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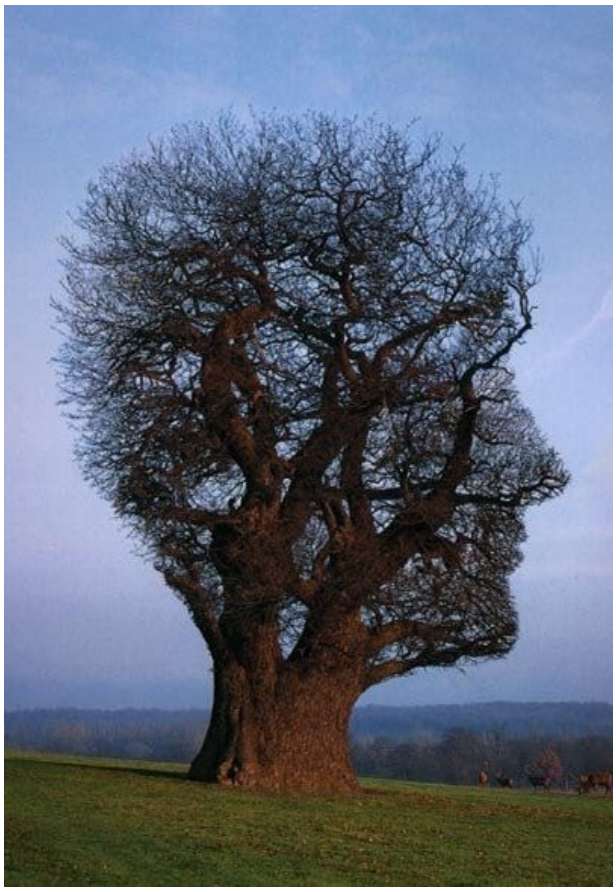
Why We Consume: Neural Design and Sustainability

Peter Sterling



Exponential economic growth is rapidly destabilizing the biosphere. Among the many factors that stimulate such growth is the human tendency to consume goods and services far beyond what is required to meet basic needs. We have to grasp what drives this tendency in order to manage it. The brain's core circuits were long believed to stimulate us to seek pleasure—greedily and selfishly—while higher cortical circuits try to rein us in. Neuroscience now shows that the core circuits serve not pleasure per se, but efficient learning. When we obtain a reward that our frontal cortex values highly, the core circuit delivers a chemical pulse that we experience as satisfaction—so we repeat the behavior. Satisfaction is brief and diminishes as a particular reward becomes predictable. This circuit design works well for pre-industrial societies in which rewards are varied and unpredictable. But capitalism shrinks the diversity of possible rewards, leaving the remainder less satisfying, and making stronger doses—i.e., more consumption—necessary. The path toward sustainability must, therefore, include expanding the diversity of satisfactions.

The evidence deepens daily that human activity is now imperiling the stability of the biosphere. The main cause is exponential economic growth, driven on the production side by capitalist competition, pursuit of profit, and financial manipulation. Yet persistent growth ultimately requires demand—that is, individual consumption. If people consumed less, stuff would accumulate and growth would slow. Economic growth far exceeds population growth, so if economic growth could be slowed, there would still be enough for all seven billion of us, at least if wealth were distributed more equally.

So why do people consume ceaselessly, far beyond the point of meeting basic needs? There are social factors, such as competition for status, and personal factors, such as shaping a self-image. Advertising plays on these factors while also stimulating us to imagine how wonderful new goods will bring fresh satisfaction. And they do briefly, but desire always resumes. Something at our neural core continually stimulates acquisitive behavior, and we urgently need to identify and manage it.

Why do people consume ceaselessly?

The standard idea, repeated over half a century, is presented again in Peter Whybrow's new book *The Well-Tuned Brain*.[1] According to Whybrow, chair of psychiatry at UCLA, the human brain is a "hybrid" comprising an ancient, preconscious core and a newer, conscious cortex. The core, he says, makes us instinctively selfish, driven by habit, and focused on short-term pleasure; the cortex supports executive functions, predominantly punishment and control. Whybrow believes this hybrid worked for hunter-gatherers because their existence was characterized by scarcity, and whatever they found had to be consumed immediately. But today, easy credit, low interest rates, and cheap goods stimulate unbounded consumption. Whybrow believes that the reason for our selfish, greedy, short-term, pleasure-seeking behaviors is that our frontal cortex fails to dominate the lower pleasure regions.

Whybrow urges us to accept more responsibility for our actions and "retune" our brains by building "character," a quality he says is not innate, but has to be "crafted through thoughtful self-command." "Neuroscience," he asserts, "suggests it's time to put impulse aside and to consider the longer view." Were he correct that this is how our brains and instincts work, we would be in even deeper trouble than we actually are. But this view of brain organization rests on a vague neuroanatomical concept from the 1950s, and his view of human nature draws on a still older view, roughly equivalent to "nature red in tooth and claw." Neither is supported by current neuroscience.

The brain's key problem is not a conflict between greed and character. Rather, its problem is how to compute efficiently. Our brain draws only 12 Watts, like a refrigerator light bulb, and fills a volume only slightly greater than a milk carton, yet it

out-thinks a supercomputer that draws millions of Watts and fills a room. To achieve this level of efficiency, natural selection has shaped every aspect of neural design for economy and integration. There can be no "hybrid," no clunky or leftover parts.[2] So how does current neuroscience understand the true function of this so-called "pleasure" circuit? And what does it say about our instincts beyond selfishness?

A Brain Circuit for Learning

The so-called "pleasure" circuit does not concern pleasure per se; it actually serves learning. The circuit evolved 450 million years ago in worms and persists because it is an efficient way to learn almost anything.[3] When we seek and obtain what in a given moment we value most (a primary reward), the circuit delivers a pulse of dopamine to several key areas, including the frontal cortex.[4] We experience this pulse of chemical as a pulse of satisfaction. The pulse soon fades, so to obtain another, we repeat the behavior. Practice leads intermittently to improvements, and each improvement is followed by a fresh pulse of satisfaction. This keeps us practicing, which further refines the neural connections for skillful and efficient execution—learning.

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Satisfaction is designed to be brief. The circuit needs to serve all sorts of learning and seeking—for food, water, salt, sex, warmth, social affiliation—but if satisfaction were prolonged, learning and seeking would grind to a halt. It seems cruel to scold people for seeking short-term pleasures because this core circuit, which drives us to do so, provides no other kind. Moreover, neuroscience suggests that our problem is not too many sources of short-term pleasure, but too few.[5]

More sources are needed because the circuit is designed to *adapt*. As a primary reward repeats, it becomes predictable, causing the pulse of satisfaction to shrink. The same meal repeated, or the same salary, or the same sex, delivers progressively less satisfaction. For a full pulse of satisfaction, the circuit requires the primary reward to be *better* than predicted. This design works best in an environment where primary rewards are diverse. But as capitalist social organization shrinks the diversity of primary rewards to the realm of material consumption, they become predictable and less satisfying. Limited to a few sources of primary reward, we consume them more intensely as the circuit adapts, and eventually they become addictions.

Whybrow repeatedly condemns our "Faustian bargain." But Faust, trapped indoors with narrow academic pursuits, felt profoundly dissatisfied and restless. He simply desired a full existence with diverse sources of satisfaction, and for seizing that, he was damned. Under natural conditions, the innate neural circuit that drove Faust does not compel greedy behavior. The circuit simply alerts the organism continually and insistently to every chance for a small satisfaction. Hunter-gatherers have intimate contact with an environment in which any moment might bring something

new: a berry, a rabbit, a patch of shade. Pre-industrial producers encounter similar opportunities, but the mechanization and specialization of capitalist production shrinks this diversity.

Such losses, what Marx called "alienation," leave us unsatisfied in the midst of material comfort—urgently seeking. Certain items—sweets, greasy food, alcohol, nicotine, cocaine, amphetamines, opiates, gambling, novel products—satisfy instantly because they act rapidly on the brain to increase the level of dopamine. The consumer feels this increase briefly, but soon these primary rewards engage the circuit's intrinsic tendency to adapt, which is why they are so dangerously addictive. Since brains differ, both innately and through experience, some people's brains (Whybrow's, for instance) might treat the expression of "character" as a strong primary reward. Whenever they are punctual, obey a law, or refuse a donut, they get a pulse of dopamine. But for others, self-control and long-term planning do not satisfy, and they are left with the goods and drugs that capitalism offers.

Human Nature

Neural design indicates that our nature cannot primarily be selfish.

Social Darwinists in the nineteenth century claimed that humans have an intrinsic "nature," one that is primarily selfish. The claim has been repeated endlessly, and to counter it, thinkers on the left have denied that that there is any such thing as human nature. Yet considerations of neural design indicate that we *must* have a nature. And the same considerations make clear that it cannot be primarily selfish. It is, in fact, far richer.

Computational efficiency requires innate neural circuits that develop under genetic control. This allows natural selection to tweak and prune circuits over many generations to optimize function for a given cost in energy and space. Thus, we have innate visual circuits that recognize motion, color, objects, and faces; and we have innate auditory circuits that learn language and music. Such circuits segregate within the brain because efficient layout shortens the wires, thereby conserving energy and space. For the same reason, circuits segregate between the cerebral hemispheres—reading and speaking on the left, art and music on the right—and this imbues the hemispheres with different computational skills.

Brain space is precious in part because innate circuits expand with practice. A motor circuit forms new connections and enlarges as a violinist practices her fingerings; so does a mapping circuit as a taxi driver navigates a city. But once the skull stops growing, so must the brain. Practicing one circuit therefore shrinks the space for others.[6] No individual can become equally adept at every task because there is insufficient time for practice, insufficient space in the skull, and insufficient energy

from the body's overall metabolic capacity. A brain that would develop all the computational skills required by a successful community would require implausibly large neural resources.

Homo sapiens' evolutionary genius was to apportion different skill sets to different brains. One brain gets special circuits for manual skills and patience—a natural toolmaker; another brain gets special circuits for observational skills and athleticism—a natural hunter. Likewise, there are natural farmers, healers, storytellers, musicians, and spiritual leaders. Innate circuits are refined through practice—through nurture of our nature. And, of course, we tend to practice what we innately do best because that brings more small satisfactions. So our species' success depends on having innate circuits, on distributing them differently within each brain, and on distributing them in various combinations within brains of different individuals.

The innate "satisfaction circuit" serves neural efficiency in several ways. First, it delivers satisfactions in the mathematically optimal form: quasi-random, brief pulses that shrink as the primary reward becomes predictable. Second, it encourages practice that refines circuits for greater speed and accuracy and for greater efficiency in space and energy. Third, it encourages the individual to exercise the circuits for which he has more innate talent, thus reinforcing the division of skilled labor. A community where each brain is innately wired for a different skill set ("experts") will easily outcompete a community where all brains are alike ("jacks-of-all-trades"). But *only* if the "experts" can cooperate.

Social policies should follow the precept "Expand satisfactions!"

In a group of purely selfish individuals, cooperation fails. To benefit from complementary skill sets, some members must have social skills, such as altruism and the ability to punish non-cooperators. For such individuals, these pro-social behaviors serve as primary rewards. Put an altruist in a brain scanner and observe the neural signatures of satisfaction while she behaves generously or watches another person behave generously. The same signatures appear when the altruist punishes a non-cooperator. The satisfaction circuit that serves practical learning thus also serves social learning. Upon this combination rests our species' awesome computational capacity.[7]

Implications for the Great Transition

What insights from brain design might aid the transition to a sustainable civilization? First, we must grasp that humans consume compulsively—insatiably—in large part because our clever circuit for reward learning now encounters too few sources of small surprise. We may rail against the capitalist manipulations that drive consumption from the top down, but that will not satiate our innate, bottom-up drive to consume. Therefore, social policies should follow the precept "Expand satisfactions!" We should

re-examine and enumerate the myriad sources that were alienated under capitalism. The list will resemble roughly what we do on vacation: more nature, exercise, sports, crafts, art, music, and sex—of the participatory (non-vicarious) sort.

To "de-alienate" on a large scale would require reorganizing economies and altering patterns of investment. Social planners should recognize that efficient brain design causes individuals to differ in what they value and thus in what they choose as primary rewards. What satisfies certain individuals will leave others still seeking. Since these patterns emerge bottom-up from brain design, social policies must accommodate them or be doomed. Start in the classroom, where we now confine large groups of children with diverse innate abilities to "attend" to one topic presented by a "teacher" on behalf of the State. A worse match to the brain circuit for learning can hardly be imagined.

Neuroscience brings to the Great Transition clarity on the role of innate circuits in achieving satisfaction and social cooperation.

Second, we must grasp that *sapiens*' efficient computation rests on two complementary processes: specialized practical skills and specialized social skills. The ingenious mechanic or mathematician may be unable to look you in the eye, whereas a brilliant counselor or political organizer may be unable to change a tire. Even a small population will harbor both skill sets, but in uneven distribution. A natural altruist will give, a natural punisher will correct a non-cooperator, and from these behaviors, each will obtain a small satisfaction. A natural non-cooperator will get the same satisfaction from a selfish behavior. Thus, social planners should explore new ways to enhance the non-cooperators' satisfactions from pro-social behaviors.

Marx complained that philosophers only *interpret* the world, whereas the point is to change it. Ironically, that is what capitalism achieved—uncomprehending planetary change. Marx might have felt the same toward neuroscientists who only elucidate circuits but offer no detailed roadmap for full transition. Yet the core responsibility of science is to *clarify* as a foundation for sound strategic thinking. This is what neuroscience brings to the Great Transition: clarification of the role played by innate circuits in achieving satisfaction and social cooperation. This can sharpen our thinking and help guide us forward.

Endnotes

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5. Sterling and Laughlin, *Principles*; Peter Sterling, "Allostasis: A Predictive Model of Regulation," *Physiology and Behavior* 106 (1): 5-15.
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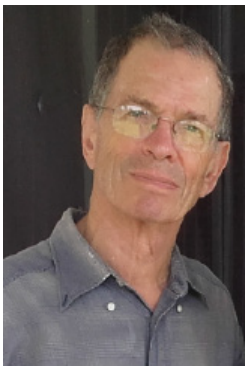
About the Author



Peter Sterling is Professor of Neuroscience in the University of Pennsylvania School of Medicine. In his forty years there, he has studied brain architecture and function in the laboratory and taught neurobiology to medical and graduate students. His lifelong social activism impelled him to investigate how capitalist social organization affects brain function and thus health—leading to a new model of physiological regulation, termed "allostasis." He is the co-author, along with Simon Laughlin, of *Principles of Neural Design* (2015).

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