The Math Gene

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Do you need a special mind to do mathematics, and if so, why has such a mind evolved? What has been its reproductive advantage? Devlin argues that a mathematical mind has no real advantage as far as reproductive advantage goes, for one thing mathematical ability only has an edge (if even that?) in a fairly advanced culture. Furthermore mathematical ability is a relatively rare thing in any given human population, and traits that confer reproductive fitness to a population tends to be widely manifested, as those tend to benefit populations as a whole, not individuals (this is one of the many reasons why evolutionary change is so slow, it advances by diffusion). Devlin argues that if you want to look at an advantageous trait you need to look at something far more prevalent. There is an obvious choice, namely language. With very few exception everybody learns language naturally and effectively without any formal instruction, just as we instinctively learn to walk. To many of us, this is a strong argument for language ability being innate, or in modern parlance neurologically hardwired, even if so far there has been no direct evidence for it. Even the less ambitious attempts of providing a universal grammar, have in spite of the efforts of a Chomsky, proved inconclusive, although they did at the time revolutionize academic linguistics, giving it at least the trappings of a 'hard science'. Language, according to some biologist[1], should be placed alongside multi-cellular organisms and sexual reproduction, as one of the mayor innovations of evolution, and is still considered as the main watershed between us humans and animals. Devlin refers back to the until fairly recently unduly neglected philosopher C.S.Pierce and his triadic classification of signs into icons, indices and symbols. Icons are the most direct signs and according to the author should be within the capability of the most primitive animal brain, examples of indices are only to be found among more advanced animals, such as mammals and birds[2], while humans are alone in being capable of truly symbolic representation. In fact I would argue that it is the shared reality of concepts which makes symbolic representation and communication possible and hence enables the emergence of language. Although of course, as Devlin points out, language is not primarily about communication, it only makes it more effective and extensive, and that obviously its use in communication shapes and streamlines it. How do we learn words? By pointing? But even pointing to a cat is not unproblematic. How do we know that it is the cat as a representative of a particular animal which is at stake? It is said that when the white men encountered the aborigines and pointed at kangaroos, the name they were given did not refer to this particular kind of animal, but animals in general. How much more subtle is it not to get more abstracts concepts as 'happiness' across? Obviously we are talking about a certain pre-understanding, just as small children understand that

[1] Among them the late Maynard-Smith

[2] What about octopuses? One of the most striking incidents of convergent evolution (in this case between mollusks and vertebrates).

doing the dishes has to to with getting things clean, and not just splashing with water, as chimpanzees supposedly imagine[3]. And maybe it is this unusually close genetic proximity[4], after all the human race did at some fairly recent time pass through a population bottle-neck, that makes this common understanding possible, and makes a genetic case for Jung's highly speculative idea of a collective unconsciousness. Of course our individual concepts are not identical, only occurring with large overlaps, this makes perfect communication an impossibility. Consequently corresponding words in different languages refer to subtly different concepts, making perfect translation a chimera. Sometimes mathematics is naively likened to a language, and it is suggested that mathematics would be far more accessible if straightforward translations were effected. This goes against the grain of basic language acquisition, in which a naming of a concept only makes sense if it is is already to a large extent understood. We only acquire words for things we need. The naming of a concept is no revelation, it is a convenience.

So what language has to do with mathematics? According to Devlin, mathematicians are able to bring the symbolic abstraction of language one further step. Mathematicians feel at home with abstractions, and they can reason with them with the same natural intimacy and with the same vivid imagination, that most people ordinarily bring to the engagement in gossip. To a mathematician mathematical objects are as interesting as people, they provoke their curiosity and stimulate their imagination, just as gossiping about friends you know, provokes and stimulates your curiosity and imagination. The practice of mathematics is just one giant soap-opera with no prospects of an end.

I think that this view of the practice of mathematics has much to commend itself, once we are aware of its obvious limitations. Its main purpose, as I see it, is to free the modern mind from viewing the different capacities of the mind as the outcomes of specific evolutionary pressures, which has so uncritically provoked the various 'Just-so' stories of so called evolutionary psychologists. The embryological development is not genetically managed in its most minute details, there is a lot of leeway for other processes. The arrangement of spots on animals is not genetically determined, only the process that gives rise to it might be so determined[5]. More generally one should keep in mind that conjoined twins give examples of intricate ways organs can be shared for which there obviously is no ready blue-print in the genetic material. Similarly the capacities of the brain should be thought of as results of processes which once started proceed with no genetic control. After all it would be absurd to reason that one and every of our thoughts were the results of specific genetic commands. Maybe the language capacity of the brain is something that naturally evolves once the brain has been given a certain critical mass of extension and intricate structure, Devlin speculates To use a modern mathematical metaphor, it provides a (strange) attractor. As such developments can be described mathematically, it gives a beautiful neurological justification for Platonism in mathematics! Mathematics forcing the human mind to perceive mathematics. Something the author obviously never had in mind.

[3] As proposed by Pinker in 'the Blank Slate'.

[4] which gives an accidental biological justification for our moral stand to view men in principle of equal worth.

[5] Devlin cites in some detail, the simple mathematical algorithm that underlies, or maybe rather accurately simulates that process

But why should some people bring to their thinking this extra dimension of abstraction? Maybe as another kind of strange attractor given a certain more or less accidental arrangement of mental states? Maybe even an arrangement of defect, similar to autism? There are no indication how to provoke such a step through pedagogical manipulation (usually referred to as instruction)? It seems to be an instinctive step taken by some individuals. Then of course thinking of mathematics as a soap-opera only explains the devotion and intense interest it can engender, it does not delve any deeper into the structure of mathematical thought per se, only that it also can be the worthy object of human love. For one thing mathematical thought is motivated by a sense of precision and adherence to objective truth, although the actual process itself, as far as it can be made consciously manifest, may be very far removed from such constricting ideals; while social thought thrives on ambiguity and outright deception. Incidentally this clearly appears as the guiding star of post-modernism, emergent as it is from social games of up-manship in academic circles. However, such distinctions are superficial, from Devlins point of view.

Mathematics as a Soap-Opera is that reductionism? To some extent it may be thought of as. After all the standard routine work of most mathematicians may be thought of as the 'mental masturbatory' activity that might characterize gossip[6]. But some of the mathematical breakthroughs in recent years, and Devlin cites in particular the proof of the Fermat conjecture, certainly go in complexity beyond the most intricate plots of soaps, and surely some of the mathematical flashes of insight have no counterpart in the world of gossip and soap. When it comes to intellectual potential, the higher abstraction of mathematics, provides a far more promising venue transcending the intrinsic limitations of social relations. But that does not take into account the emotional aspects, which in many cases may limit human mathematical exploration.

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[6] which has often been likened to the social bonding that goes on among flea picking baboons.