

component in the system may have multiple such internal dependencies and influences, sometimes amplifying one another, sometimes canceling out each other. It is reasonable to assume that all of the above personality dimensions are continuously shaped in the joint external/internal environment and co-adapt and develop accordingly. Pertinent questions about such behavioral development are predominantly whether a higher-order urge can develop *de novo* and whether an abstract urge can develop from concrete ones (it is less demanding to be able to suppress something than to be able to suppress anything). We can be fairly confident in answering positively to both questions because these phenomena pertain to various forms of learning (instrumental, generalization, and so on). This also answers positively another emerging question, whether higher-level monitoring and controlling urges can be learnt through adequate stimulation. Positive functions such as suppression and resolve are possible within this configuration, but they are not the only ones. For example, behavioral replacement in a rich or merely different environment is also a possibility. This can be gesturally homomorphic, such as vaping instead of smoking, or arbitrary behavioral replacement, such as painting instead of smoking. Negative phenomena are also possible, such as obsession when no replacement or suppression works.

Depending on the nexus of personal, social, cultural, and contextual factors present at the time, the behavioral trajectory may naturally veer toward or away from positive or negative attractors, that is, with minimal effort. Substantial and probably conscious effort might be necessary to revert to the other direction, whichever this is. It is perfectly possible to abandon effortlessly a malignant habit, for example, thanks to the appearance of a significant other, and to have a hard time sticking to a desired creative behavior, for example, because of social constraints. The conscious nature of some of these activities is reflected in the perceived effort it takes to engage in them, itself also an outcome of self-organization.

What appear ultimately as powers or weaknesses are emergent phenomena in a self-organized motivational/emotional system that feeds itself on the wealth and the contingencies of complex internal and external interactions and that is in constant motion. Our battles are lifelong.



Financial support. This research received no specific grant from any funding agency, commercial, or not-for-profit sectors.

Conflict of interest. None.

References

- Berridge, K. C. (2009). Wanting and liking: Observations from the neuroscience and psychology laboratory. *Inquiry. An Interdisciplinary Journal of Philosophy*, 52(4), 378.
- Cisek, P., & Kalaska, J. F. (2010). Neural mechanisms for interacting with a world full of action choices. *Annual Review of Neuroscience*, 33, 269–298.
- Doya, K. (2008). Modulators of decision making. *Nature Neuroscience*, 11(4), 410–416.
- Hurley, S. (2007). The shared circuits model (SCM): How control, mirroring, and simulation can enable imitation, deliberation, and mindreading. *Behavioral and Brain Sciences*, 31(1), 1–22.
- Kelso, J. A. S. (1995). *Dynamic patterns: The self-organization of brain and behaviour*. MIT Press.
- Prescott, T. J., Bryson, J. J., & Seth, A. K. (Eds.) (2007). *Theme Issue on Models of Natural Action Selection. Philosophical Transactions of the Royal Society, B* 362 (1485).
- Ross, D., Sharp, C., Vuchinich, R., & Spurrett, D. (2008). *Midbrain mutiny: The piceoconomics and neuroeconomics of disordered gambling, economic theory and cognitive science* (Chapter 1: Is there such a thing as addiction?). MIT Press.

Evolving resolve

Walter Veit^a  and David Spurrett^b 

^aSchool of History and Philosophy of Science, University of Sydney, Sydney, NSW 2006, Australia and ^bPhilosophy, University of KwaZulu-Natal, Durban 4041, South Africa.

wvweit@gmail.com; <https://walterveit.com/>

[spurrett@ukzn.ac.za](https://philpeople.org/profiles/david-spurrett); <https://philpeople.org/profiles/david-spurrett>

doi:10.1017/S0140525X20001041, e56

Abstract

The broad spectrum revolution brought greater dependence on skill and knowledge, and more demanding, often social, choices. We adopt Sterelny's account of how cooperative foraging paid the costs associated with longer dependency, and transformed the problem of skill learning. Scaffolded learning can facilitate cognitive control including suppression, whereas scaffolded exchange and trade, including inter-temporal exchange, can help develop resolve.

The Neolithic Revolution (the transition from hunter-gatherer lifestyle to agriculture) was preceded by the “Broad Spectrum Revolution” in the Upper Palaeolithic (Flannery, 1969). This saw increasing reliance on a wider variety of food sources, including ones requiring skilled processing and more sophisticated technology (Stiner, 2001). Broad spectrum hunting and gathering required skills and knowledge that no lone individual could have accumulated from scratch, and which varied quickly enough to outpace genetic selection.

We adopt Sterelny's (2012) argument that expansion in hominin expertise and reliance on technology was driven by feedback loops linking co-operative foraging, learning, and transformation of the environment. Learning broad-spectrum foraging is time-consuming and expensive, but cooperative foraging provides enough surplus to support itself. Culturally transmitted skill learning is facilitated by a transformation of the learning environment, in addition – eventually – to master–apprentice relationships. This framework can be put to work addressing the evolution of suppression and resolve, complementing Ainslie's suggestions in the target article.

Ainslie correctly notes that the evolution of the influence of future expectations on current preference is itself a resource for sophisticated tool use and other distinctive hominin practices. Advanced tool making, tool use, food preservation and storage, exploitation of food requiring processing, and group hunting require foresight and often demand extended current effort with high costs and delayed returns. Acquiring the skills for broad spectrum life takes time, perhaps many years, before an individual generates a surplus (King, 1991). Hominin life, that is, depends on extended and repeated intergenerational transfer of support and skill.

Execution of a skill like stone knapping depends on socially acquired cognitive control models (Christensen, Sutton, & McIlwain, 2016; Hiscock, 2014; Shipton, 2010). These involve hierarchically and temporally organized goals, and their application demands attention management. Sterelny (2012) argues that small motivational changes, including increased tolerance for unrelated young watching and imitating, and increased interest in adult activities by the young, can improve the fidelity of trial and error learning. Without tolerance, interest in adults is

punished. With it, it is rewarded. He also stresses how the acquisition of expertise can be supported by the learning environment. For example, learning tool making is facilitated by having the stages from material selection performed openly, with samples from the stages of manufacture available for inspection, play, and imitation.

Maintaining focus on task goals and sub-goals in the face of distractions and incomplete recall demands what Ainslie calls suppression. This challenge is reduced when the environment provides scaffolding in the form of models and reminders of goals, sequencing, and methods. Supervision helps even more. Years of experience might be needed before achieving relative independence from those props. Developing individual skill at suppression, that is, needn't be an unaided individual achievement. Co-operative foraging can both scaffold learning it, and pay for the time it takes.

Increasing intra-group specialization, a wider variety of foraging targets and a larger portfolio of tools and technology brings increasing reliance on exchange across more and varying modalities organized over much longer time-scales for hominins than other animals. Tools and other artefacts, shares of hunts and processed vegetables, child-care, protection, and much more had to be allocated and sometimes exchanged. Those who made exchanges that were too inconsistent with their longer run interests would have done badly.

Economists since Smith (1776) have favoured the idea that money arose to address inefficiencies in barter-based systems of simultaneous exchange, making delayed repayment possible. This myth is rejected by all available evidence. In societies without token money barter is either absent, restricted, or occurs between non-relatives and whole groups, and exchange, including gift, involving credit and later repayment is ubiquitous within groups (Chapman, 1980; Graeber, 2011). Much later, token money appears to have transformed practices of valuation and exchange, but this won't illuminate Palaeolithic agency.

Features of later societies provide clues. Morgan (1851) explained how surplus in Iroquois nations was stored in long-houses, and distribution handled by councils of women. Meggitt (1971) detailed a conventional hierarchy of gift-types specifying acceptable reciprocation (a stone axe could discharge a debt of a pork side, but not a whole pig), and Lévi-Strauss (1969) how rules among the Tsonga specified the division of a whole ox among a group of relatives receiving one (front leg to elder brother, hind leg to younger, and so forth). Kahn (1986) documents an inter-temporal mechanism among the Wamira: A gift of a female pig obliged repayment with that very pig's female offspring, and required shouting at the time of transfer to specify whether debt was being created or settled. Loud complaining about disappointing reciprocation is widely documented (e.g., Marlowe, 2010). Between-group barter often involved conventions, such as that one cow was worth 50 baskets of rice among the Naga of India (Einzig, 1949). Such socially stabilized practices simplify exchanges by constraining the options and crowd-sourcing the burden of tracking obligations, including delayed ones.

Exchanging and sharing in the open would also provide opportunities for learning, and allow for stabilizing input from others, including reminders of delayed consequences. Apprentice learning, when it took off, likely involved supervision in exchange along with execution and assessment of quality. Even without supervision proper, seniors ridiculing or approving a nascent exchange could provide learning signals and scaffold consistency. Gossip, when available, could distribute recognition of the easily exploitable or notably astute. Repeated and open inter-temporal bargaining and cooperation among group members can

thus increase consistency and scaffold precursors to resolve. Similar to stone-knapping which develops in a cognitive niche including successful practitioners and their products, resolve can begin socially in a shared consumption scheduling niche. Here too, the surplus generated by mature members is crucial. No hominin could acquire the skill for cooperative foraging without the surplus and learning environment generated by a group succeeding at it. The skill of temporally organized choice called resolve is arguably no different.

Financial support. This research received no specific grant from any funding agency, commercial, or not-for-profit sectors.

Conflict of interest. None.

References

- Chapman, A. (1980). Barter as a universal mode of exchange. *L'Homme*, 22(3), 33–83.
- Christensen, W., Sutton, J., & Mclwain, D. J. F. (2016). Cognition in skilled action: Meshed control and the varieties of skill experience. *Mind and Language*, 31(1), 37–66.
- Einzig, P. (1949). *Primitive money in Its ethnological, historical and economic aspects*. Eyre & Spottiswoode.
- Flannery, K. (1969). Origins and ecological effects of early domestication in Iran and the near east. In P. J. Ucko & G. W. Dimbleby (Eds.), *The domestication and exploitation of plants and animals* (pp. 73–100). Aldine Publishing Co.
- Graeber, D. (2011). *Debt: The first 5,000 years*. Melville House.
- Hiscock, P. (2014). Learning in lithic landscapes: A reconsideration of the hominid “tool-making” niche. *Biological Theory*, 9, 27–41.
- Kahn, M. (1986). *Always hungry, never greedy: Food and the expression of gender in a Melanesian society*. Cambridge.
- King, B. J. (1991). Social information transfer in monkeys, apes, and hominids. *American Journal of Physical Anthropology*, 34(Suppl. 13), 97–115.
- Lévi-Strauss, C. (1969). *The elementary structures of kinship*. Eyre & Spottiswoode.
- Marlowe, F. W. (2010). *The Hadza: Hunter-gatherers of Tanzania*. Berkeley: University of California Press.
- Meggitt, M. J. (1971). From tribesmen to peasants: The case of the Mae-Enga of New Guinea. In L. R. Hiatt & C. J. Jayawardena (Eds.), *Anthropology in Oceania* (pp. 191–209). Angus and Robertson.
- Morgan, H. L. (1851). *The League of the Ho-dé-no-sau-nee or Iroquois*. Sage and Brothers.
- Shipton, C. (2010). Imitation and shared intentionality in the Acheulean. *Cambridge Archaeological Journal*, 27(2), 197–210.
- Smith, A. (1776). *An inquiry into the nature and causes of the wealth of nations*. W. Strahan.
- Sterelny, K. (2012). *The evolved apprentice*. MIT.
- Stiner, M. C. (2001). Thirty years on the “broad Spectrum revolution” and paleolithic demography. *Proceedings of the National Academy of Sciences*, 98(13), 6993–6996.

Author's Response

Reply to commentaries to willpower with and without effort

George Ainslie

Department of Veterans Affairs, Veterans Affairs Medical Center, Coatesville, PA 19320.

George.Ainslie@va.gov; <http://www.picoeconomics.org>

doi:10.1017/S0140525X21000029, e57

Abstract

Twenty-six commentators from several disciplines have written on the assumption that choice is determined by comparative