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Garry Kasparov Is a Cyborg, or What ChessBase Teaches Us about Technology

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With the possible exception of the 1972 Fischer-Spassky match, chess has never captured the public imagination as it did when man met machine in the mid-1990s. The Kasparov–Deep Blue matches were portrayed in the mass media as the fundamental battle between human creativity and the cold powers of the calculating machine. When Kasparov defeated Deep Blue in 1996, the world celebrated with him. When he lost the 1997 match with his famous *fingerfehler*, it was headline news around the globe.

Sadly, much of the public discourse about these matches obscures the most interesting philosophical aspects of the human encounter with technology. Hubert Dreyfus, one of the few philosophers to comment on Kasparov's loss, believes that because the computer is not intelligent—because it is not an embodied being operating at an expert level of intelligence—humans have nothing to fear (Dreyfus 1992). After the match, he said that while Deep Blue's play was impressive, "in a world in which relevance and intelligence play a crucial role and meaning in concrete situations, the computer has always behaved miserably, and there's no reason to think that this will change with this victory" ("Big Blue Wins"). One of Dreyfus's students makes much the same point when he claims that because chess programs feel no emotion, "they are mere simulations of intelligence" (Carman 2006, 9).

Certainly Deep Blue did not rejoice when it beat Kasparov—but its creators did. One of Dreyfus's underlying presuppositions is that

he casts technologies such as Deep Blue as autonomous entities, abstracting from them everything that went into their construction.[1] But Deep Blue did not spring full-grown from the head of Feng-hsuing Hsu! In reifying technologies such as Deep Blue, Dreyfus seems to be carving out a safe space for human ingenuity. In truth, he ignores all of the human (and nonhuman!) ingenuity that went into the creation of the machine.

If we are to view chess as a kind of lens for understanding human-technology relations, the matches with Deep Blue may not be our best laboratory. Deep Blue only played a handful of games against limited competition in its career, and was retired by IBM after defeating Kasparov. Meanwhile, thousands of players use computers every day to study and play against both humans and machines. Surely any understanding of human-machine relations would be better modeled on common, everyday interactions rather than the dusty games of a defunct machine.

In this chapter, we will examine the human relation to technology by using our interaction with chess technology as a case study. As we will see, the question of technology has not escaped the attention of philosophers, and we will find many of their concerns and insights embodied in the way chess players relate to chess technology. We will follow chess players into their "chess laboratories," and learn how they use chess technologies to bolster or deaden their play. Ultimately, we will see that the question of technology turns on what it is that technology *does*, and a thorough understanding of how technology affects human experience is the goal of this chapter.

Heidegger and the Crafty Clones

In order to explain the role played by chess software in contemporary chess, we need some definitions. We can point out three aspects of chess software for the purposes of this chapter.

First, there is the database program itself. This is the program used to access saved data. Users can search by player, position, annotator, or opening. Second, there is the playing program or the engine. This is the software "brain" that actually plays chess, and these same engines can also plug into the database programs. Finally, there is the chess data, which comes in three main varieties. There are game databases, or collections of complete games. There are opening databases, or "opening books," which

are used by engines to play the openings. Last but not least, there are "tablebases," or specific databases for different types of endgames.

Chess enthusiasts have a number of options when it comes to their software needs. Chess Assistant© is popular with Russian players and émigrés, while SCID© is a freeware alternative. But the leader in the field of chess technology is without question ChessBase GMBH©, who develops and markets the flagship ChessBase chess database, the Fritz© family of playing programs, and a host of data products and educational modules. ChessBase is used by most of the world's best players, and no less an authority than Kasparov himself described ChessBase as "the most important development in chess since the printing press."[2] Some of the ChessBase stable of engines—most notably, Fritz, Junior, and Shredder—have become "silicon seconds"[3] for modern players, and their evaluations are cited in annotations by Grandmasters around the world. Because of the hegemony of ChessBase products in modern chess, we will use ChessBase and Fritz as our case studies when possible.

How do people use chess technology? How do they use ChessBase and Fritz in their chess activities? On a superficial level, this is a simple question to answer. Chess players now have strong analytic engines running on incredibly powerful hardware. Fritz and friends are seen as the silicon oracles residing in our computers that can be consulted about the "truth" of a position or new idea. They "look over our shoulder," silently assessing each move we enter into the computer, instantly registering their approval or disagreement. Chess technology is commonly taken to provide an irrefutable, immutable source of chess truth and knowledge—after all, a computer is objective and *never* miscalculates. . . .

Perhaps this seems overly dramatic. But one only need observe the behavior of chess software users on chessclub.com or playchess.com during the broadcast of an international event to understand this claim. On these sites, the age-old tradition of kibitzing is translated into cyber-chatter, and master-level players offer their evaluations of the position for all observers. Most players do not listen, however, preferring to cut and paste the evaluation and main variations from their chess engine into their kibitzes to others. Other observers will request computer analysis from those equipped with the newest engines and fastest hardware, refusing to analyze the position themselves. Instead of kibitzing our lines

and engaging in communal analysis, we tell each other what our versions of Fritz have to say.

This fetishization of silicon intelligence manifests itself in a number of ways. As we have just noted, kibitzers fix their engines on an observed game, and armed with computer analysis, they feel as if they are experts. Their engines see a complex tactical continuation that eludes most of the human observers, and they waste little time in trumpeting their engine's brilliant "discovery." As Jennifer Shahade notes, this is slightly rude. "If someone wants to use computers to analyze top level live games, that's fine, but why not be courteous? . . . Others might even want to train their own [sense of] tactics rather than have Fritz force-feed them variations" (Shahade 2005).

Another aspect of this fetishization is the proliferation of chess engines playing against one another on the Internet. For some reason, many chess players like to set up a computer account on chessclub.com or playchess.com and match their chess engine against other players.[4] This phenomenon really took off with the so-called Crafty clones—a number of computer accounts that used the open-source engine Crafty to generate moves. For years, one could log onto chessclub.com and find a dozen different versions of Crafty to play against. The Crafty clones were not accounts created by the author of the engine to test his creation;[5] rather, these accounts seem to have been created solely for the entertainment of their owners.[6] Some accounts would only play other computers, while others would take on all comers. Most fascinating, however, was the personal stake that every account owner seemed to have in the success or failure of "his" Crafty. The typical "clone owner" crowed about his engine's rating, or about the latest Grandmaster that her engine has slain, instead of taking pride in his own chess prowess.

Such reliance on chess technology seems, well, *strange*. In the first case, the computer thinks for us. In the second, it (literally) plays the game for us. What is it about technology that seems to compel us to defer to its superiority? Shouldn't this worry us? Why doesn't it? It was something of this concern, I think, that drove the first sustained philosophical engagements with technology. Beginning early in the twentieth century, thinkers such as Jacques Ellul, Karl Jaspers, and Lewis Mumford began to articulate a dystopian vision of technology as dangerous and dehumanizing. This "classical" or "substantialist" philosophy of technology reached

its zenith in the work of Martin Heidegger, and it is to his work that we will now turn.

In "The Question Concerning Technology" (Heidegger 1977b), his most focused effort on the topic, Heidegger tries to draw a distinction between the commonplace or "correct" definition of technology and its essence. The correct definition of technology is the one that we normally presuppose in our everyday activities. For us, technology is (1) something we "do" and (2) the tools we use. Technology is the means to our various ends—we want to drive across the country, so we hop in our cars, fuel up at the local gas station, and we're off.

This instrumental definition of technology deeply permeates our age. Consider the scare over bagged spinach in the fall of 2006. *E. coli* bacteria contamination was traced to cattle feces from nearby feedlots, which was transferred to the spinach farms via water runoff. The simplest means of overcoming this continuing threat to public health is to alter the diet of the cattle—as it turns out, grass-fed cattle do not harbor this particularly virulent bug. Instead, as Michael Pollan notes, the food industry appears to be leaning towards the irradiation of the food supply. "It's easier to find a technological fix than to address the root cause of such a problem. This has always been the genius of industrial capitalism—to take its failings and turn them into exciting new business opportunities" (2006, 17).

On the face of it, irradiation seems a dramatic overreaction to the problem. Why not alter the setup of the cattle feedlots?[7] Instead of treating manure as a nuisance, why not change the diet of the cattle, thus allowing the harvesting of all that manure for fertilizer? For Heidegger, there is something intrinsic to our age that forces us to see nature as something to be technologically managed. The world appears to us as a series of raw materials that require our irradiating machines and food processors. This, according to Heidegger, is the essence of modern technology. It is a historically conditioned "enframing" (*Gestell*) of our meaningful experience of the world and its contents. Under the sway of the *Gestell*, everything appears as a raw material for consumption, or as "standing-reserve." Trees have only the sense of harvested wood for us, and undeveloped lots of land have no meaning in themselves save their potential for development.[8] Our manner of thinking is determined by the *Gestell*—we cannot think outside of *this* box. Even we ourselves appear as "standing-reserve." We meddle with our genetic

code without concern, and we entrust our labor to human resources departments. We understand ourselves only as resources to be manipulated and managed, and not as persons with integral value.

What is most frightening from the Heideggerian perspective is the ease with which we accept this. Certainly, as in the case with the "Crafty clones," we feel as if there is something amiss. But we shrug and move along. As Heidegger puts it, "everything works. That's what's uncanny, that it works, that it leads to further functioning, and that technology continues to rip and uproot man from the earth" (1977a, 17). The computers hum and churn out predigested moves. Many software users are so impressed by Fritz and friends that they begin to let them dominate their game. In their rush to have the fastest computer or own the highest rating, they defer to the engines completely, even (as with the Crafty clones) letting them play their games for them.

Nonetheless, one wonders here whether Heidegger is doing full justice to the role these technologies play in our lives. Do all technologies dehumanize us? Are all technologies equally dangerous? Many philosophers have come to question Heidegger on precisely this point, where critics have characterized Heidegger as either a nostalgic romantic or a Luddite.[9] We can clearly understand these concerns when we examine the role that new technologies play in chess. While many people allow their engines to think for them, there are no small number of chess players who take up a productive relation with chess technologies. It is no coincidence that we have witnessed an explosion in the number of young Grandmasters across the globe.[10] With the proliferation of chess technologies—particularly the ChessBase line of products—modern chess players have incredible amounts of information at their fingertips. Chess technology opens up new possibilities for chess practice and understanding when used judiciously. It is this careful use of technology that Jennifer Shahade has in mind when she says, "Much of using Fritz well is knowing when to turn it off" (2005).

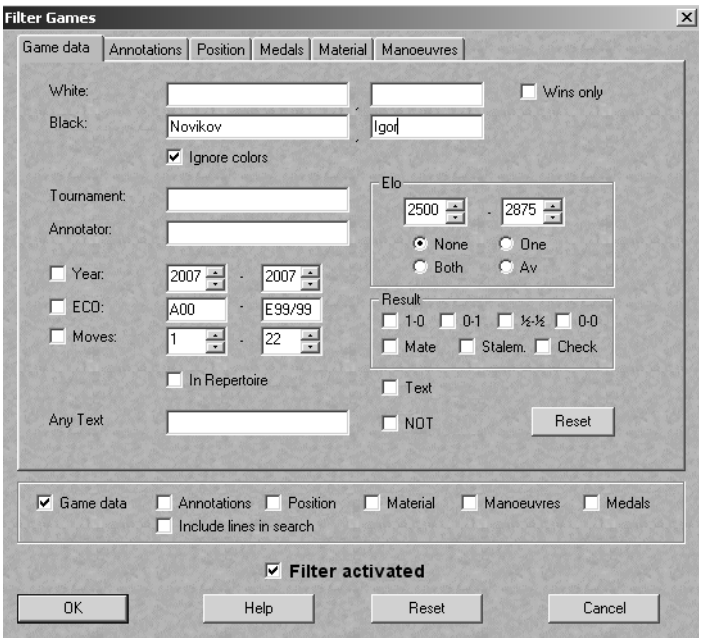
In order to assess this challenge to Heidegger's analysis, we need to understand how a strong player uses chess technology "judiciously." For this reason, we will follow a chess master into his chess laboratory, and watch him use ChessBase and Fritz to prepare for an important game.

Mirabile's Novelty

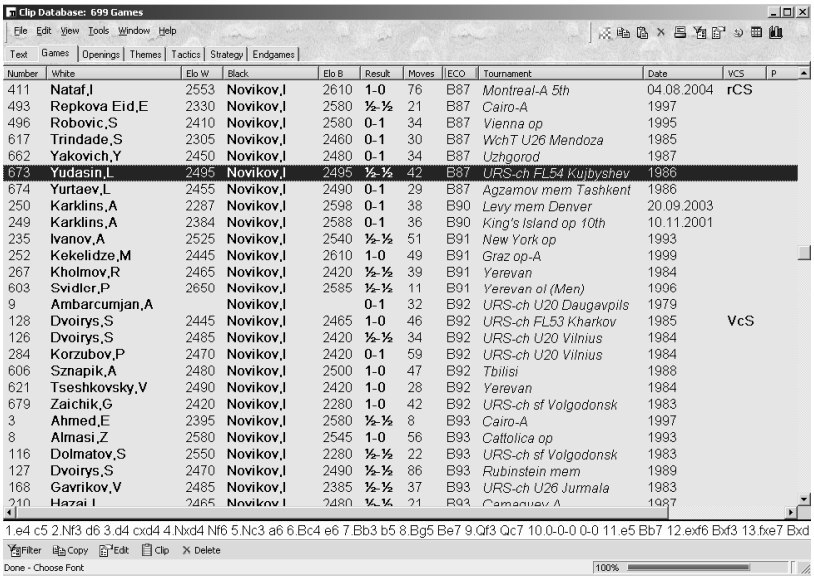
Let us begin by peering over the shoulder of a master-level player as he prepares for a game using ChessBase. In this case, the player is the American master Tim Mirabile, and the occasion is the 2002 Nassau Chess Club Championship. We will join him as he prepares for his fifth-round game with Grandmaster Igor Novikov.

How does a modern player like Mirabile, armed with ChessBase, prepare for a game? He knows he will have the white pieces in his game with Novikov, so he must locate all of Novikov's games with the black pieces. In the past, this would have meant culling the pages of printed materials, that is, magazines, opening books, and the Informant series. This is a time-consuming process, and one that requires the presence of a large, specialized chess library—a near impossibility for someone who might have traveled to play in a large tournament.

Armed with a computer and ChessBase, however, Mirabile can locate Novikov's previous games fairly easily. Using a large reference database, such as MegaBase from ChessBase, he can search for Novikov, and filter the games so as to locate only those games in which Novikov had the black pieces.



In order to further aid his research, he copies all of the filtered games to the "clip database," which serves as a temporary storage unit. What now? Using one of the numerous sorting capabilities of ChessBase, he orders these games according to ECO code[11] by clicking on that column heading.



Number	White	Elo W	Black	Elo B	Result	Moves	ECO	Tournament	Date	VCS	P
411	Nataf,I	2553	Novikov,I	2610	1-0	76	B87	*Montreal-A 5th*	04.08.2004	rCS	
493	Repkova Eid,E	2330	Novikov,I	2580	½-½	21	B87	*Cairo-A*	1997		
496	Robovic,S	2410	Novikov,I	2580	0-1	34	B87	*Vienna op*	1995		
617	Trindade,S	2305	Novikov,I	2460	0-1	30	B87	*WchT U26 Mendoza*	1985		
662	Yakovich,Y	2450	Novikov,I	2480	0-1	34	B87	*Uzhgorod*	1987		
673	Yudasin,L	2495	Novikov,I	2495	½-½	42	B87	*URS-ch FL54 Kujbyshev*	1986		
674	Yurtaev,L	2455	Novikov,I	2490	0-1	29	B87	*Agzamov mem Tashkent*	1986		
250	Karklins,A	2287	Novikov,I	2598	0-1	38	B90	*Levy mem Denver*	20.09.2003		
249	Karklins,A	2384	Novikov,I	2588	0-1	36	B90	*King's Island op 10th*	10.11.2001		
235	Ivanov,A	2525	Novikov,I	2540	½-½	51	B91	*New York op*	1993		
252	Kekelidze,M	2445	Novikov,I	2610	1-0	49	B91	*Graz op-A*	1999		
267	Kholmov,R	2465	Novikov,I	2420	½-½	39	B91	*Yerevan*	1984		
603	Svidler,P	2650	Novikov,I	2585	½-½	11	B91	*Yerevan ol (Men)*	1996		
9	Ambarcumjan,A		Novikov,I		0-1	32	B92	*URS-ch U20 Daugavpils*	1979		
128	Dvoirys,S	2445	Novikov,I	2465	1-0	46	B92	*URS-ch FL53 Kharkov*	1985	VcS	
126	Dvoirys,S	2485	Novikov,I	2420	½-½	34	B92	*URS-ch U20 Vilnius*	1984		
284	Korzubov,P	2470	Novikov,I	2420	0-1	59	B92	*URS-ch U20 Vilnius*	1984		
606	Sznapik,A	2480	Novikov,I	2500	1-0	47	B92	*Tbilisi*	1988		
621	Tseshkovsky,V	2490	Novikov,I	2420	1-0	28	B92	*Yerevan*	1984		
679	Zaichik,G	2420	Novikov,I	2280	1-0	42	B92	*URS-ch sf Volgodonsk*	1983		
3	Ahmed,E	2395	Novikov,I	2580	½-½	8	B93	*Cairo-A*	1997		
8	Almasi,Z	2580	Novikov,I	2545	1-0	56	B93	*Cattolica op*	1993		
116	Dolmatov,S	2550	Novikov,I	2280	½-½	22	B93	*URS-ch sf Volgodonsk*	1983		
127	Dvoirys,S	2470	Novikov,I	2490	½-½	86	B93	*Rubinstein mem*	1989		
168	Gavrikov,V	2485	Novikov,I	2385	½-½	37	B93	*URS-ch U26 Jurmala*	1983		
210	Hazai,I	2465	Novikov,I	2480	½-½	21	B93	*Camaguey A*	1987		

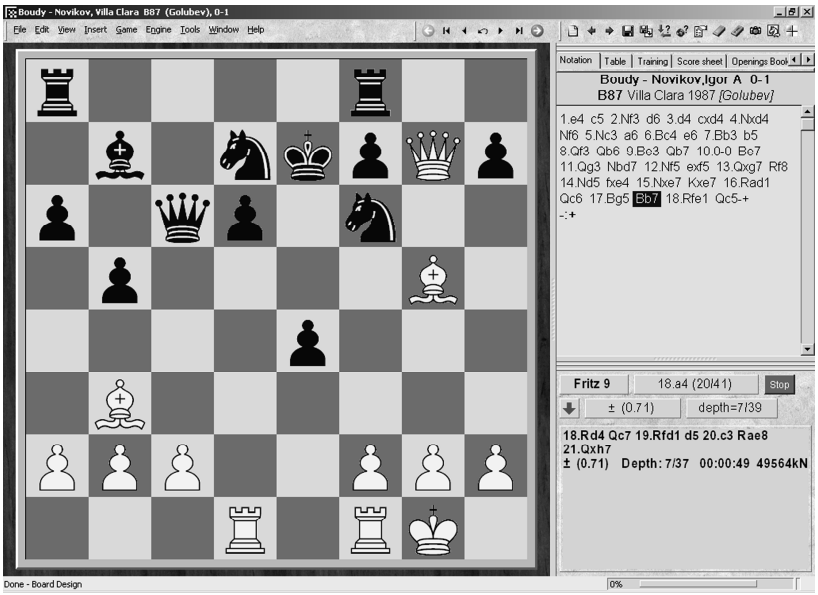
1.e4 c5 2.Nf3 d6 3.d4 cxd4 4.Nxd4 Nf6 5.Nc3 a6 6.Bc4 e6 7.Bb3 b5 8.Bg5 Be7 9.Qf3 Qc7 10.0-0-0 0-0 11.e5 Bb7 12.exf6 Bxf3 13.fxe7 Bxd

Immediately, Mirabile sees something important. While some players vary their openings often, making themselves harder to prepare for, Novikov takes the opposite approach. His opening repertoire is narrow, but quite deep. He plays the same openings again and again, and while this makes him easier to prepare for, it gives him the advantage of great familiarity with the ideas and themes in the position.

Mirabile now knows with a fairly high degree of certainty what Novikov will play against him. Mirabile almost always plays 1. e4, and Novikov almost always responds with the Sicilian Najdorf. This information narrows the field of research considerably. Mirabile need only look up what Novikov plays against his favorite line—the Sozin variation (6. Bc4)—to prepare for his game with confidence.

In looking through Novikov's games, Mirabile learns that Novikov had defended a sharp variation that he (Mirabile) had

played against another player.[12] Given that Novikov tends to play a very narrow range of openings, he might play into this line again, given the chance. So Mirabile decides to check Novikov's decisions in this game from 1987. He opens the game in his database and turns Fritz on in the background. Has Novikov overlooked something? Let's put ourselves in Mirabile's shoes:



Almost immediately, we see that White has pressure for the sacrificed material. Black is tied in knots. His pawn on e4 is weak and subject to attack. Further, Black's king is precariously placed on the e-file, and he must take care to avoid problems with his rooks if the king is forced to the back rank. Can Black hold on?

In the stem game, Boudy played 18. Rfe1. This pressures the e-pawn, but is slow. Novikov's response, 18 . . . Qc5!, unhooks the queen from defending the e-pawn, and allows him to hold the position. A modern engine like Fritz or Junior will quickly tout 18. Rd4!, and with good reason. White attacks the e-pawn directly, and threatens either Rfd1 (eyeing the d6 pawn) or Re1 on the next move. After 18. Rd4, Black's game is difficult. He can try to hold with 18 . . . Rae8, but after 19. Re1!, White has a definite advantage.

As he arrives at this position on the screen, Mirabile sees that Fritz favors this new move, and notes the spike in its evaluation. But he also knows that the computer is not always correct. For many reasons,[13] it sometimes evaluates difficult positions improperly. Certainly Fritz's suggestion merits investigation. In order to deem the move worthy of being played in an important game, however, more work is needed.

Mirabile thus begins to test Fritz's suggestion, inputting sample variations into the computer, and watching to see if Fritz's evaluation of the position matches his own. He is not merely relying on Fritz to "tell him what to play"; rather, he is using Fritz as something akin to the spell-check feature in a word processor. The engine is running in the background, watching to see if Mirabile makes any gross (tactical) errors. In the event that he overlooks some tactical shot, Fritz will alert him to his oversight. It does not "think" for him, just as a spell checker does not spell for a writer. For a strong player (and a ChessBase poweruser) like Mirabile, the engine is merely one tool among many used in the pursuit of chess truth.

The rook move works. Mirabile saves his work, and adds this idea to his opening repertoire. He cannot stop here, however; there is no guarantee that Novikov will play into this trap. So Mirabile continues his preparation by investigating other lines that Novikov has played in the past, and refreshing his own memory regarding his preferred methods of attack.

Sympathetic readers may wonder at this point about the outcome of Mirabile's novelty. Was it successful? Did Novikov play into Mirabile's hands? Happily for Tim (and for us!), he was able to spring this surprise upon his esteemed opponent and beat the Grandmaster in forty-four moves. The novelty did not suffice to win the game in itself, of course, but it did give Mirabile a strong advantage that he drove home with excellent technique.[14]

Actors, Actors Everywhere

The example of Mirabile and his novelty provides us a useful case study of how strong players use chess technology. In this light, we can begin to see both the value and the limitations of Heidegger's philosophy of technology. There is some reason to think that we remain dominated by technology to this day. The case of the Crafty clones shows us how some people become entranced by technol-

ogy. On Heidegger's account, all technology works in this way, dominating and enslaving us. Careful consideration of Mirabile and his novelty, however, exposes the limitations of Heidegger's analysis. Not *all* technologies enslave us. On the contrary, we find in the case of Mirabile and his novelty the possibility of a productive interaction with technology.

Technology, then, does not always dominate us. But what does it *do*? If there is no essence to technology, how should we understand it? The limitations of the classical approach to technology have prompted more recent thinkers to focus less upon technology in the abstract and more upon the diverse technologies themselves. It is no accident that this shift is described by Hans Achterhuis as an "empirical turn" (1997, 6ff)—by focusing on the use of specific artifacts by real people in real situations, we avoid the pitfalls of substantialism, and arrive at a philosophical position that does justice to the technologies themselves.

An adequate understanding of technology must also avoid the pitfall of instrumentalism or "neutralism,"[15] which is the idea that technological artifacts have no meaning or import outside of their use. Such an approach might seem sound if we consider Mirabile and his relation to technology, but it becomes problematic when we remember those poor souls who are so dazzled by Fritz and friends. Much of the difficulty in articulating an adequate philosophy of technology is the need to do justice to both substantialism and neutralism, while avoiding the rigidity of either position.

An interactionalist position represents a "middle ground" approach to technology. More importantly, however, it directly tackles the problem of just what it is that technology does. In human-technology relations, agency is traditionally understood to be a human property. The nonhumans involved (the material artifacts) are not conscious entities and possess no intentions to be enacted.[16] If we consider how people interact with technology, however, it quickly becomes clear that the nonhumans *do something*—they possess something like agency as it is commonly understood.

In order to help explain this claim, let me offer another example. The National Rifle Association has long marketed its anti-gun-control position with a famous slogan: "guns don't kill people; people kill people." The idea is clear. Gun control legislation is unnecessary, since people, and not guns, are the real problem. The gun, after all, can't pull its own trigger.

What does a philosophical analysis of the interaction between human and gun reveal? Don Ihde and Bruno Latour, two thinkers associated with the "empirical turn," have independently analyzed this interaction and come to similar conclusions (Ihde 1990, 27; Latour 1999, 176–93). For Ihde and Latour, both gun control and right-to-bear-arms partisans maintain untenable presuppositions about the human-gun nexus. Gun control advocates implicitly understand technology in a substantialist manner, where the artifact (the gun) bears within itself all the conditions necessary to determine human action. Here artifacts are reified to the point that they are believed to exert definite control over users. As Latour puts it, "on account of the gun the law-abiding citizen, a good guy, becomes dangerous" (Latour 1999, 76). Right-to-bear-arms advocates, on the other hand, implicitly understand technology in a neutralistic manner. All artifacts are thoroughly innocuous in themselves on this reading, and take on normative significance only when they are put to some use by a human actor.

Why do the substantialist and the neutralistic understandings of technology fail? Let's return to the human-gun relation. In this case, we have an angry human, and a gun on a table. How does the situation change when the human picks up the gun? As should be fairly obvious, this interaction considerably alters the situation. Suddenly the human actor can do new things—he can compel assent by waving his gun, or he can force someone to stop doing evil.

But it is not only the human who gains new powers in this interaction. By virtue of being picked up, the gun takes on new properties as well. Instead of lying inert on a table, the gun becomes a weapon in the hand of an angry human. Alternatively, it becomes an iconic representation of the peace movement when someone puts a flower in its barrel. One of the key insights of an interactionalist approach to technology is that both humans and nonhumans are transformed through their relations.

The human-gun example helps us to underscore the limitations of both the substantialist and neutralistic interpretations of technology. Both are versions of an untenable essentialism—either technology is essentially dangerous (Heidegger), or technology is essentially neutral (instrumentalism). The interactionalist approach of Ihde and Latour makes clear the variability or "relativism"[17] of technological mediation. Technologies are "multistable" (Ihde 2002, 33–34, 106–7), meaning that they bear within themselves certain

trajectories for use. They are nonneutral in that they transform situations through their use, but they can also take on different meanings in different contexts. A gun "acts" differently when it has a flower in its barrel, and when it is being held by a criminal. In an interactionalist approach to understanding technology, agency is spread across all actors in interaction. Humans and nonhumans exert agency upon one another, transforming one another[18] by means of technical mediation.

We see this best when we return to the example of Mirabile and his novelty. Who, we might wonder, is responsible for the creation of the novelty? Who should get the credit for the victory over the Grandmaster? Arguments could be made for either the human or the nonhuman receiving credit for the star move. In a substantialist framework, responsibility would be attributed to Fritz and ChessBase. It was the chess engine that first suggested the move, after all, and Mirabile had only to play the move on the board to gain a powerful advantage. From a neutralist perspective, it would be Mirabile who was the true author of the move. ChessBase and Fritz were merely the tools used to find the move, and of course, he still had to outplay his opponent over the board without silicon assistance.

Our examination of the process that led Mirabile to play Rd4 requires us to reject both the substantialist and the neutralist interpretations. Neither Fritz nor Mirabile are responsible for the novelty—*both* are responsible. We cannot attribute responsibility to Fritz alone. Fritz could not sift through Novikov's games on its own, and Fritz did not choose the position after 17. . . . Bb7 for careful analysis. We cannot attribute full responsibility to Mirabile, either. Fritz pointed the novelty out, and worked in the background while Mirabile examined the position so as to ensure the tactical validity of his variations. Both the human and the nonhuman are thus responsible for the creation of the novelty.

What about the victory itself? Recall what happened—Mirabile sprung his novelty on the Grandmaster, and proceeded to take the full point in forty-four moves. Can we give the human full credit for the moves after 18. Rd4? According to Mirabile himself, he had studied numerous continuations with Fritz, and was "in book" until 21. Qxh7.[19] Is the human then solely responsible for moves 21–44?

One of the consequences of an interactionalist approach to technology is the recognition that nonhumans possess some kind of agency. As we saw with the human-gun example, the human

actor is altered by means of his or her interaction with nonhumans. The same holds for the human-Fritz relation. Given his expertise in using ChessBase, and his habitual use of chess engines in his study, it would be hard to believe that Mirabile would not be influenced by the "thinking" of the machine. We would have no trouble describing its pedagogical influence if Fritz were a human study partner; why should we ignore its contributions because of its nonhuman status?

Strange as it may seem, we must attribute responsibility for the novelty and for all the remaining moves to both Mirabile and the computer. Better yet, there are *numerous* actors, humans and nonhumans, that should receive some credit for the victory. Consider all of the actors that contributed to the creation of 18. Rd4: the books and magazines that Mirabile read, the opponents he played and studied, the authors of Fritz and ChessBase, the hardware manufacturers, the Internet providers that allowed Mirabile to download new games for his database, the Fritz engine, and Tim himself! Agency is not a property of any actor in particular; rather, it is an attribute of the entire network of actors that contributed to the creation of 18. Rd4.

This is why we must see Mirabile himself as a cross between the human and the computer; he is, practically speaking, a *cyborg*. Donna Haraway, author of "A Cyborg Manifesto," understands the cyborg to be "a cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction . . . we are all chimeras, theorized and fabricated hybrids of machine and organism; in short, we are cyborgs" (Haraway 1991, 149–50). Although her idea sounds fanciful, she is making much the same point we make here. One of the consequences of our analysis is a blurring of the line between the human and the nonhuman. A blind person "sees" through a cane, extending the range of her senses beyond the "purely human." Advances in medical technologies, from eyeglasses to antibiotics to artificial joints, effect a similar effacement. Antibiotics aid our immune systems, and eyeglasses normalize our failing eyesight. This is what Ihde terms the extendibility of the human subject (Ihde 1990, 39)—our interaction with technology means that we are all cyborgs. The chess cyborg is but one species among many.

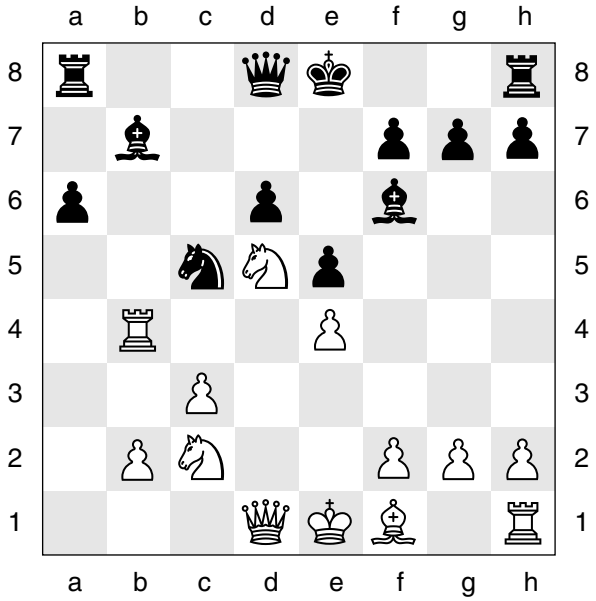
If we are correct in our description of the modern chess player as a cyborg, we should find confirmation of our thesis in modern chess practice. If interaction with chess technology has created a

new kind of player—a player with "Fritz in his head," as Gurevich says (2005)—then we should see the concrete effects of this interaction in the very moves these players make. Such evidence, and such differences, are the theme of the final section.

The First Chess Cyborg

So what is "modern" chess? What differentiates it from classical chess? The following game from 1994 provides a useful example.

1. e4 c5 2. Nf3 e6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 Nc6 6. Ndb5 d6 7. Bf4 e5 8. Bg5 a6 9. Na3 b5 10. Nd5 Be7 11. Bxf6 Bxf6 12. c3 Bb7 13. Nc2 Nb8 14. a4 bxa4 15. Rxa4 Nd7 16. Rb4 Nc5?! [16. . . . Rb8 or even Ra7 avoids the following shot]



17. Rxb7!

According to John Nunn, this is "an extraordinary idea" (2005, 153). White sacrifices an exchange to solidify his grip on the d5 square and attack the light squares. In itself, however, this seems to be insufficient compensation for the exchange. As John Watson notes, "material is somewhat reduced and White doesn't have much

development, the two bishops, or other traditional compensation for the exchange" (Watson 2003, 228). There is no immediate, tactical route to a decisive advantage. What makes White's idea so extraordinary?

17. . . . Nxb7 18. b4!

"Terrific!," says Watson (2003, 228), and with good reason. Here is the justification for White's play. With this quiet move, White is able to stop Black's knight from returning to c5 and fighting for the light squares, and this is Black's most obvious plan for contesting White's control of the center. The position is objectively unclear, but as Igor Stohl points out, White has the initiative and much easier play (Stohl 2006, 44).

White's play is exemplary, according to three leading theoreticians. And yet, notice how many basic points of classical chess strategy were broken in the execution of this "extraordinary idea." White ignores castling. The dictum that states you shouldn't move the same piece twice in the opening is cast aside—the knights have moved seven times, and the light-squared bishop not at all! And White's queenside rook, which should be developed to a center file according to classical principles, has been developed to a4, b4, and b7, at which time it was exchanged for a bishop![20] So why is White's play considered so successful in light of these obvious rule violations? Nunn offers the following explanation:

> much top class chess is incomprehensible when viewed in terms of the principles formulated in contemporary textbooks. Whereas chess has advanced greatly in the last half-century, much of the instructional material has not kept up with these advances. It is impossible to explain White's play in this game in terms of the old ideas: "rooks belong in the center," "don't move the same piece twice in the opening," and so on. In order to make sense, the game has to be viewed in modern terms: White's play is founded on the creation of a strategic plan and the single-minded execution of that plan [control of d5 and the light squares], based on the specific requirements of the position. (2005, 154)

Modern chess only makes sense, according to Nunn, if we recognize that it has exposed the limited validity of all strategic principles. A lack of dogmatism, combined with an emphasis on concrete analysis, is at the heart of modern practice. Nimzovichian principles

are true insofar as they work, but they must be jettisoned as soon as the position on the board demands it.

White's play is not chaotic in our example. He does break three cardinal rules of opening play, but he does so in order to achieve more useful goals in the position. With 17. Rxb7 and 18. b4!, White is able to cement his superiority in the center, entomb Black's knight, and control the light squares. In this position, these goals are more important than rapid castling or complete piece development.

Ideas like these have led John Watson to describe the paradigm of modern chess strategy as "rule-independence." Rule-independence is "the gradual divestment on the part of chess players of the multitudinous generalities, rules, and abstract principles which guided classical chess, and which still dominate our teaching texts. Furthermore, a rejection of the very notion of the 'rule' has taken place, in favor of a pragmatic investigation of individual situations" (Watson 1999, 97). Rules, on Watson's account, really are made to be broken. They provide the basis for chess knowledge, but real understanding only comes when we know where and when to ignore them.

Watson's characterization of rule-independence has not been without controversy; in particular, Jacob Aagaard has challenged Watson on this point.[21] For our purposes, however, it is enough to note that both authors end up describing modern chess as pragmatic[22] in nature. Both authors also highlight the role played by chess technologies in the fashioning of rule-independence or pragmatism in modern chess.

According to both Watson and Aagaard, it is because of the modern player's interaction with the computer—his ability to test moves against the computer, to find antipositional moves that work nonetheless—that the concrete, pragmatic character of modern chess has emerged. Watson makes this point very clearly in *Chess Strategy in Action*: "Players on all levels are able to try out seemingly risky, paradoxical, and "unprincipled" moves and strategies on a computer. . . . Contemporary play has thus been marked by greater openness towards positional and attacking strategies that were previously considered anti-positional and/or unsound" (2003, 9). And Aagaard's newest work, *Practical Chess Defense*, is inspired by the new possibilities opened up through careful use of chess technology. "Most of the prominent players consult chess-playing programs, so they cannot help adapting their thinking methods, as inspired by the

machines" (2006, 7). Aagaard points out two instances of this influence. Modern players more easily see "Fritz-moves," or the sort of strong, antipositional moves that the computer excels in finding. But "more important," says Aagaard, is the transition towards a pragmatic understanding of chess truths (2006, 7).

If this is correct, White's play in our example should not surprise us. Garry Kasparov was certainly a strong player before the introduction of ChessBase, and his demolition of Alexei Shirov in our example occurs at the beginning of the ChessBase era. But Kasparov has repeatedly described the importance of chess technologies in his progress, and he identifies his play in 1999 and 2000 to be his best from a competitive perspective.[23] The reason for this characterization, I think, is simple. Kasparov had thoroughly integrated chess technology into his preparation by 1999, while his opponents lagged behind to varying degrees.[24] Kasparov's opening preparation, already dangerous, became legendary for its depth and breadth, and he used the computer as a partner—not an oracle—in analysis. This integration of the computer into his training, coupled with a healthy skepticism regarding its veracity, reshaped Kasparov's game. For all intents and purposes, Garry Kasparov was the first chess cyborg.

If we must view Kasparov's encounters with the computer as emblematic of human-technology interactions, it is *this* image that we should focus upon. Certainly the balance of Kasparov's interaction with chess technology must tip in the favor of his productive, as opposed to destructive, use of the computer. We could tally this balance by simply noting that Kasparov played a total of fourteen games against Deep Blue,[25] while he used ChessBase on a daily basis for nearly twenty years. More telling, however, is the influence each technology had on Kasparov's chess and chess career.

It is not coincidental that Igor Stohl uses the year 1994 for the transition point between his twin volumes on Kasparov's best games. In 1994, chess technology came of age. Kasparov publicly lost rapid games to Fritz 3 and Chess Genius. Fritz and its "colleague" Doctor?, newly integrated into the ChessBase database program, allowed players to "check" the games of the masters for blunders and improvements. And Kasparov, who suggested the idea of a chess database to Frederic Friedel, the founder of ChessBase GMBH (Mohite 2004), was among the first to take full advantage of chess technology.

There are numerous examples of this influence on Kasparov's play after 1994. One of the first was the famous rook sacrifice sprung on Anand in the tenth game of the 1995 World Championship match. On Stohl's account, "this was the first time that Kasparov had stated he had used a computer extensively as an analytical tool" (Stohl 2006, 9). This is not to say that Fritz understood Kasparov's idea on its own. In fact, according to Stohl, the computer could not understand the key move in the variation (17. Qg4!) and had to be "convinced" of its strength through extended analysis (Stohl 2006, 78).

In Kramnik-Kasparov (Linares, 1999), Kasparov used the computer to analyze positions deep into the middlegame, and hold a draw because of his ability to locate and make use of the blind spots in computer analysis. Kasparov allowed Kramnik to achieve a position that the computer deemed a near win. Having seen more deeply into the position, however, Kasparov prepared a rook sacrifice that forced a draw.

Perhaps the most telling instance of Kasparov's studied interaction with chess technology is his 2005 encounter with Kasimdzhanov.[26]

1. d4 d5 2. c4 c6 3. Nc3 Nf6 4. e3 e6 5. Nf3 Nbd7 6. Bd3 dxc4 7. Bxc4 b5 8. Bd3 Bb7 9. 0-0 a6 10. e4 c5 11. d5 Qc7 12. dxe6 fxe6 13. Bc2 c4 14. Nd4 Nc5 15. Be3 e5 16. Nf3 Be7 17. Ng5 0-0!N

Kasparov had prepared the Meran with White for his 2003 match with Deep Junior, and in the midst of his preparation, he noticed that the computer would allow White to win the exchange in this position. In fact, Deep Junior would evaluate the position as favoring Black, despite the material deficit! This led Kasparov to more thoroughly investigate the idea, and he concluded that the computer had stumbled upon a rather remarkable positional sacrifice of material. While the position did not arise in the 2003 match, it did become part of Kasparov's opening database. Kazimdzhanov was unaware of this, and played into Kasparov's analysis. After

18. Bxc5 Bxc5 19. Ne6 Qb6 20. Nxf8 Rxf8

Kasparov had full compensation for the exchange and went on to win the game in fine style.

What, in contrast, was the influence of the Deep Blue matches on Kasparov? In my opinion, surprisingly little. Kasparov exhibited no major traumas from his loss to Deep Blue, and in fact, went on to draw his matches against Fritz and Junior in 2003.[27] If anything, the fact that Kasparov's best chess[28] came after the Deep Blue matches suggests that the loss served as a "wake-up call" for Kasparov. Instead of turning away from chess technologies after the Deep Blue matches, Kasparov embraced them, deeply integrating them into his study and preparations. In preparing for an ill-fated match against Shirov in 1998, for example, Kasparov and his team made extensive use of analysis engines in their preparations. Stohl writes, "Together with his team, [Kasparov] undertook the arduous task of electronically checking, updating, and overhauling most of his repertoire" (Stohl 2006, 12). But the computer's influence was not limited to the opening phase of the game. In the 1999 match against the "World Team," Kasparov counted on his ability to integrate the engine into his study of middle and endgame positions to grind out a victory. In these years, Fritz and Junior became full-fledged members of Team Kasparov.

To a casual reader opening to this page, this last point must seem like madness. Fritz and Junior were Kasparov's seconds? They "trained" him? If our analysis is correct, however, it's not so far fetched. Technologies do not always dominate us, and they aren't neutral tools awaiting our use. Technologies—nonhumans—possess agency too. They are multistable, as Ihde puts it—they can do different things in different contexts. Fritz and Junior have become oracles of chess truth because of Kasparov's endorsements, and Kasparov was "trained" by Fritz and Junior to see chess differently, to play in a new way. Deep Blue was just another IBM supercomputer before it beat Kasparov. Today it is a symbol of all our fears about technology.

Can we thus say that the machine "won" in 1997? Kasparov didn't come to the board alone—he was the product of human and nonhuman actors, a cyborg in the truest sense of the term. Deep Blue, too, was a tangled web of humans and nonhumans, having been tuned and tweaked by humans to play like a human Grandmaster.[29] Deep Blue was a cyborg just as surely as was Kasparov, and each combatant bore the traces of carbon and silicon based influences. We have seen in this chapter that human and nonhuman can be difficult to separate by following the actors and their associations. Can we then say that human lost to machine

when Deep Blue defeated Kasparov? Or are "human" and "machine" now so intimately intertwined that any attempt to differentiate between the two must be seen as untenable?

NOTES

Acknowledgements: I would like to thank Anna Forslund, Tim Mirabile, Jacob Aagaard, and Don Maddox (ChessBase USA) for their assistance with this project.

1. Evan Selinger makes this point in two recent essays. See Selinger 2006 and Ihde and Selinger 2005. Incidentally, Selinger ends his contribution to this volume by noting the need for an in-depth study of the relation between humans and technologies in chess competitions. (See p. 83.) My chapter can perhaps be seen as a companion piece to Selinger's for this reason.

2. This quote comes from ChessBase advertising, as well as an interview with Frederic Friedel (Mohite 2004).

3. A "second" is akin to a chess research assistant. Most Grandmasters will hire a second for important events if they can afford it, but with the proliferation of notebook computers and chess software, the need for human assistance can be somewhat mitigated.

4. In the interest of full disclosure, I had a computer account on chessclub.com that was used to test a lesser-known engine called Little Goliath.

5. In fact, Bob Hyatt (Crafty's author) had to ban most of these clones from playing against the official Crafty account so that his testing of engine modifications would not be skewed.

6. I should note that not all computer accounts are created for these odd purposes. Some computer accounts are designed to test opening theory, for example, while others are configured to allow humans to practice against them. It is the case of the Machiavelli-wannabe who lives vicariously through his or her engine that I attempt to understand here.

7. As Pollan notes, "To think of animal manure as pollution rather than fertility is a relatively new (and industrial) idea" (2006, 17)

8. Some may argue that the environmental movement is one that precisely does not understand trees and wooded lots in this way. But what are the environmentalists trying to "save" but our "natural resources?" The trees must be saved because we might need them later (to provide oxygen, etc.), and not because they are valuable in themselves. What makes Heidegger's analysis so disturbing is that no one is exempt from the *Gestell*.

9. For a fairly typical critique of Heidegger's philosophy of technology, see Verbeek 2005, 61–75.

10. Bobby Fischer was the youngest Grandmaster on record for approximately thirty-three years. He earned his title in 1958, and his record was broken by Judit Polgar in 1991. There have been fifteen players since 1991 who would have broken Fischer's record. The current record holder is Sergey Karjakin, who attained the title at the age of twelve years and seven months in 2002 (Friedel 2006).

11. ECO stands for Encyclopedia of Chess Openings. It is part of an international, "languageless" system of chess notation developed by the Yugoslavian company Sahovski Informator, which publishes the aforementioned Informator series of books.

12. Mirabile, T-Berg, G, 41st Nassau Futurity (2002), 1–0.

13. There are many reasons that a computer may misevaluate a position or a move. The engine may be buggy; that is to say, it may contain gross programming errors that cause it to offer bad advice. It may have a poor evaluation function, in which case the engine works as it is supposed to, but simply lacks the knowledge to discern the finer points of the game. Finally, the solution to a specific position or problem may lay too far ahead in the game for the computer to see. This last problem, called the "horizon effect," is particularly problematic in quieter positions where long-range planning trumps short-range tactical maneuvers. While most amateurs believe that the engines are objective and almost infallible, smarter players (as we will see) take note of their blind spots and compensate accordingly.

14. For those hardy souls who want to see the whole game, here it is: Mirabile–Novikov, NCC Championship (2002). 1. e4 c5 2. Nf3 d6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 a6 6. Bc4 e6 7. Bb3 b5 8. Qf3 Qb6 9. Be3 Qb7 10. 0-0 Be7 11. Qg3 Nbd7 12. Nf5 exf5 13. Qxg7 Rf8 14. Nd5 fxe4 15. Nxe7 Kxe7 16. Rad1 Qc6 17. Bg5 Bb7 18. Rd4 d5 19. Bxd5 Qxd5 20. Rxd5 Bxd5 21. Qxh7 Rac8 22. Rd1 Rxc2 23. Qf5 Be6 24. Rxd7+ Kxd7 25. Qxf6 Kc6 26. h4 Rc5 27. Qe7 Rg8 28. Qa7 Rcxg5 29. hxg5 Rxg5 30. Qxa6+ Kc7 31. Qa7+ Kc6 32. Qe3 Rg4 33. b4 Kb7 34. Qc5 Bd7 35. Qd5+ Kc7 36. Qxf7 e3 37. fxe3 Rxb4 38. Kf2 Ra4 39. Kf3 Kd6 40. Qf8+ Ke6 41. e4 Bc6 42. Qf5+ Kd6 43. Kf4 Rc4 44. g4 b4 1–0

15. This is Ihde's term. See Ihde 1990, chap. 1.

16. Part of the problem with Dreyfus's understanding of Deep Blue and chess computers in general is that it renders the computer in precisely this way.

17. Ihde's term; see Ihde 1990, chap 1.

18. Due to space constraints, I cannot fully delve into the transformations undergone by Fritz. However, let me briefly suggest how Fritz is transformed via its interactions with human players. As more and more human players use Fritz, and as more and more strong players publicly validate Fritz's analysis through citing it in their own work, Fritz takes on new properties. It "becomes" more correct, a stronger player. Fritz

becomes what Latour calls a "Black Box"—we now take for granted the fact that the computer plays strong moves without considering the origins of the program or the various iterations that it underwent before achieving Grandmaster strength. Fritz is constructed by a network of actors as a "silicon oracle." In this way, it is transformed through interaction.

19. Mirabile e-mail interview. My thanks to Tim for his willingness to answer questions for this chapter.

20. See Nunn 2005, 153, and Watson 2003, 228, for a more thorough accounting of these violations.

21. In *Excelling at Chess*, Jacob Aagaard explains that chess is "a large collection of rules that constantly interact, with some of them having greater importance in this or that specific position" (2002, 51). Here Aagaard affirms the validity of basic strategic rules, but with an important addendum—different rules "have greater importance in this or that position." In other words, some rules must be flouted in certain positions in the interest of other rules and goals. White temporarily ignores some basic principles in our example, but he does so that he might achieve more useful goals in the specific position. Rule-independence may be too strong a term for this phenomenon in modern chess; perhaps "rule-flexibility" may better capture it. Much more could be said about the Watson-Aagaard debate, but in the final analysis, I do not think the two disagree as much as their writings would have us believe. Aagaard himself acknowledges this in *Excelling at Chess Calculation* when he says that "the antithesis of what I am saying [i.e. Watson's 'rule-independence] is not its direct opposite. . . . [M]y belief that such things as rules and guidelines are practical tools a tournament player can use to his advantage, does not mean that I disparage calculation" (2004, 43).

22. By pragmatism, I mean that the rules of chess strategy are valid only insofar as they provide a satisfactory outcome to a problematic situation. I am consciously putting this in Deweyian terms, partially because I think Dewey's notion of warranted assertability sheds much light on the pragmatism that Watson and Aagaard discuss. On this point, and for a broadly Deweyian account of technology, see Larry Hickman's *Philosophical Tools for Technological Culture* (2001).

23. "And of course 1999. I think that was probably my best year. The quality of my decision-making and energy, I think it was the highest ever in the history of chess. Wijk aan Zee, Linares . . . I was well ahead of the rest with new ideas, and with more determination. I think my all-time peak was in Frankfurt, 1999, winning the rapid chess. That was the peak" (Greengard 2005b).

24. This is not to say that other chess players were ignorant of the benefits of human-silicon interaction. Vishy Anand is reported to be among the most expert of ChessBase users, for example. But Kasparov believes that others only began to really use computers for preparation after 1999 (Vasiliev).

25. This would include two games against Deep Thought in 1989 (2-0, Kasparov), six against Deep Blue in 1996 (4-2, Kasparov), and six in 1997 (3.5-2.5, Deep Blue).

26. Both Stohl (2006, 336) and Mig Greengard (2005a) tell the back-story of this novelty. I have been told that Kasparov related the tale in a New in Chess column, but I have not seen the text in question.

27. Stohl believes that Kasparov exhibited excessive caution in his matches against X3D Fritz and Deep Junior in 2003 (Stohl 2006, 10), but this is a misunderstanding of Kasparov's strategy. Because Kasparov was provided with copies of the engines he would be facing before the match, he was able to probe the engines for flaws and opening problems. His repeated attempts to sacrifice the g-pawn in the Semi-Slav reveals Kasparov's belief in his superior ability to play unbalanced positions, and his play bore no traces of the "anticomputer" strategy he employed against Deep Blue in 1997.

28. See note 25.

29. Consider the constitutive actors in the construction of Deep Blue: Hsu, Tan, et al., Carnegie Mellon University, IBM, the various hardware manufacturers, the Grandmasters hired to refine Deep Blue's positional play, etc.

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