



AFTERWORD TO THE PAPERBACK EDITION

Neither Vladimir Kramnik, the Braingames/Einstein World Champion, nor Garry Kasparov, the titleless number-one player, won their 2002 matches against the computers. Both matches followed the same pattern. The humans won games easily at first and led by more than one game. Then disaster struck. They both fell after uncharacteristic rudimentary blunders. After the computers leveled the matches, the humans offered early draws that were promptly accepted by the computer operators, and both matches ended up drawn.

Were the two computers really playing at Vladimir or Garry's level? The match scores said so. Do I believe that? Yes and no. Vladimir and Garry were playing at the computers' level, but the computers were not playing at the level that Vladimir and Garry were capable of.

The repeated blunders certainly indicated that the humans were not playing at their peaks, and the quick draws suggested that both had lost their fighting spirit by the end of the 2002 matches. Nonetheless, the computers did play at a reasonably high level. The question is whether they played at the world championship level. This is harder to answer.

My intuition says no, but I am not 100 percent sure.

Even before the 1996 Deep Blue match, I believed chess knowledge was crucial for world championship-level chess machines. Joel Benjamin, our match second, repeatedly demonstrated in our lab that he could use his superior chess knowledge to great effects against Deep Blue, despite the fact that Deep Blue could out-calculate him. After the first four games in the 1996 match, the Deep Blue team whispered among ourselves, "Could Joel be the better chess player than Garry against computers?" Garry's wins in the two subsequent games suggested perhaps not. The main development effort for the 1997 version of Deep Blue was to improve its chess knowledge to a level never seen before in

chess computers. I am absolutely sure that its chess knowledge level is still beyond what is possible on pure software programs such as Deep Junior and Deep Fritz. I am also reasonably sure that Deep Blue is better tactically than either program—there were combinations from the matches that even Deep Blue Jr caught but which were missed by the two programs. Yet, is Deep Blue's full capability really needed to play at the world championship level? Of this I am not sure.

It is not clear that Deep Blue's superior tactical capability is necessary. The blunders committed by Vladimir and Garry were not deep at all, and the wins by the humans were not really based on deep calculation but on superior chess knowledge. So, it appears that chess knowledge still matters. Yet the matches were drawn. Why couldn't the top two humans bring their chess knowledge to bear in the other games? There are several easy answers. One is that they were not properly prepared. This is plausible. If this is true, then some better-prepared but lesser player should win relatively easily against the two programs. Another is that they were overwhelmed by the pressure *not to lose*. This is also plausible. Publicly, both human players stated that their computer opponents were stronger than Deep Blue, but it was clear to anyone in the know that they would have lost face if they lost the matches. To me, the most surprising answer is that perhaps when a program gets sufficiently proficient tactically, it becomes increasingly difficult for humans to exploit its positional weaknesses, blatant though the weaknesses may be. The 2002 matches seemed to indicate that the top humans could exploit the programs' positional weaknesses far less often than expected. I don't like this answer—if it is true, then we could have finished the Deep Blue project a lot earlier. However, the match results certainly did not preclude it.

At the time of this writing, Garry Kasparov announced that he would play an exhibition match against Deep Fritz (Vladimir's former opponent) in New York City from November 11 to November 18, 2003. He has also agreed to play the match without a physical chessboard. Instead, he will be wearing 3D glasses and play on a virtual chessboard. For someone who requested perfect lighting conditions in the Deep Blue matches, he is obviously giving himself a severe handicap in agreeing to this unusual match condition. I wish him luck, but with this handicap, I would not be too surprised to see him lose badly through a series of blunders.