr 2016). This enables them to expedite transmission from infected to noninfected hosts. Host manipulation as a genre of endosymbiont activity is ubiquitous in parasitism of mammals including humans, and can change host population dynamics and induce ecosystemic changes (Labaude et al. 2015).

Being Plural

Advertising can then in important ways be seen as a symptom of host manipulation. Viewing compulsions semiotically as *symptoms* – from the Greek σύμ-πτωμα meaning “mishap,” “mischance,” a “falling in,” or “collapse” (Liddel and Scott 2019) – they are always pointing to the disease that is not directly seen or manifest. Symptoms represent a truncation in the semiotic circle, further indicating to the object which is the disease itself. Staying with the symptoms is to be caught in a sort of strange loop, rarely permitting exit into the thing itself, the object to which the symptom refers (Hendlin 2018).

Symptoms, in Baer’s *Medical Semiotics*, contain instances comparable to what C.S. Peirce has referred to as firstness, secondness, and thirdness, as well as what Baer calls “fourthness,” the “symptom as symbol” (Baer 1988, p. 132). Baer describes how

Secondness is the dimension in which the symptom appears as irrational brute force, as outside or inside aggressor, as irresistible impulse or inexorable blind fate. Experiences of terminal illness or of obsessive ideas (*Zwangsideen*) are examples of this irrational dimension of the symptom. As Peirce describes, such a mode of secondness is “regardless of any third,” resulting in a truncated semiotic circle. (Baer 1988, p. 132)

That staying stuck at secondness can result in a “truncated semiotic circle” means that the future-possibility open aspect of semiosis is disrupted, if not fractured. Baer views the current “broadening and pluralizing” of “the notion of symptom” as a mistaken fixation on secondness rather than understanding the full triadic context of the semiosis at hand (p. 132). Without the thirdness of otherness, symptoms are caught in a closed loop of *prima facie* assumed understanding and control, when illness’s uncanniness is precisely its unknown and uncontrollable dimensions. Fourthness or the symbolic experience of symptoms Baer (1988, p. 132–3) designates as the psychological, biomedical, and sociological aspects, of which medicine “remains deficient” as long as it concentrates on the biomedical aspects alone to the exclusion of the social dimensions of illness. Reflexively accounting for the social and psychological contexts of sickness is part of the cultural semiotics determinative of illness, including accounting for the “basic cultural assumptions from which it proceeds” (Baer 1988, p. 133; Kleinman 2003; Steele 2011; Watters 2010). Biosemiotically, medicine often fails to account for the variations and diversity present in living organisms living with and amongst other living organisms, including their varying health qualities, biochemical dispositions, diets, and countervailing endosemiotical biological protective factors, such as the strength of their microbiome (Bailey 2010; James-Todd et al. 2016; Komaroff 2017; Sørensen 2002). For Baer, western medicine over-ascribes importance to the biological (biomedical) aspect in the same gesture as it fails to take into account the context of biomolecular cross-system influences (i.e., from kidneys to bloodstream to behaviors creating different qualities of blood). This overcompensation for failing to account for the contextual influences must be recognized before adequate integration of these other factors of health and disease can contribute to our medical understandings. In medical terms, instead of recognizing the biopsychosocial model of disease, western medicine focuses on the bio part, but reductively instead of recognizing the ecological endosemiosis of different body system communications and cascades.

For example, the placebo effect plays no role in a purely biomedical model of disease. The gold standard of medical research, double-blind randomized controlled trials, are meant to control for and negate any possible placebos. Yet, from a critical, biosemiotics and cultural semiotics of health approach, only by incorporating the psychological and sociological elements of health can the meaning of symptoms and their multiple underlying determinants be assessed and treated. Because of the need to reassess the gap between status quo medical practice and health outcomes, in recent years, due to the distortions resulting from excluding these elements of health in effective diagnosis and treatment, the placebo effect has made a comeback as a powerful contributing element to illness and health (Finniss et al. 2010; Greenberg 2018; Kaptchuk et al. 2010; Kaptchuk and Miller 2015; Miller and Kaptchuk 2008). In acknowledging the role placebos play in health and disease, these psychosocial aspects of symptoms can be wisely included in medicine rather than left as a wildcard working without guidance nor acknowledgment.

Complementarily, the recent attention to how diet interacts with medications testifies to the biochemical interference patterns between food and medicine, rather than assuming that sufficient brute medicinal power alone can override unhealthy

lifestyle choices (Bubnov et al. 2015; Davis et al. 2019; Dumit 2012; Kravchenko et al. 2015; Nicholson et al. 2012; Sørensen 2002). As personalized medicine has come online in the profession, it quizzically reveals our reliance upon commons, such as air, water, soil quality and micronutrients. Personalized medicine must also attend to how individual body ecologies rely on common environmental exposures and ingestion of foods, and how both of these interact with pharmacology. Environment, in the role of diet and other interactions, remains a pesky if ineluctable component to any treatment and health as it effects the efficacy of medicines.

The Flavor Industry

Part of how our environment is formed in late capitalism has become largely determined by the exigencies of corporations. When the tobacco conglomerate RJ Reynolds bought the children's sugary drink company Hawaiian Punch, their chief biochemist remarked that "many flavorants for tobacco [would] be useful in food, beverage and other products" promising "large financial returns" (Milton 1963; Nguyen et al. 2019). That flavorants could be generalized across products as diverse as tobacco and children's beverages reveals the common addictive character across these additives. The addictiveness of additives has been underexplored in research, especially their propensities to biochemically upregulate glandular processes while baiting-and-switching the actual delivered (evolutionarily novel) biochemicals.

Drugs of abuse are characterized as both generating adverse effects to self and/or society and creating loops of reinforcing use. When more use begets more use, creating a hedonic treadmill so tolerance to the drug requires increasingly intense dosage to get the high the drug produces, we are dealing with an addictive substance. Being in the colors and flavors business, as RJ Reynolds attested (Nguyen et al. 2019), demonstrates how artificial additives come to substitute for naturally-occurring stimuli in the realm of desires.

In the competitive marketplace for our taste buds, sugar, salt, and fat are the usual suspects. Due to the revolutions in agriculture, preserving, packaging, distribution, and advertising, along with the homogenization of tastes through mass media and national and then transnational commodity chains, "Foods that were once luxuries thus became seductively commonplace" (Cross and Proctor 2014, p. 2; see Patoine in this volume). Their ease to obtain and ubiquity in the commercial marketplace exposed humans and our endosemiotic organisms to a flood of chemicals and stimuli previously never available to them – they were not evolutionarily geared to handle these new stimuli, even if the original sources of the non-extract version of the stimuli in some cases were coded as desirable (like glucose). In their refined forms, these substances take on entirely different functions in their relationships to the body. Refined, extracted, intensified, optimized, a reverse alchemy of substances makes what was once salutary, malign.

Taste and Democracy

Kant distinguishes between taste as a private faculty and as a general one. The statement “I like strawberries” is different for Kant than “strawberries are sweet,” with the former designating a personal proclivity, and the latter a generalizable aesthetic judgment. Kant writes,

taste is at bottom a faculty for the judging (*Beurtheilungsvermögen*) of the sensible rendering of moral ideas (by means of a certain analogy of the reflection on both), from which, as well as from the greater receptivity for the feeling resulting from the latter (which is called the moral feeling) that is to be grounded upon it, is derived that pleasure which taste declares to be valid for mankind in general, not merely for the private feeling of each. (Kant 2001, p. 230)

Jakob von Uexküll is well-known for his self-image of following in Kant’s footsteps (Deely 2004). Where Uexküll differs from Kant, however, is that instead of grounding organism behavior in transcendental concepts, Uexküll finds the biological organization of the organism’s structure (*Bauplan*) fundamentally indicative.

One of the many problems with the well-meaning but misdirected advice of “following your instincts” or “follow your desires” in an age of supernormal stimuli, is that our instincts are increasingly managed and engineered to achieve not the best outcomes for our organism but for the profits of another organization which is not an organism at all, but a business corporation. Corporations generalize their behavior of soliciting and enrolling instinctual drives to fulfill their own organizational blueprints (*Baupläne*). Rather than a personalized predation or parasitization, which occurs in organic relationships, the stochastic manipulation of host physiology and semiotics to map onto corporate interests impersonally attempts to hook into generalized tendencies rather than attend to individual weaknesses and resiliencies. This generality simultaneously makes corporate parasitization both less effective as they are less individualized and more effective because of the large broadcast and scope. The biosemiotic consequences of this standardization of engagement and the normalization of individuals is a lack of specificity that wears down the nuances of sense receptivity found in individual organisms. In the generality of their appeal, they map symbols onto indexical references that allow them to bypass critical judgment and appeal directly to instinctual biological processes, including different colonies of endosemiotic human bacteria, amoebas, nematodes, viruses, and other parasites.

In Sheldon Wolin’s (2017) masterpiece *Democracy Incorporated: Managed Democracy and the Threat of Inverted Totalitarianism* he observes how democratic action and *sui generis* collective decision-making has been replaced by a simulated and controlled version. He details how the blurring of the lines between where corporate power ends and state power begins upsets the role of government as enforcing fair play, and instead consists of tailoring the rules to predetermine appointed outcomes, rendering actual politics moot. To go a step further, what is being managed in our current democracies (and authoritarian governments as well), is not only

a governmentality of political bodies, but biological ones as well. Biogovernmentality, however, goes beyond our behavior to our metabolism.

Scent Manipulation as Deceptive Semiosis

Smell may be one of the most immediate sense faculties we possess as humans, in that the olfactory bulb goes directly to the brain with fewer opportunities for interceding neocortex filtration or judgment (Hendlin 2020). Olfaction is wired with less mediation than other inputs, and the biochemical reactions of smells which catalyze biochemical shifts under our conscious radar (like pheromones) have powerful effects on our behavior (Ackerman 1991). Our sense of smell is processed by the limbic system, which also is responsible for emotion and memory. Many working in the flavors and odors business acknowledge that they are intentionally bypassing rational faculties by appealing directly to human (or endosymbiont) instincts, while at the same time denying that they are catering to the potential preferences of parasites that could be undermining human agency. Alex Hiller, a marketing ethicist, for example, falls into this double-bind.

Yes, changing smells is manipulative – this is the whole point. But it is mild, and I would argue that consumers realize and accept that in all artificial, and especially retail, environments, some mild form of manipulation does take place and it in no way constrains anyone's freedom, autonomy or well-being. (Quoted in White 2011)

The fallacies of this marketing ethicist are indicative of the profession; we should “accept” that in any commercial environment that our biology is being channeled, and yet such sense engineering is downplayed as “mild,” presumably because only the weak will be affected. Such responsabilization for responding to marketing also conveniently exculpates the corporation to manipulate as they please with impunity, placing any blame on the all-too-malleable consumer (Elias et al. 2018).

Advertising to subterranean desires not present or at least not as active until or unless invoked through stimuli that indexes onto endosymbiont search images (or search tones, see Tønnessen 2018), calls into being prominences in the ecology of endosymbionts. The petrichor (the bouquet after fresh rain) of geosmin, the organic compound of earthy aroma and taste emitted as a metabolic by-product of particular classes of actinobacteria in soil, attunes human instincts and classes of our endosymbionts according to particular affordances and proclivities. The oily-salty smell of McDonald's french fries, on the other hand, reaches down into our recesses and evokes very different qualities and invitations for action from a very different set of endosemiotic agents and instincts.

In a *Time* magazine article titled “My nose made me buy it,” investigators track how artificial scents have become a major form of point-of-purchase advertising (Sifferlin 2013), short-circuiting the rational decision-making properties processing in symbolic visual advertisements. Going straight for our olfactory bulb could be seen as a cheap trick, bypassing rational judgments through the immediacy of iconic

and indexical stimulation (Ackerman 1991; Synnott 1991). Since the beginning of the twentieth century, when managing consumer purchasing to maximize it started becoming high-budget science (Cross and Proctor 2014), consumer behavior became a calculus based on testing behavior-modifying stimuli and arrangements. Actual individual decision-making matters less for marketers than the stochastic behaviors responding to their stimuli inputs.

While smell engineering can be based off of real smells like baking cinnamon and sugar, it is just as (if not more) often the result of artificially contrived odors. When smells dissimulate, advertising a certain representation while actually presenting a very different actual object, the phenomenological experience is often overwhelming in the technical sense (Barrett 2010; Cross and Proctor 2014). Disneyland's "scent machines" pump out finely engineered aromas of frying oil, dough fried in fat, sugar, donuts, and beignets to evoke childhood pleasurable smells, intended to bypass rational faculties and advertise directly to more biochemically-gearred urges. These urges often have their origins in a complex evolutionary coupling, which before industrial times were advantageous. Fat, sugar, and salt, were all relatively rare worldwide in pre-industrial diets, and so biological lust for them was rewarded (Cross and Proctor 2014; Kessler 2010). But the mass production of these substances, combined with ultra-processing of foods, lead to the creation of supernormal stimuli, foods with intensities, quantities, and combinations of these substances never found in the wild (Barrett 2010).

The chemical synthesis of analogs familiar to human-calibrated scents and tastes allows for food products to appear to our senses as if they possessed a certain substance (such as honey or animal fat) while delivering something else (like aspartame or palm oil). The chemical design of synthetic smell loses the subtlety of complex, musky aromas like real vanilla bean, but vanillin hits you and grabs you, and refuses to let go of your scent receptors. It accosts your nose with aromatic hooks, tethering you ineluctably to the source of the emanating thing.

Thus, according to a biosemiotic analysis, the synthetic version of vanilla, vanillin (phenolic aldehyde), satiates certain taste receptors with a search tone for vanilla bean (*Vanilla planifolia*), without delivering the aphrodisiac and other salutary effects. Vanillin is comprised of a single molecule, 4-hydroxy-3-methoxybenzaldehyde, while vanilla bean extracts contain roughly 200 molecules (4-hydroxy-3-methoxybenzaldehyde being one of those). Currently "less than 5% of vanilla flavoring comes from natural sources; many people are so conditioned to the use of synthetic 'vanilla' [vanillin] flavor that they prefer it to the real thing" (Cotton 2008). This paradoxical reversal of preference for the intensely-optimized but narrow-spectrum ersatz for the real thing, is a function of heuristic replacement characteristic of supernormal stimuli (Hendlin 2018). Synthesized tastes and smells titillate certain gross search tones while neglecting more subtle ones, creating a molecular Stockholm syndrome. Overwhelmed with such concentrated stimuli, while lacking the complimentary diffusing alkaloids, remaps the tone of vanilla for that of vanillin, with the original losing the semiotic power its complexities provide (see Nowlin in this volume). Nuance in flavor and smell is traded for sheer bursts of excess; quantity substitutes for quality.

As the nose is perhaps the sense organ most associated with instinct, it is no surprise that iconic and indexical advertising focuses heavily on smells. No business has made more ranging use of the manipulation of artificial smells than Disneyland. Part of the theme park's identity is wrapped up in smells, to produce the desired psychology of the parkgoer. Disney makes use of a patented scent generator called a "smellitizer," capable of producing a wide palette of smells and intensities, depending on their management needs (Wheeler 2014). While artificial smells are deployed to improve the experience Disney wishes to impart, the bottom line of smell diffusion technologies as they currently stand are to increase sales. Through the selective placement of smell vents which look like speakers, combined with circulation systems to fan the smells out to customers, Disney can effectively lure customers into its old-timey ice cream shops and restaurants.

Fragrance specialists at ScentAir, the United States' largest scent marketing and branding company, works with many major retail companies to develop scent maps of their stores. As the firm explains it: "Specific scents can be customized for specific departments, such as a baby powder smell for the child's section or a coconut scent in swimwear (which is what Bloomingdale's uses) and lilac in the lingerie department" (Sifferlin 2013). Their olfactory potions have an obvious purpose: to encourage customers to linger longer and return more often.

Another example of smell engineering is the Hard Rock Café's Orlando Hotel suffusing "ocean" smell in its lobby so "guests can imagine checking into a seaside resort," despite the hotel's hour drive from the coast (Sharrock 2013). ScentAir also engineered the hotel's scent trajectories to entice people into the downstairs ice cream shop through emitting the patented "sugar cookie" scent at the top of the stairs with "waffle cone" greeting unsuspecting customers at the bottom (Sharrock 2013). The smell firm – perhaps with a conflict of interest in its reporting – reports the hotel's ice cream shop sales increased 45% in the first six months after implementing this smell scheme (Sharrock 2013). Ironically, ScentAir also provides the smell blends "fresh air, breeze, and 'Fresh Outdoors'" to artificial environments which devoid of the perfumes smell nothing of the sort (Sharrock 2013).

ExxonMobil has also deployed ScentAir aroma technologies in their gas stations with coffee scent to promote brewed coffee purchases at kiosks, also leading to purported increased sales (Ravn 2007). Because of the buzz of scent marketing in increasing sales, Advertising Age Magazine called it one of the Trends to Watch in 2007 (Ravn 2007). While the tradition of baking bread during an open house to drive up the home's sale price is well known, the prevalence of scent marketing as a necessary element to actuate consumer behavior suggests its efficacy. Clearly, scent marketing companies have a vested interest in embellishing their reports of the efficacy of smell engineering on consumer behavior to collect more wholesale accounts. Nonetheless, as other forms of visual and aural advertising become oversaturated, scent advertising appears to be the next frontier.

Fake scents transport us to other times and places. They allow virtual vacationing based on the alkaloid receptors in our olfactory bulb and the pleasure or pain they give the brain. But fake smells (and tastes, and visual, aural, and haptics stimuli) are also dangerous; they give us information *as if* we were in the middle of a place or

situation, when in fact that is not the case at all. The simulation of sensation (Baudrillard 1994), some experts in the smell marketing industry believe, lead to increased exposure to artificial scents coupled disingenuously with decontextualized products, which could even lead to instigating the development of allergies in consumers (Ravn 2007; see Nowlin in this volume). As we increasingly live in “managed democracies” (Wolin 2017), the toxic side-effects of controlling humans and other organisms may pile up non-linearly, invisible at first and torrential when it is too late to stop the accumulated harms.

Sometimes, attention to these harms comes in the forms of hunches by laypeople noticing incongruencies in their environment. The phenomenological experience of regular people can serve as an early warning and detection system for scientists (Oreskes 2019); canaries in the coal mine. The popular fast food restaurant Subway has found itself in the middle of a “bread smell” “conspiracy” (Roston 2011). For decades Subway employed a “dough conditioner” for its bread – azodicarbonamide – that is illegal in the European Union for food use, but is used in some cases in the United States food industry, as it has been approved as Generally Regarded as Safe (GRAS) by the Food and Drug Administration (although legally limited to a maximum of no more than 0.0045% of the total weight of the flour). Azodicarbonamide, however, is also used in yoga mats and shoe soles to increase elasticity (Landau 2014). This chemical happens to be the bread smell chemical Subway has been accused of pumping out their vents while baking the bread on premises to lure in customers. After a public outcry about the health dangers and the ick-factor of using elasticizers in food, however, Subway capitulated to replace the chemical (although Arby’s, McDonalds, and Starbucks continue to regularly use azodicarbonamide in their products) (Landau 2014). Despite its usefulness in the fast-food and bread industries, the World Health Organization has reported that azodicarbonamide could potentially induce asthma when inhaled by those working with the chemical (Cary et al. 1999).

Of course, Subway is not the only venue to use such aromatically alluring practices – even if the artificiality and potential health harms of the chemical in question puts it in a distinct class. Other well-documented cases of smell manipulation involve the cinnamon roll franchise Cinnabon’s strategic placement of ovens near storefronts so smells exit, tempting passersby. Even when no actual baking is occurring, store operators routinely induce Cinnabon aromas through warming cinnamon and brown sugar on baking sheets to produce the same olfactory effect (Nassauer 2014). The baked-goods chain Panera has also switched night baking of bread to daytime hours, to maximize the pleasurable scents exuded from its stores (Nassauer 2014). Although the smell of caramelizing cinnamon and sugar maps more directly to our senses, giving a more felicitous perception of the sign-link the smell refers to than azodicarbonamide’s deceptive chemical semiosis, the aim and method of manipulating human purchasing and consumption behavior through smell remains.

Scent marketing has become a multi-billion dollar business, a requisite expenditure for the most competitive retail and restaurant environments (Nassauer 2014; Ravn 2007). The New York supermarket chain Net Cost uses scent machines to fill its stores with artificial food smells such as milk chocolate and fresh-baked bread

(Peterson 2014). But too much scent can be just as offensive, or ineffective, apparently, as not having the right scents in the right places. The cosmetics retail store Lush actively pumps away scents through an exhaust fan from its perfume-saturated store so as not to “overwhelm” customers in the store, giving the (false) impression that its highly scented products are not as overloaded with added scent as they actually are (Peterson 2014).

Responding (Reacting?) to Manipulation

The idea of “controlling oneself” around stimuli, exerting “self-control” around manipulative stimuli and a society engineered for addiction, always puts the onus of responsibility on the individual, something that sociologists of medicine call “responsibilization” (Shamir 2008). Companies pretend to exonerate themselves by making the weak-willed person responsible for their bodily sensory responses to the stimuli they are inundated with. In music, the refrain or catchy part of a tune designed to create a desire to hear it again is called a “hook.” By creating aural patterns (e.g., ear-worms) that hook into the unconscious of the listener, and are “sticky,” easily remembered and sharable, pop songs are designed to create “hits;” popular tunes provide the expected optimized stimuli they have primed listeners for.

Situational circles reproduce stimuli-response bypasses to conscious thought. This can work positively to increase reaction times when riding a bicycle, for example. But if one was raised in a milieu where processed foods and the engineered tastes and smells of refined foods competed with the simplicity of unassuming traditional or healthier foods, then despite the negative physiological reactions experienced shortly after eating processed food, the stupor they produce would be associated with positive memories. Any natural stopgaps that might exist to bar the frequent or post-satiety consumption of these foods could be overridden by positive associations with their toxic effects. After all, strong emotional bonds such as special nights out gorging on high fat, high sugar foods, such as birthday cakes and other celebratory associations relived and ritually reenacted in each iteration of consumption, rekindle hollowed out pleasant moods that once accompanied the original meal.

In dysbiotic microbiotic ecosystems, exogenous bacteria and other pathogens colonize and dominate endogenous microbiota. For example, the human “mouth is an unusual ecosystem in that the oral microbiome must be controlled,” through oral care practices such as brushing or flossing (Wade 2016, p. 67). Dental caries and periodontal diseases occur through bacterial activity, “but the primary risk factors are a sugar-rich diet for caries and host susceptibility and smoking for periodontitis. The oral microbiota is important for health because it prevents colonization by pathogens” (Wade 2016, p. 67). Thus, a healthy oral microbiological system, teeming with mutualistic bacteria prevents pathogenic incursion. But the opposite – an oral microbiome dominated by pathogenic strains – can lead to increased conversion of nitrate to nitrite which then converts to nitric oxide. This

process can have deleterious effects for non-oral diseases as well, especially on the cardiovascular system through causing infections or aggravating chronic inflammation (Wade 2016). Here, as in other parts of the body, the relationship between endogenous and exogenous bacteria is a protective one.

Yet, when the composition and ratio of endogenous to exogenous bacteria changes through environment, diet, hormones, or other factors, the previous equilibrium in the biotic system punctures at a certain point, creating a new set of conditions and chemical excretions favorable to the new inhabitants, difficult to recalibrate. This new micro-ecological equilibrium tends to reinforce the stability of its own bacterial colonial mix (c.f. Gallopín 2002), even if it might be deleterious for the long-term health of the host organism. Following the work of Sapolsky (2017), I conjecture that because there is a continuum between our own meta-cognition as a superorganism, making decisions that have been called autonomous for the whole human body, and the more but never fully automatic biochemical reactions that occur at the micro- and hormonal-levels, much of the advertising humans in the twentieth and twenty-first centuries have been exposed to are aimed at existing pathogenic constellations of bacteria through a semiotic cascade (symbol → index → icon) which uses the host to perform the pathogens' bidding. By capturing the interpretation of signs through decontextualization which is a weakness of the (merely) symbolic order which late capitalism has leveraged, the transition from "*physis to phantasia*" which occurs in symbolic orders (Baer 1988, p. 303), has created an uncoupling of food and scent from health and the things they represent, which has allowed for the capture of these processes by pathogens.

Fasting as Counterpoint to Stimuli Barrage

A number of different traditional practices involving fasting have again come into vogue recently. "Intermittent fasting" (abstaining from eating food for 16 or more hours per day) has apparently become a necessary counterweight to the excess and ever-availability of food – especially sugary, salty, fatty food – and research on intermittent fasting shows it to be effective in lowering blood pressure, insulin levels, and insulin sensitivity (Patterson and Sears 2017; Sutton et al. 2018). The 24-hour drive-through and increasingly-used food delivery services, combined with ubiquitous enticing sensory markers, have prompted many stuck in the evolutionary dilemma of unlimited access to take special measures to abstain from the glut of opportunities to feast on previously rare or nonexistent substances. Intermittent fasting can be contextualized in a larger cultural escape from overstimulation, a purgative to the binge of all kinds the acceleration of life consumer economies have wrought (Wajcman 2015).

Fasting then can be seen as a counterpoint to the current indulgent default. Jakob von Uexküll (2010) discusses contrapuntal relationships between organisms and their environments to demonstrate the ontological unity amongst organisms *and* habitats that form part of each other's *Umwelten*. When organisms share

overlapping *Umwelten*, like the orchid and wasp (Uexküll's favored example), they literally make up each other, as their behaviors, actions, and perceptions are mutually colored. Different bodies' ecologies become each other queerly (*quer* or diagonally), potentiating co-constitutive affordances. The rise of the popularity of fasting in its various forms can be reinterpreted not as a religious or ascetic practice, but instead as one following the saturation of exposure to unsafe food products. Just as the Catholic tradition of Lent is a collective religious practice, fasting and "detoxing" need not be only an individualistic practice, but new collective practices can also arise to meet this common protective need. Fasting need not be some sort of renaturalized bourgeois fantasy. In a WEIRD (western, educated, industrialized, rich, democratic) world (Henrich et al. 2010), the bombardment of manufactured pleasures optimized for attracting attention and appealing to biological drives for certain substances coupled with the contrived social symbolism, has become almost an irresistible stimulus for many. By reacting through fasting, intermittent or not, the game of dieting or abstaining serves to legitimate and uphold the dominant stimulus barrage.

What is at stake in the oscillations between biochemical overwhelm and the willpower-expending fasts, detoxes, diets, and other abstemious behavior to counterbalance the excess, is how we can as a society best tune our exposures to different stimuli optimizing for cooperation and collective flourishing. As the enduring and sometimes tortured discussions regarding the ontology of species attests (Haraway 2008; Kitcher 1984; Lloyd and Gould 1993; Wilkins 2011), species are malleable and elusive – not just conceptually, but biologically. A species reflects the history of its environment, including the biotic and abiotic entities and events they meet and refract. Where one species begins and another ends is not always a clear designation, and species barriers can be surprisingly malleable (Sommer 2011).

The stimuli that consumerism presents us with, is produced to maximize our consumption of certain foodstuffs and other disposable items, often at the detriment to our short- and long-term health, when taken to its logical extreme is a relationship of parasitism. While social Darwinism cynically interpreted such manipulations as a weeding process or naturally-condoned hierarchy, Charles Darwin in *The Descent of Man*, holds a distinctly less competitive view of the processes of evolution than in *Origin of the Species*. There, he writes, "Those communities, which included the greatest number of the most sympathetic members, would flourish best and rear the greatest number of offspring" (Darwin 1871, p. 111). This passage suggests that the oft-used natural fallacies of oppressors indeed have little grounding in nature and more often are projections of prevailing power structures. Instead, as Darwin observes, empathic, cooperative behavior, it turns out, enables the thriving of the greatest number, and because of the emergent forms of community and help that spontaneously organize when enough members of a community are flourishing, Darwin saw sympathy (according to Hume's definition) as the mechanism of resonance enabling a deeper form of communication, and indeed communion, amongst conspecifics.

Darwin's hunch has since been named and researched with solid supporting evidence as *group selection* (Price 1995; Sober et al. 1999). While Darwin stressed that

cooperation focused on strengthening group- rather than species-wide fitness, this often overlooked notion (in neoliberal social Darwinism and neo-Darwinism, at least) of group selection holds promise for bridging misunderstandings regarding individualistic competition, and the collective cooperation of survival. The idea of *interspecies* selection has been less researched up to now (but see Laland et al. 2015; Roughgarden et al. 2018), yet will likely lead to interesting findings for biosemiotics across species, as species signal together with mutual benefit.

As far as biosemiotics is committed to developing non-anthropocentric understandings of the communicative processes of nonhumans, it aims at estranging the notion that only humans have experiences, or as Nagel (1974) famously put it, “what-it-is-to-be-likeness.” The rub is that when biosemioticians speak of experience, which really is the currency of the discipline along with meaning, we are not talking about human experience, or human-esque experience, but rather the hardly imaginable experience of another species. Beyond the complications of sex, culture, or body variety in the human context, having fundamentally different semiotic systems – that is, different perception signs (*Merkzeichen*) and action signs (*Wirkzeichen*) as well as unexperienceable receiving and emitting receptors (*Merkrezeptoren* and *Wirkrezeptoren*) – defies our ability to think like a plant, or like a fungus, or prokaryote. One would have to conjure up Kafkaesque visions of metamorphosis to even dream of switching roles *experientially* (but not in terms of general interests) with such significantly different others. How can we think like a plant if a plant has no centralized nervous system, and it’s “brain” is distributed, across the thousands to millions of root sub-apices, where active neuronal-like activity is present (Baluška et al. 2006)? Similarly, thinking like an octopus, which has its central brain *and* distributed neurons (up to 20% of total neurons) in its tentacles, challenges our imagination. And yet, acknowledging such radical difference while understanding the experience of such creatures as an indicator of an environmental relation rather than a constricted western modern notion of individuality, is the entrée into understanding other humans and the multiple levels of simultaneous (endo-)semiosis at work in their actions. Thure von Uexküll (1979, p. 13) reminds us that

[T]he world surrounding a living being is not the physico-chemical world at large or the biosphere as a whole. Its organism cannot be defined in mechanical or psychological terms. 'Environment' and 'organism' can only be defined on the basis of their mutual relationships. Their relationships can be described in terms of a functional circle in which perception and operation complement and constantly redefine each other. (Translation from Baer 1988, 282)

Fasting too is quickly becoming the counterpoint to supernormal stimuli and invasive marketing. Artificial environments beget a *Naturverlassenheit*, or a nostalgia for nature. We have bizarrely made experiences of natural environments valuable due to their vanishing scarcity. The decontextualizing of smells and stimuli from their full spectrum of molecules and co-emergent symbionts spurs a return to simplicity and authenticity, a full first-person trust in each step of a much shorter commodity supply chain.

Fasting has been forgotten in westernized cultures, frowned upon as some ascetic ideal in the Nietzschean sense. Viewed often as a false moral high ground from

which to manipulate others, shaming them into joining along, abstaining from the onslaught of stimuli is even commonly regarded as heretical or irreligious to the church of capitalism. It's the "do as I say but not as I do" of capitalism: Warren Buffett and others admonish us to save, but when we really do we are outcast from spendthrift social circles (which by now, are ubiquitous). Even for former alcoholics or people wishing to lose weight, in social situations proffering forbidden fruits we tend to conflate abstemious with sanctimonious behavior, shaming teetotalers of various sorts for our own shame at lacking a healthy level of reflectiveness about our own compulsions (Alexander 2010; Alter 2017; Keane 2002).

Fasting creates space in between the metabolic processes of the cells we inhabit, and our reaction to the biochemical secretions of those cells. Fasting creates a sense of autonomy in the superorganism, because it stretches the stimulus-response effect of being driven by urges often resulting from dysbiosis. Like holding the breath between inhale and exhale, fasting creates a productive pandemonium in the body ecology, depriving addicts of their metabolic source material and conditioning, thus recalibrating the dominance of various vying bacterial groups.

Fasting from advertising likewise recalibrates our senses. I recall a visit to Cuba many years ago the almost vertiginous experience of not seeing any billboards; no products advertised. After some time I focused my attention to other things, the birds, the sky, the surf; but it took some time, addicted as my search image for advertisements had become. Detoxifying from addictive search images – search images that are not evolutionarily advantageous, but feed parasitic endosymbionts reinforcing a dysfunctional functional circle (*Funktionskreis*) – often takes abstinence. It is no wonder that 70% of smokers still quit "cold turkey" (Chapman and MacKenzie 2010), even in an era with an ever-expanding array of nicotine products designed to entice smokers into believing that they can quit smoking cigarettes while continuing their nicotine addiction by other means (Hendlin et al. 2017). Rather than the indulgent lie that we can have our cake and eat it too, sometimes the only way out of a vicious circle is to cut off the abusive semiosis at its source: by either removing oneself from one's habitat (*Umwelt*) or eradicating the disease vector from one's habitat in which one remains.

Fasting helps create productive friction where certain habit pathways have been greased and others have been made sandpaper-like (Savičić and Savić 2013). When food choices which might undermine long-term human health are engineered in a society to become the most "convenient" and "easiest" options, and work schedules have precluded traditional culinary rituals with women being conscripted into the workforce without a reduction in the amount of total hours worked for a family (Nussbaum 2000), the outsourcing of sustenance has dealt a heavy blow to nutrition. Groopman (2019) describes this process of productive friction:

The path to breaking bad habits lies not in resolve but in restructuring our environment in ways that sustain good behaviors... The central force for eliminating bad habits, according to Wendy Wood, is 'friction.' However businesses all around us try to reduce friction. A cashier taking an order at McDonald's is scripted to ask, "Would you like fries with that?" This simple question encourages us to eat more fat and carbs. Binge-watching on Netflix or

Hulu is facilitated by the way that the next episode starts automatically as the credits roll on the previous one.

Imposing barriers, even artificial ones such as fasts, digital detoxes, or other types of willful abstemious behavior, can upset the grooved habits developed by capitalist societies, which themselves may be the result of biological endo- and exo-semiotic dysbiosis.

Summoning up deliberate behavioral friction against pathways that have been artificially smoothed by manipulative interests contra to the thriving and wellbeing of the host organism, is a useful heuristic that allows space and time to enlarge between set Pavlovian or other stimulus-response engineered priming.

Of course, the other form of fasting, which doesn't require such tremendous acts of willpower time and again for every individual is deliberately redesigning social spaces to encourage healthy behavior and create friction for unhealthy behavior (Thaler and Sunstein 2008). But this level of coordination, and solidarity, first presupposes an enlightened political engagement and education that can have some inkling of what holistic biosemiotic interventions might look like. While we can grant that there are plural and potentially incommensurable good ways to set up a society, more easy to agree on is that there are undeniable forms of dysbiosis aided and abetted through (infra)structural violence (Farmer 2004; Nixon 2011). Destroying native forests and waterways, emitting pollution through unnecessarily dirty forms of energy production, and car-centric cities and regions, all tend towards forms of dysbiosis and disrupt endosymbiont health. If we accept the biochemical deterministic aspects of human life, as much as the biosemiotic freedom and active meaning-making of all organisms, this confluence permits broadened ecological approaches of mind more in accordance to the current 5EA (embodied, embedded, extended, enactive, ecological, and affective) cognitive science and Extended Evolutionary Synthesis paradigms of science and philosophy of mind as well as biology in the twenty-first century (Ahmed 2014; Bitbol 2002; Böll 2008; Laland et al. 2015; Noble 2008; Panksepp 2004; Pigliucci 2010), and intentionally designing our societies accordingly.

Conclusion

As the founders of biosemiotics entrusted the discipline to “provide the human sciences with a context for reconceptualizing foundations” based in rather than ignoring biological factors (Anderson et al. 1984, p. 8), we can see that many of the motivations for taking up the particular methods of deceptive social and biochemical mimicry that corporations commit in their advertising and promotional strategies, as well as the “hooks” of heightened addictiveness in design and composition of their products, have their origins in certain endo- and exo-ecological compositions of non-mutualistic symbionts. Bringing these cultural phenomena back into the realm of biosemiotics to honor the often overlooked biosemiotic components of

these actions (the iconic and indexical semiosis not aimed at our linguistic or rational human selves, and perhaps not even aimed necessarily at our human cells or components), provides a different angle of understanding and hopefully eventually deconstructing these pervasive, undermining phenomena. Parasitism begets parasitism, both biologically and socially – insofar as the two can be distinguished.

In the same vein as the field of public health focuses on the social determinants of health, biological processes likewise can be understood as including determinants without being determined. In other words, in accordance with one of the central tenets of biosemiotics, organisms – no matter how small or primeval – engage in heuristic processes, which allow them some elements of choice in decision-making. Rather than a matter of kind, autonomy and automaticity instead are matters of degree, highly contingent upon external factors and situations (Appiah 2006, 2007), delicate, relational, temporal, and contrapunctal. Instead of ignoring how (built) environments shape organisms, as thin descriptions of equality of opportunity might contrive, acknowledging the contrapunctal nature of humans and our environment might lead to biosemiotics playing a role in the regulation of advertisements and consultation on the self-restraint reducing qualities of certain types of engineered stimuli.

Millennia ago, Aristotle defined the human species as the political animal. We seem to have long accepted that humans are uniquely social, but we have long viewed sociality as necessarily replacing or negating the biological determinants of our actions that come from us also being animal. If advertising is a sort of parasitism, then it is only possible because parasitized people thought up advertising to serve some sort of end that would enlarge the sphere of influence of those parasites. If they weren't themselves parasitized, they would not wish to parasitize others. As biosemioticians, we must remain vigilant, however, that advertising is not just a parasitism of symbolosphere, but also of the semiosphere's other components directly relating to biological processes with indexical and iconic signs. This bioethical metaphysics of parasitism is a claim that may one day be empirically feasible to test. In the meantime, attending to the shared agency of biota in creating similar endobiotic environments in other organisms to propagate their endosemiotic ends, should be seriously considered when discussing the role and modes of food and commodity advertising in contemporary society.

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