

The two fingers of destiny

A fascinating study of academics working at the University of Bath, described in a press release from the university on 19 October, deals with the research capabilities of men and women scientists in relation to their sex hormone levels and the relative lengths of their index and ring fingers.

As a rule, male scientists have an oestrogen level as high as their testosterone level, and this influences the development of the right side of their brains which governs spatial and analytic skills. Moreover, high oestrogen levels make male scientists less likely to have children and more likely to have relatives who suffer from dyslexia. Women who undertake social sciences tend to have higher testosterone levels than others.

One intriguing finding is that an individual's levels of oestrogen and testosterone are indicated by the relative length of index and ring fingers, a ratio determined before birth and remaining the same throughout life. Finger length, indeed, is genetically linked to sex hormones. If the index finger is shorter than the ring finger, it indicates a relatively high testosterone production, whereas if it is longer oestrogen predominates. Men teaching the hard sciences of physics and mathematics tend to have index fingers as long as their ring fingers. The more usual male pattern of longer ring than index fingers is seen in those studying social science subjects such as psychology and education.

It is suggested that lower than normal testosterone levels in men lead them to spatial



skills that promote success in a scientific career. The right brain development involved is at the expense of language abilities. Why male dominance in the sciences should be the norm is unknown, but it is possible that in women the high level of oestrogen may produce different effects upon the brain than is seen in men. Alternatively, tradition may be the real reason why women are deterred from entering the science curricula.

Music and the roots of civilisation

We know that music in one form or another plays an important part in civilised activities. It is perhaps unfortunate that different people have different notions of how to distinguish between making noises and making music. Like language, most musical behaviour has left no trace in the archaeological record, and it is therefore difficult to equate it with social development.

In a discussion in *Science* for 12 November Michael Balter has reported the experiment recently carried out in the University of Reading, in which 25 researchers danced in a circle while playing different lengths of rubber tubing to produce a range of notes spanning two octaves. After several minutes the individual notes coalesced into a single pleasing melody. Thus, music, like language, is a form of communication and co-ordination, as well as a powerful way of conveying emotion.

Music clearly has an evolutionary role. It is a universal phenomenon and young infants respond strongly to it. One hypothesis is that music has played an important role in maintaining social cohesion in humans and in evo-

lutionary terms has permitted hominid survival.

It is necessary to explain why singing and dancing has not only enhanced social bonding but has brought better health and survival. It is thought that the raising of endorphin levels by music may have made human individuals better disposed to their fellows, and experimental treatment with drugs which block endorphin receptors has reduced the pleasure of individuals when hearing music.

In parent-child relationships, music has proved crucial to bonding between mothers and infants and, by doing so, it also permits mothers to achieve other tasks valuable to survival. And maternal speech, with a higher pitch and slower tempo, has many of the qualities of music. Speaking or singing to infants has been shown to decrease their blood cortisol levels, indicated by less cortisol in their saliva. And every culture in the world has produced lullabies that are emotive. Music may have evolved to soothe babies, but this fails to explain why older children and adults enjoy hearing it.

Past climate indicated by records of the dates of the grape harvest

The strangely hot summer of 2003 was responsible in France for many fatalities. It has prompted a communication by a group of French scientists in *Nature* for 18 November, describing investigations into spring and summer temperatures between 1307 and 2003, as indicated by records of the dates of the grape harvest in Burgundy. The results reveal that local temperatures as high as those reached in the 1990s have occurred several times since 1370. Nevertheless, the extraordinary summer of 2003 involved temperatures probably exceeding any since 1307.

Many European countries have recorded the dates of grape harvests for centuries, and such harvests are tightly related to summer temperatures. Thus, such records provide one of the longest uninterrupted series of regional temperature anomalies available, without chronological uncertainties. In Burgundy the dates of grape harvest have long been registered carefully in parish and municipal archives, and may be checked as far back at least as the early 13th century. Moreover, the yearly reconstruction of temperatures correlates significantly with the evidence of tree growth rings in central France, which offer a guide to summer temperatures.

It appears that there were two early warm decadal fluctuations in the 1380s and one in the 1420s. The hot period of 1420 was followed by a cold one lasting from the mid-1430s to the end of the 1450s. There were also warm periods between the 1520s and the 1630s and 1680s, with temperatures similar to those at the end of the 20th century. The peak of 1680 was followed by cooling during the period 1750s until the 1970s. The heatwave of 2003 represents an unprecedented event.

A troublesome, two-edged word

"The word 'scientific' is troublesome because it now has two distinct meanings which contrast it with two distinct sets of opposites. On the one hand it can be a quite general word of praise, meaning simply *thorough* and *methodical* as opposed to casual, vague or amateurish. In that sense historians or linguists or logicians can be called scientific — or unscientific — just as properly as astronomers. On the other hand, the word can also be a strictly factual one meaning 'concerned with the natural sciences' as opposed to other studies." — Mary Midgley: 'Science and poetry' (2001).

And I quote . . .