**CHAPTER 20 SUPPLEMENTARY MATERIAL**

**Contents of this Section**

**20.1 Memes  
20.2 Natural selection and artefacts  
20.3 Culture and life history  
20.4 The importance of amylase  
20.5 Culture as sexual display  
20.6 Do religions make people better?**

**20.1 Memes**

Susan Blackmore is one psychologist who has high hopes for the new science of memetics. In her book *The Meme Machine* (1999), she attempts to show how memes could account for the explosion in brain size that occurred about 2.5 million years ago. To follow her argument, we must adopt the concept of a meme as that which is subject to imitation. Once hominins started to imitate each other, a new replicator was born: the meme. Memes are passed on by imitation. An early hominin such as *Homo habilis* might observe another fashioning a tool in a particularly effective way, or enjoying and apparently thriving on a new foodstuff. Imitation would then bring distinct rewards at the level of both genes and memes. The genes of the imitator, and hence any genetic disposition to imitate, would be passed on if the activity conferred some survival advantage. By a parallel process, the memes would thrive, since more people are now practising whatever it was that enhanced survivability. At this stage of our evolution, genes and memes were probably closely linked in terms of the advantages they gave to the biological body.

Once imitation enhances genetic and memetic fitness, then further selection pressures are set up. Those individuals who are good imitators and, crucially, imitate other successful imitators will do better. In addition, those who choose mates who are good imitators will also leave more viable offspring. Blackmore suggests that this combination of natural and sexual selection drives up brain size by a process of positive feedback. As brains become selected for imitating, then language emerges more or less inevitably, since language is one way that memes can be propagated and obtained. As Blackmore (1999, p. 119) observes:

*I suggest that the human brain is an example of memes forcing genes to build ever better and better meme-spreading devices.*

**20.2 Natural selection and artefacts**

The idea that culture may evolve in ways analogous to Darwinian natural selection has, understandably, attracted a lot of criticism. Scientists often react in a similar wounded fashion when sociologists argue that scientific change is driven by social processes. There is now a lively debate in the literature about whether analogies drawn from organic evolution are helping to understand cultural change (see, for example, Gould, (1991), Mesoudi et al (2004), Whiten et al (2011). One criticism has been that culture cannot be divided into discrete particle –like units in the same way as genes can. However, Mesoudi et al (2004) make the interesting point that when Darwin wrote the origin he knew nothing of genes or the nature of inheritance but did rely upon the idea that features could be inherited and modified. Possibly then, a mechanism of inheritance based on particle-like units is not a necessary condition for natural selection. It is instructive to consider the essential components of evolution by natural selection – variation, competition, inheritance, modifications and adaptation- and whether or not there are cultural analogues.

In the case of variation we are surrounded by cultural variants: languages, tools, clothes, social customs and so on. Some cultural variants (for example, a wristwatch and a pair of shoes) are not in direct competition with each other; we could say that like animals living in different biomes they occupy different niches. But other variants such as types of mobile phone or systems for recording and playing music surely are. We are now much more aware than Darwin was about sources of biological variation, in particular the role of random, unplanned and undirected processes such as copying errors, damage to DNA, chromosome translocation and so on. But here too there are analogies with culture: variation arises through copying errors, mistakes, biases in human perception and memory and also through accidental or serendipitous discoveries such as X rays, dynamite, penicillin and the humble corn flake breakfast cereal.

Darwin was insistent that transmutation (the term he originally favoured for the evolution of species) was a gradual process and he spent many pages in *The Origin* arguing how a complex organ, such as the eye, could arise out of a long succession of slight modifications. In the historical and social sciences the study of technological innovation has also demonstrated how technologies evolve often through a series of small steps. The lone far-sighted heroic inventor may occasionally play a role but perhaps not as much as the popular mythology would suggest.

But here we meet a major stumbling block: the source of most cultural variation is obviously unlike biological variation in that it is non –random: it is purposeful and directed in the sense that humans actively seek to construct specific types of variants and artefacts. It is gaol led and, moreover, creators are often cognisant of the selective forces that there products must face and introduce variations in the same direction in which the selective force is expected to act. This, of course, explains why some forms of cultural innovations such as new technologies can evolve with astonishing rapidity. But possibly there is a danger of attaching too much significance to this distinction: it is what happens to the variants rather than their source which is perhaps more important. We might press the point that in epigenetics there is selection of variation (by switching genes on or off) in relation to what environment is anticipated (see Chapter 7). The goal driven nature of cultural innovation does not invalidate the essential comparison. This type of selection perhaps analogous to some degree to the artificial selection practised by animal breeders which Darwin studied so assiduously.

The adaptive nature of artefacts

The remarkable fit between form and function in the living world led theists like William Paley to argue for the existence of a masterful artificer (that is, God) who had designed creatures for the role they played. Darwin was able to show how the appearance of design- the marvellous adaptation of living things to their mode of life- was explicable through the blind, undirected process of natural selection. The fact that many cultural artefacts show adaptation is obvious – they were often designed with a purpose in mind. But as we have seen in the case of ill health, perfect biological adaptation of every part of an organism’s life and body should not always be expected. In addition, what might seem maladaptive may make perfect sense from a gene’s eye view. Hence natural selection will produce genes that are good at arranging their own transmission and replication even though the lives of the organisms that carry them may seem far from harmonious and well-constructed.

**20.3 Culture and life history**

Humans have a long juvenile period compared to other primates. The average age that girls experience their first menstrual period in modern cultures is between 12.5 and 13.5 years. This age is known to be dependent on environmental factors such as food intake and has been declining in Europe over the past 150 years. In 1860, for example, it stood at about 16.5 years and by 1960 had reduced to 13.5 years. Using these data and studies of traditional cultures, it seems likely that our ancestors in the Old Stone Age would have fully reached reproductive age at about 18–20 years (Kaplan et al., 2000). This figure seemed to have increased in the hominin lineage and then declined recently under the influence of cultural factors. Table 20.1 shows estimates by Bogin (1999) and Bogin and Smith (1996) of the period of reproductive immaturity for some of our ancestor species based on fossil evidence on bone sizes and dental development.

Table 20.1 Estimates of the juvenile period of selected hominins. Data from Bogin, B., & Smith, B. H. (1996) Evolution of the Human Life Cycle. *Human Biology: An Evolutionary and Biocultural Perspective, Second Edition*, 513-586; and Bogin, B. (1999). *Patterns of human growth* (Vol. 23). Cambridge University Press.

|  |  |
| --- | --- |
| **Species** | **Age at reproductive maturity** |
| Australopithecines | 12 |
| *Homo habilis* | 12–13 |
| *Homo erectus* | 14–15 |
| Early *Homo sapiens* | Late teens, early twenties |

This prolonged immaturity of humans is shared, in terms of physical growth, to a degree by some other primates. In most farm animals, for example, puberty is reached when they attain about 30 per cent of their adult weight, whereas the figure is about 60 per cent for humans and chimps. But despite this similarity, in terms of developmental timing, the pre-reproductive period in humans is much longer than in other primates. Significantly, its increase in the *Homo* lineage took place alongside a threefold increase in brain volume since *A. afarensis*. It is plausible, then, that this long period of development was needed to enable young humans to acquire the social, physical and cognitive skills to function as an adult in demanding ecological and social environments. It is also noteworthy that this long period of immaturity runs alongside a much lower infant mortality in humans compared to our nearest relatives. Child mortality is about 50 per cent for children in modern hunter-gatherer cultures compared to between 60 and 90 per cent for other primates (Lancaster and Lancaster, 1983).

Humans seem to exist at the extreme end of a tendency observed in other primates, namely, that the size of the adult brain is related to the length of the juvenile period: the larger the brain the longer the juvenile period (see Bonner, 1988).

**20.4 The importance of amylase**

**Amylose**

AMY1: Salivary amylase and AMY2 :Pancreatic amylase

**Isomaltose  
 and  
Maltose**

***Blood Stream***

Intestinal sucrose-isomaltase  
 and maltase-gluconamylase

**Glucose**

**Figure 20.2 The digestion of amylose (a major component of dietary starch) by various enzymes**. The genes AMY1 and AMY2 shown here produce amylase enzymes.

**Table 20.2 Comparison of repeat copies of the amylase -producing gene AMY1 in different populations according to low and high starch diets.** Data taken from Perry et al (2007)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Population** | **Diet (dominant factors shown)** | **High or low starch** | **Mean AMY1 number**  **(+/- 1 SD)** | **Aggregated means** |
| Datog (Africa) | Meat, blood, dairy | Low | 5.76 +/- 2.28 | Low starch  5.44 +/- 2.04 |
| Mbuti (Africa) | Meat, seeds, honey | Low | 5.33 +/- 1.50 |
| Biaka (Africa) | Meat, fruit, seeds, honey | Low | 5.47 +/- 2.20 |
| Yakut (Asia) | Meat, fish, dairy | Low | 5.24 +/- 1.96 |
|  |  |  |  |  |
| Hadza (Africa) | Meat, seeds, tubers | High | 6.92 +/- 2.60 | High Starch  6.72 +/- 2.35 |
| Japanese (Asia) | Rice, meat, fish, fruit, vegetables | High | 6.57 +/-2.03 |
| European- Americans (Europe) | Cereals, meat, poultry, dairy, fruit, vegetables | High | 6.80 +/- 2.43 |
|  |  |  |  |  |
| Chimpanzees (W. Africa) | Fruit, leaves, seeds, some meat | Low | 2 | 2 |

**20.5 Culture as sexual display**

In Australia and New Guinea there live some 20 species of bower birds. The behaviour of males leads them to build elaborate bowers from branches and twigs, which they decorate with all manner of colourful objects such as shells, leaves, flowers, berries, feathers, stones and discarded objects such as coins and pieces of glass. Males will spend a considerable amount of time and energy building these bowers and arranging their ornamental treasures. Females inspect these bowers and mate with the male who made the most impressive construction. Often many females mate with the same male. In one sense this is an example of an extended phenotype: in the genotype of male bowers birds are instructions that compel them to produce these cultural artefacts. Might human culture serve a similar function?

This idea was suggested in the film *The Dead Poets’ Society*, where Robin Williams plays an inspirational English teacher, Keating, who takes over a new class. One exchange with his pupils is interesting:

KEATING: Now, language was developed for one endeavour, and that is? Mr Anderson? Come on! Are you a man or an amoeba?

NEIL: Uh, to communicate.

KEATING: No! To woo women.

These two examples are in keeping with the approach elaborated by the evolutionist Geoffrey Miller (2000), who argues that we should view the arts in terms of sexual selection theory. For Miller, the generation of art is part of courtship display, a demonstration of cognitive fitness. Just as the peacock displays its extravagant and gaudy tail to attract peahens, and male bower birds build complex bowers from twigs and colourful ornaments to attract females, so humans (especially males) display their intellectual and manual skills through artful displays: telling complex stories, producing paintings, composing sonatas, making artefacts, drafting love sonnets and so on. In further support of his theory, Miller notes how creativity (measured in terms of, say, output of novels, songs, sales of music and so on) peaks at the period of peak fertility of young men. And, in a comment that is bound to infuriate many (especially women), he notes that:

*Males produce about an order of magnitude more art, music, literature … than women, and they produce it mostly in young adulthood. This suggests that … the production of art, music, and literature functions primarily as a courtship display.* (Miller, 1998, p. 119)

The essential idea of Miller is that artistic displays make men more attractive to women. In support of this, there is plenty of anecdotal but suggestive evidence of the large number of sexual partners enjoyed by musicians, artists and writers. Creativity, it seems is sexy. Miller provides some quantitative support of his hypothesis in an analysis of jazz musicians. The distribution of output in terms of number of records against age has a fairly narrow profile: most music is produced by men aged between 20 and 40, the very age when they are investing heavily in mating effort (Miller, 1999a). Jazz music is seen as a form of sexual display, since it peaks with young men and men greatly outnumber women in terms of its production – a sure case of men blowing their own trumpets.

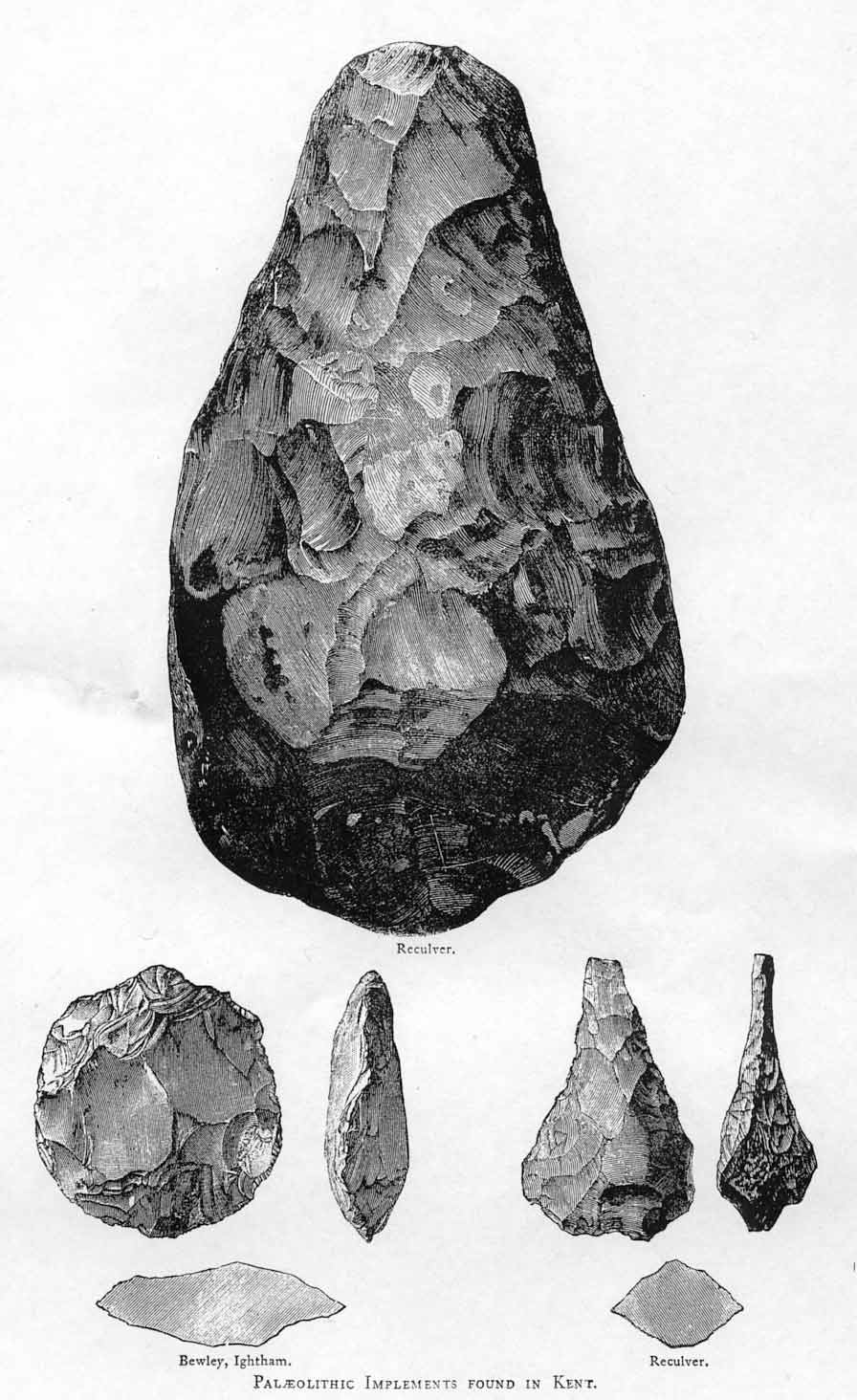
Miller’s ideas remain intriguing. He regards much of human culture as ‘wasteful sexual signalling’ that began with language, art, music, humour and clothing but was then closely followed by religion, philosophy and literature (Miller, 1999b).

The hypothesis is still rather tentative and controversial and certainly it is unable to explain the form that artistic creativity takes. In its favour, we might note that many works of art and creative displays are made by young men and that male pop stars and other cultural icons are extremely attractive to the opposite sex. On the other hand, modern culture has many examples of young females enjoying the cultural output of other females (for example female cult authors such as J. K. Rowling, or pop stars). Moreover, it is easy to find exceptions to the idea of art as a young man’s sexual display, such as the remarkable efflorescence of poetry by Thomas Hardy when in his seventies, or the late music of an aged Vaughan Williams.

Another problem is the idea of male sexual signalling does not easily translate from the world of animal behaviour to that of humans. The theories of intersexual selection that account so successfully for the behaviour and appearance of birds such a peacocks and bower birds do not necessarily provide good models for human male and female sexual interactions. As noted in Chapter 4, both males and females will be choosy and display different attributes depending on factors such as encounter rates and the operational sex ratio.

Sexual selection and artefacts

This approach has also been applied to ancient cultural artefacts. The conventional view of stone tools is that they were objects made by hominins in the Old Stone Age for mundane tasks such as hunting, animal butchery, digging and cutting wood and other materials. But in an adventurous paper, Marek Kohn and Steven Mithen (1999) have assembled evidence to support their argument that stone hand axes (see Figure 20.4 ) manufactured as early as 1.4 million years ago are best seen as products of sexual display. They agree that many stone tools (such as arrowheads and scrapers) did have a utilitarian function but argue that hand axes served other purposes. In support of their case, they note that the production of hand axes presents a number of puzzling features, such as their huge numbers in the archaeological record and the high degree of symmetry and precision to which they are crafted, which archaeologists find difficult to explain.



**Figure 20.4 Typical Acheulean hand axe from Kent, UK .** Taken from the Victoria County History of Kent (1912) Vol 1, p 312, London.

**20.6 Do religions make people better?**

Another question that can, in principle, be examined empirically is whether belonging to a religious group does indeed help promote co-operative behaviour and militate against the temptation to cheat and the actions of cheaters (Haidt, 2012). In practice this is quite difficult and the work that has been done has yielded a complex pattern of results (see Bloom, 2012 for an overview). Some tentative conclusion are listed below:

* Some surveys (for example, Brooks, 2007) do report that religious people do indeed show more caring behaviour and donate more to charities than non-religious people.
* Some research in laboratory situations found that religious people think they are more altruistic than no religious people in giving games but in reality this is not the case (Batson et al 1989)
* In the USA states that are more religious, relatively speaking, give more money to charity than states that are less religious (Brooks, 2007)
* People playing laboratory games tend to cheat less and be more generous if they feel they are being watched by an invisible agent ( for example, a supernatural deity) (Bering et al, 2005). See also Chapter 11)
* Degree of religiosity does tend to be slightly but significantly correlated with negative attitudes to out-groups of different race, colour and sexual orientation (Hall et al 2010)
* Research often reveals a positive correlation between religious fundamentalism, conservatism and authoritarian attitudes (Jost et al 2008).

In his own survey of the literature Bloom (2012) concludes that it is belonging to a group that is important in enhancing moral behaviour, and not the content of the group’s beliefs, but that this is often accompanied with distrust and prejudice towards outsiders. This position is consistent with the general idea that religions function to encourage mutualism and restrict cheating and freeriding.

**References**

Batson, C. D., K. C. Oleson, J. L. Weeks, S. P. Healy, P. J. Reeves, P. Jennings and T. Brown (1989). "Religious prosocial motivation: Is it altruistic or egoistic?" Journal of Personality and Social Psychology 57(5): 873.

Bering, J. M., K. McLeod and T. K. Shackelford (2005). "Reasoning about dead agents reveals possible adaptive trends." Human Nature 16(4): 360-381.

Blackmore, S. (1999). The Meme Machine. Oxford, Oxford University Press.

Bloom, P. (2012). "Religion, morality, evolution." Annual review of psychology 63: 179-199.

Bogin, B. (1999). Patterns of Human Growth. Cambridge, Cambridge University Press.

Bonner, J. T. (1988). The Evolution of Culture in Animals. Princeton, NJ, Princeton University Press.

Brooks, A. C. (2007). Who Really Cares: The Surprising Truth About Compassionate Conservatism--America's Charity Divide--Who Gives, Who Do, Basic Books.

Gould, S. J. (1991). Bully for Bronthosaurus: Reflections in natural history, New York: Norton.

Haidt, J. (2012). "The Righteous Mind: Why good people are divided by religion and politics." New York: Pantheon.

Jost, J. T., B. A. Nosek and S. D. Gosling (2008). "Ideology: Its resurgence in social, personality, and political psychology." Perspectives on Psychological Science 3(2): 126-136.

Kaplan, H., K. Hill, J. Lancaster and A. M. Hurtado (2000). "A theory of human life history evolution: diet, intelligence, and longevity." Evolutionary Anthropology Issues News and Reviews 9(4): 156-185.

Kohn, M. and S. Mithen (1999). "Handaxes: Products of Sexual Selection." Antiquity 73: 518-526.

Lancaster, J. B. and C. S. Lancaster (1983). Parental Investment: The hominid adaptation. How Humans Adapt: A biocultural odyssey. D. J. Ortner. Washington, DC, Smithsonian Institution Press.

Mesoudi, A., A. Whiten and K. N. Laland (2004). "Perspective: is human cultural evolution Darwinian? Evidence reviewed from the perspective of The Origin of Species." Evolution 58(1): 1-11.

Miller, G. (2000). The Mating Mind. London, Heinemann/Doubleday.

Miller, G. F. (1998). How mate choice shaped human nature : A review of sexual selection and human evolution. Handbook of Evolutionary Psychology. C. Crawford and D. L. Krebs. Mahwah, New Jersey, Lawrence Erlbaum.

Miller, G. F. (1999b). Evolution and Consumerism. Prospect: 18 -23.

Perry, G. H., Dominy, N. J., Claw, K. G. et al (2007). "Diet and the evolution of human amylase gene copy number variation." Nature Genetics 39: 1256-1260.

Whiten, A., R. A. Hinde, K. N. Laland and C. B. Stringer (2011). "Culture evolves." Philosophical Transactions of the Royal Society B: Biological Sciences 366(1567): 938-948.