

Think Tank – 9 June 2017: Michael Kerr

Brief book review: “How to Tame a Fox,” Lee Alan Dugatkin & Lyudmila Trut

Two reasons for my interest: (1) Desire to anchor the individuality-togetherness concept in evolution, and (2) develop a systems theory of the individual.

The brain beyond the long-term research this book describes was Russian geneticist Dimitri Belyaev. Lyudmila Trut has been involved since the beginning.

Belyaev was interested in the processes involved in domestication. Picked the silver fox. These foxes lives solitary lives apart from the period right after a litter of pups is born. Father and mother cooperate until young foxes leave the den, then the family dissolves. New mates next year.

Initially, chose 12 out of 100 foxes that were not calm, but not as highly reactive and aggressive as the others. They were chosen to become the parents of the next generation. Careful to avoid inbreeding.

Within three breeding generations, some of the pups were a little calmer than their parents. They did not always sneer and react aggressively when approached, sometimes indifferent, not threatened.

Much variation in each generation (tame \leftrightarrow aggressive).

Caretakers began to form a bond with the foxes.

Belyaev hypothesized that by selecting for innate tameness, it kicked off the changes involved in domestication.

By generation IV neotonic features were appearing, such as larger heads and eyes, and tail wagging in one pup in response to a human.

Belyaev was convinced that these changes were gene based, not from conditioning.

Exciting changes by generation VI including nuzzling up, rolling over on their backs to get petted, licked the human hand, and distress vocalization when a human left. These behaviors can be grouped under the label of togetherness and, in this case, with another species. Remember that these are normally solitary animals as adults, except when parenting.

Some tails were curtailing by generation VIII. Pups were hanging onto puppy behavior much longer. Normally at 45 days, wild pups explore on their own more, becoming more cautious and anxious. This was now extended by three months and even after that period they stayed remarkably calmer and more playful than is typical.

Belyaev now hypothesized that the timing of when traits turn off was extended; they were retaining juvenile traits longer. Genes or combinations of genes that regulated hormone production might be responsible for the timing changes. The activity of genes was being altered without mutations.

Tame foxes continued to increase a strong sense of connection with the workers.

By generations X, pup's ears remained floppy and developed pie-bald coloration like other domesticated animals.

Found a 50% reduction in the levels of stress hormones in tame foxes.

Lyudmila Trut moved into a house and brought a pregnant female to live with her. After the litter was born, she watched a fox seek out her protection when harassed by a litter mate. Sounds like a triangle to me. Pups also became "jealous" of other pups when Lyudmila gave them attention. The pups' moods were positively affected by the approach of a caretaker. The pups also became aggressively protective of Lyudmila.

Proved with cross-fostering that the tameness was inherited from their mothers, not altered by their foster mothers. Also clear that the foxes were learning new behaviors from being around the humans. (To what extent is multigenerational process affected by epigenetic changes as well as transmission through relationships?)

Neurochemicals such as serotonin and melatonin were increased in the tame foxes.

Belyaev proposed that traits associated with both individuality and togetherness developed through a process similar to what they were observing in foxes. For example, calm, cool, and collected humans versus aggressive ones on the one hand and increased responsiveness to social cues on the other hand.

Much of these changes in gene regulation appear to be related to the interactions in a network of genes, which seems a systems idea. (Is the genome a system that needs to be understood as a whole? Is the body a system that needs to be understood as a whole?)

Possible conclusions: (1) Togetherness is deeply embedded in the genome of many life forms, but subject to much variation in its degree of activation. The variation could be primarily epigenetic in origin (for example, normally solitary animals can become highly social); (2) A systems theory of the individual that easily integrates with family systems theory can be developed. (In 1967, a British radiologist proposed that cancer and other disturbances in cell differentiation reflected a disturbance in homeostasis of the body as a whole.)