

The evolution of consciousness

Miller, G. F. (1999). The evolution of consciousness. Unpublished manuscript, Sept. 21, 1999.

[Some portions of this appeared in *The Mating Mind*.]

Philosophical writing about consciousness often sounds like love poetry. Philosophers of mind, like medieval troubadours and lovesick teenagers, dwell upon the sublime redness of the rose, the emotional urgency of music, the soft warmth of skin, the bittersweet pangs of memory, the vertiginous freedom of imagination, and the existential loneliness of the self. Some philosophers list such experiences in an attempt to show that natural selection could not possibly account for human consciousness. How could these subjective experiences have improved our survival prospects? On the other hand, the love poets list such experiences to attract mates, understanding that their expression is the very heart of human courtship. How could these experiences not have improved our reproductive prospects?

We saw how sexual choice may have increased the size of our brains, penises, and breasts, and our capacities for art, morality, language, and creativity. Could it have reached all the way into our subjective experience, crafting a new, human kind of consciousness out of a primate brain? Can evolutionary psychology storm the citadel of the self?

Psychologist Stuart Sutherland once wrote “Consciousness is a fascinating but elusive phenomenon: it is impossible to specify what it is, what it does, or why it evolved. Nothing worth reading has been written about it.” Yet the study of consciousness has blossomed in recent years. Many of the new consciousness researchers agree that there are easy kinds of consciousness to explain, and a hard core of subjective experience that seems immune to scientific explanation. The easy kinds are usually called “psychological consciousness” or “third-person consciousness”. But I will use the term “objective consciousness”, because these include all the externally observable aspects of human consciousness, such as being alive rather than dead, awake rather than asleep, and sober rather than drugged. They also include the ability to articulate one’s state of mind by talking about sensory experiences, self-consciousness, and identity. With progress in cognitive neuroscience and artificial intelligence, these capacities now seem less like transcendental mysteries and more like technical problems of brain design. It looks increasingly possible to build a robot that implements these forms of objective consciousness.

However, there appears to be some residue left over, which philosophers call “phenomenal consciousness”, “first-person consciousness”, or “subjective consciousness”. Many philosophers believe that science cannot account for these subjective phenomena, which include the sense of what it is like to be oneself, and what it is like to have personal experiences. For example, David Chalmers argued that there might exist “zombies” that are physically identical to ordinary humans down to every brain cell and elementary particle, and that behave just like ordinary people, but that might not have any subjective experience. The lights would be on, but there’d be nobody home.

A major problem for evolutionary psychology is that if such zombies could really exist, evolution could not account for subjective consciousness. This is because selection can only shape mental adaptations insofar as they affect behavior. As defined by philosophers, only objective consciousness affects behavior, while subjective consciousness is just along for the ride. A zombie that behaved identically to a person with subjective experience would have the same survival and reproduction prospects. If subjective consciousness is not manifest in behavior, then selection, which operates on behavior, cannot favor it, and evolutionary cannot explain it.

There seems to be a gap between objective, third-person consciousness and subjective, first-person consciousness, and this gap is what makes makes zombies look conceivable. I will try to bridge the gap by considering the intermediate case of second-person consciousness, as revealed during courtship. In courtship, a third-person “him” or “her” becomes a second-person “you” – an entity whose objective consciousness becomes so well known to us through love and romance that their subjective consciousness is no longer in any doubt. Zombies only look possible if you hold them at arm’s length. Embrace them, and I think the theoretical possibility of objective consciousness without subjective consciousness crumbles before our eyes.

I married a zombie but she broke my heart

Imagine you’re a heterosexual male philosopher and you meet one of these female zombies at a night club. Her flesh isn’t dropping off and she isn’t stumbling around. Remember, according to the philosophical thought experiment, she may be indistinguishable in every detail from a beautiful, fascinating person. She just doesn’t have any real subjective experience behind all her apparent awareness. Suppose a mutual attraction develops. You share a drink with the zombie, dance around, and talk all night.

Assume that you and the zombie discover common interests and experiences. You go home and have great sex with her. She appears to have twelve loud, passionate orgasms. (But she must be faking it, like all zombies.) A relationship develops. The zombie talks about her childhood love of red crayons, her fondness for Tom Waits albums, her nervousness about public speaking, and her Ph.D. thesis, which compared the philosophical writings of John Searle to the naval artillery tactics of Lord Nelson. She is perfectly good at talking about her experiences, because, by definition, she has all the usual kinds of objective consciousness, including the ability to report sensations, memories, and plans. She just isn’t subjectively aware of what she’s reporting – she supposedly has no real experience. As the relationship matures, you meet her family, travel together, share your lives for decades, and have children together (who are presumably half-conscious.)

But remember, she might be a zombie! The conceivability argument about the possibility of zombies requires that you could take her aside at your tenth wedding anniversary, look her in the eye, and say with a straight face: “I realize that you show all the signs of objective consciousness, but I can still imagine the logical possibility that you are not having any subjective experiences whatsoever inside there.” Don’t expect an intellectual argument. Expect a divorce. Your zombie spouse would take your zombie kids to go live with her aunt on the other side of zombie-town.

Arguments about the possibility of zombies only work if you think of the zombies as strangers, not as sexual partners. Such arguments reveal the social psychology of how we dehumanize strangers, not the hypothetical gap between subjective consciousness and objective consciousness. The real mystery of consciousness is not that we have it, but how easy it is for us to treat others as if they didn't have it. Belief in the conceivability of zombies is the opposite of human sympathy. In courtship and sympathetic sexual relationships, the philosophical question of "other minds" seems to fall apart. Falling in love is, among other things, the process of learning to appreciate someone's subjective consciousness given how they behave and talk.

Computer pioneer Alan Turing alluded to the importance of courtship for testing someone's mental capacities in the original 1950 version of his "imitation game", which has come to be known as the "Turing Test". In the imitation game, an interrogator tries to determine whether they are interacting with a real woman or a computer program that imitates a woman. Turing was more interested in intelligence than female flesh, so he eliminated the physical cues of womanhood, and limited the interrogator to typing questions on a terminal, and receiving answers on a screen. The questions can be as challenging as the interrogator likes, such as "Please write me a sonnet on the subject of the Forth Bridge". In Turing's view, if a computer can successfully lead an interrogator to believe that he is interacting with a real woman, it should be considered intelligent. He emphasized that the computer must be capable of credibly demonstrating a very wide range of behaviors – his list included being kind, using words properly, having a sense of humor, catching us by surprise, claiming to enjoy strawberries and cream, falling in love, and making someone fall in love with it. (Strikingly, many of these behaviors overlap with the courtship adaptations we have considered in previous chapters.) After Turing, philosophers of Artificial Intelligence considered the sexual aspect of the imitation game a confusing distraction, and stripped it away from modern versions of the Turing Test. However, Turing's original version subtly pointed to the special challenges of demonstrating human intelligence during courtship. Even a very simple 1970s computer program like ELIZA can fool people into thinking that they are interacting with a real psychotherapist – but no one has fallen in love with ELIZA, as far as I know. Turing's more sexualized imitation game is a much better parallel to our zombie example. In both cases, it seems hard to argue that there is some magic ingredient to human intelligence or consciousness beyond that which could be demonstrated through verbal courtship.

Of course, there may be good evolutionary reasons why we treat almost everyone as zombies except our relatives, sexual partners, offspring, and friends. Such egocentrism kept our sympathy from spreading too far, where its costs would have undermined our fitness. If we had evolved from social insects like ants or termites, we would not consider "other minds" a philosophical problem. But in social primates like us, our selfish genes benefit from this illusion that consciousness is piled up like Mt. Everest on one's own mind and sprinkled in little hillocks across the minds of one's acquaintances, with the rest of nature an ocean of unconsciousness. Our brains are constructed from the ground up to act as if spreading our genes at the expense of all others is the single most important thing in the universe. The impression that our first person consciousness is qualitatively special may be the greatest confidence trick that evolution has played on us. That egocentrism appears to have been moderated only by kinship, reciprocal altruism, and sexually-selected sympathy.

Reducing consciousness versus evolving consciousness

Reductionism is the scientific strategy of trying to understand complex phenomena in terms of the interaction of simple components. It is an enormously successful and powerful strategy, often misunderstood and wrongly maligned. However, it has proven difficult to apply to consciousness. Philosopher John Searle defined the problem of consciousness as a problem of neurophysiological reductionism: "How exactly do neurobiological processes in the brain cause consciousness?". The fashionable belief that neuroscience will replace psychology has exacerbated worries about subjective consciousness. It seems hard to understand how a three-pound lump of brain cells could give rise to an "I".

This is a common problem with reductionism in biology. It is often hard to understand how a complex biological adaptation works in terms of how its constituent parts interact. How does a peacock's tail grow? How does a termite mound work? These are valid questions, but questions about "proximate" mechanisms are only part of biology. Reductionism is a valid research strategy, but it is extremely hard to apply to complex biological adaptations unless one has an idea what the adaptation evolved to do. Recent popular books on consciousness by Francis Crick, Gerald Edelman, Roger Penrose, and Daniel Dennett have tried to explain it in terms of cognitive operations, neural firings, or quantum effects. This approach usually has only limited success, because it does not ask the most important evolutionary question: "What selection pressures shaped consciousness?". That is, how did human consciousness contribute to survival or reproduction during human evolution?

Proximate and evolutionary explanations are complementary. Both are good science. But in a world of limited scientific resources and limited popular interest, there is often a tension between them. Reductionists often warn that "evolutionary speculations" should wait until reductive explanations are complete. They seem not to realize that evolutionary theories explaining the functions of animal behavior are much more sophisticated and successful than theories of how animal nervous systems produce adaptive behavior. Neuroscience has no theories as powerful as the theories of natural selection, kin selection, and sexual selection. Darwin knew that eyes were selected for vision because eyes are particularly good at forming images on the retina. He did not need to know how photo-pigment molecules change their shapes when light hits them. Likewise, we are likely to understand why species become conscious a very long time before we understand how brains become conscious.

The more efficient an adaptation is, the more difficult reductionist explanations tend to become. This is because evolution demands performance, not comprehensibility. Evolution frequently makes adaptations work by using "emergent properties" that are hard to deduce from the interaction of simple components. For example, models of brain function called "neural networks" are very efficient at perception, inference, and learning. But their efficiency depends on a way of representing information that makes them very hard to analyze reductively. When Dave Cliff and I evolved little neural networks to control simulated robots that could flee from predators, we found that the most efficient networks were the least comprehensible. They only had twenty simulated brain cells, but the dozens of feedback connections between the cells, which made them good at fleeing unpredictably, also made them hard to understand. Compare that to the human brain, with its hundred billion brain cells, and ten trillion connections between them.

Suppose an alien spaceship flew over a consciousness conference and dropped the complete reductive explanation for human consciousness, all fourteen thousand volumes of it, onto the assembled philosophers. I suspect almost none of the survivors would bother reading beyond page ten. The account would probably be about as interesting as the machine code specification of a computer's operating system. A few cognitive scientists might enjoy that, but most of the philosophers would just sigh in relief: "At last, dualism refuted, and reductionist materialism triumphant!". They would realize that what they really wanted was proof that a reductive explanation exists, without really caring what that reductive explanation is in any detail. After the second Armagnac of the evening, some might even ask "So why did human consciousness evolve to work like that?"

Fortunately, we do need alien neuroscientists to answer all of our how-questions before we have permission to ask why-questions. Evolutionary psychology does not have to wait for neuroscience to finish before it begins, any more than evolutionary biology had to wait for genetics to finish first. There is room for both – as long as the reductionists do not get greedy and demand 100% of the research money instead of the 99% they get now. To ask how natural selection and sexual selection shaped human consciousness, we only need to know a few things: consciousness exists, it has certain design features, it had various possible fitness costs and benefits, and it had genetically heritable variation.

Introspective, articulate ape seeks same

"So tell me, are you experienced?
Have you ever been experienced?
Well, I have" – Jimi Hendrix

The strongest common-sense evidence for other people having subjective consciousness is the fact that they can talk about their experiences. This is no comfort to philosophers who are paranoid about zombies, but it is to the rest of us seeking friends and partners who are more or less conscious. The consciousness of others is revealed mainly through language. Maybe we should see the evolution of human consciousness as an extension of sexual selection for language.

Two key parts of consciousness are "reportability" (the ability to articulate what we consciously experience) and "introspection" (the ability to consciously experience some of the thoughts and feelings that guide our behavior). If sexual selection on courtship conversation was the main force shaping human consciousness, we would expect the limits of reportability, introspection, and subjective experience to be roughly equal. We should be able to talk about anything we experience, because there would be no point in experiencing it if we could not report it during courtship. And we should be able to talk about anything we can introspect about too, for the same reason.

This point makes little sense until we consider different possible ways consciousness could have worked. If subjective consciousness just popped up at a certain point in evolution for no reason, it could easily have been mute. We would have selves with subjective experience, but they might be totally unable to report their experience to anyone else. They would be chained in solitary confinement, metaphysical prisoners unknown to the Amnesty International of reportability. I don't know about you, but that's

not my experience. Articulate people can articulate anything they experience. For example, the psychologist William James and his brother, the novelist Henry James, could express almost any subtlety of consciousness – even subtleties their readers may never have noticed before reading them. Inarticulate people have trouble finding the words, but that is a defect of their communication ability, not their consciousness.

Lovers sometimes say “Words cannot express what I feel about you”, but this attention-getting device usually precedes hours of impassioned chatter or love-making. Reportability is a key to courtship, not just to consciousness. Lovers talk constantly about their thoughts, feelings, and experiences. Once some form of proto-language emerged, sexual selection could have begun to shape the reportability of consciousness. If this new selection pressure favored maximum reportability, it would have lured more of our thoughts and feelings out into the open, on introspection’s parade ground, reporting for duty. Language became a conduit for sexual selection pressures to shape consciousness more directly than ever before.

The result is the effortless, fluid way we can translate from perceived objects through consciously attended qualities into spoken observations. We can walk with a lover through Sissinghurst Garden, notice a rose, consciously describe its distinctive color and fragrance, and perhaps even whisper a relevant quote from Shakespeare’s sonnet fifteen, observing “Where wasteful Time debateth with Decay to change your day of youth to sullied night; And all in war with Time for love of you, as he takes from you I engraft you new.” This high-bandwidth channel from perception into consciousness, memory, and articulate communication seems unique to humans. In animals without language, there would have been no opportunity for sexual selection to have shaped their consciousness in this way. Only when sexual choice favored reportability did our strangely promiscuous introspection abilities emerge, such that we seem to have instant conscious access to such a range of impressions, ideas, and feelings.

Sexual selection for consciousness is the opposite of sexual objectification. In a sense, it is a process of sexual subjectification – a way for evolution to create subjective experience where none existed before. Some evolutionary psychology research has focused so much on the beauty of the human body that it seems to imply that humans naturally view potential mates as nothing more than “sex objects” in the feminist sense. And in our earlier zombie example, the male philosopher was certainly objectifying the female zombie by denying her subjectivity. (Perhaps there is more than just a metaphorical relationship between the Cartesian tradition in philosophy of mind and the patriarchal tradition of objectifying women.) In both evolutionary psychology and philosophy, a greater emphasis on the psychological intricacies of courtship might help to overcome the inappropriate objectification of others.

Mate choice is not the only evolutionary force that could have favored reportability and introspection. Any other social selection pressure would work, once language began to evolve. If reportability attracted and retained good friends, social selection would favor it. If reportability improved cooperation between relatives or communication between parents and offspring, then kin selection would favor it. Even if reportability was originally favored in courtship contexts only, other social contexts would probably have reinforced it. Mate choice was probably always the most powerful form of social selection, including the most powerful shaper of reportability and consciousness. But reportability was also so useful in relating to friends, relatives, children, and clan members that the consciousness behind it no longer feels very specialized for courtship.

Shareable Data

If sexual selection developed such a lust for reportability, why can't we introspect about everything that goes on in our brains? Why do cognitive neuroscientists need to spend millions of dollars on brain imaging equipment to find out what cortical areas light up when people read the word "boondoggle", instead of just asking them? We could have evolved the sort of consciousness that Commander Data had in the 1980s *Star Trek: The Next Generation* T.V. series. Data could run all sorts of self-diagnostics concerning the operational details of his "positronic brain", and verbally report the results. But it was not Data's self-diagnostics that made the girls swoon; it was his status as one of the first American television characters to show a sense of irony.

Irony depends on a reportable personal reaction to a publicly observable event. Perhaps this is the answer. Sexual selection favors reliable indicators of fitness. But courting hominids would lie about their self-diagnostics. They might claim a 98% brain efficiency in converting glucose energy into cognitive processing, when they were only achieving 40%. Our ancestors could have caught such liars only if they happened to have portable laboratories for monitoring cerebral blood flow, complete with injections of radioactive xenon and a helmet full of Geiger counters for every potential mate.

By contrast, articulate reactions to external events make more reliable indicators of mental functioning. A choosy hominid could observe the same event, have his or her own reaction, and compare it to the reaction reported by a suitor. If the suitor's comment is inaccurate, deluded, or trite, his or her consciousness may not measure up. If a suitor reports a rhinoceros when you see a rose, you know something is wrong somewhere along his or her flow of information from sensation through perception, recognition, semantic memory, and speech.

In many quality control situations, it is easier to monitor products than production processes. Mate choice seems to have paid attention only to the more verifiable of our mental processes, crafting a consciousness that introspects mostly about things that sexual partners might care to hear about. This idea was inspired by psychologist Jennifer Freyd's theory of "shareability", which suggested that some of our cognitive processes, such as the ways we categorize objects and events, were shaped by the demands of language to produce more easily reportable results. Here, I am just putting shareability in a courtship context, where sexual choice favored a cognitive psychology better adapted to romance than survival.

Despite sexual selection for reportability, most of our mental processes are encapsulated in special-purpose brain modules that are not open to introspection. We have no idea what mental calculations allow us to perceive depth, throw a ball, or speak grammatical sentences. Mate choice would like to know about the efficiency of these calculations, but it does not ask us, because we would lie. Instead, it pays attention to how well we see, throw, or speak. Since our hominid ancestors rarely asked their mates how their mental processes worked, we have no introspective access to them. Incidentally, this problem of signal reliability in hominid sexual selection explains why psychology is such a difficult science – if we had introspective access to all of our brain processes, psychological research would demand nothing more than a comfortable armchair, a pen, and a notebook.

This leads a key hypothesis: Our mental processes became consciously accessible only insofar as their reportability contributed to effective courtship conversations. We evolved conscious access to our mental representations of external objects so we could make relevant, interesting comments about them. Memories of past experiences became conscious so we could tell life stories. Emotions, motives, and plans became conscious so we could reassure partners of our love and good intentions. Impressions of other people became conscious so we could gossip about them. Consciousness is the clearing-house that links language, memory, attention, and perception, to produce better displays of how our minds are working.

The main competing hypothesis about introspection is that it evolved as an executive control process that allowed more efficient thinking, planning, and behaving. Like the Baby Boom generation did to the United States, introspection may have developed to tune in, turn on, and take over. Perhaps unsurprisingly, many psychologists of the Baby Boom generation favor this theory of consciousness, which transforms it from a psychedelic mystery into a political elite that governs the brain's circuits through opinion polls. This sort of executive consciousness would be directed inward rather than outward. In cartoon terms, it would be like Homer Simpson's job, monitoring safety systems in a nuclear power plant. It would not be like Clark Kent's day job, monitoring news from around the world at the *Daily Planet*.

However, there is no clear reason why these control processes need to be centralized, consciously accessible, and reportable. They could work independently and autonomously, as do the homeostatic systems that control the body's physiology. The autonomic nervous system helps coordinate many bodily processes, but it isn't notably conscious. Our consciousness seems more Kentish than Simpsonian, more adapted to report external news than to monitor internal processing.

Sweet qualia

Why does red look red? It sounds like a silly question, but this is what philosophers call the problem of "qualia": the subjective, qualitative impressions made by things. The demands of reportability do not seem to explain qualia. Couldn't we just see red and report red without experiencing redness?

Notably, only a few kinds of perceptual information seem weird enough to be regularly offered by philosophers as examples of qualia. Classic examples of qualia include the colors of visual objects, the timbres of musical sounds, and the sharpness of pain. I suspect that these examples are used again and again because the subjective experiences they yield seem under-determined by the functional requirements of perception. The subjective graspable feel of a hammer's handle does not seem so puzzling, because shape information seems less arbitrary. If hammers felt like melons, we would try to pick them up the wrong way. But if red looked like blue, what difference would it make, as long as we knew which was which?

From a functional point of view, I do not find the apparent arbitrariness of some qualia very surprising. How should perceptual information like visual color and musical timbre be mentally represented? Psychologist Roger Shepard has argued that it doesn't much matter how individual attributes are mentally represented, as long as the objective

similarities of real-world attributes are mapped accurately by the subjective similarities between qualia. The subjective relationships between qualia matter much more than the qualia themselves. The functionally important attribute of red is its subjective similarity to orange and purple.

Still, what determines the subjective feel of individual qualia? The answer seems obvious: they're arbitrary. We needn't worry about it. Azure could look vermilion, and trombones could sound like termites, but as long as the rest of our brain kept track of what was what, it wouldn't matter. Why should we expect arbitrary perceptual labels to feel anything other than arbitrary? One can get all existential about that arbitrariness, but that may not be the best way to understand consciousness.

If we are serious about understanding qualia, why not start with the easy examples first? The philosopher Martin Heidegger got further thinking about the graspability of hammers than the redness of red. Easy qualia like visual shape and musical rhythm have a subjective spatial or temporal form that seems more clearly related to external space and time. Temporal qualia seem an especially promising place to start, since, as Roger Shepard observed, time is the only dimension that the mind truly shares with the world. Red may seem arbitrary, but it is hard to view the subjective rhythmic qualia of orgasm as divorced from the objective rhythms of copulation.

The peak of consciousness

Consciousness is not constant. Like health, motivation, and creativity, it rises to a peak in young adulthood and then declines in the ever-sliding dance of senescence. Qualia, introspection, and self-consciousness all seem most intense in the late teens and early 20s, with the peak of mating effort and courtship. For old philosophers, consciousness is a dusty, half-finished puzzle. For young people just reaching sexual maturity, it is a fantastic discovery, something to be enjoyed, explored, altered, displayed, and talked about during courtship. There are many symptoms of this young adult consciousness peak. This is when interest in mysticism, altered states, psychology, and philosophy of mind tends to peak. When people look for the meaning of life, whether in religious cults, political idealism, or rock music lyrics. When people take powerful psychoactive drugs. When people develop schizophrenia. As consciousness peaks, the risks of developing disorders of consciousness peak as well, as a handicap model might predict. The consciousness peak is not just a modern phenomenon: young people in many tribal societies pursue "vision quests" at this age.

As courtship effort fades a bit by the late 20s, consciousness fades as well, giving way to a more pragmatic, less flashy mind-set. Habit sets in. Life becomes more automated, as routine skills replace conscious attention. Days go by on auto-pilot. We become zombies most of the time, as far as subjective consciousness goes. We may suddenly realize we have been driving the last ten miles unconsciously. We may wake up after years of quotidian drudgery, and ask: Is this my beautiful house? Is this my beautiful wife? How did I get here? Where did my qualia go? Life passes by faster and faster as we spend less and less time being conscious. Darwin lamented his creeping inability to enjoy art or music as he aged and became more immersed in scientific theorizing. William James wrote of habit as the enemy of consciousness. The caffeine-addicted number theorist Paul Erdos once complained that he felt like a machine for turning coffee into theorems. There are effective ways to reactivate the raw qualia of youth:

meditation, long vacations, changing careers, moving abroad, painting from life, playing with children, recreational drugs, and flirtations that demand renewed courtship effort. But most of these strategies seem like too much trouble, so we tend to sit and watch television instead, squandering the human consciousness that we pretend to value so highly.

Why do we let consciousness fade after courtship? It seems a matter of laziness, like failing to exercise. It is as if consciousness costs too much energy – not just objective physical energy, but subjective attention and psychological effort. Perhaps this means consciousness is yet another costly fitness indicator. We activate it only when necessary, to cope with novel situations, especially new lovers.

The evolution of intimacy

As a couple live together over the years, their two minds grow together. This happens in the quite literal sense that they share more of the same memories, knowledge, beliefs, and plans. Their self-consciousness may merge into a sense of couple-consciousness, in which their sense of personal identity is somewhat dissolved in the couple's shared social identity and joint interests. First person singular plus second person singular becomes first person plural. The "problem of other minds" becomes a long-forgotten joke.

Intimacy develops within relationships, but the capacity for intimacy must have evolved across many generations. I think intimacy brought two main adaptive benefits: more efficient coordination, and more efficient courtship when necessary. Successful couples start as two separate vehicles for their selfish genes, but as they accumulate children, the relevant unit of adaptive function becomes the couple itself. Their two sets of genes are now in the same boat, as the relationship becomes the principal conduit for their joint reproductive success.

As Richard Dawkins pointed out in *The Extended Phenotype*, evolution can favor efficient coordination at any level of adaptive function where genes share common interests. The genes in a cell have a common interest in the cell's success, so they cooperate to sustain a shared metabolism. Likewise for the cells in an individual body: they all want the body's gonads to successfully reproduce, so they act as one, evolving sophisticated coordination mechanisms called nervous systems designed to keep the gonads alive and to put them in the right places at the right times. From the body, some evolutionary psychologists jump all the way up to the level of the tribal group as the next obvious unit of cooperation. As we saw with morality and language, group competition can act as an equilibrium selection device that favors more efficient groups, and this does not demand "group selection" that favors altruists. However, this jump to the group leap-frogs over the couple as an adaptive unit.

Couples develop shared interests not just at the psychological level, but the genetic level. In *A Treatise on the Family*, economist Gary Becker emphasized that couples become potent economic units by developing efficient coordination signals, mutual understanding, and divisions of labor. These also make couples potent reproductive units. The shared consciousness called intimacy may have evolved to reap the reproductive rewards of efficient coordination within couples.

Yet couples do not have completely overlapping interests, because they sometimes split up. Continued courtship effort is sometimes necessary to sustain a relationship. Intimacy also makes this intermittent courtship effort more efficient. It allows each partner to understand the other's interests and needs, so they can target their attempts at attraction more precisely. Couples can use subtle, customized sexual signals that would be baffling to strangers: allusions to shared experiences, in-jokes, idiosyncratic ways of derogating sexual competitors. They do not need to rely on the stereotyped sexual signals of early courtship that play to the lowest common denominator of human nature – status, beauty, wealth. By comparison, outsiders are shooting in the dark. They may offer novelty, but no intimacy.

In human evolution, retaining desired sexual partners can be as important as attracting them in the first place. If intimacy helped individuals sustain valued relationships, then sexual selection would have favored the capacity for intimacy. Sexual temptation was always an issue in the Pleistocene. Individuals who formed a series of relatively long-lasting, efficiently coordinated, intimate relationships probably reproduced more successfully than those who were always jumping from stranger to stranger. The pleasures of intimacy – including both copulation and conversation – deterred individuals from switching partners too often, saving them the time and energy costs of establishing efficient coordination with a new partner.

Our ancestors achieved higher reproductive success by merging their individual consciousness into the intimacy of sexual couples. They gained clear benefits from doing so: more efficient coordination in daily family life, and more efficient renewed courtship when the relationship was threatened by outside temptation. Sexual selection does not just explain superficial traits like large penises and long hair. It can explain any psychological capacity that tended to initiate, improve, and sustain reproductively successful relationships. Sexual selection is where we find it.

Sexual personae

People act differently when in love. One's drab, ordinary character seems to fall away, replaced by a persona that is more energetic, daring, humorous, witty, romantic, kind, successful, and charismatic. Attractive beliefs, habits, memories, and ambitions seem to crowd out the less attractive. Love often changes people almost beyond recognition, reminding parents and friends of grubs transformed into butterflies.

Chimpanzees have the capacity for “tactical deception”, for pretending to do something other than what they are really doing. But they cannot pretend to be someone other than who they were. Sexual courtship may have been the arena in which we evolved the capacity for dramatic role-playing. Courtship was the original role-playing game. The character-masks that our ancestors wore to attract mates may have been crucial in shaping our ability to act as different characters. Acting is not the prerogative of a few high-strung professionals, but a human birthright, automatically activated whenever we fall in love. This may help us understand human consciousness and the sense of identity.

At first glance, courtship just requires changing the settings on a few personality dials. Increase energy output. Boost kindness and sympathy. Turn off neuroticism. Smile more, talk faster, make more jokes. But we also tend to match our expressed interests

and preferences to those of a desired individual. One develops a crush on a mountain-climber, and suddenly feels drawn to the sublime solitude of the Alps. One dates a jazz musician, and feels prone to sell one's out-dated heavy metal albums. Should an otherwise perfect lover confide her secret belief in the healing power of crystals, one may find yesterday's sneering skepticism about such nonsense replaced by a sudden open-mindedness, a certain generosity of faith that must have lain dormant all these years. In courtship, we re-invent ourselves, working our way into roles that we think will prove attractive.

With each new lover, there is a shift in image and identity. These shifts are rarely as dramatic as the changes of sexual personae adopted by David Bowie or Madonna with each new album. But they are more profound. Often, we may find it difficult to relate to our former selves from previous romances. Events experienced by that former self, which seemed so vivid and unforgettable at the time, become locked away in a separate quadrant of memory's labyrinth, accessible only if we happen to run into the former lover. Our consciousness undergoes these sexual revolutions, reshaping itself to each new lover like an advertising company dreaming up new campaigns for capturing new market niches. And consciousness has been sexually selected to be good at these re-brandings, these roles, these sexual personae. We slip into character without any of the self-conscious drills of a Method actor.

In courtship, all the world became a stage, and all the proto-humans merely players. We evolved the ability to role-play because sexual choice favored those who were better at adopting an attractive series of sexual personae. Our identity-shifts operate not only at the level of consciousness and identity, but at all observable levels: ornamentation, clothing, posture, gesture, accent, facial expression, attitude, opinion, and ideology.

This brings us back to objective versus subjective consciousness. To a skeptic, sexual selection could only have shaped our objective consciousness and our acting ability, not our "true subjective consciousness". Our selfish genes evolved human consciousness as a grand amusement park full of simulators. There may be nothing behind our curtains. Yet our acting ability included the capacity for telling our life stories, reporting our sensory experiences, and developing emotional intimacy over many years. I do not see how an organism could put on such an act without evolving a true subjective consciousness. Admittedly, this is nothing more than an argument from personal incredulity. But zombie arguments are nothing more than arguments from personal conceivability. I don't know how to weigh one against the other. From an evolutionary viewpoint, the distinction between objective and subjective consciousness makes little sense if one considers other individuals as sexual partners rather than strangers. If the zombie problem is over-stated, there was nothing to keep sexual selection from acting on subjective consciousness, by favoring objective consciousness. In simple terms, my argument boils down to this: our ancestors may have favored sexual partners who acted more consciously to those who acted less consciously, and this may explain why we are so conscious.

Conscious knowledge

Animals with delusions should be eliminated by natural selection. Evolution should produce species with more and more accurate models of the world. This reasoning has led to the field of "evolutionary epistemology", which studies how evolutionary processes

can generate reliable knowledge. Leaders of this field such as Karl Popper, Donald Campbell, and John Ziman have credited evolution with a tendency to endow animals with reasonably accurate models of the world. This idea seems to solve many of the traditional philosophical worries about epistemology, which studies the reliability of human knowledge.

For most kinds of knowledge embodied in most of our psychological adaptations, I think their argument is correct. Natural selection has endowed us with an intuitive physics that allows us to understand mass, momentum, and movement well enough to deal with the material world. We also have an intuitive biology that allows us to understand plants and animals well enough to survive, and an intuitive psychology that lets us understand people. For two decades, psychologists have been busy investigating these intuitive forms of knowledge in children and adults. Our hundreds of adaptations for sensation, perception, categorization, inference, and behavior embody thousands of important truths about the world.

However, sexual selection makes these reliability arguments fall apart at the level of conscious ideologies. While natural selection for survival may have made perception pragmatically accurate, mate choice may not have cared about the accuracy of our more complex belief systems. Sexual selection could have favored ideologies that were entertaining, exaggerated, exciting, dramatic, pleasant, comforting, narratively coherent, aesthetically balanced, wittily comic or nobly tragic. It could have shaped our minds to be amusing and conscious, but deeply fallible. As long as our ideologies do not undermine our more pragmatic adaptations, their epistemological frailty does not matter to evolution.

Imagine some young hominids huddling around a Pleistocene campfire, enjoying their newly-evolved language ability. Two males get into an argument about the nature of the world, and start holding forth, displaying their ideologies. The hominid named Carl proposes: "We are mortal, fallible primates who survive on this fickle savannah only because we cluster in these jealousy-ridden groups. Everywhere we have ever travelled is just a tiny, random corner of a vast continent on an unimaginably huge sphere spinning in a vacuum. The sphere has travelled billions and billions of times around a flaming ball of gas, which will eventually blow up to incinerate our empty, fossilized skulls. I have discovered several compelling lines of evidence in support of these hypotheses"

The hominid named Candide interrupts: "No, I believe we are immortal spirits gifted with these beautiful bodies because the great god Wug chose us as his favorite creatures. Wug blessed us with this fertile paradise that provides just enough challenges to keep things interesting. Behind the moon, mystic nightingales sing our praises, some of us more than others. Above the azure dome of the sky the smiling sun warms our hearts. After we grow old and enjoy the babbling of our grand-children, Wug will lift us from these bodies to join our friends to eat roasted gazelle and dance eternally. I know these things because Wug picked me to receive this special wisdom in a dream last night."

Which ideology do you suppose would prove more sexually attractive? Will Carl's truth-seeking genes – which may discover some rather ugly truths – out-compete Candide's wonderful-story genes? The evidence of human history suggests our ancestors were more like Candide than Carl. We are naturally Candide-like. It usually takes years of watching BBC science documentaries to become as objective as Carl.

Runaway sexual selection for ideological entertainment would not have produced accurate belief-systems, except by accident. If ideological displays were favored as fitness indicators, the only truth they had to convey was truth about fitness. They need not be accurate world-models any more than the eyes of a peacock's tail need to represent real eyes. *Das Capital* demonstrated Karl Marx's intelligence, imagination, and energy, but its reliability as a fitness-indicator does not guarantee the truth of dialectical materialism. The majesty of Brigham Young's religious visions were sufficient to attract 27 wives (who averaged 24.5 years old at marriage – with wives number 12 through 21 marrying him when he was in his mid-40s), but that does not guarantee the veracity of his belief that dead ancestors can be retroactively converted to the Mormon faith.

When we considered the evolution of language, we saw that sexual selection rarely favors displays that include accurate conceptual representations of the world. Across millions of species throughout the earth's history, there are only two good examples of sexual selection for world-representing truth: human language and human representational art. Even so, human language's ability to refer to real objects and events does not guarantee the reliability of human ideologies expressed through language.

Sexual selection is like an insanely greedy tabloid newspaper editor who deletes all news and leaves only advertisements. In human evolution, it is as if the editor suddenly recognized a niche market for news in a few big-brained readers. She told all her reporters she wanted wall-to-wall news, but she never bothered to set up a fact-checking department. Human ideology is the result: a tabloid concoction of religious conviction, political idealism, urban myth, tribal myth, wishful thinking, memorable anecdote, and pseudo-science.

Richard Dawkins has suggested that these ideological phenomena all result from "memes" – virus-like ideas that evolved at the cultural level to propagate themselves by grabbing our attention, remaining memorable, and being easy to transmit to others. The meme idea offers a novel perspective on human culture, but it begs several questions: Why do people display such ideas so fervently in young adulthood, especially during courtship? Why do people compete to invent new memes that will make them famous? Why were most memes invented by men? Why did natural selection leave us so vulnerable to ideological nonsense? Perhaps by viewing ideological displays as part of courtship, we can answer such questions. Mostly, we use our memes to improve our sexual and social status; they do not just use us.

This sexual selection theory of ideology is a serious challenge to evolutionary epistemology. Natural selection can favor accurate intuitive models of the world, but it seems incapable of producing communication systems that can consciously share those models. Sexual selection can favor rich communication systems, but it tends to debauch and distort any consciously-expressed world-models to be more entertaining than accurate. There seems to be a trade-off between reliable individual cognition and social communication. We can be mute realists or chatty fabulists, but not both. This is far from the evolutionary epistemology view, in which truth-seeking cognition evolved with truth-sharing language to give us a double-barrelled defence against falsehood.

Our conscious beliefs are a thin layer of marzipan on the fruitcake of the mind. Most of our mental adaptations that patiently guide our behavior remain intuitively accurate. They are our humble servants, toiling away at ground level, unaffected by the strange signals flying overhead from one consciousness to another during the mental fireworks show of courtship. Sexual selection has not messed up our depth perception, voice recognition, sense of balance, or ability to throw rocks accurately. But it may have profoundly undermined the reliability of our conscious beliefs. This is the level of epistemology that people care about when arguing about all of the domains where people challenge other people's claims to "knowledge": religion, politics, medicine, psychotherapy, social policy, the humanities, and the philosophy of science. It is in these domains that sexual selection undermines the evolutionary epistemology argument, by turning consciousness from a servant of truth into an ornamental advertisement of our fitness.

Conscious science

Given minds shaped by sexual selection for ideological entertainment rather than epistemic accuracy, what hope do we have of discovering truths about the world? History suggests that we had very little hope until the social institutions of science arose. Before science, there was no apparent cumulative progress in the accuracy of human belief systems. After science, everything changed.

From a sexual selection perspective, science is a set of social institutions for channelling our sexually-selected instincts for ideological display in certain directions according to strict rules. These rules award social status to individuals for proposing good theories and gathering good data, not for physical attractiveness, health, kindness, or other fitness indicators. Scientists learn to derogate the normal human forms of ideological display: armchair speculation, entertaining narratives, comforting ideas, and memorable anecdotes. (Of course, this spills over into derogation of popular science books that try to present serious ideas in attractive form.) Science separates the arenas of intellectual display (conferences, classrooms, journals) from other styles of courtship display (art, music, drama, comedy, sports, charity). Science writing is standardized to channel creativity into inventing new ideas and arguments instead of witty phrases and colorful metaphors. Scientists are required to provide intellectual displays to young single people (through undergraduate teaching, graduate advising, and colloquium-giving), but are discouraged from enjoying any sexual benefits from these displays, so are kept in a state of perpetual quasi-courtship until retirement.

These scientific traditions are ingenious ways of harnessing human courtship effort to produce cumulative progress towards world-models that are abstract, communicable, and true. It is surprising that science works so well, given the absence of referential content in the sexual signals of all other species, and our Scheherezade-style genius for fictional entertainment. Science is not asexual or passionless. But neither is it a result of some crudely sublimated sex drive. Rather, it is one of our most sophisticated arenas for human courtship, which is the most complex and conscious form of mating that has ever evolved on our planet.