

## **Sexual selection for cultural displays**

By Geoffrey Miller

Published as:

Miller, G. F. (1999). Sexual selection for cultural displays. In R. Dunbar, C. Knight, & C. Power (Eds.), *The evolution of culture* (pp. 71-91). Edinburgh, Scotland: Edinburgh U. Press.

Friedrich Nietzsche, male, aged 27, published his first book *The birth of tragedy* in January 1872, barely a year after Charles Darwin published *The descent of man, and Selection in relation to sex*. Both books viewed human culture as a natural outcome of human sexuality and animal instinct. Although both were widely read and discussed, their views on the origins of human culture were widely forgotten. The assumption they were attacking, that culture is an autonomous sphere of human activity and belief above the biology of behaviour and instinct, persists as the dominant framework for thinking about the evolution of culture. That framework has provoked much writing about cultural transmission, memes, and gene-culture co-evolution. However, it has signally failed to deliver a good theory about what evolutionary selection pressures actually shaped the human capacity for producing and understanding concrete instances of 'culture'. This chapter suggests that, a century and a quarter after Nietzsche and Darwin, cultural theory and sexual selection theory have advanced enough that we should once more consider their subversive idea: cultural behaviour is very much more instinctive in nature and sexual in function than most cultured people would care to admit.

Nietzsche (1872) distinguished two modes of culture: the Apollonian (individual, rational, technical, cognitive, useful, hierarchical) and the Dionysian (collective, emotional, sexual, mystic, fertile, revolutionary). Most Darwinian theories have tried to explain the evolution of human culture through a strange combination of Apollonian technology, utility, and hierarchy, and Dionysian collectivity and ritual. Typically, this entails trying to find survival benefits for group cultural traditions. By contrast, this chapter emphasises Apollonian individuality and Dionysian sexuality, seeing whether culture may have evolved mostly through reproductive benefits for individual displays of 'cultural' behaviours.

Culture, rather than a system for transmitting useful technical knowledge and group-benefiting traditions down through the generations, can be considered an arena for various courtship displays in which individuals try to attract and retain sexual partners (Miller, 1993, 1997a, b). When a young male rock star stands up in front of a crowd and produces some pieces of human 'culture' known as songs, he is not improving his survival prospects. Nor is he engaging in some bizarre maladaptive behaviour that requires some new process of 'cultural evolution' to explain. Rather, he is doing something that fulfils exactly the same function as a male nightingale singing or a male peacock showing off his tail. He is attracting sexual partners. As we will see later, the fact that most publicly generated 'cultural' behaviour is produced by young males points towards its courtship function.

This cultural courtship model proposes that sexual selection through mate choice by both our male and female ancestors was a major evolutionary force in shaping human culture, i.e. the genetically inherited capacities for behaviours such as language, art, and music (Miller, 1993, 1997; in press, a; in press, b). These behaviours, according to this model, function mainly as courtship displays to attract sexual partners, and show many of the same design features

shared by other courtship displays in other species. In short, human culture is mainly a set of adaptations for courtship. This hypothesis doesn't really come from Nietzsche, of course, or from Freud. Rather, it is a relatively simple application of standard Darwinian sexual selection theory to a somewhat puzzling set of behavioural phenomena in one rather pretentious species of primate.

This chapter examines what kind of data would be most relevant to testing competing evolutionary hypotheses about culture, and reviews sexual selection theory as a possible explanatory framework. It then introduces my cultural courtship model where cultural displays function as sexually-selected indicators of phenotypic and genetic quality, and presents some data on the demographics of cultural production that seem better explained by a sexual selection model than by standard survival selection models.

### **Why cultural anthropology won't tell evolutionists what we need to know about culture**

Explaining the 'evolution of culture' is shorthand for explaining the genetic evolution, through natural selection and sexual selection, of the human mental adaptations that generate, learn, modify, and produce those behaviours that sustain 'cultural' phenomena (Tooby & Cosmides, 1992). At first glance, it would seem obvious that this explanatory project should take seriously everything that anthropologists have learned about cultural phenomena. Shouldn't the evolutionary psychology of culture take cultural anthropology as its starting point?

Unfortunately, cultural anthropology can't tell evolutionists the most important things we need to know, because its concerns have pulled in different directions. Evolutionists need thorough functional descriptions of the mental adaptations underlying culture, their specialised features, their survival and reproductive benefits and costs, their phylogeny, their phenotypic variability between humans, their genetic heritability, their lifespan development, and their strategic flexibility in response to various ecological, demographic, social, and sexual contexts. These are the basic kinds of data that biologists would routinely collect as a first step to determining why something evolved in any other species. These are the kinds of data that evolutionary psychologists are starting to collect for other human mental adaptations.

But cultural anthropologists have not usually collected that sort of data on human culture. Most cultural anthropology relies on qualitative description of cultural patterns. Where anthropologists have collected quantitative data on culture, it has generally been at the level of aggregate group data, measuring things like divisions of labour, rates of polygyny, and durations of initiation rituals. These sort of group averages do not reveal who is producing or receiving particular exemplars of culture, ideological or material.

Crucially, group aggregate data cannot reveal how individual heritable variation in the capacity for various cultural behaviours co-varies with various components of biological fitness. Thus, group average data permits only very weak and indirect tests of competing hypotheses about cultural evolution. Stronger tests would require knowing exactly what fitness payoffs accrued to individuals who generated particular kinds of behaviours that sustained various kinds of cultural phenomena, not merely knowing what those phenomena are. For example, ornithologists test hypotheses about the functions of bird song mostly by looking at how individual variation in song production co-varies with individual variation in survival and reproduction (Catchpole & Slater, 1995), not by derived predictions about emergent group-level song patterns from their hypotheses and comparing these predictions to group aggregate data.

There are special methodological problems in studying the possible courtship functions of human cultural behaviour. The “participant observation” method allows anthropologists to share in a group’s survival behaviours but usually excludes them from courting or copulating with the people they are studying. With direct experience of a group’s economic, social, and even ritual activities, but less experience with their mating activities, the survival functions of culture may have been better appreciated than the courtship functions. Also, humans are often secretive and misleading about their sexual behaviour to other members of their own group, and may be even more so to visitors (Freeman, 1983). This opens even classic sexual ethnographies such as Bronislaw Malinowski and Margaret Mead to serious doubt.

It may be more productive to shift our attention from cultural anthropology to sexual selection theory itself, to see how far it can take us in explaining what we do know about human culture. Some useful tests of the cultural courtship model may then be found right under our noses, not in hunter-gatherer ethnographies, but in evidence about cultural production in our own post-industrial societies.

### **Sexual selection theory**

If the courtship model is right, the best tools for understanding human culture can be found in sexual selection theory, as first developed by Darwin (1859, 1871) and revived in the last twenty years (Andersson, 1994; Cronin, 1991; Miller, in press, a; Miller & Todd, in press). Darwin recognised that evolution is fundamentally reproductive competition, not just Spencer’s “survival of the fittest”. Natural selection for survival ability is certainly important, but sexual selection for attracting mates is often more important. Darwin understood that in most sexually-reproducing species, there would be strong incentives for choosing one’s sexual mate carefully, because one’s offspring would inherit their traits, good or bad, along with one’s own traits. Bad mate preferences would find themselves in poor-quality offspring, and would eventually die out. Equally, poor courtship displays that attracted few mates would also die out over generations. Thus, a process of sexual selection will tend to arise in many sexually-reproducing animals, whereby individuals display their attractiveness, health, status, fertility, genetic quality, and other reproductively important traits, and individuals select their mates based on such displays. As Darwin (1871) noted, female animals are often choosier about their mates than males, and males often display more intensely than females. However, sexual selection does not necessarily produce or depend on sex differences; it could equally apply to hermaphrodites.

Victorian biologists generally rejected the idea that mate choice by females could be a major force in evolution, so the core idea in Darwin’s sexual selection theory fell into disrepute for many decades. Sexual selection has been revived only in the last two decades because evolutionary theorists finally figured out how to use analytical proofs and computer simulations to show some of the counter-intuitive ways that sexual selection can work, and animal behaviour researchers figured out how to demonstrate mate preferences experimentally in the lab and the field (Andersson, 1994). Especially in the last decade, sexual selection theory and animal mate choice research have dominated the best journals in biology and evolutionary psychology (see Miller & Todd, in press).

The strange history of sexual selection theory is important to appreciate because virtually all of 20th century anthropology, psychology, and cultural theory developed when the theory was in scientific exile. Lacking an appreciation of how mate choice shapes behavioural evolution, evolution-minded social scientists searched for survival functions for the more puzzling human cultural behaviours, largely without success.

## **Sexual selection for indicators of phenotypic and genotypic quality**

So, how does mate choice shape courtship displays? Biologists such as Alfred Russell Wallace, George Williams, and William Hamilton have long argued that mate choice should often favor cues that indicate a prospect's phenotypic quality, including health, fertility, parasite resistance, parenting abilities, and genotypic quality or heritable fitness (Cronin, 1991; Andersson, 1994). However, this idea that mate choice favors "indicators" rather than arbitrary, aesthetic traits was not widely considered until 1975, when Amotz Zahavi stirred intense controversy with his "Handicap Principle" (Zahavi and Zahavi, 1997). Zahavi proposed that the only way to reliably demonstrate one's quality during courtship is to display a high-cost signal such as a heavy peacock's tail, an exhausting bird-song concert, or an expensive sports car. Only these costly "handicap" signals are evolutionarily stable indicators of their producer's quality, because cheap signals are too easy for low-quality imitators to fake (Zahavi and Zahavi, 1997).

Many sexual cues in many species have now been shown to function as indicators: they have high growth and maintenance costs, their size and condition correlates with their owner's overall fitness and genetic quality, and they influence mating decisions (Andersson, 1994). Sexual selection theorists now believe that many sexual cues, both bodily ornaments and courtship behaviors, function as reliable indicators of an individual's quality. Such indicators, while improving reproductive prospects, actually impair survival chances, so are fairly easy to distinguish from naturally-selected traits shaped for survival. Many empirical methods have been developed to test whether a particular trait is a sexually-selected indicator, but these methods have almost never been applied in studies of human culture.

A key question is whether sexually-selected indicators reveal just environment-influenced phenotypic quality, or heritable genotypic quality as well. Until recently, many biologists and evolutionary psychologists believed that fitness must not be heritable in most species most of the time, because natural selection should tend to eliminate any genetic variation in traits that influence survival or reproduction ability (Tooby and Cosmides, 1990). However, theorists realized that mutation pressure, spatial and temporal variations in selection, and migration tend to maintain heritable fitness (see Andersson, 1994; Rowe and Houle, 1996; Pomiankowski and Moller, 1995). Also, every human mental trait ever studied by behavior geneticists shows significant heritability, even traits that must have been strongly fitness-related such as general intelligence and other capacities fundamental to cultural behaviour (Jensen, 1997; Plomin et al., 1997).

Many biologists now agree that fitness often remains substantially heritable, in most species most of the time (Moller and Swaddle, 1997; Rowe & Houle, 1996; for review see Miller & Todd, in press). Thus, our mate choice strategies probably evolved to focus on sexual cues that advertise heritable fitness. From a selfish gene's point of view, mate choice is supremely important because mate choice determines whose genes it will have to collaborate with in all succeeding generations.

The most dramatic examples of human culture, such as ritual, music, art, ideology, and language-play, seem like energetically expensive wastes of time, to someone thinking in terms of the survival of the fittest. From the viewpoint of indicator theory, that sort of wasteful display is exactly what we would expect from traits shaped for reproductive competition.

## **Sexual selection for other features of courtship displays**

Courtship displays can reveal quality in an almost limitless number of ways, because all they need do is to have high marginal fitness costs in all domains other than courtship. Thus, the indicator function vastly under-determines the details of courtship displays, and other sexual selection processes can become important. For example, the peacock's tail needs to be large, heavy, and expensive to grow to function as an indicator, but its indicator function doesn't determine its exact colours, patterns, and movements.

R. A. Fisher (1930) proposed a "runaway" model of sexual selection that could favor courtship features that are not indicators. In the runaway process, a heritable mate preference (e.g. a preference for a longer-than-average peacock tail) becomes genetically correlated with the heritable trait it favours (e.g. a longer-than-average tail), because offspring tend to inherit both the preference and the trait as a package. The result is an evolutionary positive-feedback loop that drives both the preference and the trait to an extreme. Because the runaway process is extremely sensitive to initial conditions, its evolutionary outcome is hard to predict. Given two similar species living in similar niches, runaway might lead them to evolve very different courtship displays (Miller & Todd, 1995; Todd & Miller, 1997).

Recent theorists have also suggested that perceptual biases (e.g. greater responsiveness to large, bright, high-contrast, loud, rhythmic, or novel stimuli) can influence the direction of sexual selection and the details of courtship displays (e.g. Endler, 1992; Ryan & Keddy-Hector, 1992; for review see Miller, in press, a). Small differences between species in these perceptual biases may lead to large differences in the courtship displays they evolve.

## **The cultural courtship model**

In my cultural courtship model, "culture" subsumes a variety of specific human behaviours such as telling stories, wearing clothes, dancing, making music, decorating artefacts, expressing belief in certain ideas, and so forth. The human capacity for culture, then, is not a single adaptation, but a set of interrelated adaptations that may have evolved under different selection pressures to fulfil different biological (Tooby & Cosmides, 1992). Our unique human capacities for language, art, music, and ideology may be distinct mental modules that evolved at different times, develop according to different life histories, operate according to different psychological principles, and contribute in different ways to biological fitness. In this rather modular view of mental evolution, culture does not come for free as a side-effect of having a large brain, general-purpose learning and imitation abilities, or general intelligence (Pinker, 1997).

However, there may be a common theme running through these cultural capacities. They are self-expressive. They cost time and energy. Most of them have no clear survival benefits. They are unique to our species. They show strong individual differences, with some people much better at them than others. They require intelligence, creativity, and health. They play upon the perceptual and cognitive preferences of spectators. These all the hallmarks of adaptations that have been shaped as courtship ornaments by Darwin's process of sexual selection through mate choice.

## **Cultural displays as sexually-selected indicators**

Cultural displays such as productions of language, art, music, and ideology may function in courtship as sexually-selected indicators of phenotypic and genotypic quality. This idea may

explain not only behavioural differences between humans and other primates, but also the easily observed differences between individual humans in their capacity for producing impressive, attractive cultural behaviour. The whole point of indicators is to amplify perceivable differences between individuals, to make heritable differences in health, intelligence, creativity, and other traits more apparent and easier to judge during mate choice (see Andersson, 1994; Pomiankowski & Møller, 1995; Rowe & Houle, 1996; Zahavi & Zahavi, 1997). Almost all other evolutionary theories of culture (e.g. Dissanayake, 1992; Knight, Power, & Watts, 1995) would be expected to produce very small differences between modern humans in their cultural capacities, because they assume survival selection for culture, and survival selection tends to eliminate genetic variation much faster than sexual selection.

If cultural displays evolved as sexually-selected indicators of intelligence and creativity, this may also explain why many building-blocks of cultural displays are so highly ritualised, while many higher-order structures are so variable. Comparison between courtship displays is easier if the displays share many elements in common, so deviations indicating inferior production ability can be easily noticed. For example, ritualization of vocabulary, pronunciation, and grammar makes it easy to tell who is good at language and who is not. Ritualization of timbre, rhythm, and tonality makes it easy to tell who is good at music (Miller, in press, b). This is why most people dislike abstract art, atonal music, and modernist architecture: these styles avoid just those recognisable, ritualised elements that indicate whether their creators are any good at the basics of their craft.

But individuals can display their creativity in addition to their virtuosity, by recombining these basic cultural elements in novel patterns (Catchpole & Slater, 1995; Miller, 1997; Werner & Todd, 1997). Such new patterns can yield new emergent meanings that capture attention, excite the imagination, and remain memorable. This is why people during courtship tell new stories using old words, rather than expecting a sexual prospect to be impressed by a string of newly invented words. Standardised cultural elements allow easy comparisons of behavioural virtuosity, while protean cultural patterns allow easy assessment of behavioural creativity (Miller, 1997).

### **Sexual functions versus sexual motives**

Culture as a set of adaptations for courtship does not mean that the production of cultural behaviour stems from some kind of Freudian sublimated sex drive. Sexually-selected adaptations do not need to feel very sexy to their users. A trait shaped by sexual selection does not have to include a little copy of its function inside, in the form of a conscious or subconscious sexual motivation (see Tooby & Cosmides, 1992). The male human beard, although almost certainly an outcome of sexual selection through female mate choice, is not a jungle of hidden, illicit motives. It simply grows, and displays that its possessor is a sexually mature male, without having any idea why it's doing that. Even psychological adaptations like music production may work similarly, firing off at the appropriate age and under the right social circumstances, without their possessor having any idea why they suddenly feel "inspired" to learn the guitar and play it where single people of the opposite sex happen to congregate. The cultural courtship models does not reduce culture to a crude sex drive any more than natural selection models of cultural evolution reduce culture to a crude survival drive.

### **Why sexual selection doesn't care whether myths are true**

Anthropology textbooks (e.g. Haviland, 1996) present many functions for art, music, myth, ritual, and other cultural phenomena, such as “imposing order on the cosmos”, “coping with the unpredictability of life”, “appeasing ancestral spirits”, and “maintaining tribal identity”. To an evolutionary biologist, none of these even come close to qualifying as reasonable adaptive functions for costly, complex, evolved behaviours. In a strictly Darwinian framework, behaviours only evolve when their fitness benefits exceed their fitness costs. Fitness almost always relates directly to individual survival and reproduction in the real, objective econiche that a species faces, not in an imagined world of spirits and cultural meanings. The single thing we must demand of any theory concerning the evolution of human culture is: show me the fitness!

Showing the fitness benefits for many cultural behaviours is hard because they create and transmit fictional mindscapes that are not accurate models of biological reality (Knight, Power, & Watts, 1995). The almost unbeatable advantage the courtship model has in this regard is that cultural displays must be honest only as reliable indicators of their producer’s fitness, not as accurate mental models of the world. Mate choice doesn’t care whether a story told during courtship is literally true; it only cares whether the story is good enough to prove the intelligence and creativity of its narrator. Indeed, the more fantastic, baroque, outlandish, and counter-factual the tale, the better an indicator of heritable mental capacity it may be. Without sexual selection, it seems impossible to explain why so much human culture represents the world so inaccurately, and why fiction out-sells non-fiction by such a large margin.

Language did not evolve just so we could tell each other amusing fictions. It clearly shows some design features for communicating useful, true information to others very quickly and efficiently when necessary (Pinker, 1994). The survival and social benefits of complex information-transfer from one mind to another would have been substantial. However, the courtship benefits of being able to activate complex mental representations inside the minds of sexual prospects must have also been substantial, a revolutionary advance over tickling their eyes or ears with meaningless colours and sounds, as all other species are limited to doing.

Both the survival and courtship models for language evolution face the same difficult problem of explaining why language evolved only once, in our species, if it was so useful for either function. Here the courtship model has the advantage that sexual selection is a highly stochastic process, extremely sensitive to initial conditions and unpredictable in outcome, whereas natural selection is a relatively more predictable hill-climbing process that often produces convergent evolution on the same adaptation in many lineages (Miller & Todd, 1995).

### **Why sexual selection is as smart as we are**

Sexual selection is a very powerful process, not just evolutionarily (see Miller & Todd, 1995; Todd & Miller, 1997), but epistemologically. Sexual selection through mate choice can potentially explain anything you can ever notice about evolved human behaviour as something that needs explaining. This is because anything you can notice about other people, your ancestors could have noticed too, and perhaps favoured in picking their sexual mates. While natural selection is so often blind and dumb, sexual selection is as smart as the individuals making the mate choices. Our ancestors were very smart indeed, according to the dominant social intelligence theory of human brain evolution. So, if we are even capable of noticing that someone else is wonderfully creative in their cultural efforts, that perceptual capacity itself is good evidence that mate choice could have shaped the very phenomenon we are admiring. Sexual selection through mate choice can reach as far into the minds of others as our own social intelligence can reach, and can potentially explain whatever we find admirable there.

## **Why sexual selection pre-empts natural selection**

A second immodestly powerful feature of sexual selection is that it tends to hijack whatever natural selection pressures are already shaping a species (Miller & Todd, 1995; Todd & Miller, 1993). This is because there are such large incentives to avoid mating with individuals whose offspring would stand little hope given whatever natural selection is happening. For example, suppose the capacity for social imitation happened to confer some survival advantage on our ancestors. If social imitation abilities remained subject to natural selection over many generations, it seems likely that mate preferences would evolve to favour individuals who displayed above-average social imitation abilities. Those mate preferences in turn would favour the evolution under sexual selection of courtship displays that reliably indicated one's social imitation abilities. The result would be a set of costly, exaggerated displays of one's social-imitation ability, such as a talent for humorous impersonations of sexual competitors. These displays might look vaguely related to traits useful for survival, but their principal function would be courtship. This same argument applies to any other behavioural capacity: if it was really useful for survival, mate preferences would have evolved to "realise" that, and favoured elaborate advertisements of the capacity that do not, in themselves, contribute to survival. Theories of culture evolution that stress pure survival advantages need to explain why cultural behaviours would be uniquely immune to this sort of hijacking, amplification, subversion, and complexification by sexual selection.

## **Darwinian demographics of cultural display**

The courtship hypothesis makes a simple prediction that amount of cultural production in many domains should depend heavily on the age and sex of the producer. Specifically, cultural production should increase rapidly after puberty, peak at young adulthood when sexual competition is greatest, and gradually decline over adult life as parenting eclipses courtship. Males should also show much higher rates of cultural production than females, because they are competing more intensely for mates (see Andersson, 1994; Cronin, 1991; Ridley, 1993). Daly and Wilson (1986) found that homicide follows exactly this pattern, across many different cultures and historical epochs, suggesting that violent competition is largely sexual competition. I was curious whether quantifiable types of cultural production would show the same demographic profile, suggesting similar evolutionary origins in sexual selection.

An initial sample of over 16,000 items of culture from diverse media showed the demographic profile predicted by the courtship hypothesis (Miller, submitted). The method relied on finding reference works such as music discographies, museum catalogues of paintings, and writer's directories that include very large samples of cultural works for which the age and sex of their producer can be identified. From these references, large random samples were obtained, and the number of cultural works produced by individuals of a particular age and sex were counted and plotted. The method works best for discrete, easily counted cultural productions such as paintings, books, music albums, and plays. Reference works were chosen that aimed to exhaustively list all works that fit some well-defined objective criteria, rather than small samples based on some author's quality judgements. For this short chapter, only a few example studies can be reviewed, analysing the production demographics for jazz albums, modern paintings, and modern books.

Figure 1 plots 1,892 jazz albums by age and sex of their principal musician/composer, reflecting a random sample of about 20% of the albums documented in Carr, Fairweather, and Priestly

(1988), an exhaustive reference that includes every commonly recognised jazz musician and album. The data points represent how many jazz albums (as an absolute frequency) were released by musicians of a particular age (displayed along the x-axis from age 0 to age 90), and sex (distinguished by rhomboid symbols for men and circles for women). Two striking features are apparent from the figure. First, there is an enormous sexual dimorphism in cultural production, with 1800 albums by 685 men, and 92 albums by 34 women. Males produced about 20 times as many total jazz albums as females, and produced them at a much higher rate for every age. Second, male productivity peaks very sharply at 30 years of age, rising steeply from age 20 upwards, and falling off steeply until age 50, and then more slowly until age 70. While homicide rate typically peaks in the early 20s (Daly & Wilson, 1986), the later peak for jazz album production suggests that it takes longer to learn to play good music than to kill someone, and longer between composing music and releasing the album than between pulling a trigger and committing a murder.

Figure 2 plots 3,374 modern paintings from *The Tate Gallery Collections* (1984), an exhaustive sample of every painting owned by one of Britain's major national museums. The sample includes all datable works in the collection done by every artist with a last name beginning A through K. The sample yielded 2979 paintings by 644 men and 395 paintings by 95 women, showing an eight-fold sexual dimorphism. Here, cultural productivity for both sexes peaks in their mid to late 30s, following a gradual rise from age 20, with a slower decline from 40 into the 80s.

Figure 3 plots 2,837 English-language books published in the 20th century, a random sample of about 2% of all books listed in *The writers directory* (1992). This includes 2,213 books by 180 men and 624 books by 49 women, with males still producing over three times as many books as females. The age peaks are later for books, around 43 for males and 50 for females, with the first hint of a sex difference in age profiles.

Similar results were obtained in other studies of over 2500 rock albums from Strong (1991), 3,800 major works of classical music from Sadie (1993), 850 old paintings from the *National Gallery: Illustrated general catalogue* (1986), 250 plays from Crystal (1993), and 150 major philosophical tracts from Collinson (1987) -- Nietzsche, male, aged 27, was a typical culture-producer (see Miller, submitted, for details). In every case, cultural production was much greater for males than for females, and showed the same general age profile, though with somewhat different age peaks depending on the medium.

A single pattern seems to pervade the age-sex profiles of cultural production across quite different media from different cultures and historical epochs. Human males and females show a virtually identical age-profile for cultural production: a rapid rise following late adolescence, a peak around age 30 (plus or minus a few years), and a roughly exponential decline throughout the remainder of life, with the most rapid productivity loss between ages 40 and 60, followed by a more gradual decline until death. This age pattern for cultural production resembles that found for many other domains of display behaviour (Simonton, 1988). Though this age profile looks positively skewed if chronological age is plotted on a linear axis, it looks like an almost perfect normal distribution if age is plotted on a logarithmic axis, with the production peak midway between puberty and death.

The second major result is the persistent sexual dimorphism in cultural production rates, with males producing about 10 times more cultural output, across all media, than females. This male domination of public culture has been widely recognised by both evolutionary

psychologists (e.g. Ellis, 1934) and feminist scholars (e.g. Battersby, 1989; Russ, 1983), but is almost entirely ignored in theories of cultural evolution (e.g. Dissanayake, 1992). Given observations by Darwin (1871) and hundreds of other researchers (see Andersson, 1994) that male courtship displays are almost always more frequent, more energetic, brighter, louder, and more strongly motivated than female displays, the most parsimonious biological interpretation of the cultural dimorphism is this: human cultural production functions largely as a courtship display, and the persistent sex difference in public cultural production rates reflects an evolved sex difference in courtship strategies.

There are also strong incentives for females to display cultural creativity during courtship to attract high-quality male mates. But the costs of male sexual harassment probably favoured a female display strategy of targeting desired prospects rather than broad-casting one's fertility and attractiveness to all males indiscriminately. Also, we would expect much of female "courtship" to occur after a sexual relationship forms and even after children are produced, with the cultural displays directed specifically at one's partner, and designed to solicit his continued attention and investment. These arguments suggest a sexually dimorphic motivational system, with equal capacities for cultural production in both sexes, but with males much more prone to publicly broadcast their cultural production and thereby to leave their mark on historical records of culture.

### **Do these age-sex demographics describe production of other kinds of human culture?**

The three figures shown, plotting cultural production as a function of age and sex of producer, could be termed "display profiles". Though they show some variation, there is a general pattern of much more public display by males than by females, and display rates that increase markedly after puberty, peak in young adulthood, and decline slowly with decreasing fertility. There may be a universal display profile that shows these features across many different domains and styles of cultural production. A strong version of my cultural courtship model would make the following prediction: this universal profile will be found for every quantifiable human behaviour that is public (i.e. perceivable by many potential mates) and costly (i.e. not affordable by all sexual competitors). This universal profile may even apply to evolutionarily novel behaviours such as sky-diving, playing one's car stereo at high volume, and constructing an elaborate "home page" on one's Internet web site. If the universal profile is replicated for other genres, other media, other cultures, and other historical epochs, it could be interpreted as an evolved, species-typical, sexually dimorphic, life-history adaptation, shaped by sexual selection, and fundamental to understanding the distribution of cultural behaviour in our species.

A different version of the cultural courtship model could emphasise sex differences not in display rates, but in display channels that show off particular components of phenotypic quality desired by the opposite sex. For example, one could take the standard evolutionary psychology view that males pay relatively more attention to youth and physical attractiveness in mate choice than females do (Buss, 1989), to predict that body ornamentation (e.g. cosmetics, jewellery, costly clothes) will show a display profile with a similar age peak, but with more ornamentation worn by females than by males. However, the definition of body ornamentation depends on where one draws the border around an individual's "extended phenotype" (Dawkins, 1982). If women wear more red ochre or lipstick, but high-status men "wear" more sports cars, body guards, country estates, and corner offices with skyline views, how do we quantify their relative amounts of phenotypic ornamentation? Developing better methods for

measuring cultural production and reception will be necessary for testing more sophisticated models of cultural evolution.

This courtship hypothesis is bound to stir some scepticism, but we must be clear about whether such scepticism concerns the validity of the production data, or their interpretation as serving a courtship function. If culture theorists do not believe that the universal display profile proposed here will apply to their favourite type of public cultural behaviour, I would invite them to measure production of that behaviour, using objective, replicable, quantitative methods, in a large random sample of people from their favourite culture, and see if the profile holds. The universal display profile may not be truly universal, but trying to see whether it is may be useful in distinguishing between different hypotheses about cultural evolution. At least, standard survival-benefit or group-benefit models of cultural evolution have no reason to predict sex differences in display profiles, whereas sexual selection models do.

On the other hand, some may claim that this display profile, though a possibly valid description of public cultural behaviour, is a self-perpetuating artefact of patriarchy rather than an evolved aspect of human nature (e.g. Battersby, 1989; Russ, 1983). In that case, one would have to explain why it is sensible to explain similar profiles in bird song production (e.g. Catchpole & Slater, 1995) and other courtship behaviour in other species using a different theory than one invokes for human cultural behaviour. Parsimony demands that if we see the same age and sex profiles for animal courtship behaviour and for human public cultural production, and if these behaviours show many of the same design features (e.g. high cost, aesthetic appeal, heritable variation in production ability, importance in mate choice), we should admit that the same theory, sexual selection through mate choice, might explain both phenomena.

## **Conclusion**

Human culture does not make much sense as a set of survival adaptations shaped by natural selection. Too much of cultural behaviour, such as art, music, ritual, ideology, myth, humour, and story-telling, seems so expensive in terms of time, energy, and practice costs, and so useless for survival. Anthropologists have struggled for a century to find plausible survival functions for such cultural behaviours, and have not succeeded to their general satisfaction. Indeed, the difficulty of finding survival functions for much of human culture has led many cultural anthropologists to abandon evolutionary explanation altogether as irrelevant and distracting.

This pessimism is misplaced, because it ignores the astonishing revival of Darwin's sexual selection theory in biology over the last two decades. That revival has not been taken seriously by cultural theorists, but it seems to offer their best hope for a fruitful connection with human evolutionary psychology. Human culture makes a great deal of sense as a set of courtship adaptations shaped by sexual selection through mate choice. The costs and aesthetics of cultural behaviour that make it so inexplicable in survival terms make it perfect as a set of reliable fitness indicators that help advertise one's superiority over sexual competitors. This hypothesis offers a natural way of explaining the distinctive age and sex patterns of human cultural production.

This chapter is just a first attempt at tracing the implications of sexual selection for understanding human culture, and a plea for grounding any evolutionary discussion of culture in an up-to-date knowledge of evolutionary theory, combined with rigorous quantitative measurements of the cultural behaviours to be explained. The evolutionary significance of

culture lies not in its subjective meaning, but in its objective fitness costs and benefits. Subjective meaning is simply what our would-be mates use to excite and entertain us during courtship.

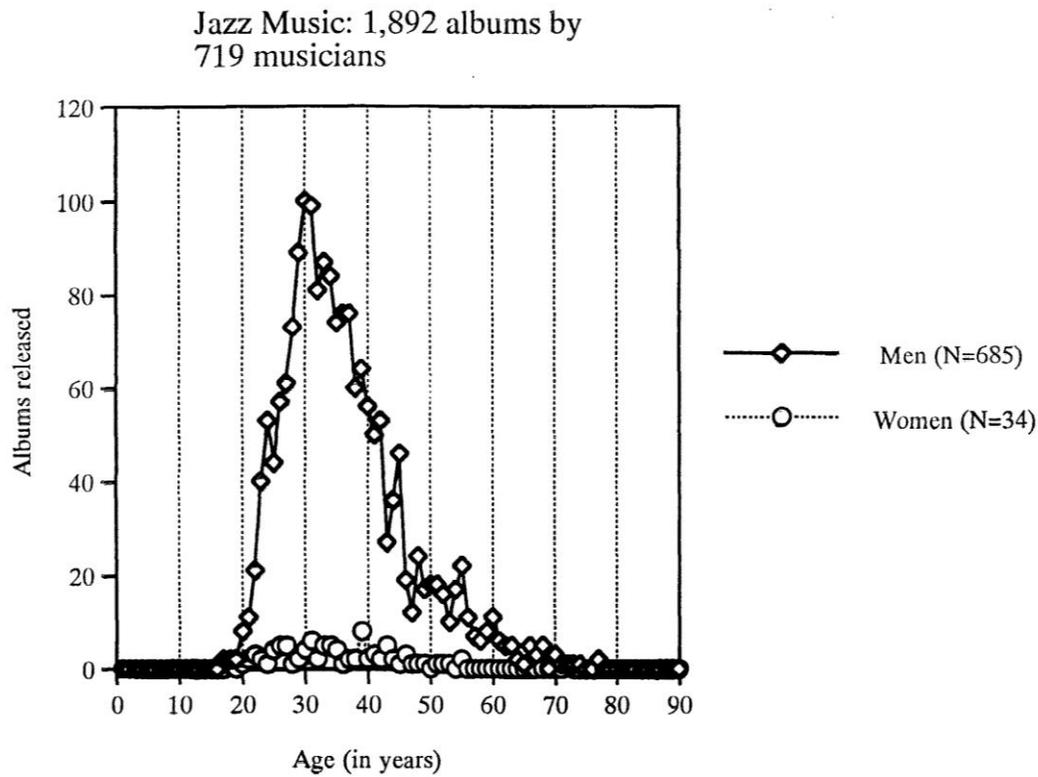
## References

- Andersson, M. B. (1994). *Sexual selection*. Princeton U. Press.
- Battersby, C. (1989). *Gender and genius*. London: Women's Press.
- Buss, D. M. (1989). Sex differences in human mate selection: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences*, 12(1), 1-49.
- Carr, I., Fairweather, D., & Priestley, B. (1988). *Jazz: The essential companion*. London: Paladin
- Catchpole, C. K., & Slater, P. J. B. (1995). *Bird song: Biological themes and variations*. Cambridge U. Press.
- Collinson, D. (1987). *Fifty major philosophers: A reference guide*. London: Routledge.
- Cosmides, L., & Tooby, J. (1994). Origins of domain specificity: The evolution of functional organization. In L. A. Hirschfeld & S. A. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture*, pp. 85-116. Cambridge U. Press.
- Crystal, D. (1993). *The Cambridge factfinder*. Cambridge U. Press
- Daly, M., & Wilson, M. (1988). *Homicide*. New York: Aldine.
- Darwin, C. (1871). *The descent of man, and selection in relation to sex* (2 vols.) London: John Murray.
- Dissanayake, E. (1992). *Homo aestheticus: Where art comes from and why*. New York: Free Press.
- Endler, J. A. (1992). Signals, signal conditions, and the direction of evolution. *American Naturalist*, 139, S125-S153.
- Fisher, R. A. (1930). *The genetical theory of natural selection*. Oxford: Clarendon Press.
- Freeman, D. (1983). *Margaret Mead and Samoa: The making and unmaking of an anthropological myth*. Harvard U. Press.
- Haviland, W. A. (1996). *Cultural anthropology* (8th Ed.). New York: Harcourt Brace College Publishers.
- Jensen, A. (1997). The neurophysiology of g. In C. Cooper and V. Varma (Eds.), *Processes in individual differences*. London: Routledge.

- Kirkpatrick, M., Price, T., & Arnold, S. J. (1990). The Darwin-Fisher theory of sexual selection in monogamous birds. *Evolution*, 44(1), 180-193.
- Knight, C., Power, C., & Watts, I. (1995). The human symbolic revolution: A Darwinian account. *Cambridge Archaeological Journal*, 5(1), 75-114.
- Layton, R. (1991). *The anthropology of art*. (2nd Ed.). Cambridge U. Press.
- Miller, G. F. (1997). Protean primates: The evolution of adaptive unpredictability in competition and courtship. In A. Whiten & R. W. Byrne (Eds.), *Machiavellian Intelligence II: Extensions and evaluations* (pp. 312-340). Cambridge University Press.
- Miller, G. F. (in press, a). How mate choice shaped human nature: A review of sexual selection and human evolution. For C. Crawford & D. Krebs (Eds.), *Handbook of evolutionary psychology: Ideas, issues, and applications*. Lawrence Erlbaum.
- Miller, G. F. (in press, b). Evolution of human music through sexual selection. For N. Wallin (Ed.), *The evolution of music*. Pendragon Press, New York.
- Miller, G. F. (submitted). Darwinian demographics of cultural production.
- Miller, G. F., & Todd, P. M. (1995). The role of mate choice in biocomputation: Sexual selection as a process of search, optimization, and diversification. In W. Banzaf & F. H. Eeckman (Eds.), *Evolution and biocomputation: Computational models of evolution. Lecture notes in computer science 899*, pp. 169-204. Springer-Verlag.
- Miller, G. F., & Todd, P. M. (in press). Mate choice turns cognitive. For *Trends in Cognitive Science*.
- Moller, A. P., and Swaddle, J. P. (1997). *Developmental stability and evolution*. Oxford U. Press.
- National gallery illustrated general catalog* (2nd Ed.) (1986). National Gallery, London
- Pinker, S. (1997). *How the mind works*. New York: Norton.
- Plomin, R., DeFries, J., McClearn, G., & Rutter, M. (1997). *Behavioral genetics* (3rd Ed.). W. H. Freeman.
- Pomiankowski, A., & Moller, A. (1995). A resolution of the lek paradox. *Proc. R. Soc. London B*, 260(1357), 21-29.
- Rowe, L., and Houle, D. (1996) The lek paradox and the capture of genetic variance by condition dependent traits. *Proc. Roy. Soc. London B* 263: 1415-1421.
- Russ, J. (1983). *How to suppress women's writing*. U. Texas Press.
- Ryan, M. J., & Keddy-Hector, A. (1992). Directional patterns of female mate choice and the role of sensory biases. *American Naturalist*, 139, S4-S35.

- Sadie, S. (Ed.). *The Grove concise dictionary of music*. London: Macmillan.
- Simonton, D. K. (1988). Age and outstanding achievement: What do we know after a century of research? *Psychological Bulletin*, 104(2) 251-267.
- Sperber, D. (1994). The modularity of thought and the epidemiology of representations. In L. A. Hirschfeld & S. A. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture* (pp. 39-67). Cambridge U. Press.
- Strong, M. C. (1993). *The great rock discography*. Edinburgh: Canongate Press.
- Ridley, M. (1993). *The red queen: Sex and the evolution of human nature*. London: Viking.
- The Tate gallery collections* (8th ed.) (1984). London: Tate Gallery.
- Todd, P. M., & Miller, G. F. (1993). Parental guidance suggested: How parental imprinting evolves through sexual selection as an adaptive learning mechanism. *Adaptive Behavior*, 2(1): 5-47.
- Tooby, J., and Cosmides, L. (1990). On the universality of human nature and the uniqueness of the individual: the role of genetics and adaptation. *J. Personality*, 58, 17-67.
- Tooby, J., & Cosmides, L. (1992). The psychological foundations of culture. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 19-136). Oxford U. Press.
- Werner, G.M., and Todd, P.M. (1997). Too many love songs: Sexual selection and the evolution of communication. In P. Husbands and I. Harvey (Eds.), *Fourth European Conference on Artificial Life* (pp. 434-443). Cambridge, MA: MIT Press/Bradford Books.
- The writers directory 1992-1994*. (10th Ed.). (1992). London: St. James Press.
- Zahavi, A., and Zahavi, A. (1997). *The handicap principle: A missing piece of Darwin's puzzle*. New York: Oxford University Press.

## Figures

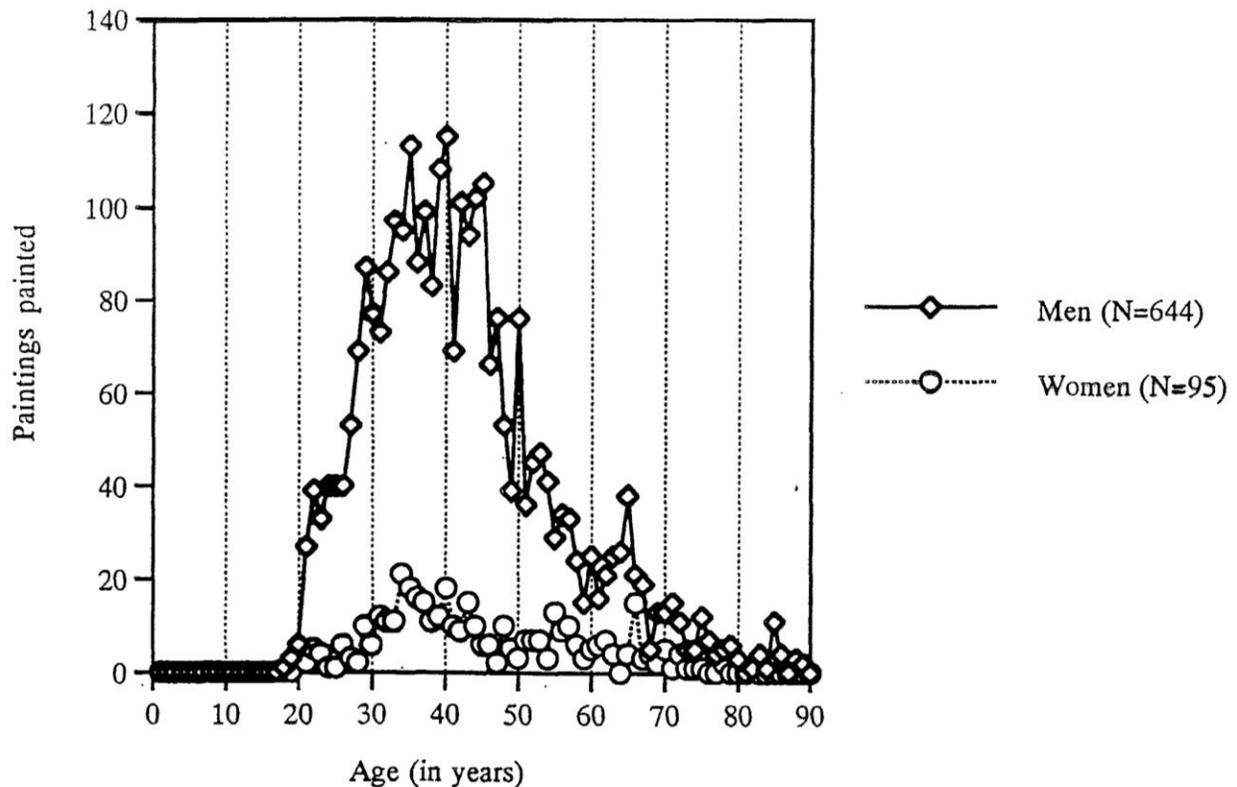


Data from  
Carr, I., Fairweather, D., & Priestly, B.  
(1988). *The Essential Jazz Companion*.

### Figure 1. Jazz albums

Output of jazz albums as a function of age and sex of the principal musician/composer, reflecting a random sample of 1,892 albums from Carr, Fairweather, and Priestly (1988). The data points represent how many jazz albums (as an absolute frequency) were released by musicians of a particular age (displayed along the x-axis, from age 0 to age 90), and sex (with rhomboids representing men and circles representing women). The sample consists of full-length L.P. records released between the 1940s and 1980s in the U.S. or Britain.

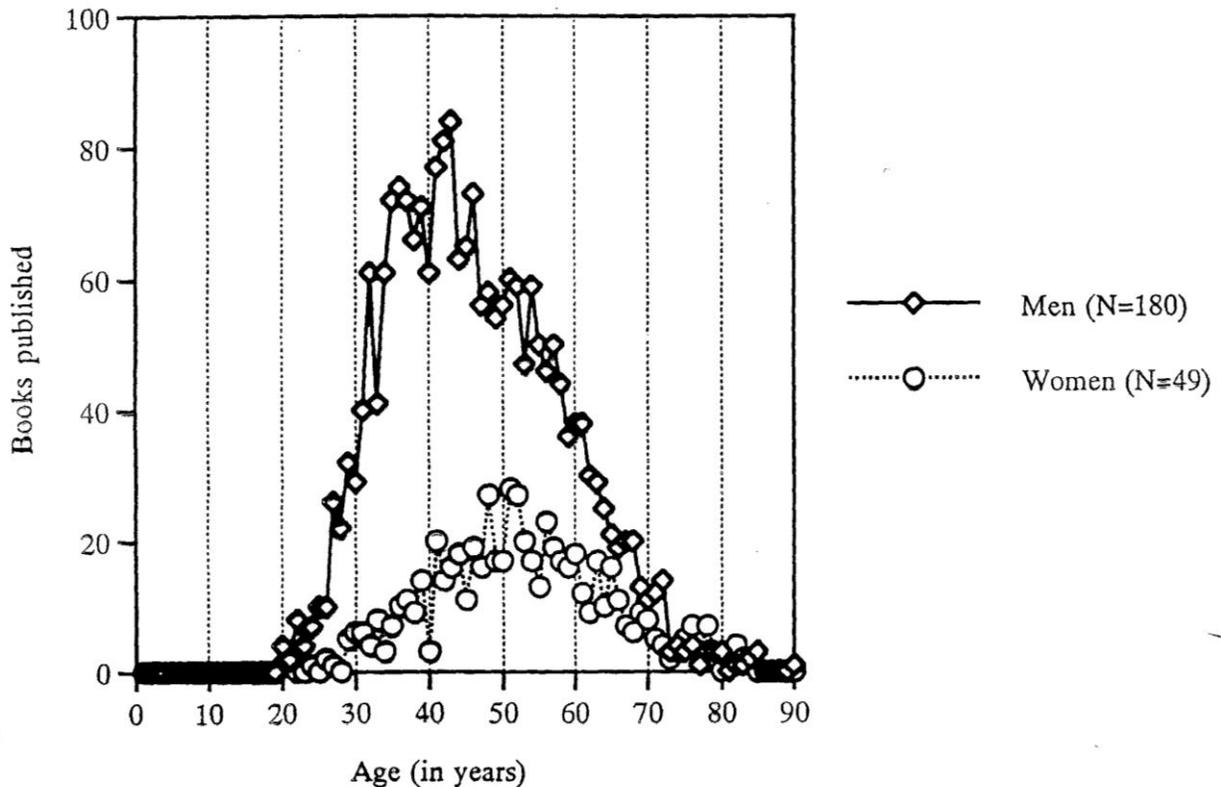
Modern paintings: 3,274 by 739 artists  
from The Tate Gallery, London



**Figure 2. Modern paintings**

Output of modern paintings as a function of age and sex of the painter, reflecting an exhaustive sample of 3,274 paintings from the Tate Gallery Collections (1984). The data points represent how many paintings (as an absolute frequency) were produced by artists of a particular age (displayed along the x-axis, from age 0 to age 90), and sex (with rhomboids representing men and circles representing women). The sample is the exhaustive set of every datable painting owned by the Tate Gallery, London, as of 1984, where the artist's last name began with A through K, and where the artist's sex could be determined by first name. The sample includes mostly 20th century British paintings.

Book-Writing: 2,837 books by 229 writers  
from The Writers Directory (1994)

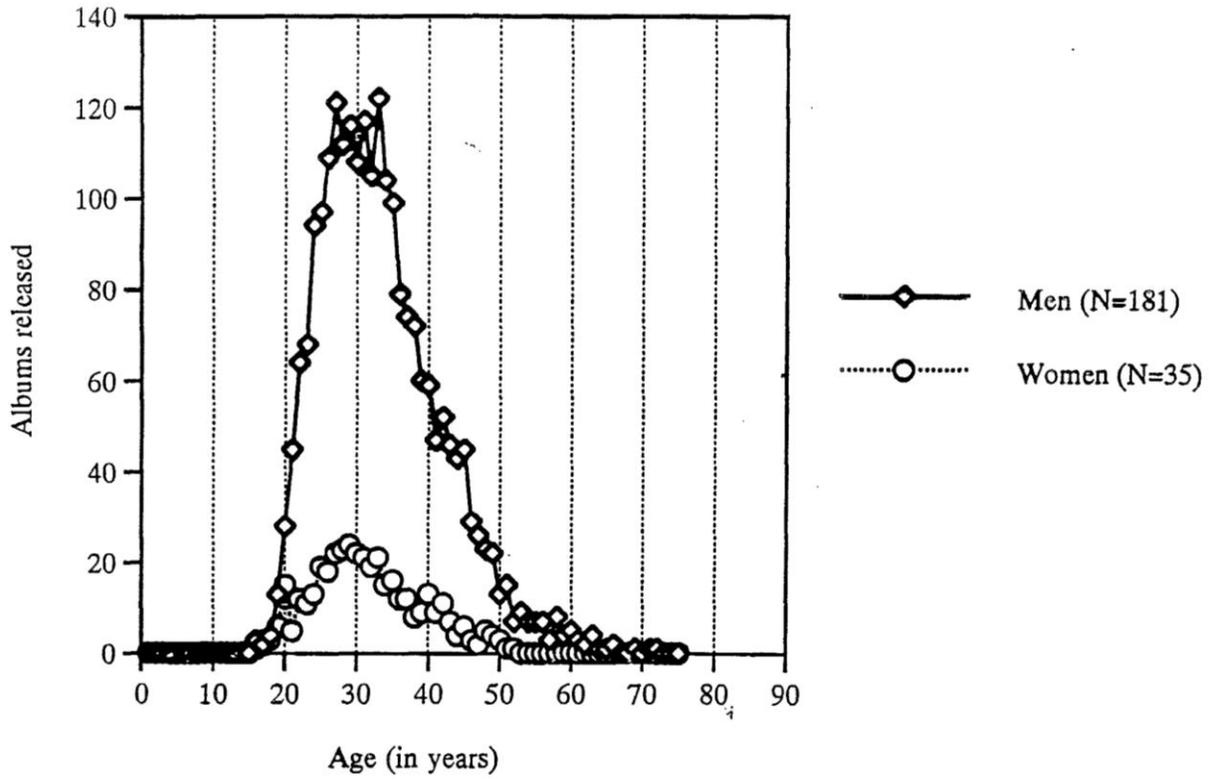


**Figure 3. Books**

Output of books as a function of age and sex of the writer, reflecting a random sample of 2,837 books from *The writers directory* (1992). The data points represent how many books (as an absolute frequency) were produced by writers of a particular age (displayed along the x-axis, from age 0 to age 90), and sex (with rhomboids representing men and circles representing women). The sample includes 20th century English-language works of both fiction and non-fiction, spanning all genres; most of the writers were British or American.

**Bonus Figure:**

Rock music: 2,718 albums by 216 musicians



Data from Strong (1991)  
"The Great Rock Discography"

*Peak: 30  
fast rise + fall*

His courtship model of cultural display makes two specific predictions. First, there should be strong sexual dimorphism in the tendency toward such display and to produce culture, because men compete for their mates much more fiercely than women (Daly & Wilson 1988, pp. 137-161). Second, "cultural production should increase rapidly after puberty, peak at young adulthood when sexual competition is greatest, and gradually decline over adult life as parenting eclipses courtship" (Miller, 1999, p. 81). His data on the producers of jazz albums, modern paintings, and books ... Sexual selection for cultural displays. In R. Dunbar, C. Knight, & C. Power (Eds.), *The evolution of culture* (pp. 71-91). New Brunswick: Rutgers Univ. Sexual selection is a mode of natural selection in which members of one biological sex choose mates of the other sex to mate with (intersexual selection), and compete with members of the same sex for access to members of the opposite sex (intrasexual selection). These two forms of selection mean that some individuals have better reproductive success than others within a population, either because they are more attractive or prefer more attractive partners to produce offspring. For instance, in the