**Chapter 1:**

# Central Park

Central Park divides two of Manhattan’s greatest treasure collections. On the west side stands the American Museum of Natural History, with its dinosaur fossils, stuffed African elephants, dioramas of apes, and displays of ancient human remains. On the east side stands the Metropolitan Museum of Art, with its Rembrandt self-portraits, peacock-shaped sitar, gold rapiers, Roman temple, Etruscan mirrors, and Jacques Louis David’s *Death of Socrates*.

These works symbolize our unique human capacities for art, music, sports, religion, self-consciousness, and moral virtue, and they have troubled me ever since my student days of studying biology at Columbia University. It was easy enough for me to take a taxi along the Transverse Road from West 79th (the natural history museum) to East 81st (the Met). It was not so easy for our ancestors to cross over from the pre-human world of natural history to the world of human culture. How did they transform themselves from apes to New Yorkers? Their evolutionary path seems obscure.

Yet we know there must have been a path. The human mind evolved somehow. The question scientists have asked for over a century is: how? Most people equate evolution with “survival of the fittest”, and indeed most theories about the mind’s evolution have tried to find survival advantages for everything that makes humans unique. To extend the metaphor, one kind of theory suggests our problem was not following the Transverse Road to a collection of decorative arts, but travelling a different route to some useful inventions. Perhaps the human mind evolved for military prowess, symbolized by the Sea-Air-Space Museum on the aircraft carrier *USS Intrepid*, docked at Pier 86. Or perhaps our minds evolved for reciprocal economic advantage, symbolized by the World Trade Center and Wall Street, or through a thirst for pure knowledge, as housed in the New York Public Library. The survival advantages of better technology, trade, and knowledge seem obvious, so many believe the mind’s evolution must have been technophilic and survivalist.

Ever since the Darwinian revolution, this survivalist view has seemed the only scientifically respectable possibility. Yet it remains unsatisfying. It leaves too many riddles unexplained. Human language evolved to be much more elaborate than necessary for basic survival functions. From a pragmatic biological viewpoint, art and music seem like pointless wastes of energy. Human morality and humor seem irrelevant to the business of finding food and avoiding predators. Moreover, if human intelligence and creativity were so useful, it is puzzling that other apes did not evolve them.

Even if the survivalist theory could take us from the world of natural history to our capacities for invention, commerce, and knowledge, it cannot account for the more ornamental and enjoyable aspects of human culture: art, music, sports, drama, comedy, and political ideals. At this point the survivalist theories usually point out that along the Transverse Road lies the Central Park Learning Center. Perhaps the ornamental frosting on culture’s cake arose through a general human ability to learn new things. Perhaps our big brains, evolved for technophilic survivalism, can be co-opted for the arts. However, this side-effect view is equally unsatisfying. Temperamentally, it reflects nothing more than a Wall Street trader’s contempt for leisure. Biologically, it predicts that other big-brained species like elephants and dolphins should have invented their own versions of the human arts. Psychologically, it fails to explain why it is so much harder for us to learn mathematics than music, surgery than sports, and rational science than religious myth.

I think we can do better. We do not have to pretend that everything interesting and enjoyable about human behavior is a side-effect of some utilitarian survival ability or general learning capacity. I take my inspiration not from the Central Park Learning Center on the north side of the Transverse Road, but from The Ramble on the south side. The Ramble is a 37-acre woodland hosting 250 species of birds. Every spring, they sing to attract sexual partners. Their intricate songs evolved for courtship. Could some of our puzzling human abilities have evolved for the same function?

# A mind for courtship

This book proposes that our minds evolved not just as survival machines, but as courtship machines. Every one of our ancestors managed not just to live for a while, but to convince at least one sexual partner to have enough sex to produce offspring. Those proto-humans that did not attract sexual interest did not become our ancestors, no matter how good they were at surviving. Darwin realized this, and argued that evolution is driven not just by natural selection for survival, but by an equally important process that he called *sexual selection through mate choice.* Following his insight, I will argue that the most distinctive aspects of our minds evolved largely through the sexual choices that our ancestors made.

The human mind and the peacock’s tail may serve similar biological functions. The peacock’s tail is the classic example of sexual selection through mate choice. It evolved because peahens preferred larger, more colorful tails. Peacocks would survive better with shorter, lighter, drabber tails. But the sexual choices of peahens have made peacocks evolve big, bright plumage that takes energy to grow and time to preen, and that makes it harder to escape from predators such as tigers. The peacock’s tail evolved through mate choice. Its biological function is to attract peahens. The radial arrangement of its yard-long feathers, with their iridescent blue and bronze eye-spots and their rattling movement, can only be explained scientifically if one understands that function. The tail makes no sense as an adaptation for survival, and perfect sense as an adaptation for courtship.

The human mind’s most impressive abilities are like the peacock’s tail: they are courtship tools, evolved to attract and entertain sexual partners. By shifting our attention from a survival-centered view of evolution to a courtship-centered view, I will try to show how, for the first time, we can understand more of the richness of human art, morality, language, and creativity.

Recent polls show that a slight majority of Americans accept that humans evolved gradually over millions of years. Yet only about 10% believe that natural selection, alone and unguided, can account for the human mind’s astounding abilities. Most think that the mind’s evolution must have been guided by some intelligent force, some active designer. Even in more secular nations such as Britain, many accept that humans evolved from apes, but doubt that natural selection suffices to explain our minds.

Despite being a committed Darwinian, I share these doubts. I do not think that natural selection for survival can explain the human mind. Our minds are entertaining, intelligent, creative, and articulate far beyond the demands of surviving on the plains of Pleistocene Africa. To me, this points to the work of some intelligent force and some active designer. However, I think the active designers were our ancestors using their powers of sexual choice to influence – unconsciously – what kind of offspring they produced. By intelligently choosing their sexual partners for their mental abilities, our ancestors became the intelligent force behind the human mind’s evolution.

**Evolutionary psychology turns Dionysian**

The time is ripe for more ambitious theories of human nature. Our species has never been richer, better educated, more numerous, or more aware of our common historical origin and common planetary fate. As our self-confidence has grown, our need for comforting myths has waned. Since the Darwinian revolution, we recognize that the cosmos was not made for our convenience.

But the Darwinian revolution has not yet captured nature’s last citadel, human nature. Over the last ten years, the new science of evolutionary psychology has made valiant attempts. It views human nature as a set of biological adaptations, and tries to discover the problems of living and reproducing that those adaptations evolved to solve. It grounds human behavior in evolutionary biology.

Some critics believe that evolutionary psychology goes too far and attempts to explain too much. I think it does not go far enough. It has not taken some of our most impressive and distinctive abilities as seriously as it should. For example, in his book *How the Mind Works*, Steven Pinker argued that human art, music, humor, fiction, religion, and philosophy are not real adaptations, but biological side-effects of other evolved abilities. As a cognitive scientist, Pinker was inclined to describe the human mind as a pragmatic problem-solver, not a magnificent sexual ornament: “The mind is a neural computer, fitted by natural selection with combinatorial algorithms for causal and probabilistic reasoning about plants, animals, objects, and people”. Although he knows that reproductive success is evolution’s bottom line, he overlooked the possible role of sexual selection in shaping conspicuous display behaviors such as art and music. For example, he asked “if music confers no survival advantage, where does it come from and why does it work?” Lacking any manifest survival function, he concluded that art and music must be like cheesecake and pornography – cultural inventions that stimulate our tastes in evolutionarily novel ways, without improving our evolutionary success. His view that the arts are “biologically frivolous” has upset many performing artists sympathetic to evolutionary psychology. In a televised BBC debate following the publication of *How the Mind Works*, the theatrical director and intellectual polymath Jonathan Miller took Pinker to task for dismissing the arts as non-adaptations, without considering all their possible functions. One of my goals in writing this book was to see if evolutionary psychology could prove as satisfying to a performing artist as to a cognitive scientist. It may be economically important to consider how the mind works, but it is also important to consider how the mind mates.

The view of the mind as a pragmatic, problem-solving survivalist has also inhibited research on the evolution of human creativity, morality, and language. Some primate researchers have suggested that human creative intelligence evolved as nothing more than a way to invent Machiavellian tricks to deceive and manipulate others. Human morality has been reduced to a Tit-for-Tat accountant that keeps track of who owes what to whom. Theories of language evolution have neglected human story-telling, poetry, wit, and song. You have probably read accounts of evolutionary psychology in the popular press, and felt the same unease that it is missing something important. Theories based on the survival of the fittest can nibble away at the edges of human nature, but do not take us to the heart of the mind.

Moreover, the ritual celibacy of these survivalist doctrines seems artificial. Why omit sexual desire and sexual choice from the pantheon of evolutionary forces that could have shaped the human mind, when biologists routinely use sexual choice to explain behavioral abilities in other animals? Certainly, evolutionary psychology is concerned with sex. Researchers such as David Buss and Randy Thornhill have gathered impressive evidence that we have evolved sexual preferences that favor pretty faces, fertile bodies, and high social status. But evolutionary psychology in general still views sexual preferences more often as outcomes of evolution than as causes of evolution. Even where the sexual preferences of our ancestors have been credited with the power to shape mental evolution, their effects have been largely restricted to sexual and social emotions – to explain, for example, higher male motivations to take risks, attain social status, and demonstrate athletic prowess. Sexual choice has not been seen as reaching very deep into human cognition and communication, and sexuality is typically viewed as irrelevant to the serious business of evolving human intelligence and language.

In reaction to these limitations, I came to believe that the Darwinian revolution could capture the citadel of human nature only by becoming more of a sexual revolution – by giving more credit to sexual choice as a driving force in the mind’s evolution. Evolutionary psychology must become less Puritan and more Dionysian. Where others thought about the survival problems our ancestors faced during the day, I wanted to think about the courtship problems they faced at night. In poetic terms, I wondered whether the mind evolved by moonlight. In scientific terms, sexual selection through mate choice seemed a neglected factor in human mental evolution. Through ten years of researching sexual selection and human evolution, from the beginning of my Ph.D. through now, it became clear to me that sexual selection theory offered valuable intelligence about aspects of human nature that are important to us, and that cry out for evolutionary explanation, but that have been ignored, dismissed, or belittled in the past.

**Trying a different tool**

The human brain and its diverse capacities are so complex, and so costly to grow and maintain, that they must have arisen through direct selection for some important biological function. To date, it has proven very difficult to propose a biological function for human creative intelligence that fits the scientific evidence. We know the human mind is a collection of astoundingly complex adaptations, but we do not know what biological functions many of them evolved to serve.

Evolutionary biology works by one cardinal rule: to understand an adaptation, one has to understand its evolved function. The analysis of adaptations is more than a collection of just-so stories, because evolutionary theory allows only two fundamental kinds of functions to explain adaptations. Adaptations can arise through natural selection for survival advantage, or sexual selection for reproductive advantage. Basically, that’s it.

If you have two tools and one doesn’t work, why not try the other one? Science has spent over a century trying to explain the mind’s evolution through natural selection for survival benefits. It has explained many human abilities such as food preferences and fear of snakes, but consistently fails to explain other abilities for decorative art, moral virtue, and witty conversation. It seems reasonable to ask whether sexual selection for reproductive benefits might account for these left-overs. This suggestion makes sexual selection sound like an explanation of last resort. It shouldn’t be viewed that way, because sexual selection has some special features as an evolutionary process. As we shall see, sexual selection is unusually fast, powerful, intelligent, and unpredictable. This makes it a good candidate for explaining any adaptation that is highly developed in one species but not in other closely related species that share a similar environment.

**What makes sexual selection so special?**

In the 1930s, biologists re-defined natural selection to include sexual selection, because they did not think sexual selection was very important. Following their precedent, modern biology textbooks define natural selection to include every process that leads some genes to out-compete other genes by virtue of their survival or reproductive benefits. When one biologist says “evolution through natural selection”, other biologists hear “evolution for survival or reproductive advantage”. But non-biologists, including many other scientists, still hear “survival of the fittest”. Even many evolutionary psychologists, who should know better, ask what possible “survival value” could explain some trait under discussion. This causes enormous confusion, and the continuing neglect of sexual selection in discussions of human evolution.

In this book I will use the terms natural selection and sexual selection as Darwin did, with natural selection arising through competition for survival, and sexual selection arising through competition for reproduction. I am perfectly aware that this is not the way professional biologists currently use these terms. But I think it is more important, especially for non-biologist readers, to appreciate that selection for survival and selection for attracting sexual partners are distinct processes that tend to produce quite different kinds of biological traits. Terms should be the servants of theories, not the masters. By reviving Darwin’s distinction between natural selection for survival and sexual selection for reproduction, we can talk more easily about their differences.

One difference is that sexual selection through mate choice can be much more intelligent than natural selection. I mean this quite literally. Natural selection takes place as a result of challenges from an animal’s physical habitat and biological niche. The habitat includes the factors that matter to farmers: sunlight, wind, heat, rain, and land quality. The niche includes predators and prey, parasites and germs, and competitors from one’s own species. Natural selection is just something that happens as a side effect of these factors influencing an organism’s survival chances. The habitat is inanimate and doesn’t care about those it affects. Biological competitors just care about making their own livings. None of these selectors cares whether they impose evolutionary selection pressures that are consistent, directional, efficient, or creative. The natural selection resulting from such selectors just happens, willy-nilly.

Sexual selection is quite different, because animals often have very strong interests in acting as efficient agents of sexual selection. The genetic quality of an animal’s sexual partner determines, on average, half the genetic quality of their offspring. (Most animals inherit half their genes from mother and half from father.) As we shall see later, one of the main reasons why mate choice evolves is to help animals choose sexual partners who carry good genes. Sexual selection is the professional at sifting between genes. By comparison, natural selection is a rank amateur. Therefore, the evolutionary pressures that result from mate choice can be much more consistent, accurate, efficient, and creative than natural selection pressures.

As a result of these incentives for sexual choice, many animals are sexually discriminating. They accept some suitors and reject others. They apply their faculties of perception, cognition, memory, and judgment to pick the best sexual partners they can. In particular, they attend to any features of potential mates that signal their fitness and fertility.

In fact, sexual selection in our species is as bright as we are. Every time we chose one suitor over another, we act as an agent of sexual selection. Almost anything that we can notice about a person is something that our ancestors might have noticed too, and might have favored in their sexual choices. For example, if some of us fall in love with people for their quick wits and generous spirits, and we wonder how these traits could have evolved, sexual choice theory suggests the answer is right in front of us. These traits are sexually attractive, and perhaps simpler forms of them have been attractive for hundreds of thousands of years. Over many generations, those with quicker wits and more generous spirits may have attracted more sexual partners, or higher-quality partners. The result was that wits became quicker and spirits more generous.

Of course, sexual selection through mate choice cannot favor what its agents cannot perceive. If animals cannot see the shapes of each others’ heart ventricles, then heart ventricles cannot be directly shaped by sexual selection. Vivisection is not a practical method for choosing a sexual partner. A major theme of this book is that before language evolved, our ancestors could not easily perceive each others’ thoughts, but after language, thought itself became subject to sexual selection. Through language and other new forms of expression such as art and music, our ancestors could act more like psychologists – in addition to acting like beauty contest judges – when choosing mates. During human evolution, sexual selection seems to have shifted its primary target from body to mind.

This book argues that we were neither created by an omniscient deity, nor evolved by blind, dumb natural selection. Rather, our evolution was shaped by beings intermediate in intelligence: our own ancestors, choosing their sexual partners as sensibly as they could. We have inherited both their sexual tastes for warm, witty, creative, intelligent, generous companions, and some of these traits that they preferred. We are the outcome of their million-year long genetic engineering experiment, in which their sexual choices did the genetic screening.

Giving so much credit to sexual choice can make sexual selection sound almost too powerful. If sexual selection can act on any trait that we can notice about other individuals, it can potentially explain any aspect of human nature that we scientists can notice too. Sexual selection’s reach seems to extend as far as psychology’s subject matter.

So be it. In science, we don’t have to play fair against nature. Physics is full of indecently powerful theories, such as Newton’s laws of motion and Einstein’s theory of general relativity. Darwin gave biology two equally potent theories: natural selection and sexual selection. In principle, his two theories explain the origins of all organic complexity, functionality, diversity, and beauty in the universe. Psychologists generally believe they have no theories of comparable power so far. But sexual selection can also be viewed as a psychological theory, because sexual choice and courtship are psychological activities. Psychologists are free to use sexual selection theory just where we need it most, to explain mental abilities that look too excessive and expensive to have evolved for survival.

This sexual choice view also sounds rather circular as an explanation of human mental evolution. It puts the mind in an unusual position, as both selector and selectee in its own evolution. If the human mind catalyzed its own evolution through mate choice, it sounds as though our brains pulled themselves up by their own bootstraps.

However, most positive-feedback processes look rather circular, and a positive-feedback process such as sexual selection may be just what we need to explain unique, highly elaborated adaptations like the human mind. Many theorists have accepted that some sort of positive-feedback process is probably required to explain why the human brain evolved to be so large so quickly. Sexual selection, especially a process called runaway sexual selection, is the best-established example of a positive-feedback process in evolution.

Positive feedback systems are very sensitive to initial conditions. Often, they are so sensitive that their outcome is unpredictable. Take two apparently identical populations, let them undergo sexual selection for many generations, and they will probably end up looking very different. Take two initially indistinguishable populations of toucans, let them choose their sexual partners over a thousand generations, and they will evolve beaks with very different colors, patterns, and shapes. Take two populations of primates, and they will evolve different hair styles. Take two populations of hominids (bipedal apes), and one may evolve into us, while the other evolves into Neanderthals. Sexual selection’s positive-feedback dynamics make it hard to predict what will happen next in evolution, but make it easy to explain why one population happened to evolve a bizarre ornament that another similar population did not.

**Sexual selection and other forms of social selection**

In the last ten years, evolutionary psychologists have reached a consensus that human intelligence evolved largely in response to social rather than ecological or technological challenges. Some primate researchers have suggested that the transition from monkey brains to ape brains was driven by selection for “Machiavellian intelligence” to outsmart, deceive, and manipulate one’s social competitors. Anthropologist Robin Dunbar has suggested that large primate brains evolved to cope with large numbers of primate social relationships. He views human language, especially gossip, as an extension of primate grooming behavior. Many researchers have suggested that acquiring our ability to attribute beliefs and desires to others, which they call our “Theory of Mind”, was a key stage in human evolution.

Scientists became excited about social competition because they realized that social competition could have become an endless arms race, requiring ever more sophisticated minds to understand and influence the minds of others. An arms race for social intelligence looks like a promising way to explain the human brain’s rapid expansion and the human mind’s rapid evolution.

The human mind is clearly socially oriented, and it seems likely that it evolved through some sort of social selection. But what kind of social selection, exactly? Sexual selection is the best-understood, most powerful, most creative, most direct, and most fundamental form of social selection. From an evolutionary perspective, social competition centers around reproduction. Animals compete socially to acquire the food, territory, alliances, and status that lead to reproduction. Sexual selection is the most direct form of social selection because mate choice directly favors some traits over others, and immediately produces offspring that are likely to inherit the desired traits.

In other forms of social selection, the link between behavior and reproduction is much less direct. For example, the ability to form and maintain social alliances leads to easier foraging, better protection against predators, and better sexual access to desired mates. This in turn may lead to higher reproductive success, if the desired mates are willing. Other forms of social selection are important, but mostly because they change the social scenery behind sexual selection. Social selection is like the political tension between the Montagues and Capulets. It matters largely because it influences the sexual prospects of Romeo and Juliet.

Sexual selection is the premier example of social selection, and courtship is the premier example of social behavior. Theories of human evolution through social selection without explicit attention to sexual selection are like dramas without romance. Prehistoric social competition was not like a power struggle between crafty Chinese eunuchs or horticulturally competitive nuns. It was a complex social game in which real males and real females played for real sexual stakes. They played sometimes with homicidal or rapacious violence, and sometimes with Machiavellian strategizing, but more often with forms of psychological warfare never before seen in the natural world: conversation, charm, and wit.

# What makes sexually-selected traits so special?

Apart from sexual selection being a special sort of evolutionary process, the adaptations that it creates also tend to show some special features. Adaptations for courtship are usually highly developed in sexually mature adults but not in youth. They are usually displayed more conspicuously and noisily by males than by females. They produce sights and sounds that prove attractive to the opposite sex. They often reveal an animal’s fitness by being difficult to produce if the animal is sick, starving, injured, or full of harmful mutations. They show conspicuous differences between individuals, and those differences are often genetically heritable. (“Heritable” means some proportion of the differences between individuals in a particular trait are due to genetic differences between individuals). As we will see, the human mind’s most distinctive features, such as our capacities for language, art, music, ideology, humor, and creative intelligence, fit these criteria quite well.

However, traits with these features are sometimes not considered legitimate biological adaptations. Evolutionary psychologists Steven Pinker and John Tooby have argued that our science should focus on human universals that have been optimized by evolution so they no longer show any significant differences between individuals, or any genetic heritability in those differences. That is a good rule of thumb for identifying survival adaptations. But, as we will see, it rules out all sexually-selected adaptations that evolved specifically to advertise individual differences in health, intelligence, and fitness during courtship. Sexual selection tends to amplify individual differences in traits so they can be easily judged during mate choice. It also makes some courtship behaviors so costly and difficult that less capable individuals may not bother to produce them at all. For art to qualify as an evolved human adaptation, not everyone has to produce art, and not everyone has to show the same artistic ability. On the contrary, if artistic ability were uniform and universal, our ancestors could not have used it as a criterion for picking sexual partners. As we shall see, the same reasoning may explain why people show such wide variation in their intelligence, language abilities, and moral behavior.

While sexually-selected adaptations can be distinguished from survival adaptations from the outside, they may not feel any different from the inside. In particular, they may not feel very sexual when we’re using them. Sexual selection is a theory of evolutionary function, not a theory of subconscious motivation. When I argue that a particular human ability evolved to attract sexual partners, I am not claiming that there is some sort of Freudian sex drive at work behind the scenes. Peacock tails do not need a sexual subconscious in order to be sexually attractive, and neither do our instincts for art, generosity, or creativity.

# Why now?

If sexual selection is so great, why hasn’t it been used before now to explain the most distinctive aspects of human nature? In the next chapter, I will trace the reasons why sexual selection theory was neglected for a century after Darwin and why it was revived only in the last twenty years. The century of neglect is important to appreciate, because virtually all of 20th-century science has tried to explain human mental evolution using natural selection alone. Even now, sexual selection is usually invoked only to explain the differences between women and men, not those between humans and other primates. Although evolutionary biologists and evolutionary psychologists all know about sexual selection, its power, subtlety, and promise for explaining human mental traits have been overlooked.

The idea that sexual choice was an important factor in the human mind’s evolution may sound radical, but it is firmly grounded in current biology. Twenty years ago, this book could not have been written. Only since then have scientists realized how profoundly mate choice influences evolution. There has been a renaissance of interest in sexual selection, with an outpouring of new facts and ideas. Today, the world’s leading biology journals are dominated by technical papers on sexual selection theory and experiments on how animals choose their mates. But this has been a secret renaissance, hidden from most areas of psychology and the humanities, and largely unrecognized by the general public.

Prudery has also marginalized sexual selection – which is, after all, about sex. Many people, especially scientists, are ambivalent about sex: fascinated but embarrassed, obsessed yet guilty, alternately ribald and puritanical. Scientists still feel awkward teaching sexual selection to students, talking about it with journalists, and writing about it for the public. Science is not so different from popular culture in this respect. Just as there are very few good films that explicitly show sexual penetration, there have been very few good theories of human mental evolution that depict our ancestors as fully sexual beings capable of intelligent mate choice.

The sexual choice idea is also timely because it counters the charge that evolutionary psychology is some sort of “biological reductionism” or “genetic determinism”. Many critics allege that evolutionary psychology tries to reduce psychology to biology, by explaining the mind’s intricacies in terms of the brute replication of genes. In general, there is nothing wrong with reductionism – it is a powerful and successful strategy for understanding the world, and a cornerstone of the scientific method. However, there are serious problems with biological reductionism in the sense of trying to account for all of human nature in terms of the survival of the fittest. Often this strategy has led scientists to dismiss far too glibly many important human phenomena – such as creativity, charity, and the arts. This book tries very hard to avoid that particular type of reductionism. My theory suggests that our most cherished abilities were favored by the most sophisticated minds ever to have emerged on our planet before modern humans: the minds of our ancestors. It doesn’t reduce psychology to biology, but sees psychology as a driving force in biological evolution. It portrays our ancestors’ minds as both products and consumers evolving in the free market of sexual choice. My metaphors for explaining this theory will come more from marketing, advertising, and the entertainment industry than from physics or genetics. This is probably the least reductionistic theory of the mind’s evolution one could hope for that is consistent with modern biology.

**The gang of three**

This sexual choice theory did not start out as a way of Darwinizing the humanities or trying to explain human creativity. It began as an attempt to solve three basic problems concerning human mental evolution. These problems crop up as soon as one asks why we evolved certain abilities that other species did not evolve.

The first problem is that really large brains and complex minds arose very late in evolution and in very few species. Life evolved relatively quickly after the earth cooled from a molten blob to a planet with a stable surface and some pools of water. Then it was another three billion years before any animal evolved a brain heavier than one pound. Even then, brains heavier than a pound evolved only in the great apes, in several varieties of elephants and mammoths, and in a few dozen species of dolphins and whales. Chimpanzee brains weigh one pound, our brains weigh three pounds, bottlenose dolphin brains weigh four pounds, elephant brains weigh eleven pounds, and sperm whale brains weigh eighteen pounds. But over 99% of animal species thrive with brains much smaller than a chimpanzee’s. Far from showing any general trend towards big-brained hyper-intelligence, evolution seems to abhor our sort of intelligence, and avoids it whenever possible. So, why would evolution endow our species with such large brains that cost so much energy to run, given that the vast majority of successful animal species survive perfectly well with tiny brains?

Second, there was a very long lag between the brain’s expansion and its apparent survival payoffs during human evolution. Brain size tripled in our ancestors between two and a half million years ago and a hundred thousand years ago. Yet for most of this period, our ancestors continued to make the same kind of stone handaxes. Technological innovation was at a stand-still during most of our brain evolution. Only long after our brains stopped expanding did any tradition of cumulative technological progress develop, or any global colonization beyond the middle latitudes, or any population growth beyond a few million individuals. Arguably, one could not ask for a worse correlation between growth in a biological organ and evidence of its supposed survival benefits. Our ancestors a hundred thousand years ago were already anatomically modern humans with bodies and brains just like ours. Yet they did not invent agriculture for another ninety thousand years, or urban civilization for another ninety-five thousand years. How could evolution favor the expansion of a costly organ like the brain, without any major survival benefits becoming apparent until long after the organ stopped expanding?

The third problem is that nobody has been able to suggest any plausible survival payoffs for most of the things that human minds are uniquely good at, such as humor, story-telling, gossip, art, music, self-consciousness, ornate language, imaginative ideologies, religion, and morality. How could evolution favor such apparently useless embellishments? The fact that there are no good theories of these adaptations is one of science’s secrets. Linguistics textbooks do not include a good evolutionary theory of language origins, because there are none. Cultural anthropology textbooks do not include any good evolutionary theories of art, music, or religion, because there are none. Psychology textbooks do not include any good evolutionary theories of human intelligence, creativity, or consciousness, because there are none. The things that we most want to explain in any evolutionary framework seem most resistant to any such explanation. This has been one of the greatest obstacles to achieving any real consilience in human knowledge, to building any load-bearing bridges between the natural sciences, the social sciences, and the humanities.

These three problems reinforce each other. They roam around like a gang, knocking the sense out of any innocent young theories that happen to stroll along. If a new theory overcomes problem three by claiming a previously unrecognized survival benefit for art or language, then problem one raises the objection “Why do we not see hundreds of species taking advantage of that survival benefit by growing larger brains with these abilities?”. Or, suppose a new theory tackles problem two by emphasizing the success of our early *Homo erectus* ancestors in spreading from equatorial Africa across similar latitudes in Asia. Then problem three can point out that many smaller-brained mammals such as cats and monkeys expanded in similar ways, without evolving such mental embellishments.

Most human evolution theories attempt to solve only one of these three problems. A few might solve two. None has ever solved all three. This is because the three problems create a paradox that cannot be solved by thinking in terms of survival of the fittest. Many human mental abilities are unique to our species, but evolution is opportunistic and even-handed. It doesn’t discriminate between species. If our unique abilities must be explained through some survival benefit, we can always ask why evolution did not confer that same benefit on many other species. Adaptations that have large survival benefits typically evolve many times in many different lineages, in a process called convergent evolution. Eyes, ears, claws, and wings have evolved over and over again in many different lineages at many different points in evolutionary history. If the human mind evolved mostly for survival benefits, we might expect convergent evolution to drive many lineages towards human-type minds. Yet there is no sign of convergent evolution towards human-style language, moral idealism, humor, or representational art.

In *The Language Instinct*, Steven Pinker claimed that the elephant’s trunk raises some of the same problems as human language: it is a large, complex adaptation that arose relatively recently in evolution, in only one group of mammals. Yet the elephant’s trunk does not really raise any of our three problems. There was convergent evolution towards grasping tentacle-like structures among octopi and squid. The evolution of the trunk allowed the ancestors of the elephant to split apart very quickly into dozens of species of mammoths, mastodons, and elephants, in an evolutionary pattern called an “adaptive radiation”. These species all had trunks, and which thrived all over the globe until our ancestors hunted them to extinction. The elephant’s trunk is used daily by every elephant to convey leaves from trees to mouth, showing clear survival benefits during foraging. The trouble with our unique human abilities is that they do not show the standard features of survival adaptations – convergent evolution, adaptive radiation, and obvious survival utility – so are hard to explain through natural selection.

Sexual selection cuts through this Gordian knot. Biologists recognize that sexual selection through mate choice is a fickle, unpredictable, diversifying process. It takes species that make their living in nearly identical ways and gives them radically different sexual ornaments. It never happens the same way twice. It drives divergent rather than convergent evolution. There are probably half a million species of beetles, but no two have the same kind of sexual ornamentation. There are more than three hundred species of primates, but no two have the same shape and color of facial hair. If the human mind’s most unusual capacities evolved originally as courtship ornaments, their uniqueness comes as no surprise. Nor should we be surprised at the lack of survival benefits while brain size was tripling. The brain’s benefits were mainly reproductive.

We get confused about the human mind’s biological functions because of a historical accident called human history. The courtship ornaments that our species happened to evolve, such as language and creativity, happened to yield some completely unanticipated survival benefits in the last few thousand years: agriculture, architecture, writing, metal-working, firearms, medicine, and microchips. The usefulness of these recent inventions tempts us to credit the mind with some general survival advantage. From the specific benefits of specific inventions, we infer a generic biological benefit from the mind’s “capacity for culture”. We imagine evolution toiling away for millions of years, aiming at human culture, confident that the energetic costs of large brains will someday pay off with the development of civilization. This is a terrible mistake. Evolution does not have a Protestant work ethic. It does not get tax credits for research and development. It cannot understand how a costly investment in big brains today may be justified by cultural riches tomorrow.

To understand the mind’s evolution, it is probably best to forget everything one knows about human history and human civilization. Pretend that the last ten thousand years did not happen. Imagine the way our species was a hundred thousand years ago. From the outside, they would look like just another group of large primates foraging around Africa, living in small bands, using a few simple tools. Even their courtship looks uneventful: a male and a female just sit together, meet eyes, and breathe at each other in odd staccato rhythms for several hours, until they start kissing or one gives up and goes away. But if one could understand their quiet, intricately patterned exhalations, one could appreciate what is going on. Between their balloon-shaped skulls pass back and forth a new kind of courtship signal, a communication system unlike anything else on the planet. A language. Instead of dancing around in physical space like normal animals, these primates use language to dance around in mind-scapes of their own invention, playing with ideas.

Talking about themselves gave our ancestors a unique window into each other’s thoughts and feelings, their past experiences and future plans. Any particular courtship conversation may look trivial, but consider the cumulative effects of millions of such conversations over thousands of generations. Genes for better conversational ability, more interesting thoughts, and more attractive feelings would spread because they were favored by sexual choice. Evolution found a way to act directly on the mental sophistication of this primate species, not through some unique combination of survival challenges, but through the species setting itself a strange new game of reproduction. They started selecting each other for their brains. Those brains won’t invent literature or television for another hundred thousand years. They don’t need to. They have each other.

The intellectual and technical achievements of our species in the last few thousand years depend on mental capacities and motivations originally shaped by sexual selection. Trained by years of explicit instruction, motivated by sophisticated status games, and with cultural records that allow knowledge to accumulate across generations, our sexually-selected minds can produce incredible things such as Greek mathematics, Buddhist wisdom, British evolutionary biology, and Californian computer games. These achievements are not side-effects of having big brains that can learn everything, but of having minds full of courtship adaptations that can be retrained and redirected to invent new ideas even when we are not in love.

# Fossils, stories, and theories

Anyone presenting a theory about human mental evolution is usually expected to present a speculative chronology of what evolved when, and show how the current fossil and archaeological data support that chronology. I will attempt neither, because I think these expectations have too often led theorists to miss the wood for the trees. The human mind is a collection of biological adaptations, and an evolutionary theory of the mind must, above all, explain what selection pressures constructed those adaptations. Chronology is of limited use, because knowing when an adaptation arose is often not very informative about why it arose. Fossil and archaeological evidence has been enormously important in showing how many pre-human species evolved, when they evolved, where they lived, and what tools they made. This sort of evidence is crucial in putting human evolution in its biological and geological context, but it has not proven terribly useful in explaining why we have the mental adaptations that we do – and in some cases, it can be misleading.

For example, an over-reliance on archaeological data may lead scientists to under-estimate the antiquity of some of our most distinctive abilities. Many have assumed that if there is no archaeological evidence for music, art, or language in a certain period, then there must not have been any. Historically, European archaeologists tended to focus on European sites, but we now know that our human ancestors colonized Europe tens of thousands of years after they first evolved in Africa a hundred thousand years ago. This Euro-centric bias led to the view that music, art, and language must be only 35,000 years old or so. Some archaeologists such as John Pfieffer claimed there was an “Upper Paleolithic symbolic revolution” at this date, when humans supposedly learned how to think abstractly and symbolically, leading to a rapid emergence of art, music, language, ritual, religion, and technological innovation. If these human abilities emerged so recently in Europe, we would not expect to find them among African or Australian peoples – yet there is plenty of anthropological evidence that all humans everywhere in the world share the same basic capacities for visual, musical, linguistic, religious, and intellectual display. The same over-conservative reasoning would lead us to say that human language must be only 4,000 years old, because the archaeological evidence for writing goes back only that far.

Also, the fossil and archaeological evidence is still very patchy and is accumulating very quickly, with new discoveries often undermining our interpretations of old

findings. Physical evidence about human origins seems the most secure place to begin in theorizing about human evolution, but this security is largely illusory. Since 1994, at least four new species of hominids have been discovered. Every year brings new bones or stones that require a major rethinking about the times, places, and products associated with human origins. The result is often theories as transient as the evidence they cite. Most human evolution theories of twenty or fifty years ago are barely worth reading now, because they aimed too much for empirical respectability at the expense of theoretical coherence, by tying themselves too closely to the physical evidence then available. The theories that remain relevant are those derived from fundamental principles of evolutionary biology and common-sense observations about the human mind. Darwin’s thoughts on the human mind’s evolution in *The Descent of Man* are still useful because he did not over-react to the new discoveries of Neanderthal skulls and living gorillas that fascinated Victorian London. Classic selection pressures are more important than classic fossils.

A final limitation is that fossil and archaeological evidence has proven much more informative about how our ancestors afforded larger brains, than about what they actually used their brains for. Evidence in the last decade has revealed how our ancestors evolved the ability to exploit energy-rich foods such as game animals that could be hunted for meat, and underground tubers that could be dug up and cooked. These energy-rich foods could also be digested using shorter intestines than other apes have. As anthropologist Leslie Aiello has argued, since guts use a lot of energy, our smaller guts also increased our available energy budget compared to that of other apes. The ability to exploit these new foods sources, at a lower gut-cost, could have allowed our ancestors to afford larger bodies, larger brains, more milk production, or whatever other costly traits evolution might have favored. But a higher energy budget does not, in itself, explain why our brains expanded or why any of our distinctive human abilities evolved. Sexual selection principles, not fossil evidence, may explain why we wasted so much of our energy on biological luxuries like talking, dancing, painting, laughing, playing sports, and inventing rituals.

An evolutionary account of the human mind cannot be constructed directly from fossils and stone artifacts. As the archaeologist Steven Mithen argued in his thoughtful book *The Prehistory of the Mind*, the physical evidence of prehistory must be interpreted in a much more sophisticated evolutionary psychology framework. Yet many scientists still have a special reverence for archaeological evidence, out of all proportion to what it can tell us about mental evolution. Fossils were certainly critical in convincing people that we had actually evolved in continuous stages from primate ancestors – almost 60% of Americans now accept the fossil evidence for human evolution. But evidence supporting the fact of human evolution is not always the best evidence regarding the mechanism of human evolution. A more fruitful place to start theorizing about the past is the present: the current capacities of the human mind (the adaptations to be explained), and the principles of current evolutionary biology (the selection pressures that can explain them). Bones and stones can be valuable sources of evidence, but they become most useful when combined with studies of other primates, and studies of humans in tribal societies, modern societies, and psychology laboratories.

This may sound like a radical change in scientific method, but it isn’t. In broadening the focus from stones and bones to the comparative analysis of present adaptations, I am in fact proposing something rather conservative: the evolutionary psychology of the human mind can play by the same scientific rules as the evolutionary biology that studies any other adaptation in any other species. It can present a bold theory about the function of the adaptation and the selection pressures that produced it, and see whether the adaptation has special features consistent with that function and those origins. Paleontology makes useful contributions to such studies, but it is not the most important source of data concerning the design and functions of biological adaptations. The details of an adaptation as it currently exists are often more informative than the fossilized remnants of its earlier forms. In this book I will draw upon the fascinating discoveries of fossil-hunters and archaeologists where appropriate, but I believe that the features of the modern human mind are often the best clues to its origin.

# Show me the genes

Over the last two decades, DNA evidence has become almost as important as fossil and archaeological evidence in understanding human evolution. In the coming decades, it is likely to become hugely more important, especially in tracing the human mind’s origins. This is because evolved mental capacities depend on genes, even when they leave no fossil or archaeological records. After the Human Genome Project identifies all 80,000 or so human genes in the next couple of years, we can look forward to three further developments that will allow much more powerful tests of my theory and other theories of mental evolution.

Neuroscientists will start to identify which genes underlie which mental capacities, by analyzing the proteins they produce, and the role those proteins play in brain development and brain functioning. (Of course there is no single gene for language or art – these are complex human abilities that probably depend on hundreds or thousands of genes.) Behavior geneticists will also identify different forms of particular genes that underlie individual differences in mental abilities such as artistic ability, sense of humor, and creativity. Psychologist Robert Plomin and his collaborators have already identified the first specific gene associated with extremely high intelligence (a form of the gene “IGF2R” on chromosome six). Very little such work has been done so far, but the genes that underlie our unique human capacities will be identified sooner or later, and evolutionary psychology will benefit.

Also, geneticists will find out more about which genes we share with other apes. Research centers in Atlanta and Leipzig are already pushing for the development of a Chimpanzee Genome Project. Since 1975, geneticists have been using a method called DNA hybridization to show that our DNA is roughly 98% similar to that of chimpanzees (compared to only 93% with most monkeys). However, this method is fairly crude, and we will not know exactly which of our genes are unique until the results of the Chimpanzee Genome Project can be compared to those of the Human Genome Project. Geneticists already know there are some significant differences: humans have 23 pairs of chromosomes whereas other apes have 24 pairs, and the genes on human chromosomes 4, 9, and 12 appear to have been reshuffled significantly compared to their arrangement on the chimpanzee chromosomes. There are plenty of genetic differences to account for our distinctive mental capacities, and the more we know about the unique human genes, the more we can infer about their evolutionary origins and functions.

Finally, it may be possible to recover more DNA from our extinct fossil relatives. DNA decays fairly quickly, and it is very hard to recover DNA from fossils older than about 50,000 years ago (*Jurassic Park* notwithstanding). However, Neanderthals survived until about 30,000 years ago, and a German team led by Svante Pääbo has already succeeded in recovering a mitochondrial DNA fragment from a Neanderthal’s arm bone. This fragment, just 379 base-pairs long, showed 27 differences compared to modern humans, and 55 differences compared to chimpanzees. This substantial difference between humans and Neanderthals suggests that our lineages split apart at least 600,000 years ago – much earlier than previously though. It also shows that humans did not evolve from Neanderthals. Potentially, the same techniques could be applied to *Homo erectus* specimens from Asia, which also persisted until about 30,000 years ago, but which split off from our ancestors even earlier. It might even be possible, at some future date, to show which other hominids shared the genes underlying our apparently unique mental abilities. For example, if Neanderthals are found to share some of the same genes for language, art, music, and intelligence that modern humans have, then we could infer that those capacities evolved at least 600,000 years ago. Although behavior does not fossilize, some of the DNA underlying behavior does, and it can sometimes last long enough for us to analyze.

The DNA revolution will unveil many more aspects of human evolution and human psychology. I cannot yet show you the many genes that must underlie each of the human mental adaptations analyzed in this book. However, the genetic evidence that will emerge in the coming years will probably render my ideas – even the apparently most speculative ones – fully testable in ways that I cannot anticipate. My sexual choice theory sometimes sounds as if it could explain anything, and hence explains nothing. This overlooks the fact that biologists are developing ever more sophisticated ways of testing which adaptations have evolved through sexual selection, and many of these methods – including a range of new genetic analyses –can be applied to human mental traits. Indeed, one goal of this book is to inspire other scientists to join me in testing these ideas.

**What we can ask from a theory of human mental evolution**

Any theory of human mental evolution should, I think, strive to fulfil three criteria – evolutionary, psychological, and personal. The evolutionary criteria are paramount. Any theory of human mental evolution should play by the rules of evolutionary biology, using accepted principles of descent, variation, selection, genetics, and adaptation. It is best not to introduce speculative new processes of the sort that have been touted recently, such as “gene-culture co-evolution”, “cognitive fluidity as a side-effect of having a large brain”, or “quantum consciousness”. Complex adaptations such as human mental capacities need to be explained by cumulative selection for a function that promotes survival or reproduction.

This evolutionary criterion makes it much more important to identify the selection pressures that shaped each adaptation than to identify how the adaptation went through some series of structural changes from some primitive state. Complex adaptations are explained by identifying functional features and specifying their fitness costs and benefits in biological context. The emphasis is on what and why, rather than how, when, or where. For every theory of every adaptation, there is one demand that modern biologists make: show me the fitness! That is, show how this trait promoted survival or reproduction.

Psychologically, the human mind as explained by the theory should bear some resemblance to the minds of ordinary women and men as we know them. The mental adaptations described in the theory should fit our understanding of normal human abilities and personalities. If you’re married, imagine your in-laws. If you commute by public transport, visualize your traveling companions. They’re the kinds of minds the theory should account for: ordinary people, in all their variation. We should not worry too much about the minds of exceptional geniuses such as theoretical physicists and management consultants. We are not really trying to explain “the human mind” as a single Platonic ideal, but human minds as collections of adaptations with details that vary by age, sex, personality, culture, occupation, and so forth. Still, differences within our species are minor compared to differences across species, so it can be useful to analyze “the human mind” as distinct from “the chimpanzee mind” or “the mind of the blue-footed booby”.

Finally, a theory of human origins should be satisfying at a personal level. It should give us insight into our own consciousness. It should seem as compelling in our rare moments of personal lucidity as it is when we are mired in that mixture of caffeine, television, habit, and self-delusion that we call “ordinary consciousness” in modern society. It is so easy, in abstract theorizing about mental evolution, to forget that we are talking about the origins of our own genes, from our own parents, that built our own minds, over our own lifetime. Equally, we are talking about the origins of the genes that built the mind and body of the first person you ever fell in love with, and the last person, and everyone in between. A theory that can’t give a satisfying account of your own mind, and the minds you’ve loved, will never be accepted as providing a scientific account of the other six billion human minds on this planet. Theories that don’t fulfill this human hunger for self-explanation may win people’s minds but not their hearts. The fact that 44% of Americans still think humans were created by God in the last 10,000 years suggests that evolutionary theories of human origins, however compelling at the rational level, have not proved satisfying to many people. We might as well admit that this is a third demand we impose on theories of human mental evolution, and see whether we can fulfill it. This criterion should not take precedence over evolutionary principles or psychological evidence, but I think it can be a useful guide in developing testable new ideas. If we cannot fulfil this criterion, perhaps we’ll just have to live with the existential rootlessness that Jean-Paul Sartre viewed as an inevitable part of the human condition.

**Working together**

In facing these three challenges, I have found my professional training as an experimental cognitive psychologist of limited value. What I learned about the psychology of judgment and decision-making was helpful in thinking about sexual choice. But most experimental psychology views the human mind exclusively as a computer that learns to solve problems, not as an entertainment system that evolved to attract sexual partners. Also, psychology experiments usually test people’s efficiency and consistency when interacting with a computer, not their wit and warmth when interacting with a potential spouse. These attitudes have carried over into fashionable new areas such as cognitive neuroscience.

Because cognitive psychology and neuroscience usually ignores human courtship behavior, this book discusses very little of these research areas that I was trained to pursue. Such research reveals how human minds process information. But evolution does not care about information processing as such. It cares about fitness – prospects for survival and reproduction. Experiments that investigate how minds process arbitrary visual and verbal information shed very little light on the fitness costs and benefits of the human abilities that demand evolutionary explanation, such as art and humor. Conversely, some less well-funded research on individual differences, personality, intelligence, and behavior genetics has proven surprisingly useful to me. Such research bears directly on the key questions in sexual selection: how do traits differ between individuals, how can those differences be perceived during mate choice, how are those differences inherited, and how are they related to overall fitness? Its conclusions are not always what we refer to nowadays as “politically correct”. I would have been more comfortable combining evolutionary biology with a politically correct neuroscience that ignores human sexuality, individual differences, and genes. But in evolutionary psychology, we have to deal with evolution, which means paying attention to genetically heritable individual differences that give survival or reproductive advantages over other individuals.

Many recent books about the human mind’s evolution have offered radical new ideas about how evolution works, but have described the mind’s capacities very conservatively. That approach suggests that modern evolutionary theory is a castle built on sand, whereas modern psychology is the Rock of Gibraltar. I take the opposite view. Mostly, my sexual choice theory relies on conservative, well-established evolutionary principles, but it takes a rather playful, irreverent view of human behavior.

This book also draws on a wide range of facts and ideas from many areas of science, including psychology, anthropology, evolutionary theory, primatology, archaeology, cognitive science, game theory, and behavior genetics. I also borrow a number of ideas from contemporary feminism and cultural theory, and from some of my intellectual heroes such as Friedrich Nietzsche and Thorstein Veblen. I won’t pretend to be expert in all these topics. Outside our own areas of expertise, scientists keep up to date by reading the same popular science books and magazine articles as other people do. This makes us vulnerable to the same intellectual fads that sweep through academic and popular culture. It also makes us dependent on the popularizers of other sciences, who sometimes have idiosyncratic views. I have tried to minimize such distortions by being fairly conservative about which ideas and data I rely on. I will try to identify which of my arguments are well-supported by the current evidence as I understand it, and which still need to be evaluated with further research.

There are also limits to my practical understanding of our mental adaptations. I know less about art than most artists, less about language than political speech-writers, and less about comedy than Matt Groening, originator of *The Simpsons*. If you find that you know more about some aspect of the human mind than I do, my errors and omissions could be considered your opportunities. There is plenty of room in evolutionary psychology for contributions by people with all sorts of expertise.

This book presents one possible way to apply sexual selection theory in evolutionary psychology, but there are countless other ways. There is no pretence here of having a complete theory of the human mind, human evolution, or human sexual relationships. This is a snapshot of a provisional theory under construction. I hope to incite discussion, debate, and further research, not to win people over to some doctrine set in stone.

# An ancestral romance

This book’s most unusual challenge is that readers will sometimes be asked to imagine what it was like for our ancestors to fall in love with beings considerably hairier, shorter, poorer, less creative, less articulate, and less self-conscious than ourselves. This is best done without visualizing such beings too concretely. I have never managed to feel genuine desire for any museum model of an Australopithecine female, however realistically their sloping foreheads, thick waists, and furry buttocks have been rendered. Nor have I found it easy to imagine feeling genuine love when gazing into the eyes of one of these ancestors from three million years ago. Our sexual preferences seem too hard-wired to permit these imaginative leaps. The limits of our contemporary sexual imaginations have always been an obstacle to appreciating the role of sexual choice in human evolution.

On the other hand, ancestral romance is not so hard to understand at a slightly more abstract level. Indeed, it may be intuitively easier to understand human evolution through sexual selection than through natural selection. While our ancestors faced very different survival problems than we do today, the problems of sexual rejection, heartbreak, jealousy, and sexual competition remain almost unchanged. Few of us have any experience digging tubers, butchering animals, escaping from lions, or raiding other tribes. But our past sexual relationships may prove a useful guide to understanding the sexual choices that shaped our species.

Each of our romantic histories goes back only a few years, but the romantic history of our genes goes back millions. We are here only because our genes enjoyed an unbroken series of successful sexual relationships in every single generation since animals with eyes and brains first evolved half a billion years ago. In each generation, our genes had to pass through a gateway called sexual choice. Human evolution is the story of how that gateway evolved new security systems, and how our minds evolved to charm our way past the ever more vigilant gate-keepers.