



Evolutionary Psychology as the Crystalizing Core of a Unified Modern Social Science

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Natural selection is the only process that pushes species uphill antientropically toward greater levels of functional organization. Consequently, all evolved functional organization found in the human architecture was constructed by selection, as a response to and a reflection of the functional demands of ancestrally recurring adaptive problems. The adaptive problems our ancestors faced selected for programs that can recognize mates, cooperation, fights, offspring, alliances, and so forth, and guide behavior appropriately for each. To achieve this, these programs necessarily evolved with native content built in, out of which meaningful but abstract situation representations are constructed by the mind in response to evolutionarily meaningful cues (e.g., *my child is hungry*, *our rivals are trying to subordinate us*). These programs evolved to guide us in social interactions according to their internal programming logics. These program logics, once reverse-engineered, can be used to construct a unified, theoretically principled social science that can model and explain cultural dynamics, economics, social organization, and even historically particular social phenomena, such as moralities, mobs, and revolutions. Unfortunately, modern humans live in a vastly expanded arena of interacting billions, while our systems of situation representation are designed for the ancestral world of foraging bands involving hundreds. Worse, these systems are informed by cues that no longer reliably mean what they once signaled, effectively causing hallucinations. So, we are ignorant armies clashing by night, lost among hallucinated misinterpretations that no longer correspond to the actual world. An awakening clarity might emerge from progress toward an evolutionarily informed, fully integrated social science.

Public Significance Statement

Our neural programs evolved to identify and respond to the recurring situations of the ancestral world. Hence, their evolved frames for seeing the world interpret the modern world in terms of these ancient forms, such as *us-vs.-them*. However, modern reality is so different from the evolved categories our mind imposes on events that modern humans are continually misled by extreme misinterpretations that no longer correspond to the actual world.

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An Integrationist Appeal: A Sound Behavioral and Social Science Should Not Flagrantly Contradict the Natural Sciences

It has been more than a quarter century since the publication of *The Adapted Mind* advanced

what we argued was a more scientifically grounded, logically integrated framework for the psychological and behavioral sciences. Indeed, from my own personal perspective, it has been half a century since I was tempted away from physics and by the prospect of deciphering the code running our brains. The temptation was strong, because the premises of the psychological, behavioral, and social sciences stood in obvious contradiction to far better-established principles drawn from thermodynamics, evolutionary biology, information theory, and related fields. This suggested to me, joining with a growing kindred

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of like-minded scholars, that there was useful work to be done. Since reality itself is self-consistent and seamless, it follows that mutually contradictory claims native to different scientific disciplines are flaring short-circuits locating what must necessarily be erroneous premises. These errors, we argued, had functioned as long-standing obstacles to scientific progress, causing the social and behavioral sciences to be notoriously (and unnecessarily) weaker and slower moving than their interpenetrating natural science counterparts. Historically, this has been highly productive approach: Successful fundamental advances in physics (e.g., by Planck, Bohr, Einstein, Dirac, Higgs) involved engaging with an internal contradiction until a successful resolution of inconsistencies was arrived at.

It is only a mild exaggeration to say that we had to publish our own volume to gain the opportunity to more fully state these views. The unified framework we advocated was one within which the many valuable, nonfallacious existing scientific threads could be integrated with the emerging research programs and novel discoveries that evolutionarily sophisticated approaches were opening up. This is an integrationist program where knowledge is to be mined for its joint implications and challenged for its contradictions. In contrast, the prevailing segregationist program has been one where authorities in different fields jealously protect their autarkic disciplinary independence from the menace of inference-laden advances infiltrating in from the rest of the sciences and detonating. After 50 years, it is perhaps not too early to reflect briefly on some of the lessons of this history and then look forward to opportunities that lie in some underexplored frontiers implied by these beginnings. Those looking for a review of the current state of the core of the field can look to the excellent *Handbook of Evolutionary Psychology* (Buss, 2015), although the expanding ramifications of this paradigm shift have now at least implicitly penetrated almost all of the behavioral sciences to some degree.

Impediments to Taking Advantage of Obvious Scientific Advances: Why Not Science at the Speed of Thought?

Despite the many notable empirical and theoretical advances across the decades stemming from this evolutionary integration, the dominant thought that strikes me is this: What a dif-

ferent world we would live in if humanity conducted science at the speed of thought—that is to say, at the speed of inference, falsification, observation, and information integration, rather than the glacially slow sociological speed of institutional change and demographic replacement (Tooby, 2014). That is, what if people actually operated closer to an ideal rationality of discovery, where we let nothing irrelevant to the solution of scientific questions stand in the way of deriving the maximum we could from the information we had? But evolved human nature and its entailed group dynamics brings us down to earth. To pick only a single thread: Since conceding error involves advertising one's own deficiencies, and these involve public shame and status losses, many scientists naturally resist revising beliefs they have identified their careers with. Because shame is aversive (Sznycer et al., 2016; Sznycer, Xygalatas, Agey, et al., 2018; Sznycer, Xygalatas, Alami, et al., 2018), and resource sharing is aversive (Sell, Tooby, & Cosmides, 2009), this resistance occurs despite the continuous emergence of falsifying or at least strikingly anomalous, ill-explained results, often accompanied by increasingly well-supported and powerful rival theoretical interpretations. Hence, we humans reflexively—one might say instinctively—wage institutional and informational warfare to delay the recognition of the merits of competing ideas, moving to block their diffusion. (The study of the dynamics of information spread across populations is often called cultural epidemiology, and an adaptationist version of it emerges naturally from evolutionary psychology; Boyer, 2018; Pinker, 2002; Sperber, 1996, 2001; Tooby & Cosmides, 1992.)

This obstruction is why Max Planck, the originator of quantum mechanics (and so well positioned to judge), observed morosely that science progresses funeral by funeral. Those who refuse to abandon false beliefs die after a lifetime's unnecessary delay in belief revision. This retards by decades when younger researchers less invested in the *ancien régime* are able to disloyally smuggle more advanced beliefs onto the premises. This process of delay is supercharged by the fact that we scholars implicitly or explicitly form “schools of thought” (i.e., primate coalitions) around beliefs. We feel pride or shame keenly at the relative social success and status of what often become our

group's collaboratively promoted quasi-ideologies (Sznycer et al., 2016; Sznycer, Xygalatas, Agey, et al., 2018; Sznycer, Xygalatas, Alami, et al., 2018; Tooby & Cosmides, 2010). Because groups and institutions are potentially immortal, our coalitional adaptations and their resulting sociological dynamics can slow progress not only for years but for generations. They infuse weightless beliefs that could be revised in a flash with a social analog to inertia. At the very least, they cause us to filter for and differentially propagate arguments and results that conform to our existing beliefs and differentially status-elevate our intellectual allegiances over others.

These processes famously operated when the disquieting heliocentric theory of Copernicus was banned, leading to the arrest and trial of the Copernican Galileo by the (Holy) Inquisition. Beliefs about bodies millions of miles away (of no practical significance whatsoever) nevertheless provoked the arrest and Inquisitorial interrogation of Galileo; all parties were mindful of the recent precedent of Giordano Bruno, who was imprisoned for years, gagged, and "terribly burned" (in James Joyce's vivid phrasing). Galileo judiciously recanted but was nonetheless condemned for "vehement" heresy and held in custody until his death. Into this gap stepped the Dane Tycho Brahe with his widely adopted and long-enduring geo-heliocentric model. Tychonic cosmology offered a safe (if hilarious) compromise: The Earth remained the immobile center of the universe; the sun, moon, and stars circled the earth. But from Copernicus he took the idea that the remainder of the planets orbited the sun. After all, if you are "reasonable" (rather than using the rationality of discovery), the truth is found in a socially calibrated, reasonable middle position. Although Copernicus published in 1543, Tychonic astronomy found many adopters well outside Catholic Europe, persisting long after Newton, indeed, well into the 18th century (Schofield, 1989, p. 41). This was long after less inhibited astronomers could calculate and predict heliocentric orbits for planets and comets to unheard of precision. It took the Church only 359 years to exonerate Galileo—say 12 generations—which they did in 1992, although Church astronomers rushed at breakneck speeds to accept heliocentrism by 1822.

Such processes are strong enough to go beyond retarding progress to reversing it—that is, to causing scientific devolutions. After modern Mendelian genetics was well established, false Lysenkoist theories of heredity emerged and spread across many (nonreligious) nations, from Poland and the Soviet Union to the People's Republic of China. Lysenkoist theories then dominated these nations' scientific beliefs and agricultural policies for decades despite a grimly unrelieved string of spectacular empirical failures and agricultural catastrophes (Gordin, 2012; Li, 1987). Most notably, they contributed to the deaths of tens of millions by facilitating famines. So, truth-independent social triangulation can handily promote the spread of cultural epidemics of false scientific beliefs even in the face of vast numbers of falsifying empirical tests.

If these seem distant in time and culture, consider Google and the Harvard faculty in the 21st century—both communities selected for their free-thinking, advanced, world-leading analytic abilities. Yet, each community had hysterical and ostracizing reactions when James Damore (at Google) and Larry Summers (at Harvard) referred to decades-established, well-replicated statistical patterns of modest psychological sex differences with generally well-understood evolutionary origins. These empirical claims about sex differences are perfectly consistent with the moral aspirations of the communities involved (for reasons discussed in Pinker, 2002), but the real crime was departing from the heavily moralized blank slate scientific ideology (Tooby & Cosmides, 1992). Because neither emerging scientific truths nor complex sciences have any simple-minded nor stable relationship to existing ideologies, diverging from careful scientific practice for the sake of ideology leaves us ignorant, ridiculous, and morally shipwrecked.

The point with Galileo and the Church is not how far we have come from primitive susceptibility to superstition: Instead, our architectures evolved to heavily weight the approval of our community members (perceived though the evolved shame-pride system) because maintaining this approval was a matter of life and death for our ancestors. So, we each of us drag a warm Mother Church and a scowling Inquisition around inside our own fearful, subordinated-to-the-group minds. This also means that

each of our institutions, coalitions, and communities gravitate toward their own triangulated consensus equilibrium of distorted beliefs—a distortion equilibrium compared to what beliefs would be based on the best available information as analyzed by a rationality of discovery.

Scientific Truth Determination Through Social Triangulation

On this account, new theories seem unacceptably “extreme” primarily because we evaluate beliefs by weighting them according to the social power of the people and institutions that hold them—that is, by numbers, status, power, and influence. It is just as if beliefs in minds were resources being contested by evolved organisms rather than attempts to reflect the world accurately; because they function as social resources, they then activate our evolved psychology of resource competition, status competition, ingroup loyalty, and approval seeking through conformity. To this psychology, a belief’s relationship to the truth is secondary to its probable impact on the social coordination of the group, on its (re)allocation of status and authority, and on its impact on the belief-holder’s approval by her coalition or community (Tooby & Cosmides, 2010). It would be an extraordinary coincidence if the truth of a belief were actually where the social power of the players negotiated it as being through the default practice of triangulated compromise. Indeed, in almost every case in the history of science, reality is eventually revealed to lie unfathomably far beyond even the wildest imaginings of the boldest thinkers of the time, however “extreme” they were seen as being. That is, even extreme theories are timid. Compare, for example, the unacceptably radical new cosmology of Copernicus and Galileo (which tamely increased the universe only a few thousandfold) with the immense, ancient, and bizarre cosmos we acknowledge now. Or contrast the views of the atomists Democritus and Dalton with the entanglements of modern quantum field theory.

The behavioral sciences’ intellectually timid rearguard battle against integrating the Darwinian adaptationist revolution parallels astronomy’s embrace of Tychonic cosmology, if not quite Lysenkoism. Currently, many behavioral and even biological scientists (such as neuroscientists) still confidently accept what we called

the Standard Social Science Model centered on a largely equipotential, blank slate mind (Pinker, 2002; Tooby & Cosmides, 1992). Even the majority of those that have anxiously toyed with making some concessions to an integrated evolutionary perspective hang on to a Tychonic compromise. That is, they posit as their default starting point that most of the consequential processes in the mind are blank-slate-like rather than permeated with evolved content. In this commonly held fallback position, the largely blank slate mind functions as the immobile earth that important social phenomena Ptolemaically orbit around. On this view, the sober, reasonable modern view is to concede that perhaps a few things show evidence of some evolutionary “influence” (i.e., may orbit around the sun of evolution). But evolutionary hypotheses are nevertheless considered to be extreme, distasteful, and unreasonable and to have a greater evidentiary burden than their “opposites,” which are assumed by default to be true unless there is overwhelming evidence to the contrary. To this day, more than a century and a half after Darwin, evolutionary biology is not even required in the great majority of behavioral science programs. This is despite the fact that evolution is the only known explanation for the organization of the human brain—brains being sometimes suspected of being connected to human behavior and thought. We might as well teach Tychonic astronomy as the latest thing to our doctoral physics students or leave gravity out of the astronomy curriculum.

Modern Integrationist Social Science Models Should Start With Evolutionary Psychology and Build Outward

In the foregoing sketch of belief dynamics as driven in part by resource and status competition (admittedly a simpleminded, highly defective, and reductive sketch), we have two things at once: First, we have at least a partial explanation for the far slower than necessary adoption of scientific advances (such as, we partially suggest, evolutionary psychology in the social, behavioral, and neural sciences). More generally, we have at least a partial explanation for why the truth-value of a belief (of whatever kind) is so often secondary in determining its intellectual fate. Second—and more importantly for our purposes here—we have a toy example

of what a modern integrationist social science model might look like—one that includes evolutionary psychology centrally. Such an integrated model couples design features in our evolved psychological architecture (e.g., neural adaptations underlying status psychology, the shame–pride emotion systems, resource defense, and coalitions) to their impact on population-level behavioral dynamics—in this case, on the population diffusion and institutional adoption of ideas. *The Adaptive Mind's* subtitle, *Evolutionary Psychology and the Generation of Culture*, was a largely unsuccessful attempt to draw attention to the fact that evolutionary psychology was not only a new approach to psychology but provided the nucleus for a new and radically different theory of culture as well. This adaptationist theory of culture recognizes the central role played by evolved psychological specializations. For an exploration of other examples, see, for example, Pascal Boyer's (2018) *Minds Make Societies*.

Blank Slate Models Are Fatally Inconsistent With Evolutionary Biology and Information Theory

The key point is that the blank slate model is fantastically improbable from the point of view of evolutionary biology, information theory, and thermodynamics (Tooby & Cosmides, 1992, 2020). Why?

To begin with, the only reason organisms (beyond the chance-produced original replicator) exist at all is that their parents inherited a physical organization that causes them to replicate themselves (Dawkins, 1982; Tooby & Cosmides, 2020; Williams, 1966). Once there is automated replication, entropy injects random modifications in successor designs (mutations); these variants are then necessarily tested by populations of events according to how well organized they are in interacting with their environments to cause their own subsequent reproduction. Over evolutionary time, this leads to ancestor-descendent chains that accumulate inconceivably high levels of order. The existence of venomous snakes selects for a detection system that registers snakes and then makes proximity aversive (Öhman & Mineka, 2001). Hence, natural selection organizes the mind so that it reflects specific aspects of the world. And the world, as encountered by a replicating lin-

eage, is not “blank” but has organized “content” in it relevant to the lineage's replication. The dense clusters of features that characterize evolutionarily recurrent situations can be conceptualized in an engineering sense as content-specialized adaptive problems. Their statistically correlated structures select for complementary decision-making circuits that generate best-bet responses (e.g., wariness toward snakes) that exploit the particular structure of each distinct domain. Our ability to prevail ancestrally against a large set of inescapably incommensurable computational problems entails that our species' neural architecture contains a large, heterogeneous constellation of distinct behavior-regulating computational adaptations (Cosmides & Tooby, 1987; Sperber, 2001; Tooby & Cosmides, 1992; Tooby, Cosmides, & Barrett, 2005).

In contrast, by its very nature, a blank slate mind starts at maximum entropy with respect to neural arrangements designed to solve any real, specific, defined adaptive problem. That is, such a design is the farthest it could possibly be in state space from having neural programs structured to regulate behavior successfully with respect to real adaptive problems. The more blank the system—the greater its initial tendency to accept neutrally all possible settings in the most “flexible” possible way—the less prepared it is to respond to the world adaptively. What defines a blank slate is its lack of *a priori* hypotheses (Bayesian priors) about what it is facing or how to respond. This leaves it unable to identify the functional meaning of anything in the world, much less have a computable appropriate response. This inertness guarantees extinction.

Consider, for example, learning as a Shannon information-theoretic problem in communication between the world and the organism (i.e., the organism needs to converge on correct interpretations of the input signals, just as with senders and receivers). As Shannon pointed out (Shannon, 1948), for communication to succeed, there must be a preexisting agreement on the probability and meaning of signals between the sender (in this case, the environment) and the receiver (in this case, the brain). Again, the blanker the slate (i.e., the lower the expectations about the meanings of the signals it receives), the more information must be supplied for the system to learn. At the limit, the information required to learn becomes infinite, and long

before that, the system would choke and fail. In short, the brain as a computational system does not evolve over generations toward maximum information entropy. Instead, as far as selection and development allow, the brain evolves toward minimum entropy and maximum computational preparedness for the cross-generationally repeating situations it encounters.

Indeed, not only does the same species-typical information-processing architecture supply Shannon's required shared "code" between the world and the organism allowing learning to proceed. But this architecture also solves all the parallel problems involved in coordinating different human minds on the same interpretations—whether for communication, jointly experienced events, or socially coordinated behaviors (Tooby & Cosmides, 2020). Common frames of reference are supplied by our common, species-typical evolved inheritance. Put broadly, our evolved psychology provides humans from all cultures with common interpretative frames that allow humans some chance to mutually understand each other's thoughts and feelings in a way that would not be possible in a blank-slate world. For example, not only grammar (Chomsky, 1975) but word meanings would be indecipherable and unlearnable unless the child came able to assign probable meanings to unknown words. The same argument applies to mind-reading, culture-learning, coalitional coordination, reading the intentions of groups, convergence on common projects, unspoken agreement on social event construal, and the common perception of community values that underlies shame, pride, and morality—which all depend upon interpretive correspondence between minds (Tooby & Cosmides, 2020). Instead of human mental content being culturally arbitrary, entirely constructed, and infinitely plastic, our rich heritage of species-typical psychological adaptations endows humans everywhere with a common suite of interpretive and motivational frames that connect us all.

The Mind Is Designed to Cross-Connect Its Evolved Content to the Contingent Instances of an Individual's Life to Assign Them Functional Meaning

To be evolutionarily functional, the mind's adaptations are (and must be) richly inflected

with content. Increasing evidence supports the view that natural selection crafted brain organization into computational, behavior-regulatory programs for, for example, *snake aversion*, *predator evasion*, maintaining *proximity to mother*, mutual *insurance* through *compassion* to *familiar others in need*, *mate* selection, *aversion* to *sex* with close genetic *kin*, *child care*, recognizing individuals as *members* of *coalitions*, maintaining the *approval* of the *group*, *aggressive extortion* and *defense*, relative *entitlement* to determine *outcomes*, and so on (Barrett, 2015; Buss, 2015; Lieberman, Tooby, & Cosmides, 2007; Öhman & Mineka, 2001).

The italicizations are to provide some idea of what we mean by evolved content that is computationally embedded in our evolved programs. The argument that many find difficult is that elements in our neurocomputational architecture are laden with evolved content but can simultaneously be highly abstract and minimal. What does it mean to say evolved content is abstract? The actual world is truly immense and endlessly dense with detailed characteristics at all fractal levels. So, for example, one's actual particular mother has an endlessly complex life history and social history, gut microbiota, fatigue level, personality structure, appearance, memories, disease load, cell populations, hormone profile, and so forth. To the brain, almost all of this dense reality is excluded entirely, not prioritized, or not represented by adaptations as evolutionarily meaningful. (The quantity of information that is actually represented is infinitesimal compared to the full range of information that could be potentially represented.) In contrast, the architecture's evolved specification of *mother* is a set of diverse, abstract, endogenous computational properties and elements that play roles in various mother-relevant or mother-informed adaptive specializations in both their self-assembly modes and online functional modes (Lieberman et al., 2007; Tooby & Cosmides, 2001).

For example, *mother* is functionally linked first to a recognition system (assigning the evolved tag of *mother* to a particular *person* so it can be used by other programs; at sexual maturity to tag her as *sexually aversive*); to tag her as *mother* for the Bowlby mother–infant attachment system (motivate *proximity* as needed); to observe which newborns she intensively cares for and then assign the implicit meaning

siblings to them for purposes of *welfare trade-offs* and *adult sexual aversion*; and so on (Lieberman et al., 2007). These clusters of contentful architecture arose in the form they do because throughout mammalian evolution, mothers were a reliably patterned part of every successful life history; they maintained proximity; offered protection, milk, assistance, and biologically informative reference points (e.g., to other kin; to what is and is not a threat; to what are safe foods); and so on. Ancestral event populations involving mothers exhibited clustered cause-and-effect networks reliably associated with cues; these created structured opportunities for the evolution of survival- and reproduction-promoting neural programs (*love her*; run to her when *menaced*; discover who your *siblings* are by her *care* for them).

It is natural selection that establishes these indispensable kernels of preexisting interpretive priors that set the correspondence between the situations the organism encounters in the world, the “signals” these situations send (i.e., observable cues that the architecture uses to differentiate and identify them), and the functional interpretations the brain converges on for guiding behavior (Tooby & Cosmides, 1990).

To guide behavior in each particular incarnated life, computational adaptations must solve what can be called the problem of cross-connection between the *evolved* and the *contingent*. The program elements crafted to deal with *mother*-relevant decisions must be cross-connected reliably to the particular person in the world that corresponds to that person’s actual mother. The compassion system must cross-connect its activation and willingness to sacrifice with instances of actual specific *persons in need*. The mating programs must cross-connect their internal parameters to appropriate specific *potential sex partners*. Evidence indicates that individuals are cross-connected to implicit assessments of aggressive *formidability*—their capacity to inflict aggressive costs (Sell et al., 2009). This is one component that helps to determine their *entitlement* to determine outcomes, to which others adjust their *deference* or *disrespect* in conflicts. The elements in the conditional *exchange* system must cross-connect specific objects or actions with the assignment of meanings such as *benefits* offered and *requirements* not met (Cosmides & Tooby, 1992). The coalitional categorization system must map

specific *humans* to locally active *coalitions* (Kurzban, Tooby, & Cosmides, 2001; Pietraszewski, Curry, Petersen, Cosmides, & Tooby, 2015).

In short, our architecture is designed to clothe the individual’s contingent world of tokens (this person, that individual reptile) in the garments of evolved meaning (*ally*, *snake*). This is a necessary precondition for the behavioral dispositions built into the architecture to become coupled to particular, local targets of action. For humans to be drawn into action, our constellation of interpretative-motivational adaptations must be cross-connected to the local contingent circumstances or tokens the individual faces at any given time. This means that the evolved content that is embedded in our minds is not only about what exists (plants, animals, coalitions, hierarchies) but what to do with these entities and how to value possible operations—what is attractive, aversive, enraging, to be protected, to be feared, and so forth. The organism’s adaptations are always forming a *situation representation*, compounded at the intersection of the evolved systems of meaning assignment with the present conditions the organism finds itself in. It is the representation that the organism responds to, not reality.

Coalitions, Hierarchies, and the Adaptationist Foundations of Human Social and Political Life

Our ancestors have lived in an intensely social world for millions of years. Consequently, we have adaptations that evolved to address the recurrent adaptive problems posed by social interactions and their replicative payoffs. Their regulatory logics organize our political conflicts, wars, economies, cultures, social structures, migrations, rivalries, social attitudes, group emotions, and so on. For this reason, understanding the design features of our programs provides a scientific foundation for the phenomena studied by economists, political scientists, social psychologists, anthropologists, sociologists, historians, philosophers, and other social scientists. The study of these adaptations and the emergent patterns they drive should be recognized as a central element in these disciplines; they provide direct and immediate clarity on many core questions and will progressively supply more illumination. Evolutionary

psychology is the logical core of the social sciences because once you start with a specific decision-making logic built into one of our species' psychological adaptations, you can then systematically unpack how that then structures the world of phenomena studied by political scientists, anthropologists, and sociologists. Then, we add others and their interactions, as our inventory of adaptations grows.

One central organizer of human sociality is the set of programs that underlie the human capacity to form coalitions (Tooby, 2017). These programs enable us to form, maintain, join, support, recognize, defend, ally with, defect from, factionalize, exploit, resist, dominate, subordinate, distrust, oppose, and attack coalitions. Without them, we could not cooperate in groups, we could not war, and we would have no politics beyond linear hierarchies.

The addition of coalitional specializations to our species architecture solves the computational problems necessary for different actors to join together to bring about mutually advantageous outcomes. One functional hurdle is that a brain can ensure a single individual executes an action, but no brain can simply execute coordinated action among a set of individuals, each with an independent brain firing on its own trajectory. For this, minds must be coordinated or aligned. This coordination among minds requires adaptations for situation-interpretation, group-conditional motivation, communication, negotiation, the mind-reading of group intentions, and the navigation of *n*-person game-theoretic dynamics (Tooby & Cosmides, 2010; Tooby, Cosmides, & Price, 2006). Coalitions are sets of individuals interpreted by their members and/or by others as sharing a common abstract identity (including propensities to act as a unit, to defend joint interests, and to have shared mental states and other properties of a single human agent, such as intentions, status, formidability, and prerogatives).

Why do we see the world in terms of allies, coalitions, and factions? Most species cannot. Among many mammalian species, an alpha can reproductively exclude others, even though beta and gamma are physically capable of beating alpha—if only they could cognitively and motivationally coordinate. The fitness payoff is enormous for solving the array of computational problems required to act successfully in groups: Two can beat one, three can beat two,

and so on. Once the problem of coordination is solved, these gains can propel an arms race of numbers, effective mobilization, coordination, and cohesion. Unlike the great majority of species, our ancestors evolved the neural code that unlocked the solutions to these problems. This supercharged the ability to successfully compete for access to reproductively limiting resources. Coalitions amplify the power of their members in conflicts with nonmembers. Ancestrally, if you had no allies or coalition, you were at the mercy of anyone who did. Hence, selection made it an instinctive motivational priority to affiliate into alliances.

The implicit conditional logic of the coalition is the mutual induction of reciprocal support and joint action—all for one and one for all. The formidability of the group—the ability to jointly inflict costs—is a major determinant of the relative rank of the group, which determines the prerogatives of the group with respect to out-group members. Human history has been heavily patterned by social dominance: from conquerors, ruling castes, aristocrats, slaveholders, Communist party members, Nazi party members, Ba'ath party members, Falangists, the Klan, ethnic majorities (if cohesive), down to increasingly mild gradients of power asymmetry.

Because it is advantageous to have sufficient allies at all social scales to withstand challenges and project power, our minds infuse sociality with meaningful coalitions and coalitional identities at all scales. It is always significant if rival groups or factions are expanding at your expense or shrinking as a result of the increasing dominance of your alliance. The instinctive forging and projection of coalitional meaning saturates human life, even where—as in science, art, or humanitarian assistance—it is a major impediment to reaching the putative goals of the activity.

A second key feature of human social life is entitlement and its socially negotiated product, rank (rank is recognized entitlement when represented with mutual consistency across individuals). Rank is the relative power to determine outcomes and, when quasi-stable, becomes represented as hierarchy. It was an enduring feature of the ancestral world that the ability to inflict or withhold costs and the ability to confer or withhold benefits allowed each individual to incentivize others to put weight on

her or his own welfare. Without our being aware of their underlying evolved logic, our emotions of anger, rage, gratitude, shame, pride, and so forth automatically implement implicit policies of incentivization on self and others, based on internal regulatory variables that evolved to track formidability and the ability to confer or withhold benefits. For example, we are angry if others place too little weight on our welfare (compared to our internal representation of what we are entitled to). Anger then motivates us to withhold benefits or inflict costs on the offender until the other cedes us what we feel entitled to (Sell et al., 2009). They may instead retaliate, attempting to recalibrate us to not feel so entitled, until mutual consistency of relative entitlements is achieved.

Hierarchy and coalition interpenetrate and interact in our evolved social adaptations, jointly determining outcomes. Because factions are coalitions within larger coalitions, hierarchies are shaped by subgroups of alliances coordinating to ascend when the opportunity presents itself. The evolutionarily recurrent situation of revolution occurs when the up-hierarchicals are displaced by a new, surgent, cooperatively dominating elite. Implicit or explicit recruitment of down-hierarchy supporters (or unaffiliated community members) into factional alliances for prospective ascent is an ongoing competition that helps to give political life its unstable dynamical character. Analyzing these programs gives insight into specific historical events: For example, the Bolsheviks, who numbered less than one ten-thousandth of the Russian population, were nonetheless able to seize power from the democratic socialist government. This is less surprising given that Lenin had picked party members based on their unswerving loyalty to him—the apex of a (ruthless) hierarchical coalition—and not to ideals or ideology. This allowed him to bring dominating aggressive force into the small arenas of government against larger numbers of less-organized, less-violent socialists, social democrats, and liberals (Sebestyen, 2017). More generally, hierarchal coalitions give us armies, chiefdoms, governments, kingdoms, mafias, gangs, oligarchies, empires, wars, and democracies. They are the external expression of these underlying cognitive adaptations, parameterized by specific conditions.

Millions of years old, our coalitional psychology nevertheless evolved long after linear hierarchy, where rank was more a direct function of each individual's competitive abilities. When coalitional adaptations appeared, they transformed human hierarchy so that it is no longer typically linear, but rather involves multi-party alliances that rise together and draw rank from each other. Because sets of individuals coordinate—and so as a group have some kind of weak analog to a mind—our architectures evolved to interpret coalitions as agent-like and read (or project) the intentions of groups. Equally, groups are interpreted as having relative entitlement (status, or rank), formidability (or dominance), prerogatives, intentions, values, and so on. They can pay deference, assert supremacy, or be fearful, angry, proud, or ashamed. It is easy (but not inevitable) to interpret another group as being locked in a rivalry, with the welfare of the two groups being locked in a zero-sum relationship.

Because coalitions function for their members as joint vehicles of dominance, status, and entitlement, political and social life is characterized by group-selfishness. People are motivated to advance not only their individual interests but also their group's interests. Individual motivation is brought into alignment with group-selfishness by mutual incentivization of each by all, because each benefits when other individuals advance the group's interests. Unfortunately, because status goods are relative and positional, they are inherently zero-sum, and so conditions of abundance do not disarm status rivalry. So, the competitive motivational-interpretive adaptations that initially evolved for individuals subsequently were coopted so that they can be cross-connected to group identities and group-selfish motivations. Indeed, they can drive group conflicts more intensely than individual conflicts. They clothe our social lives in strongly charged, richly nuanced group-related meanings. Group identities are rivalrous unless damped by alliances, distance, or a weak identification with group ("individualism").

The pleasure and pride an individual may feel at displaying aggressive dominance is ethnographically a well-known motivation, as is status display and approval-seeking. So across human societies (and given parameterized variables), we get the recurrent "glory" of war, prestige-competition and display, honor, con-

tempt as bids to status-deflate others, admiration for successful status-motivated acts of others, and the rest of the expressions of what might be called the status economy of human action.

Ancestrally, a mob was the ultimate weapon, and we feel intoxicated when we participate in joint action that elevates ourselves and deflates or destroys outgroup members. We feel pleasure and pride in actions and events that increase our coalition's status; we feel shame, pain, and anger at decreases. Hence, we are tireless upholders and propagandists that orchestrate our group's campaign for ever-increasing status. Indeed, individually and collectively, we are Orwellian Ministries of Truth. We filter social/cultural messages to downplay elements that undermine our group status and entitlement, and we amplify elements that elevate our status and entitlement. At each fractal scale, humans have conflicts of interest and so benefit from having alliances at that scale to support them in those conflicts. Hence, a common cultural attractor is for societies to self-organize into segmentary structures: As the Bedouin proverb goes, me against my brother; me and my brother against my cousin; me, my brother, and my cousin against the world.

The fundamental underlying system for representing alliance appears to be an abstract space, with physical closeness, and standing on "the side of," "with," or "against" specific others or groups constituting a map of political alliance (together with force dynamics or strength representation of formidability or status). We apply binarized concepts like "for" or "against" to abstract concepts like "women" or "pan-Slavism" with an illusory feeling of clarity—as if we know what we mean. But this is belied by the welter of contradictory specifics different members of the same coalition haphazardly cobble together when challenged. This is because at the fundamental level, the real issue is *us* versus *them*, with differentiating ideological distinctions being generated or erased as needed by the demands of the conflict and the shifting requirements of factional jockeying and the larger strategic landscape. As time passes, complex policy positions (if any) rapidly erode back to cockades, slogans, loyalty oaths, and styles. The collapse of alliance cues into one dimension and even into a minimal pair is a cultural attractor, because at the most basic level, the signal the fundamental representa-

tional system needs to organize coalitional action is binary and social—*who* are you "for"; *who* are you "against." It is true that in complex literate societies with division of labor, surface doctrines can cumulatively acquire high levels of complexity. However, typically doctrinal differences (e.g., Monty Python's Judean People's Front vs. the People's Front of Judea vs. the Judean Popular People's Front) eventually reduce functionally to flags for an underlying segmentary factional structure. Factions (e.g., Bolsheviks, Mensheviks, Social Revolutionaries) are rivals for the same up-hierarchy positions, as well as for down-hierarchy supporters and recruits. But they are part of the same coalition with respect to outsiders (e.g., Tsarists).

Situation Representations, Tableaus, and Outrages

To compute how to act, organisms need to compute specific input variables that can be thought of a highly schematized representation of the situation the organism is presently in. Important situations repeat over evolutionary time, so our adaptations are designed to be particularly effective at recognizing in locally contingent conditions when these evolutionarily recurrent situations appear. The contingent elements of these situations will be cross-connected through assignments of evolved biological meaning (e.g., a sexual opportunity; food; too great a risk of encountering a predator on the path; a status threat; the need to back up a coalition-mate).

An organism is, of course, simultaneously "in" an array of different situations at any given time. Hence, the architecture evaluates them for importance and closeness of fit and may promote one to paramount status if addressing one precludes addressing others. This activated situation representation defines the organism's immediate reality out of which it acts. Systems of situation representation are closely coupled to emotional-motivational adaptations because different situations come with their own types of payoffs (predator escape; disease avoidance; sexual consummation; triumph). Systems for evaluating which situation representation to make paramount or which payoff to pursue are needed in order to arbitrate competing courses of action. To converge on one to execute at the

expense of others requires an architecture that is organized to map them into an analog that is functionally parallel to economists' utility, capable of arbitrating trade-offs inherent in mutually exclusive behavioral choices. A situation representation therefore also includes invited actions, likely causal transformations of the situation over time, estimates of important parameters like formidability of observers, and (most subjectively salient) imagery-like elements. These imagery-like elements reflect evolved cues for situation recognition, evaluation, parameter estimation, and outcome prediction (e.g., the beauty of the partner; the nutritive value of the food; recent observations of the predator; the popularity of one's competitor). For simplicity, we call prepotent situation representations *tableaus*.

Tableau activations play a particularly important role in organizing events in which multiple individuals need to coordinate in representing the same situation. Everyone has individual agendas to pursue, so a formidable problem in activating a coalition, a common action, or a mutually enforced evaluation is getting the same tableau in everyone's mind (Tooby & Cosmides, 2010). If people had blank-slate minds, convergence on a single coordinated project out of endless possibilities would be endlessly delayed or impossible (Tooby & Cosmides, 2020). Fortunately, humans have a shared species-typical architecture with a shared library of (parameterizable) tableaus. So this makes converging on the same tableaus—the same prepotent situation representations (e.g., predator; enemy; person in extreme need; political face-off)—far easier, with mutual mind-reading among individuals facilitated by common cues or information they are mutually exposed to (this is the adaptationist analog to game theorists' common knowledge). So, it is relatively easy to pull up tableaus for such things as sharing, making friends, revolutionary action (hierarchy challenge), a hunt, war, and so on.

We are, as individuals, often motivated by activated tableaus. But group members can stabilize for each other the entrainment of one tableau over others, making it very significant for social alignment. An especially prepotent tableau carries with it its own privileged currency or valuation system that (for the duration of the tableau entrainment) dominates other cur-

rencies. Like a camera bringing some things into focus at the price of putting other things out of focus, a tableau directs attention and makes things outside the frame of the tableau disappear. In a few short months, for example, residents of the United States have rapidly switched from an intense campaign to remove an unpopular leader; to evaluating actions through a master currency of lowering carbon dioxide emission derived from the belief that the world would end in a decade unless carbon dioxide's industrial discharge was ended; to a new master currency based on minimizing exposure to COVID-19 through locking down industrial civilization; and finally, urgently moving to defund police and to purge all presumed vestiges of systemic racism. The point is that unlike normal systems of choice with trade-offs being made between multiple goods, at any one time, mutual entrainment on a single tableau drives one currency toward value dominance and overwhelming group attention. This process is enforced by shame, approval seeking, and subordinating social sanctions. This can be deployed to bring otherwise independent actors into a powerful single coalition that promotes group power. One important form of this is the outrage system.

Events in which one or more members of one group injure the welfare of one or more members of another group are an evolutionarily recurrent situation that we have called an *outrage* (Tooby, 2017; Tooby & Cosmides, 2010; Tooby et al., 2006). The mind treats these events completely differently than an identical harm inflicted by some individuals on other individuals from within the same group. Outrages are one of the easiest tableaus to activate in the human mind. They are easily represented, rapidly transmitted, and culturally evolve in ways that often usefully exaggerate the harm inflicted (when, indeed, accounts are not simply fabricated).

Why? Groups are commonly in zero-sum conflict over rank, at least implicitly. Harms that cross group boundaries cause acts by one or a few individuals to be interpreted as actions taken by their group. Acts of harm that cross group boundaries are seen by the minds of both groups as, in effect, proposing an intergroup welfare trade-off precedent that will be interpreted as reflecting the new relative rank of the two groups. The mutual awareness of the initial

outrage activates a shared interpretive framework in the two groups that maps the subsequent boundary crossing acts between the two groups (or their absence) as a power- and violence-based negotiation over contested status. It is generalization (in the minds of observers) of the status (i.e., the accepted welfare trade-off precedent) from one member of a coalition to others that makes group status a public good that must be collectively defended and asserted (Tooby, 2017; Tooby & Cosmides, 2010; Tooby et al., 2006). If the group whose member(s) have been injured feels stronger and entitled to more deference than the newly proposed (lower) welfare trade-off implies, mutual awareness of the outrage triggers an inflamed response that mobilizes coordinated aggressive action to reset the intergroup trade-off equilibrium (Tooby & Cosmides, 2010; Tooby et al., 2006). They push back to contest demotion in rank. Outrages typically provoke extraordinarily strong and frequently violent responses directed more or less indiscriminately at members of the group from which the offender or offenders came (because meaning is now assigned at the group-as-agent, not individual-as-agent, level). However, if the mistreated group feels too weak (too low in formidability), they do not coordinate to punitively push back. The perpetrators' group will recalibrate themselves as entitled to treat the members of the victims' group in the same exploitive way in the future. This ratifies their mutually understood social subordination or decline in status, entitlement, and rank.

Outrages major and minor are an endless feature of history and cultural life: the Reichstag Fire. Guernica. The murder of Emmet Till. The Gulf of Tonkin. Rodney King. The War of Jenkins' Ear. Outrages trigger ethnic riots, feuds, and political movements. Whether or not they are the causes of wars, outrages can be found as precipitators of wars in almost every case. Because it is normally difficult to get individuals to set aside competing agendas within groups, yet group power increases with coordination, outrages (real or fabricated) become a resource ingroup individuals strategically cling to, nurture, remember, and deploy at crucial junctures to mobilize joint action they (as individuals) benefit from. If acted on immediately, they can solve the coordination problem in timing: The group members are mutually aware of everyone's joint knowledge of the recent precipitating outrage event, and so there is an opportunity to

increase group rank by responding at the same time in a unified and cohesive way. Individual agendas are jettisoned in favor of the outrage tableau, and violent mob action is unleashed against the outgroup.

There are times, however, when one coalition feels a gradually growing strength that could be tapped to attack and defeat a rival. But inconveniently, their adversaries have not inflicted an outrage on them. In such cases, coalitions mentally adopt those who their rivals abuse as honorary ingroup members or proteges, in order to feel a motivationally mobilizing vicarious outrage: For Imperial Russia with designs on the Ottoman Empire, it was Orthodox Christians in Palestine. For Union Northerners, it was southern slaves. For the British at the beginning of World War I, it was German atrocities against Belgians. For the United States (eager to enter the imperialist world stage), it was the Cubans and Filipinos suffering under Spanish oppression; also to American minds, it was gratifyingly inciting to blame the explosion of the battleship *Maine* on the Spanish.

Conclusions: The Clash of Ignorant Armies

We evolved as individuals in very small-scale communities and were shaped by selection for the restricted range of decisions and problems we faced then. Indeed, even in this small ancestral world, our brains could take only an infinitesimal sampling of the total potential ocean of information that surrounded us. One need only consider Avogadro's number, or the total numbers of base pairs in the genome, neurons in a single brain, or organisms in the Rift Valley to be reminded of what we so flagrantly block from our awareness. We cross-connected then as we do now to only an evolutionarily meaningful infinitesimal, flecked through the huge unseen causal landscape we are embedded in. Ancestrally, this infinitesimal informational kernel of sand allowed us to function successfully only because our neural programs evolved to complement the now vanished structure of this past world and so draw reliable behavioral implications from the infinitesimal sample.

Now, our brains remain small, but the relevant interacting world has grown truly immense and strangely distorted. We are incapable of conceiving of the vast, intricate encompassing world as it is. The macroscopic world of the biosphere and its billions is beyond us. The

actions we evolved to track were once spread across only a few dozen square miles, but the impinging arena has now expanded to one hundred million square miles, far beyond our adaptations' ability conceive or to track. The emergence of division of labor among billions, global economies, mass societies, endless coalitions, unprecedented technologies, lightning-fast cultural epidemics, and vast hierarchies involving hundreds of millions has expanded the landscapes of our lives beyond anything we can represent. Moreover, our motivational adaptations evolved to guide behavior among a few score to a few hundred people, nor did they evolve to target or achieve moral ends. When we are presented with arenas of interaction involving huge populations, our motivational adaptations are exposed to supernormal stimuli that elicit motivational intensities far outside the ancestral range.

Moreover, these systems are informed by cues that no longer reliably mean what they once signaled ancestrally, in effect causing us to live among delusions and hallucinations. Because of these broken relationships, our systems of situation representation are misled by the cross-connecting assignments of invalid biological meanings to modern circumstances. These surface appearances conceal endless unseen and unanticipated ramifications. We would all be better off with some humility—a deep appreciation for how truly wrong we can be in our certainties. As a species, we have become Matthew Arnold's ignorant armies clashing by night, nearly lost among a dark plain of hallucinated misinterpretations that no longer correspond to the actual world. With scientific effort, abstraction, and quantitative analysis, we can perhaps with high fallibility capture a few aspects of this broader new world. Eventually, as we increasingly map the circuit logics of our evolved programs, we may find some way of compensating for their deficiencies. It is even possible that an awakening clarity might emerge from the crystallization of an evolutionarily informed, strictly scientific, integrated social science over the next half-century.

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