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W. David Stahlman



A. Charles Catania

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Faustian bargains: Short-term and long-term contingencies in phylogeny, ontogeny, and sociogeny

W. David Stahlman¹  and A. Charles Catania² 

¹University of Mary Washington

²University of Maryland, Baltimore County

Rachlin's interpretations of self-control depend on the short-term versus the long-term consequences of behavior. Sometimes these effects support each other (typing an abstract produces a written product now and is later read by others). Sometimes they conflict (procrastination now is incompatible with finishing the abstract by deadline). We usually reserve the language of self-control for human cases where long-term consequences are chosen over short-term ones. Rachlin made this distinction salient in ontogeny, but it also applies to selection in phylogeny (Darwinian evolution) and sociogeny (behavior passed from one organism to another). Our account examines relations between short-term and long-term consequences at each level of selection. For example, sexual selection has adaptive, short-term mating consequences but may drive species to extreme specializations that jeopardize long-term survival. In sociogeny, as in the Tragedy of the Commons, group members may get immediate economic benefits from exploiting resources but exhaust those resources over the long term. Whatever the level, when short-term and long-term consequences have opposing effects, adaptive behavior may depend on whether temporally extended contingencies exert more control than more immediate benefits.

Key words: Rachlin, Faustian bargains, short-term and long-term consequences, levels of selection, self-control

When we first meet Faust, he is agitated. Successful by usual standards, he is nonetheless miserable for want of the sublime. He wishes for “more than earthly food and drink” and desperately seeks the intervention of the supernatural. Mephistopheles appears and offers a deal. The demon agrees to serve the scholar for 24 years, granting him magical powers and infinite knowledge; in exchange, at the end of this term Faust will be dragged to Hell to serve Lucifer for eternity. With little deliberation, the scholar accepts the deal.

This sort of transaction is now called a *Faustian bargain*. The words came to refer to circumstances in which one agrees to trade something

of immense but deferred worth for something less valuable but immediately gratifying. Behavior analysts immediately recognize the protagonist's dilemma. All else equal, immediate reinforcers are more powerful in shaping and controlling behavior than are deferred consequences. Organisms often acquire immediate reinforcers at the expense of larger, later ones (e.g., Catania et al., 2015; Critchfield & Kollins, 2001; Green et al., 1997, 2013). Their behavior works against their future interests.

Whether the short-term and long-term consequences are reinforcers or aversives provides a basis for classifying four varieties of self-control (cf. Mischel, 1974; Rachlin, 1974, 1995b, 1997):

- (1) small reinforcer now vs. large reinforcer later (e.g., one candy now or more candy later);
- (2) small aversive now vs. large aversive later (e.g., dental visit now or diseased tooth later);
- (3) small reinforcer now and large aversive later (e.g., cigarette now and lung cancer later);
- (4) small aversive now vs. no large reinforcer later (e.g., workout now or lose competition later).

The third of these categories, in which the conjunction is *and* rather than *or*, is the Faustian case: Youth now, for a while, and

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Address correspondence to: W. David Stahlman, Department of Psychological Science, University of Mary Washington, 1301 College Ave., Fredericksburg, VA 22401. Email: wdstahlm@umw.edu

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eternal hell later (but of course, only the very young would regard extra years of youth as a small reinforcer!).

These examples are all ontogenic cases, in that they involve operant contingencies shaping the behavior of an individual. But ontogeny is only one of three levels at which behavior is selected (Skinner, 1981). It is also selected in phylogeny (Darwin, 1859) and in sociogeny or cultural selection, the differential reproduction of behavior as it spreads across individuals (Catania, 1995; Centola, 2018; Stahlman & Catania, 2020). Selection by consequences is not limited to a single substrate nor is it defined by the nature of the selected unit (Blackmore, 1999; Glenn, 1988, 2004; Hull et al., 2001; Lewontin, 1970); it must occur whenever heritable variation in a population differentially affects reproduction of a replicating unit. In this light, selection by consequences is a fundamental causal phenomenon, of which each level of selection provides a particular example. We should therefore expect analogous or parallel effects across the phylogeny, ontogeny, and sociogeny of behavior (Skinner, 1981; Stahlman & Leising, 2018), and within each level, we should expect those effects to depend on the temporal distributions of consequences.

At every level of selection, *behavior always comes first* (Catania, 2000). The phylogenetic selection of behavior is central because differential reproduction depends on what organisms can do. Organ systems evolved in the service of the behavior they enabled. The selection of behavior in ontogeny (e.g., by reinforcement) is familiar: It is the primary subject matter of behavior analysis. Like phylogenetic selection, ontogenic selection can occur artificially (as in shaping the behavior of pets through clicker training) or naturally (as in the hunting skills of foxes and other canine predators). Similarly, in sociogenic selection, as behavioral units are selected when transmitted across individuals, the selection may be either artificial (e.g., as when schoolchildren are explicitly taught science) or natural (e.g., as when the phonemes of a native language are passed on to successive generations). Contrasting with the selection of the ill-defined units called memes (Blackmore, 1999; Dawkins, 1976, 1986), behavioral units are more consistently measurable and less burdened by ambiguities regarding the replicator. Accepting the sociogenic selection of behavior does not depend on a particular

underlying mechanism, just as accepting the facts of Darwinian selection did not depend on first identifying the gene (Catania, 2001; Stahlman & Leising, 2018, p. 922). At each of these levels of selection, contingencies may be complex—the effects at any level may support or oppose those at other levels (as when the ontogenic maintenance of a mother's drug dependency manifests itself phylogenetically in the diminished viability of her offspring and sociogenically in its disruption of her interactions with friends and neighbors).

In Ontogeny

Perhaps Rachlin's most important contributions lie in his accounts of self-control and altruism (Baker & Rachlin, 2002; Brown & Rachlin, 1999; Charlton et al., 2013; Locey & Rachlin, 2012; Rachlin, 1974, 1997, 2000, 2002, 2016; Rachlin & Green, 1972; Rachlin & Jones, 2008, 2010). For Rachlin, self-control is found in temporally extended patterns of behavior that produce highly valued, distributed outcomes (e.g., good health) when other actions would produce greater value but over shorter temporal intervals. Rachlin's (1992, p. 1371; 1995a) teleological behaviorism, like other behaviorisms, understands its subject matter entirely in terms of control by an external environment. Unlike other accounts, however, it interprets behavior in terms of the wider, more abstract patterns of which it is a part. In so doing, it shows how some classes of consequences can acquire control over others.

Any choice situation pits at least two mutually exclusive ways of responding against each other. An organism cannot run up both the left and right arms of a T-maze simultaneously, though both forms of running might be strong. Choices include such cases as pressing a lever that produces food over one that delivers foot shock, or eating one food item instead of another, or running in a wheel rather than eating (Premack, 1959, 1965). Such events may be described (e.g., Rachlin, 1971) by a form of the matching law (e.g., Davison & McCarthy, 1988; Herrnstein, 1961) wherein behavior is allocated in proportion to the relative rates of its consequences.

The consequences of behavior are typically distributed over time. Behavior is a function of the relation between its short-term and long-term consequences, with actions that confer long-term benefits at the expense of short-term gains sometimes called self-controlled.

Rachlin (e.g., 1997) often offered the example of the recovering alcoholic. A person may prefer to have a drink now, as the value of a drink in the short-term is greater than the value of abstaining. Over the long-term, however, being reliably sober is more important than being drunk. Refusing a drink represents control by long-term contingencies.

Some behavior, controlled by immediate positive consequences, nevertheless has long-term detrimental effects. A bacterium divides at a prodigious rate and quickly exhausts the limited nutrients on an agar plate, dooming the colony. Individuals eat and drink to excess or take illegal drugs. People cheat on taxes to the overall detriment of the economy. Why such behavior occurs is no mystery (e.g., Rachlin, 2019, p. 68)—it is controlled by powerful and proximate outcomes. When individuals act in accordance with immediate consequences, long-term consequences be damned, they may be said to walk the “primrose path” (e.g., Herrnstein & Prelec, 1992; Rachlin, 1997, 2000). On this path, behavior always moves toward the highest local reinforcement rate, even though the consequences over longer intervals are worse overall. For the addict, taking a hit is usually better in the short-term than abstaining. The detrimental effects of drug use are visible only when behavior and its consequences are viewed over an extended period. An alcoholic who has spent recent years sober thus may be loath to have a drink because doing so represents a break in a valuable pattern of behavior that has produced long-term benefits (Rachlin, 1995a, 1995b, 2014). We will see similar examples of “walking the primrose path” at other levels of selection.

In Phylogeny

The primary engine of Darwinian evolutionary change is in the differential reproduction of organisms within a species (Charlesworth et al., 2017). This differentiation can be decomposed into individual contingencies controlling biological fitness. Phylogenetic behavior is established via Darwinian selection that follows directly from the contingencies of reproduction that characterize ancestral history. If heritable behavior differentially contributes to proximal reproductive success and is not opposed by other selective contingencies (perhaps higher-order ones), adaptive variations will accumulate in the population over

generations. The evolution of sexual reproduction itself (Maynard Smith, 1978), ubiquitous in eukaryotes, may well reflect “unsuppressed positive interaction between levels” (Gould, 1982, p. 385). Sex may be jointly supported by local effects on individuals’ biological fitness (Williams, 1975) and by the temporally extended effects of higher speciation rates in sexually reproducing organisms (Stanley, 1975; see also Grantham, 1995; Lloyd & Gould, 1993). In stable circumstances, some behavioral phenotypes become ubiquitous—their labels have included *reflexive*, *unconditioned*, and *instinctual*. These commonplace elicited forms reflect a lengthy ancestral history of pervasive and unchanging environmental contingencies. It is possible that these stable forms emerged from more variable origins—the origins of emitted behavior may predate those of elicited responding (Stahlman & Leising, 2018, p. 920; Tierney, 1986). Robinson & Barron (2017) suggest that it may be advantageous to consider “an instinct as an ‘ancestral memory’ of a specific response to the environment” (p. 27).

Any form of behavior may be supported at multiple levels by selection. For example, sexual behavior in human beings is controlled at phylogenetic, ontogenic, and sociogenic levels—it has ramifications for biological fitness but also enters into contingencies of reinforcement and into a variety of social contingencies, both verbal and nonverbal.

But when two or more sets of contingencies operate concurrently, they may clash, at which point bargains must be struck (e.g., Kirkpatrick, 1982; Lande, 1981). Some features of organisms appear inconsistent with contingencies of survival. A peacock’s tail is unwieldy. A songbird’s bright plumage makes it an easier target for predators. A male bowerbird’s work on his bower is both energy- and time-intensive. These and other analogous phenotypes evolved over generations through sexual selection as a variety of phylogenetic shaping (Skinner, 1975a). Sexual selection is often found in dimorphic species in which males compete for mating opportunities among choosy females. The differential roles of nonsocial and social factors make it arguable whether sexual selection should count as a special case of natural selection (Lyon & Montgomerie, 2012).

Debates about the importance and nature of sexual selection date back to disagreements between Darwin and Wallace (Prum, 2012, 2017; see also Hoquet & Levandowsky, 2015; Kottler, 1980; Richards, 2017, Ch. 12). Wallace was the primary promoter of the argument that the peahen's preference for the male with the most extravagant tail is based on a correlation of the tail with fitness; the peacock that can sport such a tail must be more fit relative to those with lesser tails if it can survive despite the added cost of its extravagance. But though sexual selection no doubt played a crucial role in the evolution of peafowl (genera *Pavo* and *Afropavo*) it is now doubtful that correlations with fitness drove peahen preferences.

Female preference for forms of male ornamentation at one end of a distribution may drive run-away selection for the trait whether or not those forms are correlated with fitness (Kirkpatrick, 1986; Prum 2012; see also Bailey & Moore, 2012; Fisher, 1930; Iwasa & Pomiankowski, 1995; Mead & Arnold, 2004; Pomiankowski & Iwasa, 1998; Travers, 2017). The co-evolution of peacocks with more impressive ornamentation and peahens with ever stronger preferences for beautiful tails is likely to favor descendants sharing genes that support both traits, thereby producing ever larger and more beautiful peacock tails and ever more receptive peahen audiences. But opposing consequences will also accrue, such as greater vulnerability to predators and greater metabolic demands in maintenance of the tail. With successive generations of walking the primrose path, peafowl species are more and more at risk of extinction. Even in his early writings on sexual selection, Darwin (1859, 1871) speculated that the short-term consequences of some varieties of selection might have maladaptive effects in the long term. A corollary is that drastic changes of the environment may give generalist species substantial advantages over those that have become highly specialized. The tension between short- and long-term contingencies can lead to *evolutionary dead ends*, in which the short-term reproductive advantages of a biological trait reduce speciation and raise the likelihood of biological extinction. Sexual selection has been implicated in such dead ends (Anderson & Iwasa, 1996; Coyne & Orr, 2004; Kokko & Brooks, 2003; Lande, 1980; Martins et al., 2018; Tanaka, 1996).

We have so far emphasized sexual selection, but the evolution of sexual dimorphism is just one subset of specialization. Ecologically heterogeneous environments produce diversifying selection and the evolution of generalist or *eurytopic* species (Chesson, 2000; Felsenstein, 1976; Futuyama & Moreno, 1988; Kassen, 2002). Generalists do a lot of things but relatively poorly. Specialist or *stenotypic* species, on the other hand, do few things but do them well: They exploit a limited set of resources and have correspondingly limited but efficient repertoires. Specialists may therefore be at greater risk for extinction than generalists (Haldane, 1951; Kelley & Farrell, 1998; Vamosi et al., 2014). The progressive exploitation of relatively few resources by stenotypic species over the course of evolution provide more examples of walks down the primrose path. More effective exploitation by individuals may confer an adaptive advantage over conspecifics in the short-term while driving the species to an evolutionary dead-end. Extreme specializations, such as dependence on a single food source (e.g., koalas and eucalyptus, pandas and bamboo) renders a species more vulnerable to environmental disruption. As Dobzhansky (1937, p. 127) noted, species that narrowly concentrate adaptations may be favored by natural selection in short time frames, but sacrifice “the flexibility that retention of a goodly amount of genetic variation affords against the (inevitable) change in position of the adaptive peak.” Conservation biologists have noted that, given species with similar phenotypes, higher variability of genotypes is correlated with higher survival rates when environments are disrupted (e.g., Reed, 2007; Vellend, 2006).

The degree to which species are stenotypic or eurytopic provides more examples of the conflict between short- and long-term contingencies in phylogeny. Stenotypic (highly specialized) koalas subsist on a single food source found in a limited region, while eurytopic (generalist) humans have a variable diet and have colonized every continent. Gould (1982, p. 385) questions why eurytopic marine invertebrates still flourish even though prevailing contingencies suggest they are at a relative disadvantage to stenotypic ones. He writes “[stenotypy] seems to offer advantages at both the individual level (when environments are stable) and at the species level (boosting rates of

speciation)... why then do eurytopic species still inhabit our oceans?" His solution, concise but far-reaching, is that eurytopy survives as a function of the pruning of "stenotypic branches" during dramatic, historical environmental changes, such as those occurring during mass extinctions. This lengthy evolutionary history—in this case the *entirety* of evolutionary history—may thus constrain the degree to which specialization may dominate, though the short-term contingencies would seem to favor it. The passage calls to mind Skinner (1966):

Both phylogenetic and ontogenic contingencies are effective even though intermittent... A form of behavior generated by intermittent selective contingencies is presumably likely to survive a protracted period in which the contingencies are not in force, because it has already proved powerful enough to survive briefer periods... (p. 1207).

Might the continued success of eurytopic marine species reflect a phylogenetic parallel to the control of behavior via intermittent contingencies? Should this be true, does the continued existence of eurytopic species represent an important parallel with the behavior of self-control? Stenotypy confers benefits to species in the short-term in which conditions are likely to be stable; eurytopy confers benefits in the long-term, over which major upheavals are certain. Functionally, stenotypic species have made Faustian bargains in which they "chose" short-term fecundity over long-term success (cf. Thoday, 1953). Numerous possible parallels at other levels of selection relate to the stenotypic/eurytopic divide. In ontogeny, maintaining robust response variability may ensure that an organism contacts other contingencies, some of which may prove advantageous (e.g., Neuringer, 2002, 2004; Stahlman et al., 2013). In sociogeny, the diversity of a population may aid the health and longevity of a culture. Compare, for example, strictures on human behavior in conformity-based totalitarian states versus free expression in diverse democratic liberal cultures. For example, the United States and its citizens benefited enormously from the ingress of scientists fleeing persecution from the rising tide of Fascism in Europe in the 1930's and '40s.

Overspecialization (Gould, 1982; Kuris & Norton, 1985) occurs when a trait is selectively advantageous to an individual but disadvantageous to its group, and therefore involves a conflict between two sets of contingencies. Incompatibilities between the concurrent products of selection is a ubiquitous feature of selective systems (Breland & Breland, 1961; Domjan & Galef, 1983; Seligman & Hager, 1972; Skinner, 1977; Stahlman & Leising, 2018). In the most extreme cases, short-term selective contingencies can lead in the long term to extinction of the species (Matsuda & Abrams, 1994; Nonaka et al., 2013; Parvinen, 2005; Rankin et al., 2011; Rankin & López-Sepulcre, 2005; Webb, 2003; see Jablonski, 2008). In one example of overspecialization, sociality in spiders (genus *Theridiidae*) has had multiple independent origins across a dozen species, reflecting a short-term advantage in communal brood care, nest maintenance and hunting. Extinction is more probable in these species because of increased inbreeding (Agnarsson et al., 2006; Avilés, 1997). The deleterious long-term consequences of inbreeding conflict with the beneficial short-term consequences of communal living (see also Day et al., 2016; Normark et al., 2003). In overspecialization, immediate local consequences win out over deferred broader consequences. This is analogous to a failure of self-control in ontogeny. In each case, the dominance of the temporally proximal over the distal grants a short-lived reproductive advantage to individual organisms.

In Sociogeny

Behavior is a function not only of natural selection and reinforcement, but also of sociogenic (cultural) selection (Stahlman & Catania, 2020). This variety of selection includes observational learning, imitation, the propagation of cultural practices (Centola, 2018) and, for us humans, verbal behavior above all (Catania, 2017).

Sociogenic transmission allows for the propagation of behavior (e.g., cultural practices; Skinner, 1984) across individuals. An advantageous variant (e.g., increasingly fluent articulations of native language phonemes, better ways of crafting tools, improvements in ethnic recipes) may spread throughout a culture through observational learning and imitation, though the original contingencies that induced the variant may have operated only on a single individual.

One prominent example is the Fosbury Flop (Wasserman, 2021). This is a technique of high-jumping co-discovered and popularized by Dick Fosbury, who won with it a gold medal in the 1968 Summer Olympics. Jumpers run in a curved path to the bar and rotate their bodies upon takeoff so they pass backwards over the bar before landing on their upper back. This allows a lower center of gravity during flight than other techniques, and hence produces higher clearances with equivalent jump forces. Fosbury's technique was initially met with ridicule—a fellow jumper labeled the technique “an aberration”—but results matter. In the 1972 Olympics, merely four years after Fosbury took gold, more than half the competitors employed the Flop. Today, virtually all world-class jumpers are taught to compete using this technique.

As with phylogeny and ontogeny, in sociogeny we also encounter Faustian bargains. For example, it is typically easier to teach the use of punishment than the use of reinforcement, because a strong punisher usually has an immediate effect on the punished behavior (e.g., the ongoing behavior of the slapped child is likely to stop right now), whereas the effect of reinforcing a child's behavior today may not be evident until later. Because the administration of punishment typically has more immediate effects than the administration of reinforcers, the former is more easily learned and therefore more likely to spread through cultures, although the use of punishment may be ultimately detrimental relative to the skilled use of reinforcement.

Sociogenic evolution is analogous to phylogenetic and ontogenetic evolution, and the same principles of teleological behaviorism are applicable. Rachlin (2019, p. 70; see also Smaldino, 2014) writes,

Just as... individual temporal patterns are selected as wholes, so proponents of cultural evolution argue that social patterns are selected as wholes...institutions such as schools, training centers, etc. allow patterns of cultural traits to be transmitted ‘wholesale,’ which in turn allows for selection to operate on the group-level traits that emerge from... individual-level traits. In fact, the justification for these arguments [is] identical.

Patterns of behavior are thus preserved in a kind of group selection (e.g., Sober & Wilson, 1998;

Wilson & Sober, 1994; Wilson et al., 2008) in which responses, rather than organisms, form the members of the group (Rachlin, 2019; Rachlin & Jones, 2010; Rachlin & Locey, 2011).

As in phylogeny and ontogeny, the primrose path beckons in sociogeny too. Tensions between short- and long-term consequences abound. The development and deployment of the atomic bomb helped end a horrific war but ultimately put all humanity in danger. Clear-cutting rainforest to produce arable farmland has proximal positive economic effects at the expense of biodiversity and breathable air in the long-term. Political fights break out between those who continue to burn fossil fuels and those who seek other, sustainable sources of energy—the former sometimes arguing that the immediate (even if temporary) economic pain of transitioning to clean energy is a reason to continue with the status quo. Fracking to pull more oil from the earth is a relatively expedient solution to problems of energy availability; the aversive consequences as manifested in contaminated aquifers and even in earthquakes are deferred. The arguments resemble the addict's reasoning that the pain that comes with withdrawal is too high a price to pay for getting clean (Rachlin, 1997, 2000).

Many social problems are examples of the Tragedy of the Commons (Hardin, 1968), which denotes a disastrous trip down a primrose path. Individuals may benefit relative to their peers if they are comparatively better at exploiting a shared and finite resource. This may produce a feedback loop in which they become so much better at exploiting the resource that they deplete it and produce disaster for everyone. Modern conservation practices (e.g., legal limits on cutting down trees, fishing waters, hunting game, etc.) counter short-term self-interest. In doing so, they can maintain shared resources and protect the “rights of billions of people still to be born” (Skinner, 1975b, p. 48). The parallel to Rachlin's analysis of self-control is obvious. Proponents of deregulation may point to immediate economic benefits of exploiting a natural resource while downplaying later aversive consequences. In so doing, they advocate for the narrow view characteristic of walks down the primrose path. The looming climate crisis provides a clear and sobering example (Rankin et al., 2007, p. 649).

In what sense may sociogenic selection contribute to future-oriented behavior? Scientists have long warned about the dramatic long-term consequences of carbon emissions. A future for civilization may well depend on whether their admonitions change behavior enough that we avoid the worst of their predictions. This is self-control at the sociogenic level. An alcoholic may stop drinking because doing so fits into a valuable pattern of behavior with important and beneficial long-term consequences, so perhaps a society may stop burning fossil fuels for the same reasons. As a collection of evolved cultural practices, science itself may contribute to sociogenic self-control by identifying deferred and distributed consequences and demonstrating new ways to manage them (e.g., Pennypacker, 1992; Wu et al., *in press*).

Skinner (1990, p. 105) writes, “We know the future almost wholly from what science tells us. We may suffer overcrowding, shortages, and pollution, but they are the present; they are bits of the future that we have already reached. Only through science do we know how serious they will eventually become...” He then suggests that human behavior might adapt via cultural selection to avoid the worst possible outcomes. Science, as a complex cultural variant, has evolved so that it produces ever more accurate predictions of the future and suggests means for intervention (this too is consistent with Rachlin’s teleological behaviorism). Science communication is increasingly valuable as a part of effecting change. Dire predictions regarding our future are being widely disseminated in popular and social media, in schools, and elsewhere. The degree to which the verbal behavior of scientists affects both the verbal and nonverbal behavior of individuals may lead us away from actions that could otherwise be detrimental in the long term. Verbally governed behavior may be relatively insensitive to direct changes in contingencies of reinforcement (Catania et al., 1982; Hackenberg & Joker, 1994; Shimoff & Catania, 1998), but scientific verbal behavior is more tightly anchored to data than is political talk. In cases where the aversive consequences of actions are distributed and deferred (e.g., as when we burn fossil fuels), verbal behavior anchored to science may improve distal outcomes.

Science is special in that it rests on the maintenance of correspondences between

events and their descriptions (i.e., data and facts). But verbal behavior has other functions besides the maintenance of such correspondences. The short-term and long-term consequences of verbal behavior have led to political speech that fails to maintain such correspondence. Verbal behavior has instead, in toxic variations on verbal governance, become central to the coordination of the actions of different and more and more insular political and social groups. Too often, these groups do more than ignore the verbal behavior of scientists; they contradict it.

Harris (1977, p. 194), in an anthropological “moral soliloquy,” suggests that present day humans are more capable than their ancestors of “consciously” shaping a desirable future. In doing so, he alludes to the primrose paths our forebears walked. He writes:

I suggest that [our ancestors] were unaware of the influence of modes of production and reproduction on their attitudes and values and that **they were wholly ignorant of the long-term cumulative effects of decisions made to maximize short-term cost/benefits.** To change the world in a conscious way one must first have a conscious understanding of what the world is like. Lack of such an understanding is a dismal portent. (emphasis added)

Anthropology is properly understood as being the study of evolution via cultural contingencies (Skinner, 1981). It has, like other sciences, revealed some of the long-term consequences that have historically been hidden from view. It may also, like other sciences, suggest interventions to help. Harris (1977) continues, with words that may ring familiar to behavior analysts:

I cannot see how a lack of intelligence concerning the lawful processes that have operated so far can be the platform on which to rear a civilized future. And so in the birth of a science of culture I find the beginning not the end of moral initiative. Let the protectors of historical spontaneity beware: If the processes of cultural evolution are what I have discerned,

they are morally negligent to urge others to think and act as if such processes did not exist. (p. 195)

Conclusion

Describing the relationship between short-term and long-term consequences of behavior at each level of selection extends Rachlin's analysis from the ontogenic level (e.g., self-control) to those of phylogeny and sociogeny. Given the common features of selection, we should expect to find parallels across the three levels. And indeed, we do. The following list provides illustrative Faustian examples at each level, showing current and delayed consequences for each:

- (1). Phylogeny: Select a fancy-tailed mate now; drive species toward an evolutionary dead end later;
- (2). Ontogeny: Have a drink now; suffer a hangover and poor health later;
- (3). Sociogeny: Accept a lobbyist's money for opposing a conservation bill now; endure worsening climate later.

Within and between levels and across time, immediate and delayed contingencies may support each other or may work at odds with each other. Our verbal behavior has sometimes helped us move in the direction of less harmful long-term consequences—proverbs and morality tales have long served this function—but it has also created problems of its own. Political rhetoric can counteract or even usurp good advice (e.g., Catania, 2003). Modern science might help by identifying functional relations between our behavior and its distal consequences, thus serving a critical role in maintaining future-oriented sociogenic behavior. But is it reasonable to be optimistic?

With eyes wide open, Faust accepted the demon's bargain and relinquished all rights to his eternal soul for a few years of supernatural abilities on Earth. The bargain was a bad one, but it is not inexplicable. His actions show us someone acting in accord with short-term gains and discounting deferred negative consequences. Given Faust's history of constant striving for sublimity—no matter the cost—his handshake with Mephistopheles represents just one more step along the primrose path to his own ruin. Science has opened our eyes to some dismal

consequences of our own cultural practices over the long term. The question remains whether these verbal products of science will generate an analogue of self-control at the sociogenic level that helps us eschew the short-term benefits of ultimately harmful human behavior.

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