The Drosophila revisited

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THE DROSOPHILA REVISITED

The goal of science is to enlarge our knowledge of the real world and to obtain deep insights into the relations among the building blocks of many artificial worlds. Achieving a breakthrough is the dream of every researcher. Young researchers attempt to explore new ideas, not to follow any established dogma, looking for the key insights that will lead to a breakthrough. The process then is as follows. Peers review the proposed new ideas seriously, examine them critically and, if inappropriate, reject them. Only a few, very few researchers have the talent and good fortune to create a paradigm shift.

In our games world, we have seen such a development with the rise of MCTS (Monte Carlo Tree Search). For chess, α-β minimax with enhancements was the appropriate vehicle to defeat World Champion Kasparov, but for Go, no major successes based on this algorithm have been reported. Then, unexpectedly MCTS came, saw, and won (veni, vidi, vici).

The notion of a *paradigm shift* has been coined by Thomas Kuhn (1962) in his seminal book *The Structure of Scientific Revolutions*. It was a reaction to Karl Popper's (1934/1959) book *The Logic of Scientific Discovery* in which the *model of falsifiability* is the key factor to help science progress. But even Kuhn's *Structure of Scientific Revolutions* (1962) was the subject of disagreement. Paul Feyerabend (1975) developed a new theory on the progress of science which was based on *anarchy*; no structure, anarchy is what science needs to progress. Seeing the development in the philosophy of science, we may ask ourselves: is MCTS reflective of Kuhn's viewpoint, or is it a result of Feyerabend's view on the scientific world?

For a proper comparison, let me mention two well-known paradigm shifts in the natural sciences: (1) from Ptolemaic cosmology to Copernican cosmology, and (2) from Newton's physics to Einstein's relativistic theories.

Returning to the world of computer chess, two founding fathers of computer-chess research (Herbert Simon and John McCarthy) looked over the walls surrounding our artificial-intelligence world. They became familiar with the ideas as published in *Mechanism of Mendelian Heredity* (1915) by Thomas Morgan (Noble Prize Laureate in 1933) *et al.* on the fruit fly (Drosophila melanogaster) and declared Chess as the Drosophila of AI. The underlying idea was as follows. Within some nineteen days genetics researchers are able to investigate six generations of fruit flies and analyse the consequences of mutations and cross-over's. For chess, analogous ideas could be implemented in a program: what are the consequences of rule A or heuristic B?

After the match DEEP BLUE - Kasparov (New York, 1997) in which the machine proved its superiority, a slow transition was observed in the games world from chess to other games, with Go as the current frontrunner. The ICCA changed its name to ICGA, and the question arose: Is Go the new Drosophila of AI?

Some would agree with this statement and others would vigorously oppose it. In more balanced terms one would say: for such a change of paradigm, a *paradigm shift* is a prerequisite, a shift of focus is not sufficient. At this moment (2010), we may state that the conditions are fulfilled, since MCTS can be considered as a paradigm shift. Thus, the statement "Chess is the Drosophila of AI" should be revisited.

However, in the world of genetics research progress continues at an unprecedented pace. One finding after another is published in *Science* and *Nature*. The developments in this research area are breathtaking. An important finding is that the fruit fly does **not** belong to the Drosophila genus. Indeed, the species has a black belly (melanogaster), but modern DNA research has established that the fruit fly belongs to the class of Sophophora. Since June 2010, the fruit fly is thus registered as the Sophophora melanogaster. This was approved by the highest body in the world of genetics.

Such a change in the ontology of a research discipline may make the laymen suspicious, but it was not the first time that such an event has happened. Some years ago, the governing body of the astronomy/astrophysics community decided that Pluto would no longer be classified as a planet. I understand that researchers in the world of genetics considered the Pluto case to be minor in relation to the Drosophila case. In our games world the solution is not so difficult. Chess remains the Drosophila of AI, and Go will be the Sophophora of AI.

Yet, there is a close relation between the two paradigms and that brings me to the contents of this issue. We start with a contribution by O-D. Tabibi, M. Koppel, and N. Netanyahu on genetic algorithms. The application area is chess and the ideas are successfully implemented in FALCON. This is followed by a paper describing an application of MCTS to Shogi. The new research paradigm in the Go world has prominent followers in the Shogi world.

The paradigm shift from minimax to MCTS (from chess to Go) has also not escaped the attention of our selection committees for the ChessBase Award and the ICGA Journal Award. It looks almost as if we should read Go as an abbreviation for Gene Ontology, since so much attention is now devoted to Go.

Finally, with much pleasure I announce that this editorial predicts what we will see at the Computers and Games Conference to be held at JAIST in Kanazawa, Japan from September 24-26. There, many more new ideas will be proposed. The minimax researchers can be happy: the new generation will position themselves well.

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