Ordinaries

Happiness is a genetic incentive system

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Abstract

Neoclassical and behavioral economics agree that people seek happiness, but diverge in their views of the source. Neoclassical economics assumes permanent happiness derives from objective, positive outcomes including, importantly, having financial resources. Behavioral economics argues that happiness comes from outcomes that are better than subjective reference points. Evolutionary biology understands, in great detail, both the proximate and ultimate causes of human happiness. Accordingly, evolutionary biology holds the key to a synthesis of divergent economic theories of happiness.

Ordinary: “With no special or distinctive features; normal. Not interesting or exceptional; commonplace.”
-Oxford English dictionary.

1 Happiness is foundational to economics

What would make you happy forever? One of us (Terry) asked this of a group of 400 academically-gifted North Carolina high school students during a lecture. In response, a student yelled out, “A billion dollars and a great family.” Not a bad answer, and completely consistent with neoclassical economics.

Happiness may be the most important issue in economics. Neoclassical and behavioral economists agree that human behavior is driven by a desire to be happy (i.e., ‘maximize utility’). However, the field diverges in the means of attaining the agreed upon goal of utility. Neoclassical economics assumes that objective outcomes, including money, determine happiness. In sharp contrast, behavioral economists argue that happiness is caused by gains from subjective “reference points.”

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This article explores happiness within the mission of this series (Burnham and Phelan 2019):

The Ordinaries column will interpret economic behavior from the perspective of evolutionary biology. From this view of life, the anomalies of behavioral economics will disappear into a coherent biological framework that incorporates elements of neoclassical maximization.

2 Neoclassical and behavioral economic theories of Happiness are flawed

An inspired teacher introduced the economic theory of happiness by asking a student to name a favorite candy. One student answered “Milk Duds.” In the subsequent class meeting, the teacher asked the student to the front of the class, and handed her five Milk Duds.

The student ate the five Milk Duds, and pronounced herself happy. The teacher produced five more Milk Duds, consumed by the student with a smile not quite as large. After subsequent batches of Milk Duds, the student pleaded, “Do I have to eat these?”

The Milk Dud activity illustrates the core principle of diminishing marginal utility. The standard economic model argues that when we obtain some candy, or any good, we become happier, but the value of the marginal amount shrinks (and for any particular good, might become negative).

We never tire of more money, however. So while the value of the marginal Milk Dud can become negative, neoclassical economics argues that more money always makes people happier. Wealthy humans amass large houses, beautiful jewelry and clothing, luxurious cars, and myriad technological gadgets, with smaller and smaller impact on our happiness. The one sentence summary of neoclassical economics is:

More money = More happiness.

More money = more happiness may feel intuitively correct. A short summary of the extensive body of research evidence on happiness, however, is this: *obtaining* extra money, particularly unexpected money, is great. But *having* more money has extremely limited impact on happiness. This is a reality many of us have learned through experience.

One of us (Terry again) lived in western Uganda one summer where the most commonly spoken language is Rutooro. Social greetings are an important part of daily life in this region. When traveling, cultural mores dictate that a person must verbally greet every other person along the route. The standard greeting is, “oraire ota” and the usual response is, “kurungi,” which roughly translates to, “How are you this morning?” with the answer “good”.

Because social conventions demand a hello to every individual or group on the road, days are filled with literally hundreds of “oraire ota - kurungi” exchanges. One Ugandan was asked how long it took him to walk to the local church. His answer, “that depends on how many people I see on the way.”

While the customary “*oraire ota*” and “*kurungi*” is almost invariant, emotion can still be conveyed through voice pitch and volume. Terry regularly encountered a local resident who had the most reliably positive and powerful KURUNGI in the region. His single word seem to say, “I am feeling great! Thank you for asking. Isn’t it a fantastic day? Wow, we are lucky to be alive!”

Those who subscribe to the neoclassical view of happiness might be surprised then to learn that this enthusiastic Ugandan traveled by wheelchair. Furthermore, his wheelchair was cobbled together from the scavenged parts of a shopping cart. Crooked and unmatched wheels were MacGyvered to a rickety frame. To make matters worse, the unpaved roads were a treacherous obstacle course of ruts, rocks, and rainy-season mud.

If happiness comes from material goods and money, how can a man in a shoddy wheelchair, struggling to navigate a rocky road, produce the strongest smile?

The Ugandan “*kurungi!*” story is consistent with the vast data on happiness. When you ask people to rate their happiness, you find almost no relationship between money and happiness. In fact, there are virtually no measurable factors—such as money, height, age, health, marital status—that account for a person’s happiness. For example, as U.S. GDP per capita approximately doubled between 1971 and 2001, average self-reported happiness ratings remained exactly unchanged (Easterlin and Angelescu 2012). Similarly, suicide, anti-depressant use, and other objective measures of well-being are uncorrelated with wealth or poverty.

There are a few nuances in the happiness data. For example, there appears to be a U-shape across the lifespan, with young and old people being the happiest, and middle-aged people relatively less happy. Additionally, some scholars see a coarse relationship where more money improves some aspects of satisfaction, but only up to a threshold (Kahneman and Deaton 2010).

Others, however, note that even these modest correlations between individual attributes and happiness may be spurious. For example, rich people in rich countries tend to have different circumstances from poor people in poor countries. The correlates of wealth, such as freedom of speech, may be the underlying source of the second order fluctuations in happiness. It is possible that money has no permanent impact on happiness. (see Frederick and Loewenstein 1999; Diener 2009 for reviews.)

A second—and remarkably robust—feature of the happiness data, is that people adapt relatively quickly to events. The most famous of these adaptation studies contrasted lottery winners with people who became permanently disabled (Brickman et al. 1978).

What is the happiness impact of a lottery win or a crippling car crash? The immediate emotional response is exactly as predicted by neoclassical economics. Lottery winners are extremely happy to have won, and those suffering permanent injuries are devastated. Within about a year, however, the two groups almost completely return to their pre-event happiness levels.

Happiness is more like a person’s height than a measure of their wealth. The best predictor of an individual’s happiness at age 30 is not money, fame, education, or physique. It is their own happiness at age 6. Just as tall people tend to stay tall, happy people tend to stay happy.

Table 1 Economics and Happiness circa 2020

Phenomenon	Happiness is not caused by money. Happiness has almost no relationship to any objective characteristic. Changes in happiness due to successes and failures are transitory.
Neoclassical economics	Expected utility theory. More money = more happiness.
Behavioral economics	Prospect Theory. Happiness is caused by gains and losses relative to a reference point. The source and nature of reference points is not addressed.

The neoclassical economic model of happiness is wrong.

As a replacement for standard neoclassical theory on the relationship between money and happiness, Kahneman and Tversky (1979) propose ‘prospect theory.’ In this behavioral economic theory, people love extra money, hate losses, and the impact of anything on happiness depends on its distance from some unspecified ‘reference point.’

Prospect theory is more consistent with the happiness data than the neoclassical model. However, this better fit is true, in part, by assumption because prospect theory was invented to explain the data. Furthermore, behavioral economics does not address the origin or nature of reference points. Prospect theory may be the best theory that economics has for understanding human behavior, but it is also post hoc, inconsistent, and atheoretic (Table 1).

3 Dopamine, happiness, and the nervous system

All multicellular animals (other than sponges) have a nervous system—a network of cells that connects the organism to the world by enabling sensations of light, sound, touch, taste, and smell. The nervous system also facilitates the organism’s response to that sensory information. The accumulated information carried by neurons—whether they are firing or not firing—is also responsible for information storage and retrieval. In humans, memories, ideas, and emotions are reified as biochemical reactions inside neurons.

The fundamental units of the nervous system are neurons—which specialize in detecting stimuli, integrating that information, and coordinating and effecting responses. Nociceptors, for example, are sensory neurons capable of detecting pain (Dubin and Patapoutian 2010). Chemical, thermal, or mechanical stress can induce a change in the nociceptor membrane potential.

When this nociceptor membrane potential change exceeds a threshold, a signal is sent along the neuron via an action potential. This signal is perceived as pain. Nociception occurs across a wide phylogenetic range of animals, throughout the vertebrates and invertebrates, including worms, slugs, insects, and humans (Illich and Walters 1997; Wittenburg and Baumeister 1999; Sneddon et al. 2003; Tracey et al. 2003).

Communication takes place at the synapse between neurons. In response to stimulation, neurotransmitters are released into the synaptic cleft where they may

propagate the signal by binding to an adjacent cell. The neurotransmitters released by neurons are chemicals that initiate or modify the perception of a wide variety of actions, moods, feelings, or other sensations. Several dozen neurotransmitters have been identified, each of which has a sort of “personality” based on the effects associated with its release.

While the firing of nociceptors is responsible for the perception of pain, the firing of dopamine neurons produces intense pleasure (Berridge and Kringelbach 2015). Chemically, the dopamine molecule (3, 4-dihydroxyphenethylamine) has a benzene ring, with two hydroxyl groups, attached to an amine group by an ethyl bridge. In humans, dopamine is produced from tyrosine via a series of chemical reactions that take place inside dopaminergic neurons.

When dopamine is released as a neurotransmitter it binds to G-protein coupled receptors (GPCRs) that are divided into two subclasses. When the dopamine ligand binds to a GPCR, a signal cascade occurs where an increase in cyclic AMP (cAMP), leads to a phosphorylation cascade catalyzed by protein kinase A disinhibited by the elevated cAMP concentration (Hornykiewicz 1966; Beaulieu et al. 2015).

Pleasure is mediated by a mesolimbic pathway that links the ventral tegmental area (VTA) with the spiny neurons of the nucleus accumbens in the ventral striatum. Accordingly, the nucleus accumbens is sometimes called the brain’s ‘pleasure center.’ This dopamine system is likely to be an adaptation, produced by natural selection, as it is conserved across broad taxa (Damasio and Carvalho 2013).

Many details of the pleasure system are known. In vivo recordings of individual neurons demonstrate the link between dopamine release and reward perception (Cohen et al. 2012; Schultz 2013). Destruction or inactivation of dopamine neurons in reward centers reduces or eliminates reward perception, regardless of whether this is achieved via surgical lesions (Teitelbaum and Epstein 1962) or targeted toxin lesions (Berridge et al. 1989) or administration of dopaminergic antagonists (Wise 1982; Geary and Smith 1985; Berridge 1996).

Dopamine can influence behavior in a dramatic manner. In one study, for example, rats were given a choice between food and direct neural stimulation. Electrodes were implanted directly into the neural pleasure center of each animal. The rats were then provided with two levers: one lever resulted in food, the second with direct neural stimulation. The animals could switch between the two levers to obtain a mixture of food and pleasure, or they could focus on one lever.

What happened? The rats chose instantaneous dopamine ‘til death’ (the food would also have produced dopamine, but in smaller quantities and with a lag). The animals continued pressing the pleasure-center-stimulation lever until they literally died from starvation. One animal stimulated itself more than 7500 times in a 12-h period (Olds and Milner 1954).

Psychologists have also studied the role of dopamine in learning and behavioral modification under less extreme situations. Dopamine can be produced by two sorts of stimuli, categorized as unconditional and conditional. An unconditional stimulus produces dopamine without any learning. If you feed an animal, the pleasure centers are flooded with dopamine (Yoshida et al. 1992). There is no need to teach a dog to like meat, or a child to enjoy candy.

While unconditional stimuli create dopamine without any previous exposure, conditional stimuli must be learned. Ivan Pavlov's fame derives from his work training dogs to acquire conditional stimuli. Pavlov trained his dogs that a bell, a metronome, or some other signal reliably predicted the future delivery of food. The bell is a conditional stimuli. Pavlov was able to get a salivary response to the metronome that was as strong as the untrained response to a piece of meat.

B. F. Skinner extended Pavlov's research by demonstrating that learning is modulated by the same dopamine system. With this understanding, Skinner was able to teach pigeons to play ping pong, answer math questions, and even guide bombs to targets (Skinner 1948).

Dogs, pigeons, and humans can learn a wide-variety of behaviors using this dopamine-mediated stimulus–response system. Whatever conditional stimulus leads to dopamine is reinforced by the pleasure it creates. Organisms are built to seek more dopamine by repeating the behavior. For this reason, brain researchers often refer to pleasure centers as “do-it-again” centers.

Methodological advances have made it possible to directly measure the level of dopamine release in the brain in response to external events. Wolfram Schultz, a leader in the field, writes, “an important feature of dopamine responses is their dependency on event unpredictability” (Schultz 1998, p. 3).

The dopamine system responds not to outcomes, but rather to new information. As a consequence, an untrained brain receives a dopamine surge when something good happens. Conversely, when an organism *expects* a reward, the actual arrival of the reward produces no extra dopamine (Schultz 1998, 2010, 2016). In the Pavlovian setting, for example, this means that the trained dogs receive dopamine when the bell signals that food is coming, but no additional dopamine in response to the food's arrival and consumption.

The converse is true as well. Any negative surprise, where the outcome is even slightly worse than expected, leads to suppression of dopamine release. Wolfram Schultz summarizes the dopamine system as “happiness = outcome minus expectation.”

Dopamine responds to changes in information perceived by our nervous system. Unexpected good information increases dopamine release while worse-than-expected information reduces dopamine release. Expected outcomes, regardless of whether they are amazing or terrible, do not cause the release or suppression of dopamine.

Human happiness is caused by the release of dopamine by neurons in the nucleus accumbens and other parts of the brain.

4 Happiness (and other biological traits) have proximate and ultimate causes

What is the source of happiness? As just described, dopamine is one answer to this question. But it is not a complete answer.

Biology uses a framework that recognizes multiple, complementary categories of explanations for any phenomenon (Tinbergen 1963). These include both ‘proximate’ and ‘ultimate’ causes. The proximate level of analysis is a physiological,

mechanistic explanation; *how* does something occur? The ultimate level of analysis is an evolutionary, adaptive explanation for a phenomenon; *why* does something occur?

Consider the phenomenon of bird migration each winter. The proximate cause of these annual treks is the shortening day length, perceived by the optic nerve, altering the release of melatonin by the pineal gland, which, upon crossing some threshold, triggers the behavior of facing south and flying. The avian hippocampus is centrally involved in navigation and geographic orientation (Herold et al. 2019).

The ultimate cause of bird migration lies in evolutionary payoffs as measured by survival and reproduction. Over evolutionary time, birds that did not migrate south for the winter froze to death (and/or starved). Conversely, birds that did migrate, survived and thrived. Consequently, all birds in a population today must be the descendants of those that migrated—and so carry the version of genes that induce such behavior.

The proximate and ultimate causes of bird migration, while different, are both correct and, in fact, complementary. To further explore causation, consider the sex ratio of dogs. If we add up all the births of dogs around the world in a year, the number of male puppies born is very close to the number of female puppies born. The sex ratio in dogs is 1:1. Why?

The proximate cause for the 1:1 canine sex ratio lies in the chromosomes. Individuals with two X chromosomes develop as female. Individuals with one X and one Y chromosome are male. All eggs carry one X chromosome, while half of a male's sperm carry an X chromosome and the other half carry a Y chromosome (Beatty 1970). Because half of sperm carry a sex chromosome that results in a female puppy, and half carry a sex chromosome that results in a male puppy, the result is a 1:1 sex ratio at birth.

The proximate explanation seems to fully describe the phenomenon. However, there are many examples where the sex ratio is not 1:1 (Hamilton 1967). For example, males make up significantly more than half of baby Australian brushtail possums (*Trichosurus vulpecula*) under some conditions. This is true even though these possums utilize the same mechanism as dogs for producing gametes and sex determination.

To understand the phenomenon more thoroughly, therefore, we need to consider the ultimate explanation for sex ratios. The mathematical solution to the optimal sex ratio, derived from evolutionary payoffs, was produced by Fisher (1958).

Colloquially, Fisher's theorem takes the form of thinking about a gene inside an organism 'trying' to maximize the number of grandchildren it produces—that is, maximizing its market share relative to other versions of the gene in subsequent generations. This measure of the evolutionary success of a version of a gene is called its fitness.

Imagine yourself as a gene inside a dog, living in a world filled with mostly female dogs. What is likely to lead to higher number of grand-puppies—a male or a female offspring?

The answer is that in a female-dominated population, males are relatively scarce and consequently have a higher average reproductive payoff. Production of male offspring would be favored in such a population. Conversely, female

offspring would be favored in a population with a preponderance of males. And so there is an equilibrium solution: the optimal sex ratio is 1:1, if males and females are equally costly (Fisher 1958). This is the ultimate cause for the observed birth sex ratio in dogs.

Why then are more than half of the Australian brushtail possum babies male in some situations? The ultimate cause derives from the fact that mothers and daughters live together in tree hole dens, while sons disperse to other communities. When the suitable holes are scarce, co-habitation by daughters negatively impacts both mother and daughter (Jennions et al. 2017).

Fisher predicts the equilibrium 1:1 ratio only when costs to the sexes are equal. If possum daughters ‘cost’ more because they co-inhabit dens, then there is evolutionary pressure for the sex ratio to be skewed toward sons. Fisher’s theory is supported by hundreds of research studies showing adaptive sex ratios that differ from 1:1 (Navara 2018).

The proximate cause of sex ratios, or any biological phenomenon, is not sufficient. As with the phenomenon of bird migration, more complete understanding requires combining proximate and ultimate causation.

We return to the issue of happiness. Dopamine is the proximate cause of human happiness. What is the ultimate cause?

5 Happiness is a genetic incentive system

To understand the ultimate cause of happiness, consider two questions.

- First, why do we derive no pleasure from our autonomic nervous system?
- Second, why does maple syrup taste sweet?

Our autonomic nervous system regulates heart rate, blood pressure, digestion, breathing and myriad other essential functions (as long as we are healthy). This life-sustaining physiologic regulation operates without our conscious awareness. Notwithstanding its central role in sustaining life, the autonomic nervous system produces little or no dopamine.

That might seem counter-intuitive. Why would we receive more happiness from a dollop of syrup than from our very existence? We say, “these pancakes are amazing” when it seems we ought to exclaim, “being alive is great.”

The natural sciences explanation involves two important, subtle, concepts. The first is evolutionary mismatch, covered in a previous Ordinaries column (Burnham and Phelan 2020), and the second is the gene-centric view of the world. We start with ‘selfish’ genes and revisit sweetness and mismatch below.

Dawkins (1976) explains that organisms are temporary vessels, crafted by natural selection, to favor the replication of genes:

What weird engines of self-preservation would the millennia bring forth? Four thousand million years on, what was to be the fate of the ancient replicators? They did not die out, for they are the past masters of the survival arts. But do not look for them floating loose in the sea; they gave up that cavalier freedom long ago.

Now they swarm in huge colonies, safe inside gigantic lumbering robots, sealed off from the outside world, communicating with it by tortuous indirect routes, manipulating it by remote control. They are in you and me; they created us, body and mind; and their preservation is the ultimate rationale for our existence. They have come a long way, those replicators.

Now they go by the name of genes, and we are their survival machines.

Humans and other organisms are ‘survival machines’ shaped by natural selection. All aspects of human nature are the product of this process. These include morphology of bone, muscles and organs, our brains and our behavioral mechanisms. Importantly, natural selection produced the brain’s pleasure center and the drive to repeat behaviors that produce dopamine.

The ultimate cause of human happiness is maximizing genetic replication.

Preferences and pleasure form a biologic incentive system shaped to induce behaviors that replicate genes. Our genes give us dopamine-induced happiness when we do their bidding. In some cases, the link between pleasure and genetic replication is direct. For example, food and sex create pleasure because they are central to survival and reproduction (Diamond 1998).

If the gene is the boss, and dopamine-derived happiness is the currency of genetic influence, why do we receive no dopamine for maintaining a strong heartbeat? The answer is that happiness is used in situations where the organism is in a position to know more about the correct behavior than the genes (Burnham 1997).

While genes are powerful in their ability to shape behavior, they are not omniscient. Our genes could direct us to eat a specific food or travel (like a migrating bird) to a specific location. Yet, direct control of human foraging behavior has not evolved. This is because food is unpredictable in both location and form. Rather than pre-program our every dietary action, our genes produce a flexible, contingency-based system where we choose foods guided by a genetically-encoded pleasure system.

The gene-centric view explains the lack of pleasure we derive from our autonomic nervous system. The correct respiratory rate, for example, is determined by subconscious factors that are measured by our physiology. Because the respiratory system runs on autopilot, our genes do not need to reward us with dopamine for breathing. No motivation is required. In fact, if we were to spend too much time appreciating our breathing and enjoying a dopamine reward for doing so, it might distract us.

Question number one is answered. Happiness is an incentive system designed to reward organisms for efficient behaviors that cannot be directed by genetic autopilot. Our autonomic nervous system, in contrast, is pre-programmed, so is not part of the dopamine incentive system (Burnham 1997).

Now, let’s turn to the question of why we receive pleasure from maple syrup. Perceiving sweetness is an evolutionary adaptation to allow us to recognize—and,

consequently, seek out—molecules in the environment that we can use for metabolic energy.

Sweetness is different from many other aspects of our sensory system (Johnston 1999). There is an objective aspect of temperature, brightness, color, and many other attributes that we sense, independent of our experience of them. For example, the molecules move faster in hot water than in cold. The wavelength of blue light is shorter than of red light, etc.

There is no similar objective measure of sweetness. It exists only in our nutritional machinery. Humans have the ability to efficiently capture the energy stored in the chemical bonds of the monosaccharides in syrup and convert it into the high-energy molecule ATP that is essential for cellular work. Lighting maple trees on fire or feeding them to termites reveals that the wood is also full of energy stored in chemical bonds—as much or more than in the syrup. Humans, however, cannot convert the energy stored in the chemical bonds in cellulose into ATP (Phelan 2018).

Humans evolved by natural selection to get pleasure from eating maple syrup and not from eating the wood of maple trees. A thought experiment captures the essence of the evolution of the perception of sweetness. Consider two gene variants ('alleles'). One allele encodes for taste buds that release dopamine when the person eats wood pulp. The second rewards sugar in the mouth with dopamine.

Natural selection favors the alleles that produce dopamine from sugar consumption because they will motivate their survival machines to locate and consume the molecules—sugars—that can fuel growth, activity, and reproduction. The same process leads to opposite preferences in termites (dopamine for wood, no dopamine for syrup).

We enjoy maple syrup because, among our ancestors, those who consumed maple syrup had better genetic outcomes—that is, higher fitness—than their human competitors who did not. Preferences evolve over evolutionary time, and our taste buds today reflect the lagged fitness value of different food types to our ancestors. An extra gram of sugar for our ancestors led to higher replication rates for their genes.

In a perverse twist, most modern humans, living in environments characterized by virtually unlimited access to sugars and other sources of calories, would be healthier if we consumed more fibrous wood pulp and less sugar (Berer et al. 2018). For many of us today, an extra gram of sugar leads to increased morbidity and mortality. The genetic mismatch between our preferences and our environment is covered in the Ordinaries column, "Mismatch: Strangers in a strange land" (Burnham and Phelan 2020).

The genes in ancestral humans who ate more sugar replicated more than the genes in competing humans who did not eat sugar.

The ultimate cause of pleasure generalizes in two ways.

Why do I get pleasure from X? The genes of ancestral humans who did X replicated more than the genes of competing humans who did not do X.

Why do I get displeasure from Y? The genes of ancestral humans who did not do Y replicated more than the genes of competing humans who did Y.

The ultimate cause of happiness is to induce us to engage in behaviors that were good for the genes of our ancestors. From this perspective, the mystery of happiness is removed.

6 Biology improves economic theories of happiness

Obtaining money produces happiness, but having money fails to produce permanent satisfaction. This is a central issue for economics and beyond. We strive toward illusory goals, repeatedly believing that happiness will soon be within our grasp. Once a goal is achieved, however, the emotional goal posts are moved.

The proximate cause of human happiness is the release of dopamine in the brain's pleasure center. Dopamine is released in response to unexpectedly good outcomes, and withheld when outcomes fall below expectations. We feel bad about objectively great outcomes if they are disappointing. Silver medalists in the Olympics are unhappy (McGraw et al. 2005)—a finding in complete opposition to the prediction of neoclassical economics.

The ultimate cause of this happiness system lies in its evolutionary function. Natural selection created dopamine and the pleasure-based learning system to manipulate behavior so as to increase genetic replication, not to increase happiness (see Table 2 for a summary).

Table 2 Economics and Happiness with the natural sciences

Phenomenon	Happiness is not caused by money. Happiness has almost no relationship to any objective characteristic. Changes in happiness due to successes and failures are transitory.
Neoclassical economics	Expected utility theory. More money = more happiness.
Behavioral economics	Prospect theory. Happiness is caused by gains and losses from a reference point. The source and nature of reference points is not addressed.
Evolutionary biology	The proximate cause of happiness is the release of dopamine. Dopamine responds to changes in information. The ultimate cause of happiness is to provide incentives for (ancestral) humans to achieve the genes' goal of reproductive success.

The ultimate cause of happiness is genetic replication. Here is a modified excerpt from *Mean Genes* explaining this perspective (Burnham and Phelan 2000).

Owners of dog racing facilities have learned how to create exciting contests by using an artificial rabbit. The dogs think they'll soon be feasting on rabbit flesh, but they'll never catch their prey. To entertain the customers, the racetrack keeps the rabbit just ahead of the dogs.

Happiness is a tool that our genes use to induce us toward behaviors that benefit them. The rabbit moves to further the interests of the racetrack owner, not the dog. Similarly, we strive towards elusive goals, not for our own happiness, but to further the interests of our genes.

We've been built in such a way that satisfaction cannot be won by accomplishing particular goals nor lost by any setback. Allowing us to rest on our laurels or weep over spilt milk would be a genetic mistake. Our genes don't care about our past achievements, only about continually re-positioning our emotional rabbits to keep us working.

Happiness and unhappiness are tools created by our genes to further their goals. Regardless of our circumstances, our instincts squeeze the most out of us. We are therefore very attentive to small changes that indicate progress and are almost completely unmoved by anything that we expect.

The evolutionary perspective holds the promise of a synthesis between neoclassical and behavioral theories of happiness. Behavioral economics is correct to identify movement away from reference points as a key to happiness. In fact, the dopamine system is a nearly perfect reification of prospect theory. However, neoclassical economics is correct to recognize that what appears to be an ad hoc, inconsistent set of moving reference points has been produced by an optimization process.

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