Local adaptations and long jumps

By Professor Jan Willem de Graaf
Professor of Brain and Technology, Saxion University of Applied Sciences, Deventer, Netherlands

Why are people not always ready to receive a band as enthusiastically as the Beatles? Last week I argued that it's not because there are no more bands of that level. Unfortunately, the answer is a little more complicated. In a number of scientific areas, including genetics, a distinction is made between local adaptations and long jumps. For example, kin selection can be observed; in reproduction, more similar individuals tend to attract each other more than dissimilar individuals. Genetically, descendants of kin selection resemble each other more than descendants of unrelated (dissimilar) parents. Kin selection increases homozygosity.

In addition to strong properties, however, it is also about weak properties, such as (increased sensitivity to) diseases and defects. In dog breeds this is clearly visible. Due to kin selection, all dogs of an "improved" breed increasingly resemble each other, for example in size, colour and "talents", such as guarding, working and herding sheep. As a result of the local adaptations, the breed is increasingly approaching the ideal image. At the same time, it irrevocably increases its vulnerability to unintended defects. Some breeds appear to be extremely sensitive to certain types of cancer, others to stomach torsions, etc. Heterozygosity has then made way for as much as possible homozygosity.

Imagine, you are a beautifully "bred" Great Dane, but you see a lot of offspring dying young because of stomach torsions, tumours, hip dysplasia, etc. You consider a long jump. After searching on Wikipedia you find out that you have to make amorous advances with, for example, an Irish wolfhound, a Greyhound or a Deerhound. Your offspring will remain large and impressive, but there are many new features that will lower vulnerability in the long term. For good reason, often mongrels are the strongest. So you exchange "certainty" with regard to characteristics for heterozygosity, better redundancy, and with that your offspring will be more resistant to unexpected events. All this at the expense of less predictable features ("certainties"). So far this trans-mammal-like thought experiment.

Redundancy

For good reason Mother Nature has equipped us with redundancy: 2 different eyes, hemispheres, lungs, etc. Practically all of these systems are known to function well with 1 of both. There are even children with incurable, very severe generalized epilepsy, where 1 hemisphere is removed, so that the epilepsy can no longer spread throughout the brain. Not only does epilepsy often disappear, but these children also seem to develop "normal" motor, cognitive and emotional behaviour. Double differences seem unnecessary (redundant) but are not. Kin selection is a system that makes strong traits stronger by anchoring them more strongly in the genome: it converts twice the differences - heterozygous - into twice the same (homozygous), at the expense of ultimate overall increased vulnerability.

What does this have to do with the Beatles and my column from last week? Everything! If art or science is "locked" (kin-selection; the same styles or "tricks" are exploited time and again) there is less and less room for artists with a different style or opinion. However, there comes a time when "outbreak" (with a wink to our thought experiment, cheating with an Irishman, or Greyhound) is inevitable. After such long jump, there is again room to explore, to find out, to be illiterate and to create a new (art) language. After a long jump, everyone is somehow illiterate. We often value the first to be literate as grand masters of art and science. As I wrote a few years ago, this is the advantage of illiteracy. In times of exploitation, everyone must become more literate, at the expense of increased vulnerability. Local adaptations and long jumps are both inevitable in evolutionary (developmental) systems. So both perfecting, and occasionally jumping deeply into something, doing something completely different (very different career shift).