——— DarkThought ———

competitive chess program
created by[1]

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Tournament History

9th World Computer-Chess Championship (June 1999):

- 4.5 points out of 7 games (3x win, 3x draw, 1x loss) – finished on shared 5th place as 6th of 30 participants in main tournament (microcomputer Vice-Champion and best microcomputer amateur overall, see below)

16th World Microcomputer-Chess Championship (June 1999):

- 4.5 points out of 7 games (3x win, 3x draw, 1x loss) – finished on shared 2nd place as overall Vice-Champion and best amateur of the 22 microcomputer participants in the 9th World Computer-Chess Championship (see above)

15th World Microcomputer-Chess Championship (October 1997):

- 7.0 points out of 11 games (5x win, 4x draw, 2x loss) – finished on shared 4th place as 6th of 34 participants in main tournament (best European amateur)

1st Karlsruher UniSchau (June 1997):

- 3.0 points out of 4 games (2x win, 2x draw) – exhibition match against official student chess team from the University of Karlsruhe (ELO 2225 – ELO 2305)

12th AEGON Man vs. Machine (April 1997):

- 3.5 points out of 6 games (2x win, 3x draw, 1x loss) – win against IM S. Polgar (ELO 2470), draw with GM C. Parada (ELO 2539), sole loss against IM J. van Mil (ELO 2406)

14th World Microcomputer-Chess Championship (October 1996):

- 6.5 points out of 11 games (5x win, 3x draw, 3x loss) – finished on shared 6th place as 7th of 27 participants in main tournament and on shared 3rd place in speed-chess event

11th AEGON Man vs. Machine (April 1996):

- 3.5 points out of 6 games (2x win, 3x draw, 1x loss) – loss vs. GM Bronstein (ELO 2455)

13th World Microcomputer-Chess Championship (October 1995):

- 7.0 points out of 11 games (6x win, 2x draw, 3x loss) – finished on shared 6th place as 7th of 34 participants (best European amateur, best German overall)

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[1] The program also contains code written by Peter W. Gillgasch (see “Acknowledgments” for details).
[2] Please visit the WWW pages of DarkThought at <http://supertech.lcs.mit.edu/~heinz/dt/>.

8th World Computer-Chess Championship (May 1995):

- 2.0 points out of 5 games (2x win, 3x loss) – finished on shared 14th place as 14th of 24 participants

Latest Performance on Test Suites

Test Suite	Time	Result	Speed
BS-2830 (DarkThought rating = 2734)	15 min.	18 / 27	391K nps
BT-2630 (DarkThought rating = 2526)	15 min.	27 / 30	340K nps
LCT-II (DarkThought rating = 2645)	10 min.	28 / 35	410K nps
Bratko / Kopec	1 min.	18 / 24	362K nps
Encyclopedia of Chess Middlegames	5 sec.	534 / 879	401K nps
Win at Chess	5 sec.	290 / 300	446K nps
World's Greatest Chess Games	5 sec.	23 / 50	368K nps
1001 Winning Chess Sacrifices	5 sec.	832 / 1001	435K nps

Solution Times for BS-2830

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	(in sec.)
81	13	–	4	–	15	10	–	15	109	**#00**
–	107	14	94	–	76	471	–	372	–	**#10**
186	263	53	9	–	–	21				**#20**

Solution Times for BT-2630

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	(in sec.)
0	1	2	17	0	0	0	0	–	3	**#00**
0	6	154	1	4	–	2	1	19	1	**#10**
48	1	0	5	3	–	0	55	67	17	**#20**

Solution Times for LCT-II

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	(in sec.)
3	0	273	–	27	7	205	–	7	–	**#00**
21	75	118	0	2	0	0	53	8	3	**#10**
1	5	18	9	–	–	0	0	0	15	**#20**
4	0	5	–	–						**#30**

Measured Peak Speed = 1.473 M nps

(in position "8/8/7K/8/6p1/6k1/4R3/8 w – – 0 1" from ECE3 with timing = 5 sec).

Test Configuration

- DarkThought as of May 31, 1999 with 8M transposition-table entries (4M per side), 1M King hash-table entries (512K per side), and 512K Pawn hash-table entries,
- Digital Unix 4.0e program development tools and operating system,
- 500MHz Compaq XP1000 workstation (500MHz Alpha-21264 EV6 CPU, 64KB/64KB on-chip I/D L1 caches, 4MB unified off-chip L2 cache, Compaq DS-10 mainboard, 2x 128MB/100MHz SDRAM-DIMMs = 256MB RAM).

1.1 Acknowledgements

- *DELTA Computer Products GmbH* loaned a 500MHz Compaq Alpha-21264 XP1000 workstation with 1GB SDRAM for free during the 9th WCCC / 16th WMCC in 1999 thanks to the courtesy of Heinz-Dieter Schütt, then Chief Marketing Officer of DELTA.

- *A.S.E. GmbH* loaned hardware for free during the 13th WMCC in 1995 (additional RAM) and the 14th WMCC in 1996 (433MHz DEC Alpha-21164a PC164 workstation).

- *Digital Equipment Corp. (DEC)* paid for two 500MHz DEC Alpha-21164a PC164 workstations in March 1997 under external technology research contract DE-0032-97 entitled "Optimization and Fine-Tuning of a Sophisticated Tree-Searching Application for 64-bit Alpha CPUs" as negotiated by the courtesy of Dr. Frank Severin, then Head of Digital's External Technology Group Europe.

- *Digital Equipment Corp.'s Workstation Division* (in close collaboration with KryoTech Inc., see below) shipped a cooled 767MHz Alpha-21164a Digital Personal Workstation prototype with 4MB L3 cache & 512MB SDRAM from Boston (USA) to Paris (France) and back for use by DarkThought during the 15th WMCC in 1997. Together with the prototype they sent Jeff Forsythe, an extremely able engineer, over to Paris to attend the week-long championship where he provided superb service to anybody who needed help. Furthermore, Digital Equipment Corp. shipped an identically equipped 600MHz Alpha-21164a workstation from Boston (USA) to Karlsruhe (Germany) for the final preparations of the DarkThought team two weeks before the championship. Digital Equipment Corp. did all of the above for free due to the courtesy of Ron Locklin, then Vice President of Digital's World-Wide Workstation Marketing Division.

- *KryoTech Inc.* (in close collaboration with Digital Equipment Corp., see above) provided a cooled 767MHz Alpha-21164a Digital Personal Workstation prototype for use by DarkThought during the 15th WMCC in 1997 thanks to the courtesy and greatly appreciated personal efforts of Rob diGiacomo, then Executive Vice President and Chief Marketing Officer of KryoTech Inc.

- *Sun Microsystems Inc.* donated a 167MHz UltraSparc Creator workstation for program development and 64-bit Sparc V9 benchmarking in February 1996 due to the courtesy of Eckhard Schaumann, then Head of Sun's German University Cooperation Unit.

- The *Gunther-and-Ingrid Schroff Foundation* (administered by the Chancellor of the University of Karlsruhe), the *Karlsruher Hochschulvereinigung*, and the *Institute for Program Structures and Data Organization* (IPD, Chair Prof. Tichy) awarded several generous travel grants on the occasions of tournament participation.

- The *International Computer Chess Association (ICCA)* paid for our air fares from Frankfurt (Germany) to Jakarta (Indonesia) where the 14th WMCC took place in 1996.

- *Peter W. Gillgasch*, a former co-founder of IPD's computer chess group, belonged to the DarkThought team until April 1996. His various contributions are highly appreciated until today. As described in the "Implementation History" section, DarkThought still contains some source code written by Peter.

1.2 How DarkThought Plays Chess

— Preprint of an article by Ernst A. Heinz in: ICCA Journal, Vol. 20(3), Sept. 1997. —

1.2.1 Abstract

DarkThought is a bitboard-based chess program developed at the University of Karlsruhe that has successfully participated in all world championships since 1995. On a 500MHz DEC Alpha-21164a with 128MB RAM, DarkThought routinely reaches speeds of 200K nps (nodes per second) in the middlegame while peaking at over 650K nps in the endgame.

The article describes the design and inner structure of DarkThought. To this end, it presents detailed accounts of the chess engine while elaborating on some of its innovations: *rotated bitboards*, a *fully programmable* leaf-node evaluation function, and versatile *search parameterization*.

1.2.2 Introduction

Since entering competition in May 1995, the chess program DarkThought has participated in three ICCA world championships and two AEGON man vs. machine tournaments. Work on the program started about two years before its first tournament game, when Peter W. Gillgasch and Ernst A. Heinz founded IPD's computer chess group in mid-1993. Markus Gille joined the group in early 1994 and DarkThought proceeded as a joint development of all three until Peter left the team in April 1996.

The central design philosophy of DarkThought stresses a balanced combination of speed and knowledge that some other strong chess programs also seem to pursue. DarkThought is neither heavily knowledge-based nor dumb and fast only – instead, it complements a speedy search with a fairly knowledgable evaluation. The successful tournament history of DarkThought and its world-class test suite results for BT-2630 with a rating of 2494 ELO and LCT-II with a rating of 2535 ELO strongly support the validity of the combined approach.

Other important design principles of DarkThought are configurability and portability. The program is written in ANSI-C and runs on various Unix platforms (e.g. DEC Alpha, HP PA-RISC, Intel x86, and Sun Sparc). Special source-code switches allow for the seamless selection of different implementations of time-critical functions. Thus, DarkThought can easily be tailored for any desired platform (e.g. 32-bit versus 64-bit CPUs). Other switches create different search "personalities" without any loss of efficiency, thereby enabling frequent comparisons between the most interesting ones.

Today, DarkThought is completely bitboard-based although it did not start as such. The elegance and performance potential of bitboards has lured researchers since the early days of computer chess. Several historically famous chess programs used bitboards while running on mainframes or vector supercomputers (e.g. Kaissa [2], Cray Blitz [116], Chess 4.5 [191]). The advent of ever faster microprocessors with ever larger natural word lengths made the bitboard approach more and more attractive for microcomputer-based chess programs during the past years. Beside Crafty and DarkThought there are now quite a few bitboard chess-programs around that have not yet emerged in public competition but will surely do so in the future. Furthermore, general interest in bitboards has increased significantly since Intel announced its next-generation 64-bit microprocessor to debut in 1998.

The remainder of this article firstly portrays a brief implementation history of DarkThought in Section 1.2.3. Then it details the most important parts of the program: the bitboard engine in Section 1.2.4, the search engine in Section 1.2.5, and the evaluation engine in Section 1.2.6. Last but not least, the article concludes with an outlook on future work.

1.2.3 Implementation History

Up to now, there exist four major DarkThought versions. The first one is a direct offspring of a chess program in Pascal that Peter had written for his 25MHz 68000 Macintosh in 1992. After porting the program to ANSI-C on IPD's DEC Alpha workstations, incrementally updated piece bitboards were added to speed up the evolving evaluation routines. This hybrid version of DarkThought combined a traditional move generator and search engine that manipulated piece lists with a bitboard-based evaluation. It participated in the 8th WCCC (Hong Kong, May 1995), the 13th WMCC (Paderborn, October 1995), and the 11th AEGON (Den Haag, April 1996) while running at 20K – 40K nps on a 275MHz DEC Alpha-21064a.

The second DarkThought version was already completely bitboard-based and as such a full-blown 64-bit program. But it never played a full game of chess because it could only handle test suites and lacked many important features that are necessary for real play. Peter started to work on the new program in June 1995 immediately after returning from the 8th WCCC in Hong Kong while Ernst and Markus still tuned the old DarkThought for the upcoming 13th WMCC. Beside an extensive bitboard infrastructure, the second DarkThought also featured *rotated bitboards* for sliding pieces. Peter implemented them independently of Robert Hyatt's Crafty efforts and – to the best of our knowledge – DarkThought was among the first chess programs ever (if not the very first) to contain a working implementation thereof.

The third DarkThought version emerged after Peter left the team in April 1996. While the bitboard move-generator of the second version remained mostly unchanged, Ernst and Markus rewrote large parts of the bitboard infrastructure, redesigned the search engine completely, and added an innovative evaluation engine with a *fully programmable* leaf-node evaluation function. Successive refinements of the third DarkThought version participated in the 14th WMCC (Jakarta, October 1996) and the 12th AEGON (Den Haag, April 1997).

The fourth and now current DarkThought version is an evolution of its predecessor featuring lots of speed optimizations as well as dramatic changes in the bitboard move-generator and various fundamental data structures (e.g. new chess-board representation). On a 500MHz DEC Alpha-21164a, the DarkThought version as of July 31, 1997 routinely reaches 200K nps in the middlegame while peaking at over 650K nps in the endgame (see Section 1.2.8).

1.2.4 Bitboard Engine

The advantages of bitboards in computer chess spring from the fact that trivial bitwise operations on them suffice to answer interesting questions about pieces on a chess board. For example, imagine a bitboard with 1-bits representing all squares attacked by white Pawns and another bitboard with 1-bits indicating all black pieces. A bitwise AND operation combining both these bitboards yields a result bitboard with 1-bits for all black pieces attacked by white Pawns. Because computers normally excel at bitwise operations while performing them on all bits of their natural word length simultaneously, bitboard usage proves to be very efficient.

The early proponents of the bitboard approach introduced all the basic principles of bitboard-based move generation, piece-attack detection, and positional evaluation [2, 60, 116, 191, 214]. Their publications contain a wealth of information about traditional bitboard techniques that will not be repeated here. Instead, this article focusses on the bitboard infrastructure and the fundamental principles of rotated bitboards as pioneered by DarkThought.

Bitboard Infrastructure

DarkThought makes extensive use of bitboards stored as 64-bit unsigned integers where each bit represents a square of the chess board numbered from a8 = 63 to h1 = 0. Because the bit length of integers differs between compilers, machines, and operating systems, DarkThought defines a set of portable data types like `unsigned_8`, ..., `unsigned_64` that are automatically mapped to the appropriate types of the target platform (e.g. `unsigned_64` defaults to `unsigned long long` in GNU C).

In order to simplify the handling of bitboards, DarkThought contains an abundant collection of functions and macros that provide efficient implementations of all the needed bitboard operations. Beside the basic bitwise AND, OR, XOR etc. the collection includes cascaded combinations thereof because they are frequently used and may even be executed in one cycle on some machines. The expression `(x & ~y)`,[3] for instance, corresponds to a single DEC Alpha instruction. Other important bitboard operations enjoy marvelously simple yet non-obvious formulations due to the wonders of binary subtraction and the two's complement. Two famous members of this class are the expressions `(b & -b)` and `(b & (b - 1))`. The first clears all but the least significant 1-bit of a bitboard while the second clears only the least significant 1-bit.

Unfortunately, the central find-bit and population-count operations have higher algorithmic complexity. Although a few CPUs like Motorola PowerPC, Sun UltraSparc and the forthcoming DEC Alpha-21264 feature instruction-level support of these operations, most current machines still require software implementations. The efficiency of the implementations in terms of speed and memory consumption is of crucial importance for bitboard-based chess programs because it tends to limit their overall performance. In this respect, the short expression for clearing the least significant 1-bit gives rise to a neat formulation of an iterative population-count function.

```
unsigned int iterative_popcount(unsigned_64 b) {
    unsigned int n;
    for (n = 0; b != 0; n++, b &= (b - 1));
    return n;
}
```

If the given bitboard contains few 1-bits, the loop terminates quickly thus making this short and easily inlinable function run fast. Otherwise, DarkThought prefers the following non-iterative formulation that stems from the well-known "Hacker's Memory" collection of programming tricks. It performs better than intuitive methods with lookup tables because the tables get either too large or need too many lookups.[4]

```
#define m1 ((unsigned_64) 0x5555555555555555)
#define m2 ((unsigned_64) 0x3333333333333333)

unsigned int non_iterative_popcount(const unsigned_64 b) {
    unsigned_32 n;
    const unsigned_64 a = b - ((b >> 1) & m1);
    const unsigned_64 c = (a & m2) + ((a >> 2) & m2);
    n = ((unsigned_32) c) + ((unsigned_32) (c >> 32));
    n = (n & 0x0F0F0F0F) + ((n >> 4) & 0x0F0F0F0F);
    n = (n & 0xFFFF) + (n >> 16);
    n = (n & 0xFF) + (n >> 8);
    return n;
}
```

[3] ANSI-C syntax is used for all examples throughout the article.

[4] A clear explanation of how this bit-fiddling trick works lies beyond the scope of the article.

The idea of this population-count trick can also be applied to the find-bit problem yielding a find-function without any memory accesses. Unfortunately, however, this find-bit function is slower than fine-tuned table lookups. As executed by DarkThought the lookups generate negligible memory traffic and compile to roughly 15 machine instructions on a DEC Alpha while relying on the conditional data-move capabilities of modern CPUs. This clever find-bit implementation further exploits the fact that the number of the least significant 1-bit of a bitboard is equal to the number of the most significant 1-bit of the bitboard xor'ed with itself minus one: `FIND_LSB(b)` = `FIND_MSB(b ^ (b - 1))`.

Rotated Bitboards

Vectors of attack masks for all pieces on each square of an otherwise empty chess board enable an easy attack detection for sliding pieces without having to loop over the squares of the respective diagonals, files, and ranks [214]. This loop-less attack-detection scheme operates on consecutive strings of bits representing the rays of squares potentially covered by the sliding piece. In order to really excel, it therefore requires efficient access to consecutive strings of ray bits. As listed below, the normal row-major mapping of squares to bits in a bitboard consecutively aligns the bits of each file. Hence, it only provides efficient access to consecutive strings of file bits.

Normal Bitboard.

#7	#6	#5	#4	#3	#2	#1	#0	Bit/Byte
a8	b8	c8	d8	e8	f8	g8	h8	**#7**
a7	b7	c7	d7	e7	f7	g7	h7	**#6**
a6	b6	c6	d6	e6	f6	g6	h6	**#5**
a5	b5	c5	d5	e5	f5	g5	h5	**#4**
a4	b4	c4	d4	e4	f4	g4	h4	**#3**
a3	b3	c3	d3	e3	f3	g3	h3	**#2**
a2	b2	c2	d2	e2	f2	g2	h2	**#1**
a1	b1	c1	d1	e1	f1	g1	h1	**#0**

A column-major mapping of squares to bits in a bitboard, however, consecutively aligns the bits of each rank. Consequently, such flipped bitboards allow for efficient access to consecutive strings of rank bits.

Flipped Bitboard.

#7	#6	#5	#4	#3	#2	#1	#0	Bit/Byte
a8	a7	a6	a5	a4	a3	a2	a1	**#7**
b8	b7	b6	b5	b4	b3	b2	b1	**#6**
c8	c7	c6	c5	c4	c3	c2	c1	**#5**
d8	d7	d6	d5	d4	d3	d2	d1	**#4**
e8	e7	e6	e5	e4	e3	e2	e1	**#3**
f8	f7	f6	f5	f4	f3	f2	f1	**#2**
g8	g7	g6	g5	g4	g3	g2	g1	**#1**
h8	h7	h6	h5	h4	h3	h2	h1	**#0**

In the case of diagonals, the necessary mappings prove to be more complex. The number of diagonals amounts to 15 in each of the two directions a1–h8 and a8–h1. Furthermore, diagonals are of variable lengths ranging from 1 to 8. Because not all diagonals can be stuffed into separate bytes of a bitboard the mapping must pack some together in a clever way.

Figuratively, viable mappings can be deduced as follows: slice a normal bitboard along one of the main diagonals (a1–h8 or a8–h1), then rotate the half with the squares of the main diagonal to lie at the bottom, and finally paste the other half such that it results in a parallelogram. As shown below, the diagonalized mappings of squares to bits in a bitboard consecutively align the bits of each a1–h8 and a8–h1 diagonal. Thus, diagonalized bitboards enable efficient access to consecutive strings of diagonal bits if the ends of the diagonals (as marked by vertical bars) are known.

A1–H8 Bitboard.

#7	**#6**	**#5**	**#4**	**#3**	**#2**	**#1**	**#0**	**Bit/Byte**
a8	$\mid$ b1	c2	d3	e4	f5	g6	h7	**#7**
a7	b8	$\mid$ c1	d2	e3	f4	g5	h6	**#6**
a6	b7	c8	$\mid$ d1	e2	f3	g4	h5	**#5**
a5	b6	c7	d8	$\mid$ e1	f2	g3	h4	**#4**
a4	b5	c6	d7	e8	$\mid$ f1	g2	h3	**#3**
a3	b4	c5	d6	e7	f8	$\mid$ g1	h2	**#2**
a2	b3	c4	d5	e6	f7	g8	$\mid$ h1	**#1**
a1	b2	c3	d4	e5	f6	g7	h8	**#0**

A8–H1 Bitboard.

#7	**#6**	**#5**	**#4**	**#3**	**#2**	**#1**	**#0**	**Bit/Byte**
a8	b7	c6	d5	e4	f3	g2	h1	**#7**
a7	b6	c5	d4	e3	f2	g1	$\mid$ h8	**#6**
a6	b5	c4	d3	e2	f1	$\mid$ g8	h7	**#5**
a5	b4	c3	d2	e1	$\mid$ f8	g7	h6	**#4**
a4	b3	c2	d1	$\mid$ e8	f7	g6	h5	**#3**
a3	b2	c1	$\mid$ d8	e7	f6	g5	h4	**#2**
a2	b1	$\mid$ c8	d7	e6	f5	g4	h3	**#1**
a1	$\mid$ b8	c7	d6	e5	f4	g3	h2	**#0**

For historical reasons, diagonalized and flipped bitboards are both called rotated. In order to fully exploit the benefits of rotation, DarkThought incrementally updates rotated bitboards with 1-bits for all occupied squares of the current position. Additionally, it manages compressed vectors of rotated attack masks that strike a good balance between instruction and memory efficiency.

1.2.5 Search Engine

DarkThought is a sophisticated alpha-beta searcher using PVS/NegaScout [51, 174] with state-of-the-art enhancements like aggressive futility pruning [95, 182], internal iterative deepening [7, 184], dynamic move ordering (history+killer heuristic) [3, 76, 180, 183, 191], recursive null-move pruning [20, 62, 77], selective extensions [7, 17], interior-node recognizers [94, 190], and an extended transposition table [161, 191]. On average, all enhancements taken together reduce the effective branching factor of DarkThought to 2–3 and its search-tree size to roughly 55% of that of the according minimal tree [124]. These observations are consistent with reports by other researchers [17, 216].

At the top level DarkThought employs lazy alpha bounding and iterative deepening with an aspiration window of half a Pawn [127, 191]. In contrast to plain alpha bounding [182], the lazy scheme delays the complete resolution of both new best moves and fail highs up to the next iteration. Top-level alpha bounding often saves some effort while at the same time searching new best moves one ply deeper than usual. If the top-level search is unstable or if the final score lies far below the score of the previous move, DarkThought extends the duration of the current search up to threefold when playing in tournament mode.

The full-width search of variable depth is backed by a "most valuable victim / least valuable aggressor (MVV/LVA)" style quiescence [32] that triggers the static leaf-node evaluations and follows capturing moves only. In order to work well such half-blind quiescence needs deep full-width searches as executed by DarkThought which routinely reaches 11–13 plies in standard middlegame positions within a minute. Due to its high search depths and wealth of extensions, DarkThought does not switch off null moves until one side has no more pieces (i.e., it still performs null-move pruning if both sides have just a single minor piece plus Pawns). Our overall experience of numerous matches and test-suite runs suggests that the positive effects of largely increased full-width depth strongly outweigh the zugzwang-related negative ones. At least for tournament play, early discovery of deep pawn breakthroughs and related tactical tricks seems to be much more important than accurate zugzwang detection in endgames with major or minor pieces on both sides.

Node Expansion

DarkThought implements a standard node-expansion procedure whose structure probably does not differ much from that of other chess programs. It executes the following successive steps as suggested by several authors and excellently summarized in [141, 144].

- Extension decisions related to incoming move (U),
- internal iterative deepening (U),
- transposition-table lookup (L/U),
- interior-node recognizer decision (L/U),
- endgame database lookup (L/U),
- null-move search with deep extension decision (U),
- single-reply extension decision (U),
- futility pruning decision (F/L),
- static evaluation (F/L),
- search of all outgoing moves (L/U).

The letters in parantheses behind each step explain where in the search tree it is actually applied: F means "frontier" (depth $= 1$), L "lower part" (depth ≤ 0), and U "upper part" (depth ≥ 1) where depth denotes ply distance from the quiescence horizon. The last node expansion step achieves good move ordering by arranging the sequence of recursive search calls as listed below.

1. Hashed move from transposition table (L/U),
2. capture moves in MVV/LVA order (L/U),
3. killer moves (U),
4. history moves (U),
5. statically pre-sorted remaining moves (U).

This ordering scheme enjoys wide-spread use in computer chess because it represents the best currently known according to many independent researchers. An unintended yet nice side effect thereof is that it also saves precious memory bandwidth because it does not require the creation of a move list prior to history-move selection.

In contrast to most other chess programs, DarkThought uses a single node-expansion routine to handle both full-width and quiescence-search nodes. Because of better code reuse (see above lists of steps), a single node expansion routine can be made smaller than two separate ones and it is much easier to reconfigure. The complexity of the implementation, however, increases considerably as compared to the solution with two separate routines.

Extension Heuristics

At the time of this writing, DarkThought relies on the selective deepening powers of five different search-extension heuristics.

- Check extensions [191],
- deep-search extensions [62],
- recapture extensions [29],
- Pawn extensions [135],
- single-reply extensions [135].

In order to avoid possibly explosive growth of the search tree as caused by excessive deep-search extensions in the case of repeated mutual mating threats, DarkThought restricts them to null moves at depth $= 2$ in the first $2 * \mathit{iteration\_number}$ plies on all paths. For recapture extensions DarkThought employs a Hitech-style definition based on material balance instead of full evaluation scores: recaptures are captures or Pawn promotions that lead to a similar material balance as that of the root node. Pawn extensions relate to moves of advanced Pawns to the 7th / 2nd rank (for White / Black resp.) and all non-capturing moves of Pawns to the 6th / 3rd rank.

According to literally thousands of test runs these extensions combine extremely well with one another and the rest of the search, especially with futility and null-move pruning (see [17] for an independent confirmation). Still, DarkThought attempts to reduce the number of meaningless extension triggers by restricting some of them (e.g. Pawn extensions) to the lower parts of the search tree up to a certain, possibly adaptive depth threshold. Such *extension layering* requires careful fine-tuning before it works without intolerable reduction of the overall extension benefits. Fortunately, this seems to be its only disadvantage.

Search Parameterization

As mentioned in the introduction, one important design principle of DarkThought is configurability without loss of efficiency. To this end, it contains a large collection of source-code switches that allow for the quick and easy generation of versatile search "personalities". Descriptions of the most interesting parameters and their effects follow below.

Search Algorithm. Beside standard PVS/NegaScout, DarkThought can run pure fail-soft alpha-beta (FAB) and a mixture of both that uses PVS until reaching a configurable depth where it switches to FAB. Viable values for the depth threshold range from 1 to 4.

Null-Move Search. Generally regarded as both a curse and a blessing of microcomputer-based chess programs, the realm of null-move pruning provides ample opportunities for many improvements (e.g. by parameter fine-tuning). In DarkThought, null moves may be layered (i.e. disabled in either the upper or lower parts of the search tree up to a predefined depth threshold), made non-recursive or even switched off completely. The first DarkThought delayed null moves until depths ≤ 5 after Don Dailey (of Socrates and StarSocrates fame) enthused about this scheme during the 8th WCCC in Hong Kong, 1995.

Like many other chess programs, DarkThought currently uses a depth-reduction factor of 2 for null-move searches. But other values (especially depth-adaptive ones in combination with various material thresholds for disabling the null move in endgames) are constantly experimented with. The same holds for depth and score margin of the deep-search extension which default to 2 and the value of 3 Pawns respectively.

Transposition-Table Access. DarkThought performs multiple probes in the transposition table because experiments conducted by Peter in 1993 showed the superiority thereof as compared to multiple tables (see [16] for an independent confirmation). The number of probes per access is a redefinable parameter normally set to 4.

The depth up to which DarkThought accesses the transposition table can be configured independently for read and write operations. Setting both to one ply below the quiescence horizon currently produces the best overall results.

Extension Heuristics. All extensions may individually be layered or completely turned off. Check extensions can be disabled if the piece material of the checking side falls below a certain threshold (e.g. less than two pieces). The depth up to which checking moves are followed unconditionally is modifiable, too, yet normally set to the frontier as this combines well with futility pruning and capture-only quiescence.

Data Structures. Because most computers exhibit different behaviour as for memory performance and cache sensitivity, DarkThought contains distinct implementations of many data structures accessed during the search. First and foremost, you may choose between a single global board modified by corresponding make/unmake-move operations and stacked local boards that require no unmake after but copying prior to the make-move operation during node expansion. Similarly, stacked local move lists as opposed to a single global move list may be selected. Although they feature much higher memory consumption, the localized data structures will simplify any future parallelization attempts. Last but not least, there exist several variations of history tables with the piece-to-square formulation [210] used by default.

1.2.6 Evaluation Engine

DarkThought decouples the chess knowledge as specialized scoring functions from the rest of the evaluation infrastructure. Before the start of each search, a root-node oracle [29] not only fills all piece-on-square tables (PSTs) afresh but it also selects appropriate scoring functions according to an extensive analysis of the root position. For each selected scoring function the oracle compiles a list of associated parameters and plugs both into the fully root-node programmable leaf-node evaluation function. In contrast thereto, limited hardware capabilities severely restricted the programmability of the evaluation in Hitech [27] that inspired the design of the evaluation engine in DarkThought.

The evaluation infrastructure automatically tracks the state of the evaluation function (incl. PSTs) in order to detect any changes incurred by the oracle. In case of a change, the evaluation-dependent contents of all affected hash tables are cleared. Other important services of the evaluation infrastructure include the root-node programming interface and all-out management of the evaluation hash tables. Thus, the scoring functions can concentrate on their respective tasks without ever worrying or even knowing about hashing.

Programmable Evaluation Function

Unlike other chess programs, DarkThought features a leaf-node evaluation function whose properties are almost completely root-node programmable. Beside oracle-supplied PST values, this includes upper score bounds for futility-pruning decisions and plug-in functions for all remaining scoring tasks. The interplay of the programmable components is hard-wired inside the evaluation infrastructure and proceeds as follows.

- Material-balance scoring,
- evaluation futility-pruning decision,
- Pawn-structure scoring (H),
- Pawn-related King scoring (H),
- race scoring of passed Pawns,
- PST piece-placement scoring,
- positional futility-pruning decision,
- further positional scoring (H).

For all steps marked with an H, the evaluation infrastructure automatically hashes the computed scores. While hashing of Pawn-structure scores and Pawn-related King scores works most efficiently with separate hash tables [29, 161], the positional as well as the overall evaluation scores get stored in the extended transposition table because they relate to the entire board position. Hashing of material-balance scores was abandoned after none of several examined hash functions achieved acceptable hit rates.

After the completion of Pawn-structure scoring all important facts related to the bare Pawn constellation of the current position are known. The evaluation infrastructure automatically hashes these facts, too, before passing them to the subsequent scoring steps for efficient reuse.

The futility-pruning decisions provide quick exits if the sum of partial scores so far plus an upper bound for the remaining scores falls below alpha. The oracle determines appropriate upper bounds (one for the whole score excluding material balance and one for the positional score alone) with respect to the material situation at the root position and the programmed scoring plug-ins.

The root-node programming process itself includes the selection and installation of appropriate evaluation functions with associated parameter tables for material-balance scoring, Pawn-structure scoring, Pawn-related King scoring, Pawn-race scoring, and further positional scoring. Up to now, the oracle can choose between general functions for Pawn-structure analysis, Pawn-race analysis, and complex positional analysis as well as a special function for middlegame King safety analysis. These functions know about fianchetto Bishops, center control, connected Rooks, King attacks, mobility, open files, outposts, passed Pawns, Pawn shelters, Pawn storms, and weak Pawns. More special scoring functions for different endgames and general functions for the analysis of positions with reduced material will be implemented in the future.

Evaluation Machines

Taken together, all programmable components of the evaluation function constitute an *evaluation machine* that describes the current state of the whole evaluation engine. Evaluation machines are the central data structures which the oracle and the evaluation infrastructure operate on. DarkThought specifies them by the following `EVAL_MACHINE` type declaration.

```
typedef struct {
    int (*material_balance)(const SIDE, const BOARD *const);

    int (*analyze_pawns)(const BOARD *const, PAWN_FACTS *const);

    int (*analyze_king)(const SIDE, const BOARD *const,
                                    const PAWN_FACTS *const);
    int (*analyze_race)(const SIDE, const BOARD *const,
                                    const PAWN_FACTS *const);
    int (*analyze_posn)(const SIDE, const BOARD *const,
                                    const PAWN_FACTS *const);
    int max_eval_score[2], max_posn_score[2];

    void *king_tables[2], *pawn_tables[2], *posn_tables[2];
    int king_tab_size[2], pawn_tab_size[2], posn_tab_size[2];

    int piece_on_square_table[6][64][2];
} EVAL_MACHINE;
```

The five function variables `material_balance`, `analyze_pawns`, `analyze_king`, `analyze_race`, and `analyze_posn` refer to the currently installed scoring plug-ins. The type identifiers `BOARD`, `SIDE`, and `PAWN_FACTS` denote the internal representations of the chess board, of the side to move, and of the facts related to the bare Pawn constellation respectively. Please note that `analyze_pawns` must compute the Pawn facts because all remaining analysis functions receive them as constant read-only parameters.

The vectors `max_eval_score` and `max_posn_score` contain the upper bound values as determined by the oracle and needed by the evaluation as well as the positional futility-pruning decisions for both sides. Similarly, the vectors `king_tables`, `pawn_tables`, and `posn_tables` hold pointers to the parameter tables of the corresponding scoring functions for both sides. The actual sizes of the parameter tables are given by the respective element values of the vectors `king_tab_size`, `pawn_tab_size`, and `posn_tab_size`. Last but not least, the vector `piece_on_square_table` contains the placement scores of all piece types on any square of the chess board for both sides as calculated by the oracle.

1.2.7 Future Work

One of the nicest things about computer chess is the fact that the to-do list of interesting ideas seems to grow steadily despite all the improvements made since the last time you checked. For DarkThought, in particular, the whole field of parallelization is still untapped. While parallel or distributed probability-based B* [26] looks very attractive, DarkThought already contains all localized data structures as necessary for massive alpha-beta parallelization [47].

DarkThought on a single CPU will use fractional ply extensions [135] in the foreseeable future. Singular extensions [8], enhanced transposition-table cutoffs [177], and MTD(f) [171] are all worth a trial, too. Automatic learning and tuning of opening books ranks high on the list as well. More mundane tasks like low-level speed tuning and similar programming "hacks" are scheduled to take place just before important tournaments such as world championships. Please visit the WWW page of DarkThought in order to follow its progress and download further information (e.g. notations of all tournament games played by the program).

1.2.8 Appendix — Performance on Test Suites as of July 31, 1997

Test Configuration

- DarkThought as of July 31, 1997 with 4M transposition-table entries (2M per side), 512K King hash-table entries (256K per side), and 256K Pawn hash-table entries,
- Digital Unix 4.0b program development tools and operating system,
- 500MHz AlphaPC164 workstation (500MHz DEC Alpha-21164a EV56 CPU, 8KB/8KB on-chip I/D L1 caches, 96KB unified on-chip L2 cache, 1MB unified off-chip L3 cache, DEC PC164 mainboard, 8x16MB PS/2 SIMMs = 128MB RAM) as provided by Digital Equipment Corp. under external technology research contract DE-0032-97 entitled "Optimization and Fine-Tuning of a Sophisticated Tree-Searching Application for 64-bit Alpha CPUs".

Test Suite Results

Test Suite	Time	Result	Speed
BS-2830 (DarkThought rating = 2638)	15 min.	14 / 27	225K nps
BT-2630 (DarkThought rating = 2494)	15 min.	27 / 30	264K nps
LCT-II (DarkThought rating = 2535)	10 min.	26 / 35	249K nps
Bratko / Kopec	1 min.	18 / 24	214K nps
Encyclopedia of Chess Middlegames	20 sec.	609 / 879	249K nps
Win at Chess	5 sec.	287 / 300	267K nps
World's Greatest Chess Games	10 sec.	22 / 50	224K nps
1001 Brilliant Ways to Checkmate	5 sec.	946 / 1001	313K nps
1001 Winning Chess Sacrifices	5 sec.	830 / 1001	259K nps
Nolot Positions (#1 Nxh6! 20:40 min. – #10 Rxf7! 44:25 min. – #11 Rxh6! 2:40 min.)	60 min.	3 / 11	210K nps

Solution Times for BS-2830

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	(in sec.)
516	17	–	18	–	282	13	–	24	298	**#00**
–	342	31	–	–	–	–	–	–	–	**#10**
405	245	204	11	–	–	41				**#20**

Solution Times for BT-2630

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	(in sec.)
0	2	6	48	0	0	0	1	–	6	**#00**
1	14	572	2	8	–	9	0	24	2	**#10**
122	2	179	7	12	–	4	119	208	48	**#20**

Solution Times for LCT-II

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	(in sec.)
15	0	–	–	66	42	264	–	5	–	**#00**
52	164	525	0	2	0	1	110	3	12	**#10**
11	15	–	15	–	–	0	0	3	30	**#20**
5	2	25	–	–						**#30**

Measured Peak Speed = 665K nps

(in position "6R1/8/3K4/8/8/7p/7k/8 w - - 0 1" from ECE3 with timing = 5 sec).

1.3 Extended Futility Pruning

— Preprint of an article by Ernst A. Heinz in: ICCA Journal, Vol. 21(2), June 1998. —

1.3.1 Abstract

This article presents a new selective pruning technique for alpha-beta based game-tree search in computer chess. *Extended futility pruning* builds on ideas of both deep razoring and normal futility pruning at frontier nodes (depth = 1). It cuts complete branches of the search tree at pre-frontier nodes (depth = 2) according to solely static criteria at the respective nodes and thus performs true forward pruning.

Although extended futility pruning is theoretically unsound, extensive experiments with our master-strength chess program DarkThought show that it works markedly well in practice. Even at fixed search depths, extended futility pruning exhibits hardly any loss of tactical strength while shrinking the search trees by 10%–20% on average as compared with normal futility pruning. Furthermore, extended futility pruning combines nicely with a conservatively limited variation of razoring that reduces the search trees at fixed search depths > 10 plies by additional 5%–15% on average. Last but not least, the presented pruning schemes scale very well with search depth and reap ever more benefits at higher depths.

1.3.2 Introduction

Until the advent of Tech [76] and Chess 4.x [191] in 1972–1973 most chess programs were highly selective alpha-beta searchers. They mainly relied on knowledge-intensive plausible move generators that cut off statically "implausible" moves at nodes of all levels and thus pruned large parts of the search tree. But as soon as brute-force searchers like Chess 4.x reached depths ≥ 5 plies in the middle game, they routinely punished the tactical shortcomings of plausible move generation and started their own reign. Except for the triggering of variable-depth search extensions, typical brute-force chess programs of this era featured no selectivity at all in the full-width parts of their searches. Avid proponents of the brute-force search paradigm deem any kind of forward cutting too suspicious and unsafe as to employ it in their alpha-beta searchers. These true brute-forcers do not even trust normal futility pruning at frontier nodes (see Section 1.3.4).

In 1989–1990 Beal [20] and Goetsch & Campbell [77] reported about their experiments with the null move which initiated a renaissance of selective searching in computer chess. Null-move pruning exhibits only minor tactical weaknesses and scales very well with search depth. The spectacular success of null-move pruning in microcomputer chess made it one of the most popular alpha-beta enhancements today. State-of-the-art chess programs using null-move pruning easily reach search depths of 10–12 plies in the middle game on fast microcomputers. Thence, the field of computer chess now needs new techniques that make alpha-beta searching more scalable at high search depths > 10 plies. The prospect of ever more powerful computers further adds to this need.

We believe that selective forward-pruning schemes promise good chances for improvement in this area. A prerequisite for the practical success of any such scheme will be to preserve the tactical strength of the search. Our new pruning techniques *extended futility pruning* (see Section 1.3.5) and *limited razoring* (see Section 1.3.6) fulfill this requirement and scale nicely.

1.3.3 Related Work

Although it enjoys wide-spread use there does not exist much published material about futility pruning at frontier nodes. Schaeffer briefly explains the underlying futility idea in his

1986 Ph.D. thesis [182]. To the best of our knowledge, this is the earliest publication that presents quantitative experimental data illustrating the effectiveness of futility pruning at frontier nodes. Ye and Marsland's 1992 article [216] about forward pruning and search extensions in Chinese chess supports Schaeffer's findings by independent experiments. Section 1.3.4 discusses futility pruning at frontier nodes in detail.

Marsland's excellent (yet meanwhile somewhat outdated) overview of computer chess and search from 1992 [141] mentions three other statically selective pruning techniques that gained broad attention in the early days of computer chess. But Newborn's GAMMA algorithm [166], Slagle's marginal forward pruning [189], and Birmingham & Kent's razoring [34] seem to generate only little interest today (if any at all) because their aggressive selectiveness incurs too many tactical risks. Nevertheless, we deem the fundamental ideas of these forward pruning schemes as still very valuable. With the right additions and modifications, static forward pruning following a similar spirit like the above can work great as presented in the remainder of this article.

Null-move pruning [20, 77] and Buro's PROBCUT enhancement [50] differ from the selective pruning schemes mentioned so far because they base their pruning decisions on dynamic rather than static criteria at the respective nodes. Both try to save work by speculatively replacing normal searches with much cheaper searches of reduced depths. The full-width nature of the reduced searches makes these two forward pruning techniques quite safe and successful in practice.[5]

1.3.4 Futility Pruning at Frontier Nodes

The well-known technique of futility pruning at frontier nodes (depth = 1) exploits the peculiarities of "standing pat" at horizon nodes (depth = 0). "Standing pat" means to compute the static evaluation score of a node in order to test it against the upper search bound for a possible fail-high beta cutoff without further lookahead. Thus, "standing pat" implements the null-move assumption during the quiescence search with static node evaluations serving as null-move scores of zero depth. The following two sections describe the theory and practice of futility pruning at frontier nodes in detail because they provide the foundations for our new pruning scheme.

Theory

Futility pruning at frontier nodes saves a lot of work by deciding in advance which moves will cause a "stand pat" beta cutoff at the direct successor nodes on the search horizon. This requires the search to determine lower bounds for the static evaluation scores of horizon nodes based on the situations and moves at frontier nodes. Such bounds are easy to obtain for non-checking moves and typical chess evaluation functions that simply add material balances and positional scores.

Lower Bounds for Static Evaluation Scores

$$eval\_score(node) = mat\_balance(node) + posn\_score(node) \tag{1.1}$$

$$0 \le |posn\_score(node)| \le max\_posn\_score \in \mathbf{N}$$

$$\Downarrow$$

$$eval\_score(node) \ge mat\_balance(node) - max\_posn\_score \tag{1.2}$$

[5] Although Buro developed and tested PROBCUT within his master-strength othello program LOGISTELLO it should work in computer chess as well.

With *max_posn_score* denoting a constant upper bound on the absolute values of all positional scores, the term *mat_balance(node)* $-$ *max_posn_score* represents a tight lower bound for the static score of a node as computed by typical evaluation functions. This tight lower bound allows for the formulation of a theoretically sound futility condition at frontier nodes that enables the advance detection of subsequent "stand pat" beta cutoffs for non-checking moves. The theoretical soundness of the futility condition follows from the well-known relations of alpha, beta, and the material balances at direct successors of a node.

Alpha / Beta and Material Balances at Direct Successor Nodes

$$alpha(node) = -beta(succ(node, move)) \tag{1.3}$$

$$mat\_balance(succ(node, move)) = -mat\_balance(node) - mat\_gain(move) \tag{1.4}$$

Theoretically Sound Futility Condition at Frontier Nodes

$$mat\_balance(node) + mat\_gain(move) + max\_posn\_score \leq alpha(node) \tag{1.5}$$

$$\Downarrow$$

Futility Condition Applied to Successor Nodes

$$mat\_balance(succ(node, move)) - max\_posn\_score \geq beta(succ(node, move))$$

$$\Downarrow$$

"Stand Pat" Beta Cutoff at Horizon Nodes

$$eval\_score(succ(node, move)) \geq beta(succ(node, move))$$

Given a suitable value for *max_posn_score*, it is therefore safe to simply cut off all non-checking moves at frontier nodes for which the futility condition *mat_balance(node)* + *mat_gain(move)* + *max_posn_score* $\leq$ *alpha(node)* holds. The according futility cutoff-rate heavily depends on the value of *max_posn_score* and the material balances of the positions encountered during the search. The tighter the bound on positional scores (i.e., the smaller *max_posn_score*) and the greater the material imbalances are, the more cutoffs occur.

Practice

Real chess programs tend to sacrifice the theoretical soundness of futility pruning in favor of using it as a truly selective pruning technique. As mentioned above the tightness of the bound on positional scores greatly influences the futility cutoff-rate. Viewed the other way round, the introduction of a configurable futility margin instead of the theoretical bound *max_posn_score* allows for a variable leverage of the cutoff-rate. By choosing specific margins, chess programs can exert effective control over the futility cutoff-rate and the desired degree of selectiveness.

With margins ranging from 2–4 Pawns, selective futility pruning at frontier nodes proves to be quite safe in practice. While causing hardly any tactical mistakes it shrinks the search trees by 60% on average according to independent experiments by various researchers (e.g. Schaeffer [182], Ye and Marsland [216]). Many implementations increase the selectiveness even further by severely restricting possible search extensions in the subtrees of non-futile captures and checking moves at otherwise futile frontier nodes.

Selective Futility Condition at Frontier Nodes

$$mat\_balance(node) + mat\_gain(move) + futil\_margin \leq alpha(node) \tag{1.6}$$

$$futil\_margin \in \{2 * pawn\_val \ldots 4 * pawn\_val\} < max\_posn\_score$$

1.3.5 Futility Pruning at Pre-Frontier Nodes

Our new pruning technique extends on the scheme of selective futility pruning at frontier nodes and combines it with an idea from razoring. Therefore, we call it "extended" futility pruning. Extended futility pruning cuts complete branches of non-checking moves at pre-frontier nodes (depth = 2) according to solely static criteria at the respective nodes as formally described below. This is of course theoretically unsound and also slightly riskier than normal futility pruning. However, extensive experiments with our master-strength chess program DarkThought show that extended futility pruning works markedly well in practice.

Theory

The practical success of futility pruning at frontier nodes springs from the chess-related meaning of the selective futility condition. If the condition $mat\_balance(node) + futil\_margin \leq alpha(node)$ holds for a node the side-to-move suffers from a material disadvantage of at least $futil\_margin \geq 2 * pawn\_val$ with respect to the lower search bound. Because this bound must be exceeded in order to avoid a fail-low alpha cutoff, the side-to-move clearly features a bad position at the given node (relative to the bound).

In bad positions it is generally quite unusual in chess that quiet moves or non-checking captures with small material gains substantially improve the situation. The probability of such an improvement depends on the actual disadvantage $alpha(node) - mat\_balance(node)$ and the remaining search depth at the node. The greater the disadvantage and the smaller the remaining depth are, the more unlikely will searches of these moves reveal any improvements over checking moves and captures with large material gains. In the case of selective futility pruning at frontier nodes the disadvantage amounts to at least 2 Pawns with a remaining depth = 1. The practical results of selective futility pruning at frontier nodes show that 1-ply searches of presumably futile moves almost never discover better compensation for disadvantages of ≥ 2 Pawns than 1-ply searches of truly non-futile moves.

Because extended futility pruning applies at pre-frontier nodes with a remaining depth = 2, the margin of material disadvantage triggering extended cutoffs of presumably futile moves must be considerably higher than the normal futility margin. Otherwise, the selective risks of extended futility pruning would easily exceed its gains. Values ranging from Rook to Rook+Pawn for the extended futility margin make good sense from a chess point of view and they prove to work very well in practice (see below). For additional safety, extended futility pruning reuses an idea from razoring and does not perform any cutoffs at pre-frontier nodes if the immediately predecessing move caused an extension of search depth.

Extended Futility Condition at Pre-Frontier Nodes

$$\begin{gathered} mat\_balance(node) + mat\_gain(move) + extd\_futil\_margin \leq alpha(node) \\ extd\_futil\_margin \in \{rook\_val \dots rook\_val + pawn\_val\} \end{gathered} \tag{1.7}$$

Practice

Our chess program DarkThought relied on extended futility pruning with a cutoff margin of 6 Pawns during the 15th ICCA World Microcomputer Chess Championship (WMCC) in October 1997. DarkThought finished the championship on a shared 4th place among 34 strong participants. Hence, the new pruning scheme already inaugurated its practical value with a successful real-life performance under tough tournament conditions.

In our quantitative experiments with all 2180 postions from the test suites "Encyclopedia of Chess Middlegames" (ECM, 879 positions), "Win at Chess" (WAC, 300 positions), and "1001 Winning Chess Sacrifices" (WCS, 1001 positions) extended futility pruning performed equally well. The version of DarkThought used for the experiments was mostly identical with the one described in our article "How DarkThought plays chess" [96].

DarkThought is a fast yet sophisticated alpha-beta searcher using PVS/NegaScout [51, 174] with state-of-the-art enhancements like normal futility pruning, internal iterative deepening [7, 184], dynamic move ordering (history+killer heuristic) [3, 76, 180, 183, 191], recursive null-move pruning [20, 62, 77], selective extensions [7, 17], interior-node recognizers [94], and an extended transposition table [161, 191]. On average, all enhancements taken together reduce the effective branching factor of DarkThought to 2–3 and its search-tree size to roughly 55% of that of the according minimal tree [124]. Therefore, the program already generated very slim search trees without the new pruning scheme while routinely reaching search depths of 11–13 plies in normal middlegame positions at tournament time-controls.[6]

Test Suite	Normal #Nodes	Normal #Solved	Extd. Δ Nodes	Extd. Δ Solved	(No.)
ECM–08	1,232,004,798	552 / 879	−11.86%	−1.81%	(–10)
ECM–10	8,823,781,692	642 / 879	−13.41%	−0.94%	(–6)
ECM–12	83,443,531,950	704 / 879	−16.70%	−1.14%	(–8)
WAC–08	146,094,041	285 / 300	−14.10%	0.00%	(0)
WAC–10	946,867,509	296 / 300	−20.38%	−0.68%	(–2)
WAC–12	8,998,551,515	296 / 300	−29.89%	0.00%	(0)
WCS–08	750,804,397	841 / 1001	−11.86%	−0.48%	(–4)
WCS–10	5,398,696,585	866 / 1001	−17.22%	−0.35%	(–3)
WCS–12	52,801,555,626	874 / 1001	−26.58%	+0.23%	(+2)
Sum–08	2,128,903,236	1678 / 2180	**−12.01%**	**−0.83%**	**(–14)**
Sum–10	15,169,345,786	1804 / 2180	**−15.20%**	**−0.61%**	**(–11)**
Sum–12	145,243,639,091	1874 / 2180	**−21.11%**	**−0.32%**	**(–6)**

Table 1.1: Performance of Normal vs. Extended Futility Pruning.

Even at fixed search depths, extended futility pruning exhibits hardly any loss of tactical strength when $extd\_futil\_margin = 6 * pawn\_val$. Yet it shrinks the search trees by additional 10%–20% in comparison with our state-of-the-art implementation of normal futility pruning. Table 1.1 gives the according performance data as obtained by searching all 2180 positions of the ECM, WAC, and WCS test suites to fixed depths of 8, 10, and 12 plies with the 1997 WMCC version of DarkThought (see Appendix 1.3.8 for a detailed description of the exact experimental setup). The data shows that extended futility pruning scales nicely with higher search depths. The overall relative savings as counted in number of nodes visited increase from 12% at a fixed search depth of 8 plies to 21% at a fixed search depth of 12 plies. Simultaneously, the already extremely low quota of less overall solutions further decreases from 0.8% at a fixed search depth of 8 plies to 0.3% at a fixed search depth of 12 plies.

The preserved tactical strength clearly distinguishes extended futility pruning from pure razoring. As for our own experience, pure razoring greatly suffers from tactical misconceptions that often tend to delay critical findings for some search plies which in turn causes gross blunders with inacceptable frequency. Moreover, our new scheme may even be easier to implement

[6] Private and public discussions with authors of other chess programs confirm this notion. During the last three WMCCs DarkThought seemed to always search among the smallest trees of all participating programs.

than pure razoring.

1.3.6 Limited Razoring at Pre-Pre-Frontier Nodes

Pushing the idea of futility pruning one step further to pre-pre-frontier nodes (depth = 3), we combine it with the depth-reduction mechanism of deep razoring. At first we describe the rules of the ensuing pruning technique and explain in detail how to integrate both extended futility pruning and limited razoring with an existing alpha-beta search. Thereafter, we present our extensive experiments which show that limited razoring works very well in practice, especially in combination with extended futility pruning.

Theory

Because of the high remaining search depth, only a giant margin of material disadvantage ranging from at least Queen to Queen+Pawn allows for the sufficiently riskless triggering of the razor. We achieve additional safety by neither razoring nodes with ≤ 3 opposing pieces nor if the immediately predecessing move caused an extension of search depth. Otherwise, our conservative version of razoring reduces the remaining search depth of pre-pre-frontier nodes by 1 ply if they fulfill the razor condition. Then it applies extended futility pruning to the freshly razored nodes. Thence, the overall effect of limited razoring at pre-pre-frontier nodes is to cut off quiet moves and non-checking captures with insufficient material gains and a remaining depth of 3 plies while reducing the search depth of all other moves by 1 ply if the side-to-move suffers from a severe disadvantage.

Limited Razor Condition at Pre-Pre-Frontier Nodes

$$mat\_balance(node) + razor\_margin \leq alpha(node) \tag{1.8}$$
$$razor\_margin \in \{queen\_val \ldots queen\_val + pawn\_val\}$$

The integration of both extended futility pruning and limited razoring with an existing alpha-beta searcher proves to be quite simple. Figure 1.1 provides the skeleton of a correspondingly selective search function that outlines the necessary additions. Because of its verbose ANSI-C style and the numerous embedded comments, the search skeleton is quite self-explanatory. It assumes all not explicitly declared identifiers to be suitably defined and initialized. Furthermore, the following two general observations are noteworthy.

- The result variable of the search function requires proper initialization in case of a selective search because all legal moves might get pruned.
- The score of a search whose mode of operation depends on the values of alpha or beta at the current node (e.g. extended futility pruning) must not be stored as an exact result in the transposition table. Storing it as a bound is often possible but requires careful handling, too.

```
int search(int alpha, int beta, int depth, int move, node parent) {
    node current;
    int extend, fmax, fprune, fscore, score, selective;
    /* execute the opponent's move and initialize some local variables */
    make_move(parent, move, &current);
    fprune = selective = 0;
    score = -INFINITY;
    /* determine if and how to extend the search at the current node */
    extend = extensions(depth, move, current);
    depth += extend;
    /* decide about limited razoring at pre-pre-frontier nodes */
    fscore = (mat_balance(current) + razor_margin);
    if (!extend && (depth==PRE_PRE_FRONTIER) && (fscore <= alpha)
          && (opposing_pieces(current) > 3)) depth = PRE_FRONTIER;
    /* decide about extended futility pruning at pre-frontier nodes */
    fscore = (mat_balance(current) + extd_futil_margin);
    if (!extend && (depth == PRE_FRONTIER) && (fscore <= alpha)) {
        fprune = selective = 1;
        score = fmax = fscore;
    }
    /* decide about selective futility pruning at frontier nodes */
    fscore = (mat_balance(current) + futil_margin);
    if (!check(move) && (depth == FRONTIER) && (fscore <= alpha)) {
        fprune = selective = 1;
        score = fmax = fscore;
    }
    /* "selective == 1" and "-INFINITY < score ≤ alpha" hold if
     * the search will be selective at the current node.
     *
     * continue like normal but prune all futile moves if "fprune == 1"
     */
    ...
    for (move=first(current), (move!=0), move=next(current,move))
        if (!fprune || check(move)            /* recursive search call */
                    || (fmax + mat_gain(move) > alpha)) {...}
    ...
}
```

Figure 1.1: Search with Extended Futility Pruning and Limited Razoring.

Practice

According to our quantitative experiments with *razor_margin* = *queen_val*, limited razoring at pre-pre-frontier nodes exhibits no measurable loss in tactical strength as compared with extended futility pruning alone. Yet it shrinks the search trees by additional 5%–15% on average at fixed search depths > 10 plies. Table 1.2 lists the according performance data as obtained by searching all 2180 positions of the ECM, WAC, and WCS test suites to fixed depths of 8, 10, and 12 plies with the 1997 WMCC version of DarkThought (see Appendix 1.3.8 for a detailed description of the exact experimental setup). The data shows that limited razoring hardly influences searches of fixed depths ≤ 10 plies but then really takes off at fixed depth of 12 plies. We observe even greater savings (10%–15%) in other test positions with deep solutions which need search depths ≥ 13 plies to be found.

Test Suite	**Extd. #Nodes**	**Extd. #Solved**	**+Razor Δ Nodes**	**+Razor Δ Solved**	(No.)
ECM–08	1,085,889,029	542 / 879	−0.91%	+0.92%	(+5)
ECM–10	7,640,512,567	636 / 879	−1.50%	0.00%	(0)
ECM–12	69,508,462,114	696 / 879	−9.64%	−0.43%	(–1)
WAC–08	125,494,781	285 / 300	−0.21%	0.00%	(0)
WAC–10	753,895,911	294 / 300	−1.93%	0.00%	(0)
WAC–12	6,308,884,467	296 / 300	−3.87%	0.00%	(0)
WCS–08	661,758,996	837 / 1001	−2.41%	−0.24%	(–2)
WCS–10	4,469,041,033	863 / 1001	−2.54%	+0.23%	(+2)
WCS–12	38,766,902,141	876 / 1001	−6.68%	+0.11%	(+1)
Sum–08	1,873,142,806	1664 / 2180	**−1.39%**	**+0.18%**	**(+3)**
Sum–10	12,863,449,511	1793 / 2180	**−1.89%**	**+0.11%**	**(+2)**
Sum–12	114,584,248,722	1868 / 2180	**−8.32%**	**0.00%**	**(0)**

Table 1.2: Performance of Extended Futility Pruning vs. Added Razoring.

Test Suite	**Normal #Nodes**	**Normal #Solved**	**Ex.+Rz. Δ Nodes**	**Ex.+Rz. Δ Solved**	(No.)
ECM–08	1,232,004,798	552 / 879	−12.66%	−0.91%	(–5)
ECM–10	8,823,781,692	642 / 879	−14.71%	−0.94%	(–6)
ECM–12	83,443,531,950	704 / 879	−24.73%	−1.28%	(–9)
WAC–08	146,094,041	285 / 300	−14.28%	0.00%	(0)
WAC–10	946,867,509	296 / 300	−21.92%	−0.68%	(–2)
WAC–12	8,998,551,515	296 / 300	−32.60%	0.00%	(0)
WCS–08	750,804,397	841 / 1001	−13.98%	−0.71%	(–6)
WCS–10	5,398,696,585	866 / 1001	−19.32%	−0.12%	(–1)
WCS–12	52,801,555,626	874 / 1001	−31.49%	+0.34%	(+3)
Sum–08	2,128,903,236	1678 / 2180	**−13.24%**	**−0.66%**	**(–11)**
Sum–10	15,169,345,786	1804 / 2180	**−16.81%**	**−0.50%**	**(–9)**
Sum–12	145,243,639,091	1874 / 2180	**−27.68%**	**−0.32%**	**(–6)**

Table 1.3: Performance of Normal vs. Extended Futility Pruning + Razoring.

Last but not least, we like to highlight the synergetic performance of both extended futility pruning and limited razoring combined. Table 1.3 presents the according data by comparing the normal version of DarkThought (see Section 1.3.5) with one that is identical except for the addition of extended futility pruning and limited razoring.

1.3.7 Conclusion

Extended futility pruning and limited razoring apply the futility idea to pre- and pre-pre-frontier nodes. Slight modifications and additions with respect to normal futility pruning provide the proper safety precautions that greatly reduce the selective risks of the new schemes. Extensive experiments with 2180 positions from the well-known test suites ECM, WAC, and WCS provide quantitative empirical evidence for the benefits of each scheme alone and of both combined. While scaling well with search depth and hardly compromising any tactical strength, extended futility pruning and limited razoring reduce the search effort of our strong and tournament-proven chess program DarkThought by additional 10%–30% on average at fixed search depths of 8–12 plies. Moreover, extended futility pruning demonstrated its practical viability with a successful real-life performance under tough tournament conditions during the 15th WMCC in October 1997. These convincing results show that statically selective forward-pruning techniques do not only promise some success but really deliver on making alpha-beta search more scalable at high search depths.

1.3.8 Appendix — Experimental Setup

- Test suites "Encyclopedia of Chess Middlegames" (ECM, 879 positions), "Win at Chess" (WAC, 300 positions), and "1001 Winning Chess Sacrifices" (WCS, 1001 positions) as available on the Internet,
- DarkThought as of October 31, 1997 with 8M transposition-table entries (4M per side), 1M King hash-table entries (512K per side), and 512K Pawn hash-table entries,
- Digital Unix 4.0b program development tools and operating system,
- 500MHz AlphaPC164 workstation (500MHz DEC Alpha-21164a EV56 CPU, 8KB/8KB on-chip I/D L1 caches, 96KB unified on-chip L2 cache, 1MB unified off-chip L3 cache, DEC PC164 mainboard, 8x16MB PS/2 SIMMs = 128MB RAM) as provided by Digital Equipment Corp. under external technology research contract DE-0032-97 entitled "Optimization and Fine-Tuning of a Sophisticated Tree-Searching Application for 64-bit Alpha CPUs".

1.4 Efficient Interior-Node Recognition

— Preprint of an article by Ernst A. Heinz in: ICCA Journal, Vol. 21(3), Sept. 1998 —

1.4.1 Abstract

This article re-examines the implications of *interior-node recognition* when focussing on its efficient yet seamless integration into modern chess programs. By means of a thorough discussion of its fundamental principles, we reveal various problems related to the practical application of interior-node recognition. Then, the rest of the article presents an implementation framework for recognizers that solves all known problems and has already proven its practical viability in our high-speed chess program DarkThought.

Among others we introduce the new concept of *material signatures* which allow for a quick and easy classification of chess positions into different categories of material distribution. By including material signatures in the internal representation of the chess board, they can incrementally be updated during the execution of moves. This makes the computation of material signatures extremely cheap in practice.

1.4.2 Introduction

Without knowing about Slate's 1984 article we independently reinvented his original "interior-node score bounds" [190]. Based thereon, we developed our own so-called "interior-node recognizers" and have used them in our chess program DarkThought [96] since its tournament début at the 8th World Computer-Chess Championship (WCCC) in Hong Kong, May 1995.

DarkThought is a fast yet sophisticated alpha-beta searcher using PVS/NegaScout [51, 174] with state-of-the-art enhancements like extended and normal futility pruning [95, 182, 216], internal iterative deepening [7, 184], dynamic move ordering (history+killer heuristic) [3, 76, 180, 183, 191], recursive null-move pruning [20, 62, 77], selective extensions [7, 17], and an extended transposition table [161, 191]. DarkThought routinely reaches 200K nodes per second (nps) and search depths of 11–13 plies in normal middlegame positions at tournament time-controls on a 500MHz DEC Alpha-21164a PC164 workstation. The search speed often doubles in endgame positions and actually peaks at 750K nps on the aforementioned hardware.

To the best of our knowledge, there exist no other published works about interior-node recognition than Slate's article written 14 years ago. At least somewhat related are two equally old articles by Beal who explored how to mix heuristic and perfect evaluations [22, 23]. In contrast to Slate's disjoint score bounds for these different kinds of evaluations (see Section 1.4.3), Beal's "nested minimax" solution requires the search to back up multiple values that indicate the degree of reliability for the resulting scores. But Beal's scheme combines poorly with alpha-beta pruning because it substantially reduces the number of possible cutoffs. Regarding research in another area, private communication with J. Schaeffer revealed that the reigning World Man-Machine Checkers Champion Chinook [176, 179] employs techniques that are similar in concept to interior-node recognition. Unfortunately, however, the Chinook team has not yet published anything as to this respect.

The strongest chess programs running on supercomputers of the early 1980s barely reached search depths of 8 plies in the middle game while processing around 20K nps. Thence, it is hardly surprising that Slate's article does not mention any efficiency problems related to the implementation of interior-node recognizers. This seems to have been no big issue back in 1984 because slow searchers usually tend to invest much effort into accurate evaluations. But at today's speeds of several hundred thousand nodes per second, the efficiency of the whole recognizer implementation matters a lot.

In the following sections we discuss and explain in detail how we solved all the conceptual and efficiency problems related to interior-node recognition if applied by a modern high-performance chess program. We seamlessly integrated interior-node recognition with the rest of our search (e.g. transposition tables) while never comprising any speed, knowledge, or accuracy. Our design and implementation proved their practical viability under tough tournament conditions during the 15th World Microcomputer Chess Championship (WMCC) in Paris, October 1997. The version of DarkThought competing there contained a lot of recognizers for many different types of endgame positions. With all its recognizers enabled and running on a cooled 767MHz DEC/Kryotech Alpha-21164a workstation DarkThought surpassed the magic speed limit of 1M nps during this event [82, 97].

1.4.3 Fundamentals of Interior-Node Recognition

The basic idea of interior-node recognition is really trivial yet extremely powerful. It simply says: stop the search immediately and cut the whole subtree when reaching a position with a known game-theoretical value (draw, loss, or win). At a first glance, this theoretically sound cutoff scheme looks easy to implement. But the practical consequences of integrating it into a game-playing alpha-beta searcher are highly complex.

In case of losses and wins, for instance, you cannot just return the same loss/win values as search results for all lost/won positions. Otherwise, the game-playing program will not make any progress in these positions because there is nothing to distinguish between them. Consequently, appropriate scoring functions need to be supplied for all recognized positions. While the recognizer scores must not interfere with mate and static evaluation scores, they should still provide a good estimate of the recognized game-theoretical value. Slate's concept of interior-node score bounds [190] solves this problem by reserving two normally unused ranges of values for recognizer scores. Figure 1.2 shows how neatly the new ranges fit directly in-between the usual mate and static evaluation scores.

–M ... –M+N	–R–K ... –R	–E ... 0 ... +E	+R ... R+K	M–N ... M–1
Mated-in-N	Recog-Loss	Eval. ↑ Scores	Recog-Win	Mate-in-N

$$-M \leq -M+N < -R-K < -R < -E < 0 < +E < +R < R+K < M-N \leq M-1.$$

Figure 1.2: Slate's Interior-Node Score Bounds.

During the 8th WCCC in 1995, DarkThought used an equivalent scoring scheme for its interior-node recognizers which included access functions to Thompson's 5-piece endgame databases [205]. Such databases combine neatly with interior-node recognition because they contain game-theoretical values for elementary positions. Thompson's endgame databases employ a distance-to-conversion rather than a distance-to-mate metric and thus do not return exact mate scores. Therefore, the recognizers converted the raw database results into a special recognizer score accounting among others for the material balance of the position.

We abandoned the scheme of interior-node score bounds in 1996 when it became clear that disjoint scoring ranges for recognizers and the static evaluation tend to introduce frequent scoring inconsistencies during iteratively deepened searches of high depths. The inconsistencies are caused by incomplete recognizer coverage of positions that represent subgames of other positions for which recognizers exist. Pawn (under-) promotions often lead to such subgames, especially if any recognized positions contain more than one Pawn per side. This kind of recognizer incompleteness is hard to avoid in practice unless the implementation restricts recognizers to solely trivial cases. Hence, in our opinion Slate's theoretically sound scheme of interior-node score bounds with disjoint ranges for recognizer results and static evaluation scores carries only little practical value for modern high-speed chess programs.

Other difficult problems caused by interior-node recognizers relate to their efficient implementation. First and foremost, the efficient selection of recognizers proves to be a challenging task. The problem is to decide at each node in the search tree whether the current position lends itself to recognition at all and, if so, how to select the appropriate recognizer. Please note as an important constraint that the recognizer selection constitutes just a tiny fraction of the whole work done at each node with an overall frequency of several hundred thousand times per second. Further efficiency problems and general conceptual complications arise during the algorithmic encoding of the underlying chess knowledge into the final recognizer functions.

1.4.4 Recognizers and Transposition Tables

Independent of any implementation details, interior-node recognizers may be viewed as access functions to permanent databases of omniscient search results. In this rather abstract respect recognizers resemble transposition tables which also serve as databases of search results and are found in all decent chess programs. Therefore, one must integrate recognizers with transposition tables if planning to augment the search by interior-node recognition. But despite its obvious importance Slate's article does not mention anything about this task. Hence, we developed our own new scheme for the efficient yet seamless integration of recognizers and transposition tables. In the remainder of this section, we explain and discuss the peculiarities of our new scheme in more detail.

The central idea of our scheme is to handle interior-node recognition conceptually like an additional transposition-table access that gets executed after the normal ones. Thus, the search only falls back on interior-node recognition if all probes in the standard transposition tables fail. This greatly reduces the number of recognition trials whenever the rate of successful probes in the standard transposition tables is high (e.g. in endgames).

Treating interior-node recognition conceptually like an access to a transposition table provides for other advantages as well. In particular, our integration framework actually requires the results returned by recognizer calls to contain more information than just plain scores. Like entries in transposition tables they must at least comprise bound information, too. The following subsections discuss the peculiarities of our scheme in more detail.

Recognizer Results

In order make recognizer results compatible with the results of probes from standard transposition tables, we compose them of bound and score information. Incorporating bounds into their results further increases the usefulness of recognizers because it enables them to return a meaning of the kind "this is at least/at most a draw/loss/win for Black/White". Furthermore, recognizer results may contain an expense indicator that tells the controlling search whether to store them directly into the standard transposition tables. For the sake of clarity, the following descriptions elaborate on each of the three proposed result items.

Bound. The bound information determines if the recognizer score is exact, a lower bound, or an upper bound. Because of the intended similarity we suggest to adopt the same values for identification of the different bounds as those already in place within the transposition tables. We introduce the special new bound value *fail_bound* for the sole purpose of signalling unsuccessful recognitions.

Expense. In general the search does not store results of successful interior-node recognitions directly into the standard transposition tables because they do not have a best move associated with them. Moreover, recognizer calls are normally much cheaper than even pure quiescence searches such that it does not make much sense to clog precious transposition entries with them. In case of really expensive recognition results (e.g. external endgame database values), however, direct storing might be beneficial. To this end the recognizer supplies the expense information as part of its result. Based thereon, the controlling search decides if it deems direct storing of the recognition result worthwhile.

Score. The score information features just the according numerical value.

Due to the diversity of information that our recognizer results contain, their handling after successful recognitions proves to be somewhat involved. Figure 1.3 provides the skeleton of a normal search function which outlines the necessary additions. Because of its verbose ANSI-C style and the numerous embedded comments, this search skeleton is quite self-explanatory. It assumes all not explicitly declared identifiers to be suitably defined and initialized. Please note how closely the actions resemble the handling of bounds and scores as read from standard transposition tables. Successful recognitions actually "massage" the search tree in a similar manner as successful accesses to transposition tables. Beside causing direct cutoffs by exact, fail-high, or fail-low scores, recognizer results may also shrink the alpha-beta window (raise alpha or lower beta) at the current node while the search still descends on its way down in the game tree. Upon lowering beta, the search skeleton carefully keeps track of the largest upper bound (denoted by *upper*) that it may return. It does so in the same way as it keeps track of the best score so far. Fail-high cutoffs respect this upper bound by returning the minimum of *upper* and the best score so far as their result. This works flawlessly because $beta \leq upper$ always holds.

```
int search(int alpha, int beta, int depth, int move, node parent) {
    node current; int score = -infinite_val; int upper = -score;
    /* execute the opponent's move and determine the search extensions */
    make_move(parent, move, &current);
    depth += extensions(depth, move, current);
    ...
    /* call recognizer and analyze the result in case of recognition success */
    {   recog recog_func = ...;
        recog_result rresult = recog_func(current);
        if (recog_success(rresult)) {
            /* extract bound, expense, and score from recognizer result */
            int bound, expense, rscore;
            recog_extract(rresult, &bound, &expense, &rscore);
            /* store results of expensive recognitions in transpos. table */
            if (store_directly_into_tt(expense))
                store_recog_into_tt(current, depth, rresult);
            /* handle recognizer results that are exact scores */
            if (bound == exact_bound) return rscore;
            /* handle recognizer results that are lower bounds */
            if (bound == lower_bound) {
                /* recognizer fail-high beta cutoff */
                if (rscore >= beta) return min(rscore, upper);
                /* raise alpha and the best score so far */
                if (rscore > alpha) alpha = rscore;
                if (rscore > score) score = rscore;
            }
            /* handle recognizer results that are upper bounds */
            if (bound == upper_bound) {
                /* recognizer fail-low alpha cutoff */
                if (rscore <= alpha) return rscore;
                /* lower beta and the best upper bound so far */
                if (rscore < beta)  beta  = rscore;
                if (rscore < upper) upper = rscore;
            }
        }
    }
    ...
}
```

Figure 1.3: Search with Result Handling of Successful Recognitions.

Recognizer Scores

In view of the hardly avoidable incompleteness of the recognizer coverage (see Section 1.4.3) we suggest to employ recognizer scores that are compatible with static evaluation scores. Hence, we base our recognizer scores mainly on the material balances of the according positions if neither draws nor mates get recognized.[7] Compatibility with static evaluation scores has the further advantage of enabling the implementation to replace expensive evaluations by cheap recognitions. Simply skip the calls of the static evaluation function in case of successful recognitions and reuse the already computed recognizer scores as static evaluation scores.

In order to illustrate how scoring functions for interior-node recognition work, we develop such functions for the well-known classes KBBK (with differently coloured Bishops) and KBNK of elementary endgames. The winning strategy for KBBK with is to drive the lone King into any corner and mate it there by a concerted effort of all three pieces. The strong King must approach the scene, too, because two minor pieces cannot mate on their own. The same winning strategy applies to KBNK with the notable exception that the lone King has to be driven into a corner controlled by the Bishop of the strong side. Therefore, the distance between the lone King and the nearest target corner as well as the distance between the lone and the strong King are important traits of the respective positions. Beside these explicitly obvious relations of the two Kings the recognizer scores should also reflect the different degrees of difficulty involved in winning KBBK (with a maximal distance-to-mate of 19 moves) in contrast to winning the much harder KBNK (with a maximal distance-to-mate of 33 moves).

The below two scoring functions *KBBK(p)* and *KBNK(p)* implement the above guidelines for given positions p with all minor pieces valued at 3.25 Pawns and *k_corner_dist()*, *kb_corner_dist()*, as well as *kk_dist()* suitably defined. Both scoring functions are efficient to compute and easy to implement. They let the search make progress in all recognized positions and channel it into greatly preferring KBBK over KBNK but not over positions where the winning side is up a Queen or more.

$$\begin{aligned}\mathbf{KBBK(p)} &= \mathit{material\_balance}(p) + \mathit{winning\_bonus}(p)\\ &= 6.5 + 2.5 - 0.25 * \mathit{k\_corner\_dist}(p) - 0.125 * \mathit{kk\_dist}(p)\\ &= \mathbf{9 - 0.25 * k\_corner\_dist(p) - 0.125 * kk\_dist(p)}\end{aligned}$$

$$\begin{aligned}\mathbf{KBNK(p)} &= \mathit{material\_balance}(p) + \mathit{winning\_bonus}(p)\\ &= 6.5 - 0.5 - 0.25 * \mathit{kb\_corner\_dist}(p) - 0.125 * \mathit{kk\_dist}(p)\\ &= \mathbf{6 - 0.25 * kb\_corner\_dist(p) - 0.125 * kk\_dist(p)}\end{aligned}$$

1.4.5 Efficient Detection and Selection of Recognizers

In order to select an appropriate recognizer for a given position you must first decide whether the position lends itself to recognition at all. This is an absolutely non-trivial task if executed at every node in the search tree with an overall frequency of several hundred thousand times per second. Moreover, it constitutes only a tiny fraction of the whole work done at each node.

[7]Please note that mates (as read from distance-to-mate endgame databases, for example) require special care, too, because standard quiescence searches (whether captures-only or checks included) can normally not return any real mate scores.

For the sake of simplicity and practical relevance let us assume that both sides can have at most 8 Pawns and 2 pieces of each kind. Under these simplified assumptions there are still $(3^4 * 9) * (3^4 * 9) = 3^{12} = 531441$ different constellations of material distribution for Black and White to decide between (four kinds of 0 to 2 pieces and 0 to 8 Pawns per side).

Of course, a lookup table with 531441 pointer elements referring to the according recognizers of the different material constellations provides a straightforward solution to the detection problem. Just mark all elements in the lookup table with the special value NULL if there are no recognizers available for their constellations. The major drawback of this easy yet naive solution springs from its huge memory consumption. The lookup table requires $531441 * sizeof(pointer)$ bytes of memory which roughly tranlsates to 2 MBytes in case of 4-byte pointers and to 4 MBytes in case of 8-byte pointers. Frequently accessed lookup tables of large sizes like these are horribly inefficient because they tend to thrash the data caches and other data paths of modern computers, thus causing the whole application to slow down considerably.

The remainder of this section discusses how to refine the straightforward approach into a viable solution by greatly reducing the size of the lookup table. During the course of our work we discovered that the most effective way to do so is by means of shrinking the index space of the table. The implementation of our final solution in DarkThought needs less than 1 KBytes of memory. It runs at a blazing speed and does not affect any other part of the program through cache thrashing or related effects.

Material Signatures

Our first refinement to the index scheme of the lookup table replaces the exact piece counts by 1-bit flags that solely indicate the presence of any Pawns or pieces of the respective kinds. The refined scheme treats both Pawns and pieces in an identical way. The new index function comprises ten 1-bit parameters which are simply concatenated to yield the index number. The ten 1-bit parameters naturally break up into two groups of five bits, namely one each for Pawns and the four kinds of pieces per side. The two groups of five 1-bit values represent the "material footprints" of their sides. The separate concatenation of the five 1-bit values on their own results in 5-bit strings that we use as signatures for the material states of both sides. Below we summarize some important properties of these novel *material signatures*.

Properties of Material Signatures in Chess

$$mstate(side,\, pos) = \sum_{k=0}^{4} \Big(2^k * has\_piece(side,\, pos,\, k)\Big) \in \{0 \ldots 31\}$$

$$\Downarrow \quad k \in \{0 \ldots 4\}$$

$$\begin{aligned} piece\_nr(side,\, pos,\, k) \neq 0 \iff & \; has\_piece(side,\, pos,\, k) \\ \iff & \; \Big(mstate(side,\, pos) \;\; \& \;\; 2^k\Big) \neq 0 \\ \iff & \; \Big((mstate(side,\, pos) \gg k) \;\; \& \;\; 1\Big) = 1 \end{aligned}$$

The integer values of material signatures range from 0 to $2^5 - 1 = 31$. Bit $k \in \{0 \ldots 4\} = \{Bishop, \ldots, Pawn\}$ of a material signature gets set if the side in question has at least one man of kind k on the board. Like other important state information in computer chess, material signatures lend themselves to efficient calculation by incremental updates during the execution of moves by the search. To this end DarkThought includes two material signatures in its internal representation of the chess board, namely one for Black and one for White.

With the material signatures of Black and White spanning its index space, the refined lookup table contains $2^{10} = 32 * 32 = 1024$ elements overall. Altogether the elements require $1024 * sizeof(pointer)$ bytes of memory which tranlsates to 4 KBytes in case of 4-byte pointers and to 8 KBytes in case of 8-byte pointers. Hence, the adoption of material signatures for indexing reduces the memory consumption of the lookup table more than 500-fold as compared with the initial naive approach from above. But even the refined lookup table still wastes a great deal of precious data-cache space due to poor information density. According to our extensive practical experiences with recognizers in DarkThought, most entries of the table tend to be NULL.

Further Empirical Refinements

Our aforementioned practical experiences gave rise to an empirical investigation of all positions for which we knew or at least imagined automatic interior-node recognition to be possible. The ensuing characterization of potentially recognizable positions showed the following.

- Nearly all potentially recognizable positions feature at most two pieces per side excluding Pawns.[8]
- Many potentially recognizable positions feature equal or at least partially inclusive material signatures for both sides.
- Many potentially recognizable positions feature a lone King.

Based on the last two observations above, we further refined the lookup table and achieved another 16-fold reduction of its index space in our current version of DarkThought. This decreased the number of elements in the lookup table to mere 64, resulting in a cache-friendly memory consumption of 256 bytes with 4-byte pointers and 512 bytes with 8-byte pointers.

The main idea of the new index scheme is to separate positions with lone Kings from the rest because only one of their two material signatures conveys interesting information. Hence, we split the lookup table into two halfs. In positions with a lone King the lower 32 entries correspond to the material signatures of the strong sides. The remaining positions get mapped to the upper 32 entries by combining the material signatures of both sides into a single value through a logical OR operation. With the material signatures of Black and White given by *b_mstate* and *w_mstate* respectively, the new index function allows for its efficient calculation as detailed below. Modern computers execute the six necessary operations in a few clock cycles after loading both material signatures into registers of their CPUs.

Efficient Index Calculation for Recognizer Lookup Table

$$\underbrace{(b\_mstate \mid w\_mstate)}_{\in \{0 \ldots 31\}} \quad + \quad \underbrace{32 * ((b\_mstate \neq 0)\ \&\&\ (w\_mstate \neq 0))}_{\text{(either 0 or 32, selects between lower and upper half)}}$$

A minor drawback of the efficient index scheme springs from its mapping behaviour. The logical OR operation combines several distinct material signatures into one and the same result. Thence, the new index function maps different constellations of material distribution to identical entries of the lookup table. The constellations KBKN, KBBKN, KBBKBN, KBBKNN, KBNKB, and KBNKBN are good examples for this peculiar mapping behaviour

[8]The only valid yet practically irrelevant counterexamples that we know of are positions with more than two equally coloured bishops for any side.

because logical OR combinations of their material signatures always yield BN = Bishop + Knight. Consequently, the recognizer functions referred to in the lookup table do not know the exact material constellations of the positions they receive in advance. Instead, they must dynamically determine the actual material constellations during each call in order to select the appropriate recognition procedure (e.g. KXXK versus KXK for any kind of piece X other than a King). Our implementation assists the dynamic selection process by means of efficiently accessible 4-bit counters for Pawns and each kind of pieces per side. DarkThought keeps the counters in its internal representation of the chess board and incrementally updates them whenever the search executes a move.

Furthermore, we make sure to avoid any senseless function calls in unrecognizable positions. Many such calls would normally ensue from the mapping behaviour of the new index scheme: KBBKBN, KBBKNN, and KBNKBN, for instance, are currently not recognizable but they get mapped to the same function pointer of the lookup table as KBKN for which an endgame database enables the perfect recognition. An additional lookup table with 1024 flag bits occupying just 128 bytes of memory provides an elegant solution for this problem. The new table employs the index scheme of the last section with fully concatenated material signatures of both sides. Each flag bit of this second lookup table indicates whether the function referred to by the main lookup table can really recognize positions with material constellations that correspond exactly to the full index of the second table. Hence, the additional lookup table allows for the quick and easy detection of superfluous function calls altogether. But it does not eliminate the minor drawback of mapping similar material constellations to the same entry of the recognizer lookup table (see above).

Thanks to the ample descriptions above, the implementation details of our final solution for the efficient detection and selection of recognizers should now be ready to understand. Figure 1.4 presents the skeleton of a normal search function that outlines the necessary additions. Its verbose ANSI-C style and the various embedded comments make this search skeleton quite self-explanatory. It assumes all not explicitly declared identifiers to be suitably defined and initialized. The search skeleton omits the handling of successful recognitions because we already outlined it on its own in Figure 1.3. What deserves special attention, however, is the design of the second lookup table hosting the 1024 availability flags. For the sake of efficient storage and access, we use an array of 32-bit unsigned integers to implement the table. While Black's material signature selects the array element, White's material signature extracts the desired bit of the selected value.

```
/* global declaration of tables for availability flags and recognizer functions */
unsigned int32 recog_avail[32];
recog recog_table[64];

/* macro definition for the detection of available recognizers */
#define recog_available(b_mstate, w_mstate) \
    ((recog_avail[(b_mstate)] >> (w_mstate)) & 1)

/* macro definition for the calculation of a recognizer index */
#define recog_index(b_mstate, w_mstate) \
    (((b_mstate) | (w_mstate)) + (32 * ((b_mstate) && (w_mstate))))

/* implementation of the central alpha-beta search function */
int search(int alpha, int beta, int depth, int move, node parent) {

    node current; tt_entry tt_ref; int hit, score = -infinite_val;

    /* execute the opponent's move and determine the search extensions */
    make_move(parent, move, &current);
    depth += extensions(depth, move, current);
    ...
    /* probe the transposition tables at the current node */
    hit = probe_transposition_tables(current, depth, &tt_ref);

    /* if the probe failed try to apply an appropriate recognizer */
    if (!hit) {
        /* determine material signatures for Black and White */
        unsigned b_mstate = black_mstate(current);
        unsigned w_mstate = white_mstate(current);

        /* detect the availability of an appropriate recognizer */
        if ((b_pieces(current) <= 2) && (w_pieces(current) <= 2)
              && recog_available(b_mstate, w_mstate)) {
            /* select the according recognizer function */
            recog recog_func = recog_table[recog_index(b_mstate,
                                                      w_mstate)];
            /* call the selected recognizer function */
            if (recog_success(recog_func(current)))
                {...}   /* handle the result of a successful recognition */
        }
    }
    ...
}
```

Figure 1.4: Search with Detection and Selection of Recognizers.

Last but not least, we like to sketch the proper initialization of the two lookup tables for availability flags and recognizers. Figure 1.5 shows the skeleton of an according initialization function containing all the necessary actions. As before, its verbose ANSI-C style and the embedded comments make the code easy to comprehend. The initialization skeleton implicitly reuses the global definitions of macros and variables from Figure 1.4. It of course assumes all other not explicitly declared identifiers to be suitably defined and initialized. As for the installation of new recognizers, it is important to note that the efficient index scheme of the recognizer lookup table is commutative in its parameters: *recog_index(x,y) = recog_index(y,x)*. Because such commutativity does not hold for the index scheme of the availability lookup table we must set two different flag bits therein for each new recognizer. These flag bits correspond to the two material constellations which result from interpreting two given material signatures *mstate_1, mstate_2* as representing either Black and White or White and Black respectively.

```
/* installs the given func. as a recognizer for the desired material constellation */
void new_recog(recog func, unsigned mstate_1, unsigned mstate_2) {
    /* set the according flag bits in the availability lookup table */
    recog_avail[mstate_1] |= (1 << mstate_2);
    recog_avail[mstate_2] |= (1 << mstate_1);
    /* enter the given function into the recognizer lookup table */
    recog_table[recog_index(mstate_1, mstate_2)] = func;
}
/* initializes the lookup tables of availability flags and recognizer functions */
void init_recognizers(void) {
    /* initialize both lookup tables with their respective zero values */
    unsigned i; for (i = 0; i <= 31; i++) {
        recog_avail[i] = msig(0,0,0,0,0);    /* B, N, Q, R, P = 0 */
        recog_table[i] = NULL;
    }
    /* install the available recognizer functions in both lookup tables */
    /*          recog. func.          B N Q R P          B N Q R P   */
    new_recog(kb_k_recog,  msig(1,0,0,0,0), msig(0,0,0,0,0));
    new_recog(kq_kr_recog, msig(0,0,1,0,0), msig(0,0,0,1,0));
    ...
}
```

Figure 1.5: Initialization of Lookup Tables for Flags and Recognizers.

1.4.6 Recognizer Functions

The latest version of DarkThought features high-speed recognizers for the following classes of endgame positions with little material on both sides.

- KK, KBK, KNK (always drawn),
- KBKB, KBKN, KNKN (normally drawn but exceptional wins possible for any side by mates in 1 move),
- KBBK, KBNK (normally won for the strong side but exceptional draws possible by stalemate or by conversion to KBK and KNK),

- KNNK, KNNKB, KNNKN (normally drawn but exceptional wins possible for any side by mates in ≤ 7 moves),
- KQX*K, KRX*K (normally won for the stronger side but exceptional draws possible by stalemate or by conversion to drawn subgames, X* = arbitrary major and minor pieces),
- KPPP*K (sophisticated detection of draws, P* = one or more Pawns),
- KBP*K, KBP*KB, KBP*KN (sophisticated detection of draws for bishops of wrong colour, P* = one or more Pawns),
- KPK, KQK, KRK (3-piece endgame databases),
- KBKP, KBPK, KNKP, KNPK, KPKP, KPPK, KQKB, KQKN,
  KQKP, KQKQ, KQKR, KRKB, KRKN, KRKP, KRKR
  (4-piece endgame databases).

It goes without saying that we continously search for new classes of positions that allow for their efficient interior-node recognition. We definitely want to add many more recognizer functions in the near future. In this respect, database recognizers for 5-piece endgames are promising candidates. According to our experiences with past versions of DarkThought, however, the recognition of and accesses to 5-piece endgame databases require careful fine-tuning until they perform at acceptably high speeds.

Implementation Example

In general recognizer functions must distinguish between three different types of recognitions corresponding to the different modes of their results (bound, exact, or fail). For any KB[B]K recognizer that does not access endgame databases taken as an example, this implies to detect the three conditions below.

1. KB[B]K is drawn if the Bishops cover squares of a single colour only. Then, the strong side is unable to mate the lone King and the KB[B]K recognizer can return an exact result with a draw score.
2. The lone King might still draw if it attacks a bishop (possible conversion to drawn KBK) or if it stands on any edge of the board with the strong King near (possible stalemate). In both cases, the KB[B]K recognizer has to back off and return a recognition failure as its result.
3. All other KB[B]K positions feature a winning KBB side and the recognizer can return bounded scores that indicate the great advantage.

Thanks to the KBBK scoring function from Section 1.4.4, we already know how to calculate the bounded scores for a winning KBB side. Now we simply put everything together in order to implement a working function for our KB[B]K example. Figure 1.6 presents an according skeleton for a KB[B]K recognizer function in ANSI-C. The skeleton outlines the decision procedure of the recognizer that evaluates the above three conditions and returns the appropriate results. As usual it assumes all not explicitly declared identifiers to be suitably defined and initialized.

```
/* interior-node recognizer for all KB[B]K endgame positions */
recog_result kb_k_recog(node kb_k_pos) {
    int recog_bound, recog_score;
    /* return an exact draw score if the KB[B] side is unable to mate */
    if (kb_cannot_mate_k(kb_k_pos))
        return recog_value(exact_bound, low_expense, draw_score);
    /* return a recognition failure if the lone King might still draw */
    if (k_attacks_kb_bishop(kb_k_pos) || kb_may_stale_k(kb_k_pos))
        return recog_value(fail_bound, 0, 0);
    /* calculate the KB[B] score and initialize the recognizer bound */
    recog_bound = lower_bound;
    recog_score = (9 * pawn_val) - kk_dist(kb_k_pos) * (pawn_val / 8)
                    - k_corner_dist(kb_k_pos) * (pawn_val / 4);
    /* invert both the bound and the score if the lone King is to move */
    if (lone_k_to_move(kb_k_pos)) {
        recog_bound = upper_bound;
        recog_score = -recog_score;
    }
    /* return a bounded recognizer result if the KB[B] side definitely wins */
    return recog_value(recog_bound, low_expense, recog_score);
}
```

Figure 1.6: Recognizer Function for KB[B]K Endgame Positions.

1.4.7 Discussion and Conclusion

Position #23 (FEN "8/7p/8/p4p2/5K2/Bpk3P1/4P2P/8 w – –") of the well-known test suite BT-2630 exemplifies what interior-node recognizers are capable of. This endgame position features little material on both sides (KBPPP vs. KPPPP) and it requires White to play "g4" immediately in order to win. The table below shows that with the help of its recognizers DarkThought manages to solve the position after roughly a second in iteration #10 while running on a 500MHz DEC Alpha-21164a PC164 workstation. Without the recognizers, however, it takes DarkThought 2:24 minutes, 47 million additional nodes, and 8 more plies of search depth to do so.

BT-2630: Pos. #23	**With Recognizers**	**Without Recognizers**
Solved in Iteration	10	18
Time to Solution	1 sec	144 sec
#Nodes to Solution	351,263	47,531,238
Search Speed	325K nps	327K nps

These impressive differences spring to a large part from the added knowledge of the recognizers. Any chess expert who knows about the great importance of knowledge in endgames will agree that this example is not artificially constructed. The recognizers of DarkThought behave like this in countless other endgame positions with little material on both sides, too. But comparisons of different versions of the same program with and without recognizers do not allow for a sound quantification of the recognizer framework alone. They rather measure the combined merits of both the recognizer implementation and the added recognizer knowledge. Because this knowledge could also be implemented by other means than interior-node recognition (e.g. in the static evaluation function), we need to compare our recognizer implementation with full-fledged alternative implementations of the whole recognizer knowledge in order to measure the effectiveness of the recognizer framework *per se*.

We deem the usefulness of such comparisons far too low as to justify their substantial implementation efforts. The advantages of recognizers over other forms of the respective knowledge are quite obvious in our opinion. We are convinced that most readers will agree with us on this issue after reading the following brief summary about recognizers and their distinguishing features.

- Interior-node recognition applies the knowledge at the earliest possible time during the search. It can cause direct cutoffs of complete subtrees and it "massages" the game tree already on the way down of the search by tightening the alpha-beta bounds.
- Bounded recognizer results enable the painless implementation of inexact knowledge like "this position is at least/at most a draw/loss/win for Black/White".
- Recognizer functions encapsulate handy chunks of knowledge that are completely independent of each other.
- Accesses to endgame databases integrate perfectly with interior-node recognition (simply code them into appropriate recognizer functions).
- Successful recognitions reduce the number of expensive static evaluations by reusing the normally much cheaper recognizer scores instead.
- Efficient implementation schemes make our recognizer framework extremely fast such that it does not slow down the search at all.
- Material signatures are useful for many other important tasks beside the detection and selection of recognizers.

Last but not least, we invite all interested readers and especially the still skeptic ones to take a closer look at the latest test games of DarkThought as published on our WWW pages at <http://wwwipd.ira.uka.de/Tichy/DarkThought/>. In many of these games DarkThought easily outplayed its strong commercial opponents in endgames with little material on both sides. The portrayed strength of DarkThought in such positions clearly springs from its high-speed endgame recognizers. They turned many objectively lost games into draws and correspondingly drawn games into wins. The strength of the recognizers also surfaced during several electronic discussions on the Internet. DarkThought routinely solved difficult endgame positions much faster than most other strong chess programs involved in the testing.

1.5 DarkThought Goes Deep

— Preprint of an article by Ernst A. Heinz in: ICCA Journal, Vol. 21(4), Dec. 1998 —

1.5.1 Abstract

This article follows up on the work by Hyatt and Newborn who let Hyatt's chess program CRAFTY "go deep" in 1997. We repeated Hyatt and Newborn's experiment with our own chess program DARKTHOUGHT and obtained similar experimental results as originally reported by Hyatt and Newborn with CRAFTY. Both experiments provide strong empirical evidence for the surprising observation that even at high search depths of 11–14 plies modern chess programs steadily discover new best moves in still 16% of all searches on average.

Moreover, the experiments do not reveal any conclusive trend towards fewer new best moves at search depths beyond 14 plies. Hence, the available experimental results do not really fuel the intuitive notion that such "changes of mind" taper off continuously with increasing search depths. If at all, only the behaviour of DARKTHOUGHT with a drop to 13.7% new best moves on average in iteration #14 hinted at further decreasing "changes of mind" for search depths of 15 plies and more

Additionally gathered data about the 14-ply searches of CRAFTY and DARKTHOUGHT allowed us to study the behaviour of both programs in greater detail. This led to the astonishing finding that regardless of the actual search depth sizable 30%–50% of all new best moves on average represented "fresh ideas" which the programs never deemed best before. The finding adds support to Newborn's hypothesis about the playing strength of chess programs as initially formulated in 1985. Furthermore, the new data educated us about continuing odd/even instabilities of modern chess programs. These instabilities decreased notably only at high search depths of 9–14 plies in positions with reduced material as they mostly occur in endgames and late middlegames.

1.5.2 Introduction

Deep searches with far look-ahead continue to fascinate the whole computer-chess community because they promise to achieve ever stronger play for all decent programs. Thompson pioneered the scientific investigation of the general relation between search depth and playing strength in chess programs by his famous self-play experiments with the then reigning World Computer Chess Champion BELLE in the early 1980s [57, 58, 206]. His experiments led to the surprising result that the playing strength of BELLE increased almost linearly with search depth by roughly 200 rating points per ply for full-width searches of fixed depths ranging from 3–9 plies. Several other researchers later confirmed Thompson's findings by self-play experiments with their own chess programs HITECH, PHOENIX, THE TURK, and ZUGZWANG [28, 121, 158]. In Figure 1 of their article [121] Junghanns et al. showed that in all these cases the winning percentages of the program versions searching one ply deeper than their direct siblings remained range-bound between 70%–80% with no clearly visible, let alone statistically significant, average downward trends at the end of the 9-ply data curves. We thoroughly discuss the above mentioned self-play research and further related works in Section 1.5.3.

In 1985 Newborn [163] introduced a technique different from self-play in order to study the general relation of search depth and playing strength in chess programs. The rationale of Newborn's novel approach sprang from the assumption that new best moves as discovered by chess programs at higher search depths ought to represent better choices than the best moves preferred at shallower depths. To this end, Newborn tracked the according behaviour of BELLE for searches to fixed depths of 11 plies on a set of 447 test positions from real games. The close correlation of his data with Thompson's earlier self-play results made Newborn propose an interesting hypothesis concerning the playing strength of chess programs that we elaborate on in Section 1.5.4.

Unfortunately, Newborn's new experimental methodology of observing the behaviour of deep searches did not gain much popularity. Nobody followed his initial example until Junghanns et al. let PHOENIX and THE TURK search roughly 1,000 positions from self-play games to fixed depths of 9 plies while recording all the new best moves beside other information [121]. In 1997 Hyatt and Newborn himself then conducted another behavioural experiment with Hyatt's chess program CRAFTY searching 347 new test positions to a fixed depth of 14 plies each [114]. This experiment revealed the astonishing fact that the rate of new best moves as chosen by CRAFTY at high search depths of 9–14 plies remained quite steady around 15%–17% on average and hardly decreased anymore. In order to check whether this exceptional behaviour may actually hold for modern chess programs in general or if it was only an artifact of the specific CRAFTY implementation as used by Hyatt and Newborn in 1997, we repeated their experiment with our own chess program DARKTHOUGHT [96].

DARKTHOUGHT is a fast yet sophisticated alpha-beta searcher using PVS/NEGASCOUT [51, 174] with state-of-the-art enhancements like extended and normal futility pruning [95, 182, 216], internal iterative deepening [7, 184], dynamic move ordering (history+killer heuristic) [3, 76, 180, 183, 191], recursive null-move pruning [20, 62, 77], selective extensions [7, 17], interior-node recognizers [94], and an extended transposition table [161, 191]. DARKTHOUGHT routinely reaches 200K nodes per second (nps) and search depths of 11–13 plies in normal middlegame positions at tournament time-controls on a 500MHz DEC Alpha-21164a PC164 workstation. The search speed often doubles in endgame positions and peaks at 750K nps on the aforementioned hardware. Although CRAFTY and DARKTHOUGHT share many basic design principles, they also feature substantial differences regarding such fundamental issues as node expansion, position evaluation, and search strategy. In particular, DARKTHOUGHT seems to be much more selective than CRAFTY in the full-width part of its search (e.g. extended futility pruning). Besides, it relies on lazy alpha-bounding for the top-level search at the root node [96] and thus delays the full resolution of new best moves as long as possible (preferrably to the next iteration). Last but not least, DARKTHOUGHT does not employ fractional extensions which are among the specialities of CRAFTY. Overall we deem it fair to say that both programs sufficiently resemble each other and at the same time differ enough from one another in order to make comparative evaluations of their search depths meaningful.

Hyatt and Newborn relied on more than 20 volunteers to execute the 14-ply searches for the 347 test positions on heterogeneous PC-class machines at speeds of 25K–100K nps. Despite this highly distributed setting, their whole experiment still took about three weeks to complete. We succeeded in repeating the whole experiment in only four and a half days with DARKTHOUGHT running at an average speed of 250K nps each on 8x 500MHz DEC Alpha-21164a PC164 workstations. During the searches we let DARKTHOUGHT record more information about the new best moves at every iteration than what Hyatt and Newborn originally studied for their experiment in 1997. With the help of an automated Perl script we also derived the equivalent additional data for CRAFTY from Hyatt and Newborn's publicly available result file. We present a detailed discussion of our new experimental results for DARKTHOUGHT and CRAFTY in Section 1.5.6.

1.5.3 Relating Search Depth to the Strength of Chess Programs

To the best of our knowledge, Gillogly and Newborn in 1978 independently reported the earliest attempts at modeling the relationship between the playing strength of chess programs on one hand and the available computing power or search depth on the other. Gillogly introduced his so-called "technology curve" [75] that plotted the playing strength against what he called "machine power" on a logarithmic scale. Newborn related the numbers of nodes as searched by different chess programs in three minutes (average time per move in tournament games) to the playing strengths of the very same programs as derived from their actual performances in tournaments [164, 165]. Later on, Levy [138] and Levy and Newborn [131] refined Newborn's initial scheme by contrasting the highest rated tournament performances of the best chess programs with the years of their achievement. All these comparisons inevitably led to speculative extrapolations of the graphs which Levy characterized to the point as the "meta-science of prediction in computer chess" in his latest article about the subject in 1997 [130].

Self-play matches as pioneered by Thompson with his chess machine BELLE in 1982 [206] represent a more rigorous method of investigating the relationship between available computing power or search depth and the playing strength of chess programs. A great advantage of such matches is that the encountered winning percentages quantify the differences in playing strength of the various participating versions of the same program. Despite lingering doubts and questions regarding the magnitude of self-play rating differences [28], many researchers felt and still feel that self-play is the best of the available approaches in order to assess the expected "diminishing returns" of additional search in chess. In the context of self-play matches the presence of diminishing returns should lead to notably reduced winning percentages of the deeper or longer searching program versions with the progression towards higher search depths and search times.

Up to now nobody proved the existence of diminishing returns for self-play in computer chess by means of statistically significant experiments. For matches of only 20 games, even high winning percentages of 70%–75% barely suffice to decide with good confidence that the victor is indeed stronger than his opponent in general. Consequently, such small sample sizes do not allow for any confident quantification of the absolute rating differences between the opponents. In order to confidently assess rating differences of 70 points we need about 500 games per match and for differences of 40–50 rating points the number of necessary games per match increases to 1000. Hence, we completely agree with Mysliwietz [158] who already criticized the statistical uncertainty of many famous self-play experiments in computer chess back in 1994. Based on these explanations it is now easy to understand why we label many experimental results as "not statistically significant" while describing all prominent self-play experiments in computer chess below.

1982: Thompson [206]. Thompson's pioneering experiment featured 100 self-play games with matches of 20 games each between versions of BELLE differing by exactly one ply in lookahead for fixed search depths of 3–8 plies. The gain in playing strength averaged at 246 rating points per ply of search. The experiment showed no diminishing returns at any search depth but its results are not statistically significant anyway.

1983: Condon and Thompson [57]. In the second experiment, Condon and Thompson let BELLE self-play 300 games in round-robin style with matches of 20 games each between all program versions for fixed search depths of 3–9 plies. The gain in playing strength averaged at 217 rating points per ply of search. Now the observed ratings hinted at limited diminishing returns from a fixed search depth of 6 plies onwards. Yet the results of the experiment are not statistically significant.

1988: Szabo and Szabo [198]. The two Szabos determined the technology curve of their chess program TECHMATE that self-played 6882 games on two Atari ST computers linked together via their MIDI ports. The number of games per match between longer and shorter searching versions of the program varied strongly from a minimum of 32 to a maximum of 1367. The gain in playing strength averaged at 156 rating points per doubling of available search time (computing power). The experimental data indicated slight diminishing returns at longer search times. Several results from the experiment are statistically significant. Unfortunately, however, this does not hold for the results of the most interesting program versions with really long search times. They simply did not play enough games to draw reliable conclusions.

1990: Berliner et al. [28]. The HITECH team made their chess machine self-play 1056 games in a round-robin setting with matches of 16 games each between all program versions of HITECH and LOTECH (a variant of HITECH scaled down knowledge-wise) for fixed search depths of 4–9 plies. The gain in playing strength averaged at 195 rating points per ply of search for HITECH and at 232 rating points per ply for LOTECH. The overall ratings showed signs of limited diminishing returns starting at a fixed search depth of 6 plies. But there was no clear trend of diminishing returns at higher search depths and the experimental results are not statistically significant.

1994: Mysliwietz [158]. In his own experiment, Mysliwietz let the parallel chess program ZUGZWANG self-play 450 games with 50 games per match between program versions that differed roughly by a factor of 2 in search speed due to varying numbers of allotted processors. The gain in playing strength averaged at 109 rating points per doubling of search speed for 9 successive doubling steps. The observed ratings do not exhibit any diminishing returns at all. Most of the match results from this experiment are statistically significant in the sense that they allow for the discrimination of stronger and weaker opponents with 95% confidence. The true general rating gain for the version of ZUGZWANG used in the experiment lay in the estimated range of 76–143 points per ply of search with 95% confidence. Thence, Mysliwietz's experiment does neither support nor falsify the hypothesis of diminishing returns for self-play of ZUGZWANG with good confidence.

1997: Junghanns et al. [121]. The self-play experiment with Junghanns' chess program THE TURK featured 480 games with matches of 80 games each between program versions differing by exactly one ply in lookahead for fixed search depths of 3–9 plies. The gain in playing strength averaged around 200 rating points per ply of search.[9] The winning percentages of the deeper searching versions of THE TURK actually increased steadily from fixed search depths of 6 plies onwards, thus even hinting at additional gains in returns for higher search depths rather than diminishing ones. The match results from this experiment are statistically significant in the sense that they allow for the discrimination of stronger and weaker opponents with 95% confidence. As in the case of Mysliwietz's experiment, however, the resulting data of the THE TURK neither supports nor falsifies the hypothesis of diminishing returns for self-play of this program with good confidence.

In their article Junghanns et al. [121] then continued to look for diminishing returns by means of other metrics than self-play. They finally claimed to have found empirical evidence in this respect. According to their explanations the low search quality of chess programs (i.e. their high error probability) and the abnormally large lengths of self-play games inadvertently hide the doubtlessly existent diminishing returns in computer chess. Although we greatly

[9] We estimated this number because the original text only gives the winning percentages but not the absolute rating differences.

appreciate Junghanns et al.'s new trial aimed at the better understanding of diminishing returns in computer chess, we are not convinced that their claims hold when subjected to rigorous methodological and statistical testing. In our opinion the quest for indisputable and statistically significant demonstrations of diminishing returns for additional search in computer chess still remains to be concluded.

1.5.4 Newborn's Hypothesis Concerning the Strength of Chess Programs

In 1985 Newborn discovered that the self-play results of BELLE correlated closely with the rates of new best moves as chosen by it during searches to fixed depths of 11 plies on a set of 447 test positions from real games. Moreover, the behaviour of TECH III [199] during searches to fixed depths of 11 plies for the 300 well-known "Win At Chess" test positions resembled the behaviour of BELLE during its equally deep searches. Based on these two observations Newborn [163] formulated an interesting hypothesis concerning the playing strength of chess programs in general. His hypothesis relates the increases in playing strength for deeper searches to the rates of new best moves as chosen at consecutive search depths (deeper versus shallower). Specifically, let $BC(k)$ denote the rate or number of new best moves as observed in iteration $\#k$ and let $RI(k)$ denote the actual increase in playing strength for searches of depth k in comparison with searches of depth $k-1$.

Newborn's Hypothesis. Suppose values for $BC(k)$, $BC(k+1)$, and $RI(k)$ have been determined over a wide sample of game positions. When going from searches of depth k to searches of depth $k+1$, the rating of the program in question can then be expected to improve by

$$RI(k+1) = RI(k) * \frac{BC(k+1)}{BC(k)} .$$

The hypothesis intuitively relies on the straightforward yet very important assumption that the new best moves as determined by deeper searches are of higher quality than the existing best moves which they displace. If this fundamental rationale is not fulfilled, the hypothesis does not make much sense at all. Please imagine a chess program that simply switches back and forth between a few good moves all the time. Such behaviour does surely not increase the playing strength of the program at any search depth. Therefore, the discovery of "fresh ideas" (e.g. new best moves which the program never deemed best before) looks like a much better and more meaningful indicator of increases in playing strength than just the change of the preferred choices. Surprisingly enough, nobody seems to have investigated this aspect of Newborn's hypothesis prior to us. In Section 1.5.6 we present empirical evidence that supports the validity of the hypothesis in this respect. According to the experimental results of both CRAFTY and DARKTHOUGHT sizable 30%–50% of all new best moves as chosen by modern chess programs represent "fresh ideas" on average.

Newborn's hypothesis neatly fitted the results of the self-play experiments and the behavioural experiments to fixed search depths of 11 plies as available for BELLE in 1985. To the best of our knowledge, however, no researcher ever tested the validity of the hypothesis for higher search depths than 11 plies nor for other chess programs than BELLE. Nevertheless, in 1997 Hyatt and Newborn [114] applied the above formula of expected rating increase for an additional ply of search to their experimental results of CRAFTY in order to calculate "extrapolated" ratings of the program at search depths of 6–14 plies. They seeded their calculations with the according ratings of BELLE from 1985 as given values for the 4-ply and 5-ply searches. Hyatt and Newborn obviously interpreted the similar search behaviours of BELLE and CRAFTY on different sets of test positions as sufficient reason to assume the validity of Newborn's hypothesis for CRAFTY as well.

We object to Hyatt and Newborn's "extrapolation" because in our opinion neither the application of the hypothesis itself nor the repeatedly recursive style of its application were appropriate in this case. First and foremost, there exist no published results of self-play experiments for CRAFTY at any fixed search depths such that not even a single value of $RI(k)$ could be determined in compliance with the prescriptions of the hypothesis. Instead, Hyatt and Newborn rather calculated them too by repeatedly applying the recursive formula of expected rating increase to each additional ply of search. This essentially means that Hyatt and Newborn employed the hypothesis in order to derive assumedly independent preconditions of itself. These fabricated preconditions then served as the basis for the next true application of the hypothesis yielding the calculation of an absolute rating and so forth. Thence, the ratings of CRAFTY as postulated by Hyatt and Newborn in Figure 7 of their article (e.g. 2601 points at a fixed search depth of 11 plies and 2983 points at a fixed search depth of 14 plies) lack real substance.

1.5.5 Corrected Test Positions

As offered by Hyatt and Newborn in 1997, we obtained their 347 original test positions from <ftp://ftp.cis.uab.edu/pub/hyatt/plytest/positions.gz>. To our utter suprise we discovered that the original test positions still contained 4 doubles and 4 other errors in their FEN specifications although they were already used in Hyatt and Newborn's experiment. We cross-checked our discovery by inspecting Hyatt and Newborn's publicly available result file from <ftp://ftp.cis.uab.edu/pub/hyatt/plytest/results.gz>. There, the suspected errors and doubles were indeed visible in the output of CRAFTY (wrong castling rights in position #34, Pawn on 8th rank in position #90, and two black Kings in position #255). We removed the doubles and corrected the errors as described below. Overall, we were left with 343 corrected test positions to conduct our own experiment with.[10]

- Doubles occurred in the original positions #1 and #16, #44 and #47, #115 and #279, and #240 and #247 which are pair-wise identical.
- The FEN specification of position #34 mis-spelled the castling rights as `Kqkq` instead of the correct `KQkq`.
- The FEN specification of position #90 placed a non-existent Pawn on the 8th rank by reading `pr4k1/` instead of the correct `1r4k1/`.
- The FEN specification of position #255 placed a second black King on the 1st rank by reading `/1r3k2` instead of the correct `/1r3K2`.
- The move information associated with position #61 suggested to play the impossible `Rxf7` instead of the correct `Ng5`.

1.5.6 Experimental Results

Before the start of the experiment we decided to broaden our behavioural studies of deep searches with respect to Hyatt and Newborn's original setup. Because of these extended objectives we let DARKTHOUGHT record more detailed information than just the search depth at which the best move changed as compared with the previous iteration. While searching each of the 343 corrected test positions to a fixed depth of 14 plies, DARKTHOUGHT also determined whether the new best move after the current iteration was "fresh" in the sense that it never

[10] Hyatt and Newborn will most probably correct their publicly available files, too.

constituted the best move at the end of any former iteration. Moreover, DarkThought tracked all the instances where the new best move after the current iteration was the same as the best move of two or three iterations ago. In these cases there are typically several good moves with nearly equal scores that compete for the pole position and cause frequent changes of the best moves in consecutive iterations. The well-known and wide-spread instability of searches at odd and even depths belongs to this behavioural category with the new best move after the current iteration being the same as the best move of two iterations ago.

In order to formalize the above explanations of what DarkThought recorded, we let $B(i)$ denote the best move after iteration i. The columns "Best Change", "Fresh Best", "(I – 2) Best", and "(I – 3) Best" of the forthcoming tables (Table 1.5 – Table 1.12) list the numbers of positions for which the following conditions held after the search completed iteration i.

- **Best Change:** $B(i) \neq B(i-1)$.
- **Fresh Best:** $B(i) \neq B(j)$ for all $j < i$.
- **(I – 2) Best:** $B(i) = B(i-2)$ & $B(i) \neq B(i-1)$.
- **(I – 3) Best:** $B(i) = B(i-3)$ & $B(i) \neq B(i-2)$ & $B(i) \neq B(i-1)$.

We also derived these four relations for Crafty by applying a short Perl script to Hyatt and Newborn's publicly available result file (see Section 1.5.5). The script automatically computed the complete result data of Crafty as listed in the tables of this section. The data includes all the additional information for Crafty that equals the special recordings of DarkThought. Therefore and because we eliminated the doubles from the original set of test positions, we could not reuse the experimental results as originally published by Hyatt and Newborn in 1997. Furthermore, Hyatt and Newborn's numbers differ from those that our Perl script produces for Crafty from Hyatt and Newborn's original result file which spans the full set of 347 test positions (see Appendix 1.5.11). Hence, we consistently refer to our own numbers throughout the whole section.

The experimental results as published by other researchers correspond exactly to our "Best Change" columns. Up to now, nobody except Junghanns et al. [121] ever mentioned any further characteristics of the new best moves. In this respect we advance the state-of-the-art by studying some interesting relations between all new best moves ("Fresh Best") and sequences of two or three successive new best moves ("I – 2 / I – 3 Best") that occur during single searches of modern chess programs. The remainder of this section presents the collected data and discusses our interpretation of the raw numbers in detail. For a description of the exact experimental setup of DarkThought please see Appendix 1.5.9.

"Best Change" Rates for All Test Positions

Table 1.4 summarizes the "Best Change" rates $BC(i)$ and their estimated standard deviations = standard errors $s(i) = \sqrt{BC(i) * (1 - BC(i))/343}$ as observed in our experiment for all 343 corrected test positiosn at search depths of 2–14 plies. These percentages of DarkThought closely resemble the according numbers of Crafty from 1997 for the same set of positions and search depths as well as the numbers of Belle from 1985 for a different set of 447 test positions and search depths of 4–11 plies [163]. For the convenience of the reader and in order to make our subsequent discussions more transparent, we also include the numbers of Belle and Crafty in Table 1.4 showing them side-by-side with our own new data of DarkThought.

Search Depth	Belle 1985	(Standard) (Error)	Crafty 1997	(Standard) (Error)	DarkThought 1998	(Standard) (Error)
2	– –	– –	38.78%	(2.63%)	35.28%	(2.58%)
3	– –	– –	36.73%	(2.60%)	39.65%	(2.64%)
4	33.10%	(2.23%)	30.61%	(2.49%)	31.78%	(2.51%)
5	33.10%	(2.23%)	30.32%	(2.48%)	29.45%	(2.46%)
6	27.70%	(2.12%)	27.41%	(2.41%)	24.49%	(2.32%)
7	29.50%	(2.16%)	24.49%	(2.32%)	21.28%	(2.21%)
8	26.00%	(2.07%)	22.45%	(2.25%)	25.07%	(2.34%)
9	22.60%	(1.98%)	** 18.37% **	(2.09%)	21.57%	(2.22%)
10	** 17.70% **	(1.81%)	17.20%	(2.04%)	24.20%	(2.31%)
11	18.10%	(1.82%)	16.62%	(2.01%)	** 17.49% **	(2.05%)
12	– –	– –	16.91%	(2.02%)	15.45%	(1.95%)
13	– –	– –	14.58%	(1.91%)	16.62%	(2.01%)
14	– –	– –	15.45%	(1.95%)	$_{**}$13.70%$_{**}$	(1.86%)

Table 1.4: "Best Change" Rates of Belle, Crafty, and DarkThought.

The table illustrates that BELLE, CRAFTY, and DARKTHOUGHT feature very similar "Best Change" behaviours on average. This is quite surprising if you consider the substantial differences of the three programs regarding such fundamental issues as node expansion, position evaluation, and search strategy. The experimental results of DARKTHOUGHT support the pioneering findings of Hyatt and Newborn at high search depths of 12–14 plies in particular. For these search depths the "Best Change" rates of both CRAFTY and DARKTHOUGHT stayed range-bound around 16%. As a tentative conclusion we conjecture that the three columns of Table 1.4 taken together provide convincing empirical evidence that the very gradual decreases of the "Best Change" rates at high search depths are not only artifacts of specific implementations but rather represent an actually general phenomenon of chess programs which rely on depth-first alpha-beta search with iterative deepening. Despite the overall similarities, however, two numbers of DARKTHOUGHT roused our attention because they differ notably from those of BELLE and CRAFTY.

Drop below 20%. The "Best Change" rates of both BELLE and CRAFTY dropped at least one iteration earlier to 17%–18% than that of DARKTHOUGHT (see numbers marked by ** in Table 1.4) which stayed well above 20% until iteration #10 inclusively. We attribute the more unstable behaviour of DARKTHOUGHT to the increased selectivity of its search as compared with the two other programs. While the standard errors still leave some room for doubting the statistical significance of the drops below 20%, Appendix 1.5.10 nullifies the corresponding concerns by deriving 80%-confident and 90%-confident bounds on the "Best Change" probabilities of BELLE, CRAFTY, and DARKTHOUGHT.

Iteration #14. The "Best Change" rates of CRAFTY remained surprisingly constant at roughly 15%–17% from iteration #9 onwards. DARKTHOUGHT only behaved like this from iteration #11 to iteration #13 and then recorded another drop of its "Best Change" rate to 13.7% for the final iteration #14 (see number marked by $_{**}$ in Table 1.4). This constitutes the first experimental result reported so far which hints at the validity of the intuitive notion that the average "Best Change" rates should taper off even further at search depths beyond 14 plies. The experimental results of CRAFTY do not really support this notion because the "Best Change" rate of CRAFTY does not decrease but rather increases again for iteration #14. Unfortunately, it remains totally unclear whether the special behaviour of DarkThought signals a consistent trend towards lower "Best Change" rates at higher search depths than 14 plies or if it is just a fluctuation at the end of our data curve. The statistical calculations of Appendix 1.5.10 do not suffice to discriminate the outstanding data point because the 80%-confident and the 90%-confident upper bounds on the "Best Change" probability of DarkThought in iteration #14 equal 15.34% and 16.26% respectively. Thence, new experiments with search depths of at least 16 plies are needed to resolve this interesting question.

Experimental Results for All Test Positions

Search Depth	**Best Change**	(#)	**Fresh Best**	(#)	**(I − 2) Best**	(#)	**(I − 3) Best**	(#)
2	35.28%	(121)	100.00%	(121)	0.00%	(0)	0.00%	(0)
3	39.65%	(136)	85.29%	(116)	14.71%	(20)	0.00%	(0)
4	31.78%	(109)	55.05%	(60)	31.19%	(34)	13.76%	(15)
5	29.45%	(101)	56.44%	(57)	24.75%	(25)	10.89%	(11)
6	24.49%	(84)	65.48%	(55)	19.05%	(16)	5.95%	(5)
7	21.28%	(73)	49.32%	(36)	28.77%	(21)	10.96%	(8)
8	25.07%	(86)	50.00%	(43)	24.42%	(21)	4.65%	(4)
9	21.57%	(74)	40.54%	(30)	28.38%	(21)	13.51%	(10)
10	24.20%	(83)	37.35%	(31)	34.94%	(29)	8.43%	(7)
11	17.49%	(60)	31.67%	(19)	36.67%	(22)	10.00%	(6)
12	15.45%	(53)	45.28%	(24)	20.76%	(11)	9.43%	(5)
13	16.62%	(57)	42.11%	(24)	28.07%	(16)	10.53%	(6)
14	13.70%	(47)	34.04%	(16)	25.53%	(12)	12.77%	(6)

Table 1.5: Results of DarkThought for All 343 Corrected Test Positions.

Search Depth	**Best Change**	(#)	**Fresh Best**	(#)	**(I − 2) Best**	(#)	**(I − 3) Best**	(#)
2	38.78%	(133)	100.00%	(133)	0.00%	(0)	0.00%	(0)
3	36.73%	(126)	71.43%	(90)	28.57%	(36)	0.00%	(0)
4	30.61%	(105)	65.71%	(69)	25.71%	(27)	8.57%	(9)
5	30.32%	(104)	59.62%	(62)	30.77%	(32)	6.73%	(7)
6	27.41%	(94)	56.38%	(53)	24.47%	(23)	8.51%	(8)
7	24.49%	(84)	47.62%	(40)	30.95%	(26)	7.14%	(6)
8	22.45%	(77)	37.66%	(29)	31.17%	(24)	11.69%	(9)
9	18.37%	(63)	30.16%	(19)	38.10%	(24)	4.76%	(3)
10	17.20%	(59)	40.68%	(24)	32.20%	(19)	5.08%	(3)
11	16.62%	(57)	52.63%	(30)	24.56%	(14)	5.26%	(3)
12	16.91%	(58)	41.38%	(24)	24.14%	(14)	10.34%	(6)
13	14.58%	(50)	32.00%	(16)	22.00%	(11)	14.00%	(7)
14	15.45%	(53)	39.62%	(21)	32.08%	(17)	5.66%	(3)

Table 1.6: Results of Crafty for All 343 Test Positions.

Table 1.5 summarizes the complete experimental results of DarkThought for all 343 corrected test positions. Table 1.6 shows the corresponding numbers of Crafty as automatically computed by our Perl script from Hyatt and Newborn's publicly available result file. The three rightmost columns of the tables list the novel statistics of our additionally gathered data. Their percentages relate to the absolute numbers of the "Best Change" column. As already expected beforehand, our novel statistics reveal some very interesting general features of the new best moves at every iteration.

Fresh Best. In contrast to what we and probably many others suspected, the rates of fresh best moves (relative to all new best moves) of both CRAFTY and DARKTHOUGHT did not steadily decrease from one iteration to the next – even not at high search depths of 9–14 plies. Instead, the "Fresh Best" rates wavered directionless between 30%–50% from iteration #7 onwards. This finding lends support to the validity of Newborn's hypothesis about the playing strength of chess programs (see Section 1.5.4) because

$$\frac{\#\text{“Best Change”}(i)}{\#\text{“Best Change”}(i-1)} \approx \frac{\#\text{“Fresh Best”}(i)}{\#\text{“Fresh Best”}(i-1)} \quad \text{holds for } i \geq 8.$$

The surprising approximation means that the discovery of fresh best moves remains substantial even at high search depths of up to 14 plies and decreases as gradually on average as the discovery of any new best moves (see Section 1.5.6). Given the strong empirical evidence from the experimental results of both CRAFTY and DARKTHOUGHT, we expect the approximation to be valid for modern chess programs in general.

(I – 2) Best. The numbers of this column show that CRAFTY and DARKTHOUGHT suffered from instable odd/even behaviour in 25%–35% of all "Best Change" searches regardless of their nominal depth. We deem it quite remarkable that the rates of odd/even instability (relative to all new best moves) wavered in such a narrow range starting with iteration #3. Overall, the average probabilities of odd/even instability during any "Best Change" search amounted to 26.5% for CRAFTY and 24.4% for DARKTHOUGHT. The experimental results of both programs therefore strongly suggest that modern chess programs feature odd/even instabilities for 25% of all "Best Change" searches in general. Last but not least, we like to mention that the sum of "Fresh Best" moves and "(I – 2) Best" moves equalled about 65%–75% of all new best moves for both CRAFTY and DARKTHOUGHT from iteration #8 onwards (sole exception: CRAFTY at iteration #13).

(I – 3) Best. There are hardly any noteworthy facts to report for the last columns of Table 1.5 and Table 1.6. The rates of "(I – 3) Best" moves (relative to all new best moves) wavered more radically than both the "Fresh Best" rates and the "(I – 2) Best" rates. We were surprised that the "(I – 3) Best" rates averaged at 10% for both CRAFTY and DARKTHOUGHT which was well above our expectations.

Experimental Results for the Opening Positions

The 343 corrected test positions contain a subset of 106 opening positions that occurred at the 7th move (51 positions) and the 14th move (55 positions) of real chess games. Table 1.7 presents the experimental results of DARKTHOUGHT for these 106 opening positions alone. Table 1.8 lists the corresponding numbers of CRAFTY as automatically computed by our Perl script from Hyatt and Newborn's publicly available result file. The numbers exhibit the following unusual yet clearly sporadic fluctuations.

- DARKTHOUGHT – "Best Change" at iteration #7, "Fresh Best" at iteration #11, "(I – 2) Best" at iteration #8, and "(I – 2) Best" iteration #11 and iteration #14.

- CRAFTY – "Fresh Best" at iter. #9 and "(I – 2) Best" at iteration #6.

Search Depth	Best Change	(#)	Fresh Best	(#)	(I – 2) Best	(#)	(I – 3) Best	(#)
2	37.74%	(40)	100.00%	(40)	0.00%	(0)	0.00%	(0)
3	50.94%	(54)	83.33%	(45)	16.67%	(9)	0.00%	(0)
4	39.62%	(42)	54.76%	(23)	35.71%	(15)	9.52%	(4)
5	33.96%	(36)	44.44%	(16)	38.89%	(14)	0.00%	(0)
6	25.47%	(27)	55.56%	(15)	25.93%	(7)	3.70%	(1)
7	16.98%	(18)	44.44%	(8)	27.78%	(5)	22.22%	(4)
8	25.47%	(27)	59.26%	(16)	11.11%	(3)	7.41%	(2)
9	25.47%	(27)	37.04%	(10)	29.63%	(8)	11.11%	(3)
10	29.25%	(31)	25.81%	(8)	41.94%	(13)	9.68%	(3)
11	18.87%	(20)	15.00%	(3)	55.00%	(11)	15.00%	(3)
12	17.93%	(19)	42.11%	(8)	26.32%	(5)	15.79%	(3)
13	16.04%	(17)	41.18%	(7)	35.29%	(6)	5.88%	(1)
14	13.21%	(14)	35.71%	(5)	14.29%	(2)	14.29%	(2)

Table 1.7: Results of DarkThought for the 106 Opening Positions.

Search Depth	Best Change	(#)	Fresh Best	(#)	(I – 2) Best	(#)	(I – 3) Best	(#)
2	34.91%	(37)	100.00%	(37)	0.00%	(0)	0.00%	(0)
3	49.06%	(52)	65.38%	(34)	34.62%	(18)	0.00%	(0)
4	32.08%	(34)	55.88%	(19)	38.24%	(13)	5.88%	(2)
5	33.02%	(35)	60.00%	(21)	31.43%	(11)	8.57%	(3)
6	31.13%	(33)	60.61%	(20)	15.15%	(5)	12.12%	(4)
7	30.19%	(32)	43.75%	(14)	34.38%	(11)	9.38%	(3)
8	25.47%	(27)	29.63%	(8)	44.44%	(12)	11.11%	(3)
9	22.64%	(24)	12.50%	(3)	41.67%	(10)	4.17%	(1)
10	19.81%	(21)	52.38%	(11)	28.57%	(6)	4.76%	(1)
11	19.81%	(21)	38.10%	(8)	23.81%	(5)	14.29%	(3)
12	22.64%	(24)	45.83%	(11)	33.33%	(8)	0.00%	(0)
13	16.98%	(18)	27.78%	(5)	22.22%	(4)	22.22%	(4)
14	19.81%	(21)	33.33%	(7)	38.10%	(8)	4.76%	(1)

Table 1.8: Results of Crafty for the 106 Opening Positions.

We attribute these fluctuations to the reduced size of the test subset. Other than that the results for the opening positions alone closely resemble those for the whole test set which Section 1.5.6 and Section 1.5.6 already discussed in great detail. The analyses of the overall results mostly apply to the results for the opening subset as well. Only the "Best Change" rates of CRAFTY for the opening positions do not really fit into the general picture because they stayed around 20% up to iteration #14 inclusively. In contrast to the overall results, DARKTHOUGHT executed much stabler searches in the opening positions than CRAFTY from iteration #11 onwards. This is probably due to a more aggressive evaluation of development and tempi of CRAFTY in the opening phase of the game. The special behaviour of DARKTHOUGHT that drops its "Best Change" rate to nearly 13% in iteration #14 is also visible for the opening subset alone.

Experimental Results for the Middlegame Positions

The 343 corrected test positions contain a subset of 107 middlegame positions that occurred at the 21st move (55 positions) and the 28th move (52 positions) of real chess games. Table 1.7

Search Depth	Best Change	(#)	Fresh Best	(#)	(I – 2) Best	(#)	(I – 3) Best	(#)
2	28.97%	(31)	100.00%	(31)	0.00%	(0)	0.00%	(0)
3	40.19%	(43)	86.05%	(37)	13.95%	(6)	0.00%	(0)
4	27.10%	(29)	51.72%	(15)	31.03%	(9)	17.24%	(5)
5	31.78%	(34)	55.88%	(19)	20.59%	(7)	20.59%	(7)
6	20.56%	(22)	81.82%	(18)	18.18%	(4)	9.09%	(2)
7	24.30%	(26)	46.15%	(12)	30.77%	(8)	11.54%	(3)
8	28.97%	(31)	54.84%	(17)	29.03%	(9)	0.00%	(0)
9	23.36%	(25)	32.00%	(8)	36.00%	(9)	16.00%	(4)
10	27.10%	(29)	41.38%	(12)	44.83%	(13)	6.90%	(2)
11	18.69%	(20)	30.00%	(6)	35.00%	(7)	5.00%	(1)
12	12.15%	(13)	53.85%	(7)	15.38%	(2)	7.69%	(1)
13	23.36%	(25)	40.00%	(10)	28.00%	(7)	12.00%	(3)
14	14.95%	(16)	25.00%	(4)	50.00%	(8)	6.25%	(1)

Table 1.9: Results of DarkThought for the 107 Middlegame Positions.

Search Depth	Best Change	(#)	Fresh Best	(#)	(I – 2) Best	(#)	(I – 3) Best	(#)
2	35.51%	(38)	100.00%	(38)	0.00%	(0)	0.00%	(0)
3	31.78%	(34)	76.47%	(26)	23.53%	(8)	0.00%	(0)
4	33.64%	(36)	58.33%	(21)	30.56%	(11)	11.11%	(4)
5	35.51%	(38)	52.63%	(20)	34.21%	(13)	7.89%	(3)
6	28.04%	(30)	56.67%	(17)	30.00%	(9)	10.00%	(3)
7	21.50%	(23)	47.83%	(11)	34.78%	(8)	8.70%	(2)
8	21.50%	(23)	43.48%	(10)	26.09%	(6)	4.35%	(1)
9	20.56%	(22)	36.36%	(8)	45.45%	(10)	4.55%	(1)
10	21.50%	(23)	30.43%	(7)	34.78%	(8)	8.70%	(2)
11	18.69%	(20)	60.00%	(12)	30.00%	(6)	0.00%	(0)
12	16.82%	(18)	33.33%	(6)	22.22%	(4)	22.22%	(4)
13	13.08%	(14)	35.71%	(5)	28.57%	(4)	7.14%	(1)
14	13.08%	(14)	50.00%	(7)	28.57%	(4)	7.14%	(1)

Table 1.10: Results of Crafty for the 107 Middlegame Positions.

presents the experimental results of DarkThought for these 107 middlegame positions alone. Table 1.8 lists the corresponding numbers of Crafty as automatically computed by our Perl script from Hyatt and Newborn's publicly available result file. The numbers exhibit the following unusual yet clearly sporadic fluctuations.

- DarkThought – "Best Change" at iteration #12 and iteration #13, "Fresh Best" at iteration #6 and iteration #12, "(I – 2) Best" at iteration #6, and "(I – 2) Best" at iteration #12 and iteration #14.

- Crafty – "Fresh Best" at iteration #11 and iteration #14.

We attribute these fluctuations to the reduced size of the test subset as in the case of the opening positions (see Section 1.5.6). Other than that the results for the middlegame positions alone closely resemble those for the whole test set which Section 1.5.6 and Section 1.5.6 already discussed in great detail. The analyses of the overall results mostly apply to the results for the middlegame subset as well. However, the "Fresh Best" rates of Crafty and DarkThought remained larger on average for the middlegame positions alone than for all other positions at high search depths of 9–14 plies. As probably expected by most experts, the real middlegame positions were therefore clearly the hardest for both programs to decide on. Moreover, the behaviour of CRAFTY for the middlegame subset does not lead to an increase of its "Best Change" rate at the final iteration #14.

Experimental Results for the Remaining Positions

Search Depth	**Best Change**	**(#)**	**Fresh Best**	**(#)**	**(I – 2) Best**	**(#)**	**(I – 3) Best**	**(#)**
2	38.46%	(50)	100.00%	(50)	0.00%	(0)	0.00%	(0)
3	30.00%	(39)	87.18%	(34)	12.82%	(5)	0.00%	(0)
4	29.23%	(38)	57.89%	(22)	26.32%	(10)	15.79%	(6)
5	23.85%	(31)	70.97%	(22)	12.90%	(4)	12.90%	(4)
6	26.92%	(35)	62.86%	(22)	14.29%	(5)	5.71%	(2)
7	22.31%	(29)	62.07%	(18)	27.59%	(8)	3.45%	(1)
8	21.54%	(28)	35.71%	(10)	32.14%	(9)	7.14%	(2)
9	16.92%	(22)	54.55%	(12)	18.18%	(4)	13.64%	(3)
10	17.69%	(23)	47.83%	(11)	13.04%	(3)	8.70%	(2)
11	15.38%	(20)	50.00%	(10)	20.00%	(4)	10.00%	(2)
12	16.15%	(21)	42.86%	(9)	19.05%	(4)	4.76%	(1)
13	11.54%	(15)	46.67%	(7)	20.00%	(3)	13.33%	(2)
14	13.08%	(17)	41.18%	(7)	11.76%	(2)	17.65%	(3)

Table 1.11: Results of DarkThought for the 130 Remaining Positions.

Search Depth	**Best Change**	**(#)**	**Fresh Best**	**(#)**	**(I – 2) Best**	**(#)**	**(I – 3) Best**	**(#)**
2	44.62%	(58)	100.00%	(58)	0.00%	(0)	0.00%	(0)
3	30.77%	(40)	75.00%	(30)	25.00%	(10)	0.00%	(0)
4	26.92%	(35)	82.86%	(29)	8.57%	(3)	8.57%	(3)
5	23.85%	(31)	67.74%	(21)	25.81%	(8)	3.23%	(1)
6	23.85%	(31)	51.61%	(16)	29.03%	(9)	3.23%	(1)
7	22.31%	(29)	51.72%	(15)	24.14%	(7)	3.45%	(1)
8	20.77%	(27)	40.74%	(11)	22.22%	(6)	14.81%	(4)
9	13.08%	(17)	47.06%	(8)	23.53%	(4)	5.88%	(1)
10	11.54%	(15)	40.00%	(6)	33.33%	(5)	0.00%	(0)
11	12.31%	(16)	62.50%	(10)	18.75%	(3)	0.00%	(0)
12	12.31%	(16)	43.75%	(7)	12.50%	(2)	22.22%	(2)
13	13.85%	(18)	33.33%	(6)	16.67%	(3)	12.50%	(2)
14	13.85%	(18)	38.89%	(7)	27.78%	(5)	5.56%	(1)

Table 1.12: Results of Crafty for the 130 Remaining Positions.

When removing the 106 opening positions and the 107 middlegame positions from the full set of 343 corrected test positions, you end up with a subset of 130 remaining positions that occurred at the 35th, 42nd, ..., and 70th moves of real chess games. This final subset contains mostly endgame positions complemented by a few ones from late middlegames. Table 1.11 presents the experimental results of DARKTHOUGHT for these 130 remaining positions alone. Table 1.12 lists the corresponding numbers of CRAFTY as automatically computed by our Perl script from Hyatt and Newborn's publicly available result file. The numbers exhibit the following unusual yet clearly sporadic fluctuations.

- DarkThought – "Fresh Best" at iteration #8 and "(I – 2) Best" at iteration #10 and iteration #14.
- Crafty – "Fresh Best" at iteration #11, "(I – 2) Best" at iteration #10, and "(I – 2) Best" at iteration #12 and iteration #14.

We attribute these fluctuations to the reduced size of the test subset as in the cases of the opening and the middlegame positions (see Section 1.5.6 and Section 1.5.6). Up to iteration #8 inclusively the results for the remaining positions alone closely resemble those for the whole test set which Section 1.5.6 and Section 1.5.6 already discussed in great detail. Starting with iteration #9, however, the "Best Change" rates of Crafty and DarkThought for the remaining subset dropped markedly below that of all other positions and stayed lower on average until iteration #14. Given the strong empirical evidence from the experimental results of both Crafty and DarkThought, we expect this more stable behaviour at high search depths in late middlegames and endgames to hold for modern chess programs in general.

Thanks to our additionally recorded data we can actually explain the drops of the "Best Change" rates from iteration #9 onwards. In comparison with their preceding siblings for the opening and the middlegame positions Table 1.11 and Table 1.12 reveal that the numbers of "(I – 2) Best" moves for the subset of remaining positions differ substantially from those of the other subsets. Starting with iteration #9, both Crafty and DarkThought produced only three "(I – 2) Best" moves per iteration on average for the remaining subset (50%–100% less than usual) while the overall numbers of "Fresh Best" moves and "(I – 3) Best" moves remained roughly the same as for the other subsets.[11] Therefore, the notable drops of the "Best Change" rates spring almost entirely from the smaller number of "(I – 2) Best" moves. This means that the odd/even instability of both Crafty and DarkThought decreased with less material on the chess board.

1.5.7 Conclusion

The repetition of Hyatt and Newborn's experiment with our own chess program DarkThought confirmed their findings regarding the "Best Change" rates of Crafty. Based on the experimental results of both Crafty and DarkThought taken together, we are confident to project steady discoveries of new best moves in at least 16% of all searches on average for modern chess programs even at high search depths of 11–14 plies. Surprisingly enough, the experiments do not provide any conclusive empirical evidence for the intuitive notion that the "Best Change" rates taper off continuously with increasing search depths. They rather remained range-bound within 15%–17% for most of the deep searches as investigated in the experiments. If at all, primarily the behaviour of DarkThought with a drop to roughly 13.7% new best moves on average in iteration #14 hinted at decreasing "changes of mind" for search depths of 15 plies and more. Further experiments with markedly higher search depths of at least 16 plies are needed to resolve the interesting question whether this signals a consistent trend towards even lower "Best Change" rates at search depths beyond 14 plies or if it was just a fluctuation at the end of our data curve.

At this point we take the opportunity in order to call on all prospective experimenters to derive or record at least as much data as we did for the experiments with Crafty and DarkThought.[12] Studying the rates of "Fresh Best" moves and "(I – 2) Best" moves will surely be

[11] Of course, the lower numbers of "(I – 2) Best" moves caused the "Fresh Best" rates to increase and the "(I – 2) Best" rates to decrease w.r.t. the overall "Best Change" amounts.

[12] The complete yet totally raw result files of the experiments with both Crafty and DarkThought as well as our short Perl script for the automatic analysis of the result files of Crafty are publicly available in gzip'ed TAR format at URL <ftp://i41s10.ira.uka.de/pub/ernst/deep14.tgz>.

worth the additional efforts without any doubt. These rates revealed novel traits and insights concerning the search behaviours of both CRAFTY and DARKTHOUGHT. The "Fresh Best" rates led to the astonishing observation that regardless of the actual search depth sizable 30%–50% of all new best moves on average represented "fresh ideas" which the programs never deemed best before. This finding supports the validity of Newborn's hypothesis about the playing strength of chess programs as originally formulated in 1985. The "(I – 2) Best" rates educated us about continuing search instabilities of modern chess programs at odd and even search depths respectively. These odd/even instabilities decreased solely at high search depths of 9–14 plies in positions with reduced material as found mostly in endgames and late middlegames.

Last but not least, we like to mention that the repetition of Hyatt and Newborn's experiment was not only a scientifically rewarding but also a practically useful endeavour. For what could better demonstrate the effective scalability of DARKTHOUGHT than to "go deep" at fixed search depths of 14 plies on 343 test positions from real games in less than five days?

1.5.8 Acknowledgements

The Institute for Program Structures and Data Organization at the University of Karlsruhe (Chair Prof. Tichy) generously provided 8x 500MHz DEC Alpha-21164a PC164 workstations for our exclusive use during a whole week in July 1998. Without these abundant computing resources the execution of our "deep" experiment with DARKTHOUGHT would have been much harder to undertake. The anonymous reviewers deserve due credits and sincere thanks for their valuable comments and suggestions which greatly helped to improve the initial submission. The first raw version of the Perl script that we employed for the automatic analysis of the experimental results of CRAFTY stems from one of the reviewers. Finally, we warmly thank Prof. van dan Herik (Editor-in-Chief) and the remaining editorial staff of the ICCA Journal for their superb work and kind cooperation which enabled the inclusion of some late additions and revisions in this article.

1.5.9 Appendix A — Experimental Setup

- 343 test positions as obtained and corrected (see Section 1.5.5) from Hyatt's WWW page at URL <ftp://ftp.cis.uab.edu/pub/hyatt/plytest/positions.gz>,
- DARKTHOUGHT as of July 31, 1998 with 8M transposition-table entries (4M per side), 1M King hash-table entries (512K per side), and 512K Pawn hash-table entries,
- Digital Unix 4.0d program development tools and operating system,
- 500MHz AlphaPC164 workstation (500MHz DEC Alpha-21164a CPU, 8KB/8KB on-chip I/D L1 caches, 96KB unified on-chip L2 cache, 1MB unified off-chip L3 cache, DEC PC164 mainboard, 8x32MB PS/2 SIMMs = 256MB RAM).

1.5.10 Appendix B — Bounds on the "Best Change" Probabilities

The "Best Change" behaviours of chess programs represent typical count data for a binary-valued random variable in the terms of standard statistics. The count probabilities of binary-valued random variables generally adhere to binomial distributions. For large enough sample sizes n and success counts m with $m > 4$ and $n - m > 4$, however, corresponding normal distributions provide practically sufficient approximations of the awkward to handle binomial distributions. Classic engineering statistics [88] derive the following lower and upper bounds of the success probability P for given values of m, n and any desired %-level of confidence as specified by the single-sided percentiles z of the N(0, 1) normal distribution.

$$P \geq \left(m + z^2/2 - z * \sqrt{m * (1 - m/n) + z^2/4}\right) * (n + z^2)^{-1} \tag{1.9}$$

$$P \leq \left(m + z^2/2 + z * \sqrt{m * (1 - m/n) + z^2/4}\right) * (n + z^2)^{-1} \tag{1.10}$$

With the help of these formulas we determined 80%-confident ($z = 0.8416$) and 90%-confident ($z = 1.2816$) bounds on the "Best Change" probabilities of Belle ($n = 447$), Crafty ($n = 343$), and DarkThought ($n = 343$). For Belle we calculated the success count m from its "Best Change" rates of Table 1.4. For Crafty and DarkThought we used the absolute "Best Change" numbers of Table 1.5 and Table 1.6 as their observed success counts m. The resulting bounds clearly discriminate the drops of the "Best Change" rates below 20% for all three programs with at least 80% confidence (see Table 1.13 where $\geq$ denotes lower bounds and $\leq$ upper bounds).

Search Depth	Belle C = 80%	Belle C = 90%	Crafty C = 80%	Crafty C = 90%	DarkTh. C = 80%	DarkTh. C = 90%
2	– –	– –	$\geq$ 36.59%	$\geq$ 35.46%	$\geq$ 33.14%	$\geq$ 32.05%
3	– –	– –	$\geq$ 34.57%	$\geq$ 33.47%	$\geq$ 37.45%	$\geq$ 36.32%
4	$\geq$ 31.26%	$\geq$ 30.32%	$\geq$ 28.56%	$\geq$ 27.52%	$\geq$ 29.70%	$\geq$ 28.65%
5	$\geq$ 31.26%	$\geq$ 30.32%	$\geq$ 28.27%	$\geq$ 27.24%	$\geq$ 27.42%	$\geq$ 26.40%
6	$\geq$ 25.99%	$\geq$ 25.11%	$\geq$ 25.43%	$\geq$ 24.43%	$\geq$ 22.59%	$\geq$ 21.64%
7	$\geq$ 27.75%	$\geq$ 26.84%	$\geq$ 22.59%	$\geq$ 21.64%	$\geq$ 19.48%	$\geq$ 18.59%
8	$\geq$ 24.24%	$\geq$ 23.38%	$\geq$ 20.61%	$\geq$ 19.70%	$\geq$ 23.16%	$\geq$ 22.20%
9	$\geq$ 20.97%	$\geq$ 20.16%	$\leq$ *20.19%*	$\leq$ *21.20%*	$\geq$ 19.76%	$\geq$ 18.87%
10	$\leq$ *19.24%*	$\leq$ *20.10%*	$\leq$ *18.98%*	$\leq$ *19.97%*	$\geq$ 22.31%	$\geq$ 21.36%
11	$\leq$ *19.70%*	$\leq$ *20.57%*	$\leq$ *18.38%*	$\leq$ *19.35%*	$\leq$ *19.29%*	$\leq$ *20.27%*
12	– –	– –	$\leq$ *18.68%*	$\leq$ *19.66%*	$\leq$ *17.17%*	$\leq$ *18.12%*
13	– –	– –	$\leq$ *16.25%*	$\leq$ *17.19%*	$\leq$ *18.38%*	$\leq$ *19.35%*
14	– –	– –	$\leq$ *17.17%*	$\leq$ *18.12%*	$\leq$ *15.34%*	$\leq$ *16.26%*

Table 1.13: Confident Bounds on the "Best Change" Probabilities.

1.5.11 Appendix C — Published Results of Crafty from 1997

Table 1.14 lists the "Best Change" rates as originally published by Hyatt and Newborn in 1997 [114]. Because Hyatt and Newborn did not provide any explicit numbers for the 107 middlegame positions alone, we calculated them as described in Appendix 1.5.11 below. The numbers in parantheses represent the rates that our automatic Perl script computed when we applied it to Hyatt and Newborn's original result file of Crafty for the full set of 347 test positions. The slight differences do not affect the overall interpretation of the results and we regard them as constituting some omnipresent imprecisions of measurement. Please note that we debugged our Perl script thoroughly, performed many cross-checks during its execution and really trust its automatically generated output.

Search Depth	Crafty All	(Auto-) (matic)	Crafty Open	(Auto-) (matic)	Crafty Middle	(Auto-) (matic)	Crafty Rest	(Auto-) (matic)
2	38.90%	(38.90%)	35.50%	(35.45%)	35.50%	(35.51%)	44.60%	(44.62%)
3	37.80%	(36.89%)	49.10%	(49.09%)	33.80%	(31.78%)	31.50%	(30.77%)
4	30.00%	(30.55%)	30.00%	(31.82%)	34.60%	(33.64%)	26.20%	(26.92%)
5	30.50%	(30.55%)	33.60%	(33.64%)	35.50%	(35.51%)	23.80%	(23.85%)
6	27.40%	(27.38%)	30.00%	(30.91%)	28.10%	(28.04%)	24.60%	(23.85%)
7	23.30%	(25.07%)	30.00%	(31.82%)	19.50%	(21.50%)	20.80%	(22.31%)
8	23.30%	(22.48%)	26.40%	(25.45%)	24.10%	(21.50%)	20.00%	(20.77%)
9	17.30%	(18.16%)	21.80%	(21.82%)	19.70%	(20.56%)	11.50%	(13.08%)
10	17.90%	(17.00%)	20.00%	(19.09%)	22.50%	(21.50%)	12.30%	(11.54%)
11	16.70%	(16.43%)	20.00%	(19.09%)	17.70%	(18.69%)	13.10%	(12.31%)
12	17.00%	(17.00%)	23.60%	(22.73%)	15.90%	(16.82%)	12.30%	(12.31%)
13	14.40%	(14.70%)	17.30%	(17.27%)	13.00%	(13.08%)	13.10%	(13.85%)
14	15.30%	(15.56%)	19.10%	(20.00%)	13.20%	(13.08%)	13.80%	(13.85%)

Table 1.14: "Best Change" Rates as Published by Hyatt and Newborn.

Results of Crafty for the Middlegame Positions in 1997

Unfortunately, Hyatt and Newborn did not present the experimental results of CRAFTY for the 107 middlegame positions alone in their article. Therefore, we derived the "Best Change" rates of CRAFTY for these positions by ourselves from the available data of the other positions. The absolute number of new best moves as chosen by CRAFTY in the middlegame positions equals the number of new best moves for all test positions minus the new best moves for the opening positions minus the new best moves of the remaining positions. Table 1.15 shows our according calculations in detail and lists the resulting "Best Change" rates of CRAFTY for the 107 middlegame positions from iteration #2 to iteration #14.

Search Depth	Calculation of the "Best Change" Rates for the 107 Middlegame Positions		Best Change
2	$(0.389 * 347 - 0.355 * 110 - 0.446 * 130)\ /\ 107$	=	35.50%
3	$(0.378 * 347 - 0.491 * 110 - 0.315 * 130)\ /\ 107$	=	33.80%
4	$(0.300 * 347 - 0.300 * 110 - 0.262 * 130)\ /\ 107$	=	34.60%
5	$(0.305 * 347 - 0.336 * 110 - 0.238 * 130)\ /\ 107$	=	35.50%
6	$(0.274 * 347 - 0.300 * 110 - 0.246 * 130)\ /\ 107$	=	28.10%
7	$(0.233 * 347 - 0.300 * 110 - 0.208 * 130)\ /\ 107$	=	19.50%
8	$(0.233 * 347 - 0.264 * 110 - 0.200 * 130)\ /\ 107$	=	24.10%
9	$(0.173 * 347 - 0.218 * 110 - 0.115 * 130)\ /\ 107$	=	19.70%
10	$(0.179 * 347 - 0.200 * 110 - 0.123 * 130)\ /\ 107$	=	22.50%
11	$(0.167 * 347 - 0.200 * 110 - 0.131 * 130)\ /\ 107$	=	17.70%
12	$(0.170 * 347 - 0.236 * 110 - 0.123 * 130)\ /\ 107$	=	15.90%
13	$(0.144 * 347 - 0.173 * 110 - 0.131 * 130)\ /\ 107$	=	13.00%
14	$(0.153 * 347 - 0.191 * 110 - 0.138 * 130)\ /\ 107$	=	13.20%

Table 1.15: Calculated Results of Crafty for the 107 Middlegame Positions.

1.6 DarkThought at 9th WCCC (June 1999)

From June 14–20, 1999, DarkThought successfully participated in the 9th World Computer-Chess Championship (WCCC '99). With 4.5 points out of 7 games (3x win, 3x draw, 1x loss) it finished the tournament on a shared 5th place as microcomputer Vice-Champion, best microcomputer amateur, and overall 6th of 30 participants.

Final Standings of 9th WCCC

Rk = final rank, **Pts** = overall points, **SOP** = sum of opponents' points, **Rx** = results of each round.

Rk	Pts	SOP	Program	R1	R2	R3	R4	R5	R6	R7
1	5.5	29.0	Shredder	w30+	b03+	w07+	b08=	w10=	b02=	w05+
2	5.5	28.0	Ferret	b20+	w14+	b10−	w24+	b12+	w01=	w03+
3	5.0	27.5	Fritz	b27+	w1−	b26+	w13+	b05+	w10+	b02−
4	5.0	26.5	CilkChess	w21+	b24+	b05−	w12=	b11+	w06=	b10+
5	4.5	32.5	Junior	w15+	b06+	w04+	b10=	w03−	w08+	b01−
6	*4.5*	*28.5*	*DarkThought*	*b12+*	*w05−*	*b21+*	*w11=*	*b16+*	*b04=*	*w07=*
7	4.5	28.0	Rebel	b25+	w11+	b01−	w18+	b08−	w13+	b06=
8	4.5	27.5	Nimzo	b26=	w22+	b16+	w01=	w07+	b05−	w09=
9	4.5	23.5	ChessTiger	b10−	w13−	b29+	w22+	b14+	w19+	b08=
10	4.0	33.5	Hiarcs	w09+	b17+	w02+	w05=	b01=	b03−	w04−
11	4.0	27.0	LambChop	w18+	b07−	w15+	b06=	w04−	b24+	w16=
12	4.0	26.5	Francesca	w06−	b28+	w17+	b04=	w02−	w16=	b20+
13	4.0	24.5	VirtualChess	w24−	b09+	w19+	b03−	w26+	b07−	w18+
14	4.0	22.0	GromitChess	w28+	b02−	w18−	b23+	w09−	w27+	b25+
15	4.0	21.0	Eugen	b05−	w29+	b11−	w21+	b24=	w20=	b19+
16	3.5	26.5	Zugzwang	w19=	b23+	w08−	b17+	w06−	b12=	b11=
17	3.5	9.5	MChess	b29+	w10−	b12−	w16−	b25=	w26+	w24+
18	3.0	25.5	P.ConNerS	b11−	w20+	b14+	b07−	w19−	w21+	b13−
19	3.0	23.5	IsiChess	b16=	w26=	b13−	w25+	b18+	b09−	w15−
20	3.0	22.0	Diep	w02−	b18−	w30=	b28+	w22+	b15=	w12−
21	3.0	20.5	Patzer	b04−	w27+	w06−	b15−	w30+	b18−	w29+
22	3.0	9.5	Mini	w23=	b08−	w28=	b09−	b20−	w30+	b27+
23	3.0	7.0	Now	b22=	w16−	b27−	w14−	w28=	b29+	b26+
24	2.5	28.5	SOS	b13+	w04−	b25+	b02−	w15=	w11−	b17−
25	2.5	20.0	Arthur	w07−	b30+	w24−	b19−	w17=	b28+	w14−
26	2.0	25.0	Ikarus	w08=	b19=	w03−	w27+	b13−	b17−	w23−
27	2.0	21.0	Centaur	w03−	b21−	w23+	b26−	w29+	b14−	w22−
28	1.5	20.5	RuyLopez	b14−	w12−	b22=	w20−	b23=	w25−	b30=
29	1.0	21.0	XXXX-II	w17−	b15−	w09−	b30+	b27−	w23−	b21−
30	1.0	19.5	Neurologic	b01−	w25−	b20=	w29−	b21−	b22−	w28=

Shredder became World Computer-Chess Champion 1999 by winning the playoff against Ferret.

Games Played by DarkThought at 9th WCCC

Francesca – DarkThought: [0 – 1] (9th WCCC, Round 1, June 14, 1999)
1. c4 e5 2. Nc3 Nf6 3. g3 Bb4 4. Qb3 Nc6 5. Nd5 Nd4 6. Qd1 Nxd5 7. cxd5 Qf6 8. Bg2 Qg6 9. e4 Bc5 10. d3 O-O 11. Nf3 Nxf3+ 12. Bxf3 Qb6 13. O-O c6 14. Qb3 Qxb3 15. axb3 cxd5 16. exd5 d6 17. Be3 b6 18. Rfc1 Bh3 19. Rc4 a5 20. d4 exd4 21. Bxd4 b5 22. Bxc5 bxc4 23. Bxd6 Rfc8 24. bxc4 Rxc4 25. Be5 a4 26. Bc3 Rb8 27. Bh5 Bd7 28. f4 Rb6 29. Be2 Rc8 30. Bh5 Ra6 31. Be2 Rd6 32. Bf3 f6 33. Bg2 Ra6 34. Ra3 Rd6 35. Ra1 Kf7 36. Be4 Re8 37. Bf3 Kg8 38. Kf2 Rc8 39. Kg1 Rc4 40. Be2 Rc7 41. Bf3 Rb7 42. Re1 Rdb6 43. Bd4 Rb3 44. Be4 Rb8 45. Bc2 R3b5 46. Bd3 Rb4 47. Bc3 R4b6 48. Bd4 R6b7 49. Re7 Bb5 50. Rxb7 Rxb7 51. Bc2 Rc7 52. Bf5 Rc4 53. Be3 Rb4 54. d6 Rxb2 55. d7 Bxd7 56. Bxd7 a3 57. Be6+ Kh8 58. Bd4 Rd2 59. Bc3 a2 60. Bf5 Rd5 61. Bh3 Rd3 62. Bb2 Rd2 63. Bc3 Rc2 64. Bd4 Rc4 65. Bb2 Rc1+ 66. Bf1 Kg8 67. Bd4 Rd1 68. Bb2 Kf7 69. f5 Ke7 70. g4 Kd6 71. Bc3 Kc5 72. h3 Rc1 73. Bb2 Rb1 74. Bc3 Rb3 75. Ba1 Kb4 76. Bd4 Rb1 77. Kf2 Rd1 78. Be3 a1=Q 0-1

DarkThought – Junior: [0 – 1] (9th WCCC, Round 2, June 15, 1999)
1. d4 d5 2. c4 dxc4 3. e4 e5 4. Nf3 exd4 5. Bxc4 Nc6 6. O-O Be6 7. Bb5 Bc5 8. Bxc6+ bxc6 9. Qc2 Bb6 10. Qxc6+ Bd7 11. Qc4 c5 12. b3 Ne7 13. Ne5 O-O 14. Ba3 Ng6 15. Nxg6 hxg6 16. Rc1 Rc8 17. Nd2 Re8 18. Qd3 Qh4 19. Rc2 Bc6 20. f3 Qh5 21. Rac1 Bb7 22. Kh1 Rc6 23. Nf1 Rd8 24. Kg1 Qe5 25. h3 a5 26. Kh1 Qc7 27. Nd2 Ba7 28. Nc4 Ba6 29. Qd1 Bb5 30. Nb2 d3 31. Rd2 Qf4 32. e5 Qxe5 33. Nc4 Qf4 34. Rxd3 Rxd3 35. Qxd3 Bb8 36. Kg1 Qh2+ 37. Kf1 Bg3 38. Qe3 Bf4 39. Qg1 Qxg1+ 40. Kxg1 Bxc1 41. Bxc1 Bxc4 42. bxc4 Rd6 43. Be3 Rd1+ 44. Kh2 Ra1 45. Bxc5 Rxa2 46. f4 Rc2 0-1

Patzer – DarkThought: [0 – 1] (9th WCCC, Round 3, June 15, 1999)
1. c4 e5 2. Nc3 Nf6 3. Nf3 Nc6 4. d4 exd4 5. Nxd4 Bb4 6. Bg5 O-O 7. e3 h6 8. Bxf6 Qxf6 9. Be2 Bxc3+ 10. bxc3 d6 11. O-O Ne5 12. f4 Nd7 13. Nb5 Qd8 14. Bf3 Nc5 15. Nd4 Re8 16. Re1 Ne4 17. Bxe4 Rxe4 18. Rb1 Qe7 19. Qd3 b6 20. Nc6 Qe8 21. Nd4 Ba6 22. Nb5 Qe7 23. g3 Bb7 24. Nd4 Re8 25. Kf2 g5 26. Qd1 Ba6 27. Qa4 gxf4 28. gxf4 Rxe3 29. Qxe8+ Qxe8 30. Rxe3 Qa4 31. Ra1 Bxc4 32. Kg3 Qa3 33. Kh3 Kg7 34. Nf5+ Kh7 35. Ng3 Qb2 36. Rae1 Qxa2 37. Ne4 f5 38. Ng3 Kg6 39. Nh1 Bd5 40. Rg3+ Kf7 41. Rgg1 Qd2 42. Kg3 Qxc3+ 43. Kh4 Bc4 44. Nf2 Qf3 45. Nh3 Be2 46. Rxe2 Qxe2 47. Rg3 a5 0-1

DarkThought – LambChop: [1/2 – 1/2] (9th WCCC, Round 4, June 16, 1999)
1. e4 c6 2. d4 d5 3. Nc3 dxe4 4. f3 exf3 5. Nxf3 Nf6 6. Bd3 Bg4 7. O-O Bxf3 8. Qxf3 Qxd4+ 9. Be3 Qg4 10. Qf2 e6 11. Ne4 Nbd7 12. Rad1 Qh5 13. Nxf6+ Nxf6 14. Be2 Qa5 15. Bd4 Be7 16. Qg3 Kf8 17. Kh1 Rd8 18. Bxf6 gxf6 19. Rxd8+ Bxd8 20. Qb8 Qc7 21. Qxa7 Qe5 22. Bf3 Bc7 23. Qg1 Qxb2 24. Rb1 Qxc2 25. Rxb7 Bd6 26. Bh5 Be7 27. Rxe7 Kxe7 28. Qa7+ Kd6 29. Qd4+ Ke7 30. Qa7+ 1/2-1/2

Zugzwang – DarkThought: [0 – 1] (9th WCCC, Round 5, June 17, 1999)
1. e4 d5 2. exd5 Qxd5 3. Nc3 Qa5 4. d4 Nf6 5. Nf3 c6 6. Bc4 Bf5 7. Bd2 e6 8. Ne4 Qb6 9. Nxf6+ gxf6 10. O-O Qxb2 11. Rb1 Qxc2 12. Qxc2 Bxc2 13. Rxb7 Bd6 14. Re1 O-O 15. Ba5 Re8 16. Re3 Ba4 17. Nd2 Re7 18. Rb2 Bc7 19. Bxc7 Rxc7 20. Rg3+ Kh8 21. Be2 Nd7 22. Ra3 Nb6 23. Ne4 f5 24. Nc3 Bb5 25. Nxb5 cxb5 26. Rxb5 Rc1+ 27. Bf1 Nc4 28. Rd3 Ra1 29. Rb7 Nd6 30. Rb2 Rc8 31. f3 Rcc1 32. Rf2 f4 33. g3 fxg3 34. hxg3 Nf5 35. f4 Re1 36. Rdf3 Nxd4 37. Ra3 Nf5 38. Rff3 Nxg3 39. Rxg3 Rxf1+ 40. Kg2 Rxf4 41. Rxa7 h6 42. Rf3 Rxf3 43. Kxf3 Kg7 44. a4 Kg6 45. Ra8 Kf5 46. Ra7 f6 47. a5 e5 48. Ke3 h5 49. a6 Ra3+ 50. Kd2 e4 51. Rh7 Kg6 52. Re7 f5 53. a7 Kf6 54. Rc7 f4 55. Rc4 Kf5 56. Rc7 e3+ 0-1

Cilkchess – DarkThought: [0 – 1] (9th WCCC, Round 3, June 18, 1999)
1. e4 d5 2. exd5 Qxd5 3. Nc3 Qa5 4. Bc4 Nf6 5. Nf3 Bg4 6. O-O Nc6 7. h3 Bh5 8. Bb5 O-O-O 9. Bxc6 bxc6 10. Re1 Qf5 11. Re3 e6 12. Ne2 Bd6 13. Ned4 Qc5 14. g4 Bg6 15. Rc3 Qd5 16. Nxc6 Ne4 17. Nxd8 Nxc3 18. bxc3 Bxc2 19. Qxc2 Qxf3 20. Nxf7 Bh2+ 21. Kxh2 Qxf2+ 22. Kh1 Qf1+ 23. Kh2 Qf2+ 24. Kh1 Qf1+ 25. Kh2 Qf2+ 26. Kh1 1/2-1/2

DarkThought – Rebel: [1/2 – 1/2] (9th WCCC, Round 7, June 19, 1999)
1. c4 e5 2. Nc3 Nf6 3. Nf3 Nc6 4. g3 d5 5. cxd5 Nxd5 6. Bg2 Nb6 7. O-O Be7 8. d3 O-O 9. a3 Be6 10. b4 a5 11. b5 Nd4 12. Nd2 a4 13. Bxb7 Ra5 14. Rb1 Qd7 15. Nf3 Nxb5 16. Nxe5 Nxc3 17. Nxd7 Nxd1 18. Nxf8 Bb3 19. Nxh7 Ra7 20. Bf3 Nc3 21. Ra1 Kxh7 22. Bb2 Na2 23. Rfb1 Nd5 24. Bxd5 Bxd5 25. Be5 c6 26. Rb2 f6 27. Bd4 Rd7 28. Rb8 Bxa3 29. Ra8 Bb3 30. Bxf6 gxf6 31. Rxa2 Bxa2 32. Rxa4 Re7 33. Kf1 Be6 34. Rxa3 Bh3+ 35. Ke1 Rb7 36. Ra1 Kg6 37. f3 Bd7 38. h4 Kh5 39. e4 Rb2 40. Ra5+ Kh6 41. g4 Kg6 42. h5+ Kf7 43. e5 Rb5 44. Rxb5 cxb5 45. exf6 Kxf6 46. d4 Bc6 47. f4 Bf3 48. g5+ Ke6 49. Kd2 Bxh5 50. Kc3 Kf5 51. Kb4 Be8 52. Kc5 1/2-1/2

1.7 DarkThought at 16th WMCC (June 1999)

The 16th World Microcomputer-Chess Championship (WMCC '99) took place as part of the 9th World Computer-Chess Championship (WCCC '99) from June 14–20, 1999, which DarkThought successfully participated in. With 4.5 points out of 7 games (3x win, 3x draw, 1x loss) it finished the tournament on a shared 2nd place of the microcomputer ranking as World Microcomputer-Chess Vice-Champion 1999 and world-best microcomputer amateur overall.

Final Standings of 16th WMCC

8 of the 30 participants in the 9th WCCC' 99 ran on parallel computers which made them non-eligible for the microcomputer ranking. Please remove the entries Cilkchess, Diep, Ferret, Fritz, Junior, XXXX-II, Zugzwang, P.ConNerS from the table "Final Standings of 9th WCCC" in order to arrive at the final microcomputer standings.

Games Played by DarkThought at 16th WMCC

Please refer to the Section "Games Played by DarkThought at 9th WCCC" in order to see the games played by DarkThought during the tournament.

1.8 DarkThought at Test Games (1998–1999)

From March 1998 to January 1999 DarkThought played a series of 280 test games against 20 strong PC chess programs. Prior to the games, the according version of DarkThought had achieved good ratings for the well-known test suites BS-2830 (2720), BT-2630 (2521), and LCT-II (2610). All games were played with DarkThought running on a 600MHz DEC Alpha-21164a LX164 workstation using 170MB RAM overall while the opponents enjoyed the service of our then fastest PC featuring an AMD K6/233MHz CPU and 64MB of RAM. We list the names and settings of the 20 PC chess programs in alphabetical order below.

- Chessmaster 4000 Turbo — [Windows/NT 4.0, 32MB hash (ttable_size = 25), sel = 10, chess engine based on The King 2.0],

- COMET A.86/A.90 — [MS-DOS 6.2, 52MB hash, sel = 1, pb = on],
- CRAFTY 16.4 — [Windows/NT 4.0, 32MB hash, no tablebases, engine in FRITZ 5.32, default play style],
- FRITZ 3.10 — [Windows/NT 4.0, 16MB hash (max.), engine in FRITZ 5],
- FRITZ 5.00/5.03 — [Windows/NT 4.0, 48MB hash, endgame databases enabled],
- FRITZ 5.32B — [Windows/NT 4.0, 48MB hash, default play style],
- GENIUS 3 — [MS-DOS 6.2, 32MB hash, default play style (active)],
- GENIUS 5 — [MS-DOS 6.2, 32MB hash, default play style (active)],
- HIARCS 6.0 — [Windows/NT 4.0, 16MB hash (max.), engine in FRITZ 5],
- JUNIOR 4.6 — [Windows/NT 4.0, 48MB hash, engine in FRITZ 5],
- JUNIOR 5.0 — [Windows/NT 4.0, 48MB hash, default play style],
- MCHESS 5 — [MS-DOS 6.2, 10MB hash (max.), default play style (normal)],
- MCHESS 7.1 — [MS-DOS 6.2, 60MB hash (max.), default play style (normal)],
- MEPHISTO MEISTERSCHACH — [Windows/NT 4.0, hash automatic (24MB), standard style, no handicap, chess engine based on NIMZO 3.5],
- MEPHISTO SHREDDER — [Windows/NT 4.0, 24MB/16MB hash/eval, sel = 12, endgame databases enabled, chess engine based on SHREDDER 1],
- NIMZO 98 — [Windows/NT 4.0, 48MB hash, standard style, "Paderborn" update],
- NIMZO 99A — [Windows/NT 4.0, 48MB hash, NIMZO author's favourite play style (B = 435, N = 425, P = 105, Q = 1240, R = 685, opp. = Junior)],
- REBEL 8 — [MS-DOS 6.2, 60MB hash, default play style (strong, normal, sel = N)],
- REBEL 9 — [MS-DOS 6.2, 60MB hash, default play style (strong, normal, sel = N)],
- SHREDDER 2 — [Windows/NT 4.0, 24MB/16MB hash/eval, sel = 12, endgame databases enabled].

The 266 test games were played from the so-called "Nunn Positions" #2 (ECO B89), #3 (ECO C19), #4 (ECO C97), #5 (ECO D36), #7 (ECO E15), #8 (ECO E98) and #9 (ECO A25) with all opening books and learning features of the programs disabled. In order to partly account for the hardware advantage of the 600MHz DEC Alpha-21164a (18.4 SPECint95) over the AMD K6/233MHz (9.6 SPECint95), DARKTHOUGHT played at a rate of 60 moves in 90 minutes while the PC programs received additional 30 minutes on their clocks (60 moves in 120 minutes). The test games ended 209.5 : 70.5 in favour of DARKTHOUGHT (74.82% winning percentage, see Table 1.16) which showed that it was not only good at solving test suites but also quite promising at standard tournament play.

The below "Jakarta Revanche" game against MEPHISTO SHREDDER adds to this promise. The game was started from the position after White's move 14. d5! as played by SHREDDER against DARKTHOUGHT in the 6th round of the 14th WMCC (Jakarta, October 1996). Nearly all computer-chess periodicals published this very position after the championship and asserted

	DT #2	DT #3	DT #4	DT #5	DT #7	DT #8	DT #9	Sum
CO	− −	+ −	− −	− −	− −	− −	− −	1.0 : 13.0
CM	= −	− −	= −	= +	= −	+ −	= =	5.0 : 9.0
CR	= =	+ −	= −	= =	− =	= −	= −	5.0 : 9.0
F3	= =	− −	− −	− −	− −	− −	= =	2.0 : 12.0
F5	= =	= −	= −	+ −	= =	+ −	− =	5.5 : 8.5
FB	− −	= −	+ −	− =	= =	= −	− −	3.5 : 10.5
G3	− =	− =	− =	+ −	= =	= −	= =	5.0 : 9.0
G5	= =	− =	− −	= −	− −	= −	− −	2.5 : 11.5
H6	− −	+ −	+ −	− −	= =	− −	= +	4.5 : 9.5
J4	= =	− −	− −	− =	− −	− =	= =	3.0 : 11.0
J5	− −	− =	+ =	− =	− +	= −	= −	4.5 : 9.5
M5	− =	+ −	= −	− =	− −	= −	− −	3.0 : 11.0
M7	− =	= −	+ −	= −	− =	+ −	= −	4.5 : 9.5
MM	− −	− −	= =	= −	− −	− −	− −	1.5 : 12.5
MS	− −	− −	− −	− −	= −	= −	− =	1.5 : 12.5
N8	+ −	+ −	− −	+ −	= −	− −	− =	4.0 : 10.0
N9	= −	= −	= =	− −	+ −	− =	− +	4.5 : 9.5
R8	+ −	+ −	= =	− =	− −	= −	− −	4.0 : 10.0
R9	+ −	+ −	− −	− −	− −	− −	− =	2.5 : 11.5
S2	− −	+ −	− −	= =	= −	= −	− =	3.5 : 10.5
Sum	10.5 : 29.5	11.5 : 28.5	10.0 : 30.0	10.5 : 29.5	9.0 : 31.0	8.5 : 31.5	10.5 : 29.5	**70.5 : 209.5**

Table 1.16: Strong PC Chess Programs vs. the 1998 Version of DarkThought.

the hopelessness of Black's position. But within roughly a minute of computing time our new version of DarkThought found a brilliant defense for Black (see moves 16–23) that leads to nearly equal play. Mephisto Shredder remained clueless about the tricky maneuvre until very late and then even managed to lose the drawish endgame which emerged after move 34.

Mephisto Shredder – DarkThought: [0 − 1] (Revanche Game of 6th Round at 14th WMCC '96, March 1998)
1. d4 d5 2. c4 e6 3. Nc3 c5 4. cxd5 exd5 5. Nf3 Nc6 6. g3 c4 7. Bg2 Bb4 8. O-O Nge7 9. a3 Ba5 10. e4 dxe4 11. Nxe4 O-O 12. Qe2 b5 13. Rd1 Bf5 14. d5 Nxd5 15. Nh4 Be6 16. Ng5 Re8 17. Qh5 Nf6 18. Rxd8 Raxd8 19. Qe2 Bg4 20. Qxe8+ Rxe8 21. Bxc6 Re1+ 22. Kg2 Bd2 23. Bxd2 Rxa1 24. Bc3 a6 25. Bb7 h6 26. Bxf6 hxg5 27. Bxg5 Rb1 28. Bxa6 Rxb2 29. Nf3 Bxf3+ 30. Kxf3 c3 31. Bc1 Rb1 32. Be3 c2 33. Ke2 c1=Q 34. Bxc1 Rxc1 35. Bxb5 g5 36. h3 Rh1 37. Bd7 Kf8 38. a4 Ke7 39. Bf5 Kd6 40. Kf3 f6 41. Kg2 Ra1 42. Bc2 Ke5 43. Bb3 Kd4 44. h4 gxh4 45. gxh4 Ke5 46. h5 Kf5 47. Bc2+ Kg5 48. Kf3 Kxh5 49. Kf4 Ra2 50. Bd1+ Kg6 51. f3 Rd2 52. Bb3 Rb2 53. Bd1 Rb4+ 54. Ke3 Kg5 55. a5 f5 56. a6 f4+ 57. Kf2 Rb2+ 58. Ke1 Ra2 59. Be2 Kh4 60. Bc4 Ra4 61. Bb5 Ra3 62. Kf2 Rc3 63. Be2 Rc2 64. Ke1 Kg3 65. Kd1 Rc5 66. Ke1 Rc7 67. Bd1 Rc1 68. Kd2 Rc6 69. Be2 Kf2 70. Bd3 Kxf3 71. a7 Rc8 72. Bc4 Rd8+ 73. Ke1 Ke4 74. Bf7 Ra8 75. Kf2 Rxa7 0-1

Games Played by DarkThought from Nunn Position #2 (ECO B89)

DarkThought – Chessmaster 4000 Turbo: [1 − 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 Nd7 14. Na4 a5 15. h4 Ba6 16. Qe3 Qa7 17. Qxa7 Rxa7 18. Rd2 Rb7 19. f3 Rd8 20. Rhd1 Rc8 21. Kb1 Rb4 22. c3 Rb7 23. Bf2 Rbb8 24. g3 c5 25. h5 c4 26. Bc2 Bb7 27. Ba7 Ra8 28. Be3 Bc6 29. Rf2 Rab8 30. Rfd2 f5 31. Re1 Rf8 32. exf5 Bxf3 33. h6 Rf7 34. Rg1 gxh6 35. Bxh6 Nf6 36. g4 Kh8 37. g5 Ne4 38. Rh2 Rxf5 39. g6 d5 40. gxh7 Rf7 41. Ka1 Rd8 42. Be3 Rg7 43. Rxg7 Kxg7 44. Bb6 Rh8 45. Bc7 Bf6 46. Nb6 Ng5 47. Bf5 a4 48. Nxa4 Nxh7 49. Nb6 Nf8 50. Rxh8 Kxh8 51. a4 d4 52. Nxc4 e4 53. cxd4 Bxd4 54. a5 e3 55. Be5+ Bxe5 56. Nxe5 Be2 57. Ng4 Bxg4 58. Bxg4 Kg7 59. b4 Kf6 60. Kb2 Kg5 61. Be2 Kf4 62. b5 Ke5 63. b6 Kd6 64. Bb5 Kc5 65. b7 e2 66. b8=Q e1=Q 67. Qb6+ Kd5 68. Qc6+ Ke5 69. Qc5+ Ke6 70. a6 Qd2+ 71. Ka3 Nd7 72. Qc6+ Qd6+ 73. Qxd6+ Kxd6 74. Bxd7 Kc7 75. Bb5 Kb8 76. Kb4 Kc8 77. Bc6 Kb8 78. Kc5 Ka7 79. Bb5 Kb8 80. Kc6 Ka7 81. Kc7 Ka8 82. Kb6 Kb8 83. a7+ Kc8 84. a8=Q# 1-0

Chessmaster 4000 Turbo – DarkThought: [1/2 − 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bg5 Nd5 13. Bxe7 Nxc3 14. Qd2 Qxe7 15. Qxc3 Bb7 16. Kb1 d5 17. Rhe1 Qh4 18. exd5 cxd5 19. Qc7 Rab8 20. f3 Qf2 21. Qe5 a5 22. c4 a4 23. Bxa4 dxc4 24. Bc2 Bd5 25. Re2 Qb6 26. Be4 Bxe4+ 27. Rxe4 Rfc8 28. Rg4 g6 29. Qc3 Qf2 30. Qc2 Qxc2+ 31. Kxc2 Ra8 32. Rgd4 Rxa2 33. Rd8+ Rxd8 34. Rxd8+ Kg7 35. Kc3 h5 36. Rd4 Ra1 37. Kxc4 Rc1+ 38. Kb3 g5 39. h3 e5 40. Rd2 Kf6 41. Ka4 Ra1+ 42. Kb5 Ra2 43. Kc4 Kf5 44. Kc3 Ra7 45. b4 g4 46. fxg4+ hxg4 47. hxg4+ Kxg4 48. b5 f5 49. b6 Rb7 50. Rb2 f4 51. Kd3 f3 52. gxf3+ Kxf3 53. Rb3 Kf4 54. Kc4 e4 55. Rb5 e3 56. Kd3 Kf3 57. Rf5+ Kg4 58. Rf6 Kg5 59. Rd6 Kf4 60. Re6 Rd7+ 61. Ke2 Rd2+ 62. Ke1 Rd7 63. Rh6 Ke4 64. Rh5 Kd3 65. Rb5 Rb7 66. Rb4 Rb8 67. b7 Kc2 68. Ke2 Kc3 69. Rb1 Kc2 70. Rb6 Kc3 71. Kxe3 Kc4 72. Ke4 Re8+ 73. Kf5 Rb8 74. Ke6 Kc5 1/2-1/2

DarkThought – Comet A.90: [1 − 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 a5 14. f3 Re8 15. h4 Be6 16. h5 Reb8 17. h6 Bxb3 18. axb3 g6 19. Bh4 Rb4 20. g4 Ne8 21. Qe3 Bxh4 22. Rxh4 Qa7 23. Qxa7 Rxa7 24. Rh2 f6 25. Rhd2 Kf7 26. Rd3 Ke6 27. Re1 Rd7 28. Na2 Rb8 29. Rc3 Rb6 30. Rc4 Ra6 31. Ra4 Nc7 32. Nc3 d5 33. f4 d4 34. f5+ Kf7 35. Nb1 Nb5 36. Rd1 Nd6 37. Nd2 Rb7 38. c3 c5 39. Kc2 Rd7 40. Rda1 d3+ 41. Kd1 gxf5 42. gxf5 Ra8 43. Ke1 Rg8 44. Kf2 Nb7 45. Rg1 Rxg1 46. Kxg1 Ke7 47. Kf2 Kd6 48. Ke3 Kc6 49. Ra1 Kb5 50. Rg1 Nd6 51. Rg7 Kc6 52. Rxd7 Kxd7 53. Kxd3 Nf7 54. Nc4 Nxh6 55. Nxa5 Ng4 56. Ke2 h5 57. Kf3 Nh2+ 58. Kg2 Ng4 59. Kg3 Kc7 60. Nc4 Kc6 61. Kh4 Nf2 62. Nd2 Kd7 63. Kxh5 Nd3 64. Kg6 Ke7 65. Nf1 Nf4+ 66. Kg7 Nh5+ 67. Kg8 Ke8 68. b4 cxb4 69. cxb4 Ke7 70. Ne3 Kd7 71. Nd5 Kc6 72. Kf7 Kb5 73. Nxf6 Nf4 74. Nd7 Kxb4 75. Ke7 Nh3 76. f6 Ng5 77. f7 Nxf7 78. Kxf7 Kc4 79. Nxe5+ Kb4 80. Ng6 Kb3 81. e5 Kc4 82. e6 Kb4 83. e7 Kb3 84. Nf4 Kc4 85. e8=Q Kd4 86. Qb5 Ke3 87. Qe5+ Kf2 88. Qc3 Kf1 89. Qd2 Kg1 90. Qg2# 1-0

Comet A.90 – DarkThought: [0 − 1] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. f3 Na5 12. Kb1 e5 13. Nf5 Bxf5 14. exf5 Nxb3 15. cxb3 Qc6 16. g4 d5 17. g5 d4 18. gxf6 Bxf6 19. Ne4 dxe3 20. Rd6 Qc8 21. Nxf6+ gxf6 22. Rg1+ Kh8 23. Rxf6

Qc5 24. Rc1 Qd4 25. Rd1 Qf4 26. a3 Rad8 27. Rxd8 Rxd8 28. Rxf7 Rd2 29. f6 Kg8 30. Rg7+ Kf8 31. Qe1 Qd4 32. Qc1 Rd1 33. Rc7 e2 34. Rc8+ Kf7 35. Rc7+ Kg6 36. Ka2 Rxc1 37. Rxc1 Qd1 38. Rb1 e1=Q 39. Rxd1 Qxd1 40. f7 Kxf7 41. b4 Qxf3 42. b5 e4 43. a4 e3 44. Kb3 e2+ 45. Ka2 e1=Q 46. b4 Qxb4 47. h3 Qfa3# 0-1

DarkThought – Crafty 16.4: [1/2 – 1/2] (Test Game, Nunn Position #2, January 1999)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 Rb8 14. h4 Qb7 15. f3 Nh5 16. Bf2 Nf4 17. Qf1 Be6 18. g3 Bxb3 19. axb3 Ne6 20. Rd2 Rfd8 21. Qd1 Qc7 22. Re1 Qa5 23. Kb1 Qb4 24. h5 Bg5 25. Be3 Bxe3 26. Rxe3 Rd7 27. Red3 Rbd8 28. h6 g6 29. Re2 Nc5 30. Rdd2 a5 31. Re3 f6 32. f4 exf4 33. gxf4 d5 34. exd5 Qxf4 35. Qe1 Qxh6 36. Re8+ Rxe8 37. Qxe8+ Qf8 38. Qxf8+ Kxf8 39. dxc6 Rc7 40. Rd6 Ke7 41. Nb5 Rc8 42. c3 Nxb3 43. Rd7+ Ke6 44. Rd6+ Ke7 45. Rd7+ Ke6 1/2-1/2

Crafty 16.4 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #2, January 1999)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Rxd4 e5 13. Rc4 Qd8 14. g5 Nd7 15. g6 hxg6 16. Nd5 Nc5 17. Bxc5 dxc5 18. Nxe7+ Qxe7 19. Qe3 b6 20. Rc3 Be6 21. h4 Rfc8 22. Bd5 Bxd5 23. exd5 Qd6 24. Qf3 Rd8 25. Rd1 b5 26. Re3 Ra7 27. h5 g5 28. Qf5 f6 29. Qg6 Qf8 30. Ra3 Qf7 31. b3 c4 32. bxc4 bxc4 33. Qxf7+ Kxf7 34. Kb2 Rh8 35. Ra4 Rxh5 36. Rxc4 Rh2 37. Rd2 Rb7+ 38. Kc3 Rh4 39. Rc6 a5 40. Kd3 Rd4+ 41. Ke2 Rxd2+ 42. Kxd2 Rb5 43. c4 Rb2+ 44. Ke1 Rb1+ 45. Ke2 Ra1 46. Rc7+ Ke8 47. c5 Rxa2+ 48. Ke3 g6 49. d6 Rc2 50. c6 Kd8 51. f3 Rc3+ 52. Kd2 Rc5 53. Ke3 Rc1 54. Ke4 Rd1 55. Rd7+ Kc8 56. Ke3 a4 57. Ke2 Rc1 58. Rc7+ Kd8 59. Ke3 Rc3+ 60. Kf2 a3 61. Rd7+ Kc8 62. Rc7+ Kd8 63. Rd7+ 1/2-1/2

DarkThought – Fritz 3.10: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 Rb8 14. h4 Nd7 15. Na4 Rd8 16. Rd2 Nf8 17. Rhd1 Ne6 18. Qc4 Bf8 19. f3 g6 20. Kb1 Bh6 21. Re2 Nd4 22. Ree1 Nxb3 23. axb3 Be6 24. Qxa6 c5 25. Bf2 c4 26. Nb6 cxb3 27. c3 Qc6 28. Qa5 Qc7 29. Qa6 Qc6 30. Qa5 Qc7 31. Qa6 1/2-1/2

Fritz 3.10 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Rxd4 e5 13. Rc4 Qd8 14. g5 Nd7 15. h4 b5 16. Rb4 d5 17. Bxd5 Bxb4 18. Bxa8 Bxc3 19. bxc3 Qa5 20. Kb2 Nb6 21. Bxb6 Qxb6 22. Bd5 Be6 23. Rd1 Rc8 24. Bxe6 Qxe6 25. Rd5 h6 26. gxh6 Qxh6 27. Rxe5 Qf6 28. Qg4 Qc6 29. Qg3 b4 30. c4 Qxc4 31. Qd3 Qc6 32. Rf5 g6 33. Rf3 Qc5 34. Re3 a5 35. e5 Kg7 36. h5 gxh5 37. Rg3+ Kf8 38. Rg5 h4 39. Kb1 Ke7 40. Qf5 Qc6 41. Rg7 Qh1+ 42. Kb2 Qd5 43. Qg5+ Kd7 44. Qg4+ Kc7 45. Qf4 Kb6 46. Rxf7 h3 47. Rf6+ Kb5 48. Qe3 Rc5 49. Rh6 Qc4 50. Qd2 Rd5 51. Qe3 Rc5 52. Qd2 Rd5 53. Qe3 Rc5 1/2-1/2

DarkThought – Fritz 5.03: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 Rb8 14. h4 Qb7 15. f3 Be6 16. h5 c5 17. Na4 Bxb3 18. axb3 Rfc8 19. h6 g6 20. Bh4 c4 21. bxc4 Nh5 22. b3 Bxh4 23. Rxh4 Qb4 24. Qd3 Qa3+ 25. Kd2 Qb4+ 26. Ke2 Rc6 27. Kf2 Nf6 28. Rh3 Nh5 29. g3 Nf6 30. Nc3 Rbc8 31. Kg1 Qb6+ 32. Kh1 Qd8 33. Qd2 Qe7 34. Rh2 Qf8 35. Qg5 Qe7 36. Rhd2 Kh8 37. Rd3 Rb8 38. Qd2 Rd8 39. Na2 a5 40. Qxa5 Nh5 41. Qe1 Qg5 42. Nb4 Rcc8 43. Kh2 Qxh6 44. Rxd6 Nf4+ 45. Kg1 Rxd6 46. Rxd6 Nh3+ 47. Kg2 Ng5 48. Rd3 Qh3+ 49. Kg1 Ra8 50. Re3 Ne6 51. Nc6 f6 52. Re2 Ng5 53. Re3 Ne6 1/2-1/2

Fritz 5.03 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Rxd4 e5 13. Rc4 Qd8 14. g5 Nd7 15. Qh5 b5 16. Rb4 d5 17. Nxd5 Bxb4 18. Nxb4 Bb7 19. g6 hxg6 20. Qxg6 Qf6 21. Qg4 Nb6 22. Rg1 Nc4 23. Bxc4 bxc4 24. Nd5 Bxd5 25. exd5 c3 26. bxc3 Rac8 27. Bg5 Qxf2 28. Be7 Qe3+ 29. Kd1 g6 30. Rg3 Qb6 31. Bxf8 Rxf8 32. Kc1 Qf2 33. Rd3 Qxh2 34. d6 Rb8 35. d7 Qh6+ 36. Rd2 Rd8 37. Qc4 Qg5 38. Qc6 Kg7 39. Qd6 e4 40. Qd4+ f6 41. Qd6 Kf7 42. Qc7 f5 43. Qc4+ Kg7 44. Qe6 Qf6 45. Qe8 Qg5 46. Qe6 Qf6 47. Qe8 Qg5 48. Qe6 1/2-1/2

DarkThought – Fritz 5.32b: [1 – 0] (Test Game, Nunn Position #2, January 1999)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 Nd7 14. Na4 Rb8 15. h4 Nf6 16. f3 Rd8 17. h5 h6 18. Kb1 Re8 19. Qc4 Be6 20. Qxa6 Bxb3 21. cxb3 Ra8 22. Qc4 Qb7 23. Qc2 Red8 24. Rd3 Rdb8 25. Bh4 d5 26. Rc3 d4 27. Rxc6 Qb5 28. Ka1 Qb4 29. g3 Bd8 30. Bxf6 Bxf6 31. Rc1 Bg5 32. Rd1 Be3 33. Nc5 Qa5 34. a3 Qd8 35. Nd3 Qg5 36. g4 Qe7 37. b4 Qg5 38. Qc4 Re8 39. Rh1 Rab8 40. b5 Rb7 41. a4 Ra7 42. b6 Raa8 43. b7 Rab8 44. Rc8 Qe7 45. Qc6 Rd8 46. Rxd8+ Rxd8 47. a5 Kh7 48. Kb1 f6 49. a6 Rb8 50. Qc8 Rxc8 51. bxc8=Q Qf7 52. Rh2 Qb3 53. a7 Qd1+ 54. Nc1 Qa4 55. g5 fxg5 56. Rc2 Qxc2+ 57. Kxc2 d3+ 58. Nxd3 Bxa7 59. Nxe5 g6 60. Qf8 gxh5 61. Qf7+ Kh8 62. Ng6# 1-0

Fritz 5.32b – DarkThought: [0 – 1] (Test Game, Nunn Position #2, January 1999)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Rxd4 e5 13. Rc4 Qd8 14. g5 Nd7 15. Qh5 b5 16. Rb4 d5 17. Nxd5 Bxb4 18. Nxb4 Bb7 19. g6 hxg6 20. Qxg6 Qf6 21. Qg4 Nb6 22. Bxb6 Qxb6 23. Rg1 Qh6+ 24. Kb1 a5 25. Nd5 Bxd5 26. Bxd5 Ra6 27. Qg3 Rf6 28. h3 Rf4 29. Rd1 b4 30. Qg2 Rc8 31. f3 Rh4 32. Rh1 a4 33. Bb7 Rc7 34. Bd5 a3 35. Bb3 axb2 36. Kxb2 Qd6 37. Rg1 Qf6 38. Rd1 Kh7 39. Rd2 Qh6 40. Rd5 Rxh3 41. Rxe5 Rh1 42. f4 Rh4 43. Rg5 Rxf4 44. e5 g6 45. Rg3 Re7 46. Re3 Rf5 47. Qg3 Rh5 48. Re4 Qd2 49. Qd3 Qg5 50. Qf3 Rh4 51. Re2 f5 52. Qd5 Kh6 53. Re1 Qg3 54. Qd2+ Kg7 55. e6 Kh7 56. Rf1 Qe5+ 57. Kb1 Qf6 58. Qd6 Ra7 59. Re1 Rb7 60. Bd5 Re7 61. Qc5 Qg7 62. Qd6 g5 63. Rf1 Kg6 64. Bb3 Qf6 65. Qd8 Re4 66. Qg8+ Qg7 67. Qc8 g4 68. Bd5 Rd4 69. Bc6 Kg5 70. Bd7 g3 71. Qc7 f4 72. Qc5+ Kg6 73. Rh1 Rd2 74. Qxb4 Rd4 75. Qc5 g2 76. Qh5+ Kf6 77. Rg1 Qh7 78. Qxh7 Rxh7 79. Rxg2 Rh1+ 80. Kb2 Rb4+ 81. Kc3 Re4 82. Kd2 Rhe1 83. Rf2 Kg5 84. a4 R1e3 85. Rg2+ Kh4 86. Rg7 Re2+ 87. Kc3 f3 88. Rf7 f2 89. Bb5 R2e3+ 90. Kd2 Kg3 91. a5 Rf3 92. Rg7+ Kh4 93. Rh7+ Kg5 94. a6 Rxe6 95. Rh1 Rf8 96. Bd3 Kg4 97. Ra1 Re7 98. Rf1 Kg3 99. Ra1 Rd8 100. Rb1 Re6 101. a7 Ra6 102. a8=N Raxa8 103. Ke2 Rd4 104. Kd2 Rd6 105. Ke3 Re8+ 106. Kd2 Kf3 107. Ra1 Re2+ 108. Kc3 Re1 109. Ra8 Rxd3+ 110. cxd3 f1=Q 111. Rf8+ Kg3 112. Rxf1 Rxf1 0-1

DarkThought – Genius 3: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 a5 14. f3 Nh5 15. Qd2 Nxg3 16. hxg3 Be6 17. Rh5 Bxb3 18. axb3 h6 19. Rdh1 Qd8 20. Kb1 Re8 21. Rd1 Qb6 22. Rhh1 Reb8 23. Na4 Qb5 24. Qe3 Rb7 25. Rd3 Qb4 26. g4 Bg5 27. Qf2 Kf8 28. g3 Kg8 29. f4 Be7 30. Qe2 f6 31. Rhd1 Rab8 32. f5 Rc8 33. Rc3 Qb5 34. Qf3 Qa6 35. Rcd3 Qa7 36. Qe2 Rb4 37. Nc3 Rcb8 38. R3d2 Qc5 39. Qa6 Qb6 40. Qxb6 R8xb6 41. Kc1 Rb7 42. Re1 Rd4 43. Rxd4 exd4 44. Ne2 d3 45. Nd4 Rb6 46. cxd3 c5 47. Ne6 Rxb3 48. Kc2 c4 49. Nf4 Bd8 50. Ra1 Rb4 51. d4 Rb3 52. Ra3 Bb6 53. Ne6 Rb4 54. Kc3 Kf7 55. b3 cxb3 56. Rxb3 Rxb3+ 57. Kxb3 Ke7 58. Ka4 d5 59. Kb5 Ba7 60. exd5 Kd6 61. Kc4 Kd7 62. Nc5+ Kc7 63. Ne4 Bb6 64. d6+ Kd7 65. d5 Ba7 66. Kb5 Bb8 67. Kxa5 Bxd6 68. Kb5 Ba3 69. Kc4 Bb2 70. Nc5+ Kd6 71. Ne6 Be5 72. Nf4 Ke7 73. Kc5 Kd7 74. Nh5 Bd6+ 75. Kd4 Bf8 76. Kc4 Bd6 77. Nf4 Be5 78. Ne2 Kd6 79. Nd4 Bxg3 80. Ne6 Be5 81. Nxg7 Bf4 82. Ne6 Be3 83. Nd4 Kd7 84. Ne2 Kd6 85. Nc3 Bb6 86. Nb5+ Kd7 87. Kd3 Bd8 88. Nd4 Kd6 89. Ke4 Bb6 90. Ne2 Ba5 91. Ng1 Kc5 92. Nf3 Kd6 93. Nh4 Be1 94. Ng2 Bb4 95. Nf4 Bc3 96. Ne6 Ba5 97. Kd4 Bb6+ 98. Kd3 Kxd5 1/2-1/2

Genius 3 – DarkThought: [0 – 1] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Bxd4 e5 13. Be3 Bxg4 14. f3 Be6 15. Qg2 Kh8 16. Rhg1 Rg8 17. Kb1 b5 18. f4 b4 19. Nd5 Bxd5 20. exd5 exf4 21. Bxf4 a5 22. Ba4 Nd7 23. Rdf1 Bf6 24. Bg5 Raf8 25. Rf4 Bxg5 26. Qxg5 Ne5 27. Rh4 g6 28. Qf6+ Rg7 29. Rd4 Rc8 30. Rdd1 Qd8 31. Rdf1 Nc4 32. Qxd8+ Rxd8 33. Rf6 Nd2+ 34. Kc1 Ne4 35. Rf3 f5 36. a3 Re7 37. Bc6 Nf6 38. axb4 axb4 39. Rf4 Ne4 40. Rg2 Ra7 41. Kb1 Rb8 42. h4 Rb6 43. b3 Rba6 44. Ba4 Rf7 45. Kb2 Kg7 46. Re2 Rb6 47. Re1 Re7 48. Bc6 Ra6 49. Re2 Ra5 50. Re1 Kf6 51. Rff1 Rea7 52. Ba4 Ke5 53. Re2 Rxd5 54. Rfe1 Rc7 55. Rg2 Rdc5 56. Kb1 d5 57. h5 f4 58. hxg6 hxg6 59. Rf1 g5 60. Rh2 g4 61. Rh5+ Kd4 62. Rxf4 Rxc2 63. Rh1 Kd3 64. Rd1+ Nd2+ 65. Rxd2+ Rxd2 66. Rf1 Rcc2 67. Rg1 Rb2+ 68. Ka1 Rg2 69. Bc6 g3 70. Bxd5 Rxg1+ 71. Kxb2 g2 72. Bf3 Rb1+ 73. Kxb1 g1=Q+ 0-1

DarkThought – Genius 5: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 Qb6 14. h4 Be6 15. f3 Nh5 16. Bf2 Qb4 17. g3 Rfb8 18. Rd2 a5 19. Na4 Bxb3 20. axb3 Rb7 21. Rhd1 Nf6 22. Rd3 Nd7 23. Be1 Qb5 24. Nc3 Qb6 25. Bf2 Nc5 26. Bxc5 Qxc5 27. Na4 Qb4 28. Rc3 Qb5 29. Qd3 h6 30. Qc4 Qxc4 31. bxc4 Rab8 32. b3 Kh7 33. Rcd3 Ra8 34. Nc3 g6 35. Na4 Kg7 36. Kd2 Kf6 37. Ke3 Ke6 38. Nc3 h5 39. R1d2 Rf8 40. Rd1 Ra8 41. Ke2 f5 42. Ra1 fxe4 43. fxe4 g5 44. hxg5 Bxg5 45. Rad1 Be7 46. Rh1 Rh8 47. Ra1 Ra7 48. Rf3 Rg8 49. Nd1 Bd8 50. Ne3 Bb6 51. Rh1 Rh7 52. Nf5 Rg4 53. Rh4 Rh8 54. Kd3 Kd7 55. Rf1 Rxh4 56. gxh4 Rg8 57. Rf3 Ke6 58. Rg3 Rxg3+ 59. Nxg3 Bd8 60. Nxh5 Bxh4 61. Ng7+ Kd7 62. Ke2 Bf6 63. Nh5 Bg5 64. Ng3 Ke6 65. Kf3 Bd2 66. Kf2 d5 67. exd5+ cxd5 68. cxd5+ Kxd5 69. Kf3 Be1 70. Ne4 Kd4 71. Ke2 Bb4 72. Kf3 Be7 73. Nd2 Bf8 74. Ke2 e4 75. Nf1 Bh6 76. Ng3 Bf4 77. Nf5+ Kc3 78. Ne7 Kxc2 79. Nc6 Kxb3 80. Nxa5+ Kb4 1/2-1/2

Genius 5 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Bxd4 e5 13. Be3 Bxg4 14. f3 Be6 15. Rhg1 Kh8 16. Qg2 Rg8 17. Bxe6 fxe6 18. Qh3 Qc4 19. Rd3 b5 20. Kb1 Rac8 21. Rg2 d5 22. exd5 exd5 23. Qe6 e4 24. fxe4 dxe4 25. Qxc4 Rxc4 26. Rd1 b4 27. Ne2 Rd8 28. Rxd8+ Bxd8 29. Bd4 a5 30. b3 Rc6 31. c4 Re6 32. Kc2 Bc7 33. Kd2 Re8 34. Ke3 Bb8 35. h3 Be5 36. Bb6 Nd7 37. Bxa5 Bd6 38. Rg5 Bc5+ 39. Rxc5 Nxc5 40. Bxb4 Nd3 41. Bd6 Re6 42. Bg3 Nb4 43. a4 Nc2+ 44.

Kd2 Nb4 45. Bf4 Rf6 46. h4 Kg8 47. Ke3 Nd3 48. a5 Kf7 49. Bg5 Rf1 50. Kd4 Rb1 51. Kc3 Rd1 52. Be3 Re1 53. Kd2 Ra1 54. Ng3 Rxa5 55. Nxe4 Ne5 56. Bf2 Ra2+ 57. Kc3 Re2 58. Kd4 Ke6 59. c5 Nc6+ 60. Kd3 Ra2 61. Bg3 Ra3 62. Kc4 Na5+ 63. Kb5 Kd5 64. Nc3+ Ke6 65. Ne4 Rxb3+ 66. Kxa5 Kd5 67. Be1 Kxe4 68. c6 Kf5 69. c7 Ra3+ 70. Kb6 Ra8 71. Kb7 Rg8 72. Bb4 Kg4 73. Be7 g6 74. Bf6 h6 1/2-1/2

DarkThought – Hiarcs 6: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 Qxc6 12. f3 b5 13. a3 Bb7 14. h4 Rac8 15. h5 h6 16. Bf4 Rfd8 17. g4 Ne8 18. Be3 Bf6 19. Bd4 Be5 20. Rd3 Bf4+ 21. Be3 Bxe3+ 22. Qxe3 a5 23. Rhd1 Ba6 24. Rd4 Qb6 25. Qe1 Bb7 26. Qd2 Rc7 27. Kb1 Rdc8 28. Ka1 e5 29. Rd3 b4 30. Na4 Qb5 31. g5 hxg5 32. h6 bxa3 33. bxa3 gxh6 34. Qh2 Kg7 35. Rh1 h5 36. Qxh5 Kf6 37. Qh6+ Ke7 38. Qxg5+ Kd7 39. Rh7 Ra8 40. Qg8 Bc6 41. Rxf7+ Kd8 42. Rxd6+ Kc8 43. c4 Qxb3 44. Rxc7+ Kb8 45. Rcxc6 Qxa3+ 46. Kb1 Qb4+ 47. Nb2 Qxd6 48. Rxd6 Kc7 49. Rd5 Kc6 50. Qe6+ Kb7 51. Qd7+ Nc7 52. Rb5+ Ka6 1-0

Hiarcs 6 – DarkThought: [0 – 1] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. g4 d5 13. f3 Bb7 14. g5 Nh5 15. Qf2 f6 16. Qh4 g6 17. f4 Rae8 18. Kb1 f5 19. Rhf1 h6 20. exd5 cxd5 21. Bd4 hxg5 22. fxg5 Bd6 23. Rd2 Kh7 24. Rfd1 e5 25. Bf2 d4 26. Ne2 Bf3 27. Rc1 Be7 28. Ng3 Qd8 29. Nxh5 Bxh5 30. Rg1 Qb8 31. Rd3 Bb4 32. Ba4 Bc3 33. Bb3 Ba5 34. c3 Qb5 35. c4 Qc5 36. Rc1 Rh8 37. Ba4 Rd8 38. Bg1 e4 39. Rb3 Bc7 40. Rb7 Kg8 41. b4 Qe5 42. Bc6 Rh7 43. Bd5+ Kh8 44. Qe1 e3 45. Qf1 f4 46. Kc2 Bg4 47. Rxc7 Rxc7 48. Kb3 Rxd5 49. Qd3 Bf5 50. Qd1 d3 51. cxd5 Rxc1 52. Qxc1 d2 53. Qd1 Qxd5+ 54. Ka3 Qd3+ 55. Kb2 Qd4+ 56. Kb3 Be6+ 57. Ka4 Qc4 58. Qa1+ Kh7 59. Ka3 d1=Q 60. Qb1 Qxb1 61. Bxe3 Qbxa2# 0-1

DarkThought – Junior 4.6: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 a5 13. h3 e5 14. Bd2 Be6 15. f4 exf4 16. Bxf4 Bxb3 17. axb3 Rfe8 18. Rhf1 Bf8 19. g4 Re6 20. g5 Nd7 21. Qc4 Qc8 22. Bg3 Nc5 23. Rf4 Rb8 24. Bf2 Rb4 25. Qe2 Nxe4 26. Nxe4 d5 27. Qh5 g6 28. Qg4 Rbxe4 29. Rxe4 dxe4 30. Qf4 Re8 31. h4 Qe6 32. Be3 a4 33. bxa4 Qa2 34. Qc7 Qa1+ 35. Kd2 Bb4+ 36. Ke2 Qxa4 37. b3 Qb5+ 38. Kf2 Bc3 39. Qd7 Rf8 40. Qg4 Qb4 41. Kg2 Bg7 42. Rd7 f5 43. gxf6 Rxf6 44. Rd8+ Bf8 45. Re8 Qd6 46. Qxe4 Kf7 47. Bg5 Re6 48. Rxe6 Qxe6 49. Qf4+ Kg8 50. Kf2 Bc5+ 51. Kf3 Qh3+ 52. Ke2 Qg2+ 53. Kd3 Qd5+ 54. Ke2 Bf8 55. Bf6 Ba3 56. Qe3 Bd6 57. Qe8+ Bf8 58. Ke1 Qh1+ 59. Kf2 Qh2+ 60. Ke1 Qg3+ 61. Ke2 Qg4+ 62. Ke3 c5 63. Be5 Qh3+ 64. Kd2 Qf5 65. Kc1 h6 66. Kb1 g5 67. hxg5 hxg5 68. Ba1 g4 69. Bb2 Kh7 70. Qc6 Qf1+ 71. Ka2 Qf4 72. Qe6 c4 73. b4 g3 74. Be5 Qf3 75. Qxc4 g2 76. Bh2 Qf1 77. Qe4+ Kh8 78. Qg4 Kh7 79. b5 Bg7 80. Qe4+ Kh8 81. Qe8+ Kh7 82. Qh5+ Kg8 83. Qd5+ Kh7 84. Qd3+ Qxd3 85. cxd3 Bd4 86. Kb3 Kg6 87. Kc4 g1=Q 88. Bxg1 Bxg1 89. d4 Kf7 90. d5 Ke7 1/2-1/2

Junior 4.6 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. f4 b5 12. a3 Bd7 13. Kb1 Na5 14. Ba2 Nc4 15. Bxc4 bxc4 16. g4 d5 17. Bc1 Rab8 18. exd5 Bxa3 19. dxe6 Bxb2 20. Bxb2 Qb7 21. Nb3 Bc6 22. Qxc4 Bxh1 23. g5 Nh5 24. Rd7 Qc6 25. exf7+ Kh8 26. Qxc6 Bxc6 27. Rc7 Bf3 28. Ba3 Nxf4 29. Bxf8 Rxf8 30. Nc5 h6 31. N3e4 Bxe4 32. Nxe4 Kh7 33. Nc5 hxg5 34. Re7 Ng6 35. Ra7 Nf4 36. Kb2 g6 37. Ne4 g4 38. Nf6+ Kg7 39. Ne8+ Kh6 40. Nd6 Ne6 41. c4 Kg7 42. Ne8+ Kh6 43. Nf6 Kg7 44. Nxg4 Rxf7 45. Rxa6 Rf4 46. h3 Kf7 47. Ne5+ Kf6 48. Nxg6 Rxc4 49. Nf8 Re4 50. h4 Kf5 51. Nxe6 Rxe6 1/2-1/2

DarkThought – Junior 5.0: [1 – 0] (Test Game, Nunn Position #2, December 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 Qxc6 12. f3 b5 13. a3 Nd7 14. h4 Nc5 15. Ba2 Bf6 16. Qd2 Nb7 17. Bd4 Bxd4 18. Qxd4 Rd8 19. g4 Bd7 20. h5 h6 21. g5 Qc5 22. g6 Qxd4 23. gxf7+ Kxf7 24. Rxd4 Rac8 25. Ne2 Rc5 26. Nf4 Rdc8 27. Rd2 Rg5 28. Rhd1 a5 29. Rd3 Kf6 30. Rd4 Rb8 31. R4d2 Rc8 32. Kb1 Rg3 33. e5+ Kxe5 34. Nxe6 Kf6 35. Nf4 Bc6 36. Nd5+ Bxd5 37. Bxd5 Nc5 38. Rd4 Rg5 39. Ba2 Rd8 40. Rf4+ Rf5 41. Rxf5+ Kxf5 42. Bd5 b4 43. axb4 axb4 44. Ka2 Ke5 45. Bc6 d5 46. Re1+ Kf4 47. Re7 Rd6 48. Bb5 Rb6 49. Be8 b3+ 50. cxb3 d4 51. Rc7 Ne6 52. Rd7 Ke3 53. Bg6 Nf4 54. Bf7 Rb5 55. Re7+ Kxf3 56. Be8 Rg5 57. b4 d3 58. Bc6+ Kf2 59. Rf7 Ke3 60. Re7+ Kd2 61. b5 Rc5 62. b4 Rc2+ 63. Ka3 Nxh5 64. Bf3 g6 65. Re8 Rc3+ 66. Ka4 Kc1 67. b6 d2 68. b7 Rxf3 69. Rd8 Nf4 70. Rxd2 Kxd2 71. b8=Q Rf1 72. b5 Ra1+ 73. Kb3 Rb1+ 74. Ka2 Rb4 75. b6 Nd3 76. Qd6 Rb5 77. Qc7 Rc5 78. Kb3 Rh5 79. Kc4 Rh4+ 80. Kd5 Rh5+ 81. Kd6 Rb5 82. b7 g5 83. b8=Q Rxb8 84. Qxb8 g4 85. Kd5 Nf2 86. Qe5 Kd3 87. Qe1 g3 88. Qg1 Ke2 89. Qxg3 1-0

Junior 5.0 – DarkThought: [0 – 1] (Test Game, Nunn Position #2, December 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Rxd4 e5 13. Rc4 Qd8 14. g5 Nd7 15. Qh5 b5 16. Rb4 d5 17. Bxd5 Bxb4 18. Bxa8 Bxc3 19. bxc3 Qc7 20. Kb2 Nb6 21. Bxb6 Qxb6 22. Qf3 Bg4 23. Qxg4 b4 24. Ka1 Rxa8 25. Qf3 bxc3 26. Qxc3 Qxf2 27. h4 Qf4 28. Qc4 Rf8 29. Qd3 h6 30. gxh6 Qxh6 31. h5 Rc8 32. c3 Rb8 33. c4 Rc8 34. Qc3 Qd6 35. Rc1 Rc5 36. Kb2 a5 37. a3 a4 38. Ka2 Qd4 39. Qc2 Kh7 40. Kb1 Kh6 41. Qe2 Rc6 42. Rc2 Rb6+ 43. Ka2 Rb3 44. c5 Rd3 45. Qf2 Qd7 46. Rb2 Qh3 47. Rb6+ f6 48. Qc2 Rxa3+ 49. Kb2 Qe3 50. Rb4 Rd3 51. Rxa4 Rd2 52. Rc4 Rxc2+ 53. Kxc2 f5 54. c6 fxe4 55. Rc3 Qf2+ 56. Kb3 e3 57. c7 Qf7+ 58. Kb2 e2 59. c8=Q e1=Q 60. Qh8+ Kg5 61. Qd8+ Qf6 62. Qd3 e4 63. Qc2 Qexc3+ 0-1

DarkThought – MChess 5: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 a5 13. h3 Ba6 14. Qd2 Rfd8 15. g4 Rab8 16. f3 Qb7 17. Na4 c5 18. c4 Qc7 19. Rh2 Rb4 20. Qc2 Nd7 21. Bd2 Rb7 22. f4 d5 23. exd5 exd5 24. Re2 Nf6 25. f5 Ne4 26. Kb1 dxc4 27. Bxc4 Bxc4 28. Qxc4 Rxd2 29. Rdxd2 Nxd2+ 30. Rxd2 Rb4 31. Qc2 Bg5 32. Re2 Qc6 33. Nc3 h6 34. Ne4 Be7 35. f6 Bxf6 36. Nxf6+ gxf6 37. Qc1 Qd5 38. Rc2 Re4 39. Rxc5 Qd3+ 40. Ka1 Qg3 41. Qxh6 Re1+ 42. Rc1 Qxh3 43. Qd2 Rxc1+ 44. Qxc1 Qxg4 45. b3 Qg5 46. Qc8+ Kg7 47. Kb1 Qg6+ 48. Kb2 f5 49. Qc7 Qg2+ 50. Ka3 Qd5 51. Qg3+ Kf6 52. Qc3+ Qe5 53. Qc6+ Ke7 54. Qb7+ Kd8 55. Qxf7 Qe7+ 56. Qxe7+ Kxe7 1/2-1/2

Mchess 5 – DarkThought: [0 – 1] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 a5 13. h4 Rd8 14. f3 Ba6 15. Qe3 Nd7 16. Kb1 Bb5 17. a3 Ba6 18. Na4 Kh8 19. h5 Ne5 20. h6 g6 21. Qb6 Qxb6 22. Nxb6 Ra7 23. Bxe5+ dxe5 24. Bc4 Rd4 25. Bxa6 Rxa6 26. Nd7 f6 27. c3 Rxd1+ 28. Rxd1 Kg8 29. Kc2 a4 30. g4 g5 31. c4 Kf7 32. Kc3 c5 33. Rd2 Kg6 34. b4 axb3 35. Kxb3 Kxh6 36. a4 Kg6 37. Ka3 h5 38. gxh5+ Kxh5 39. Rh2+ Kg6 40. Rd2 Kf7 41. Rd3 Ke8 42. Rd1 Ra7 43. Nb8 Ra8 44. Nc6 Ra6 45. Nxe7 Kxe7 46. Rh1 Kf7 47. Rh7+ Kg6 48. Rc7 g4 49. fxg4 Kg5 50. Rf7 Ra8 51. Rg7+ Kf4 52. Rf7 Kxe4 53. Rxf6 Re8 54. Kb3 Kd3 55. Rf3+ Kd4 56. g5 e4 57. Rg3 e3 58. Kc2 Rd8 59. g6 Ke4 60. g7 e2 61. Rg6 e5 62. Rg1 Ke3 63. Rh1 Rg8 64. Rh5 e1=Q 65. Rxe5+ Kf2 66. Rxe1 Kxe1 67. Kd3 Rxg7 68. Ke4 Rd7 69. Ke5 Rd4 70. a5 Rxc4 71. Kd5 Rc1 72. a6 Ke2 73. a7 Ra1 74. Kxc5 Rxa7 0-1

DarkThought – MChess 7.1: [1/2 – 1/2] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 a5 13. h3 Rd8 14. g4 Nd7 15. Na4 Ba6 16. Qd2 Ne5 17. Kb1 c5 18. Nc3 Rab8 19. Qc1 Nc4 20. Bxc4 Bxc4 21. b3 Ba6 22. g5 c4 23. Qd2 Qc6 24. Ka1 Rbc8 25. Rc1 d5 26. exd5 exd5 27. Nb1 Bb4 28. Qd4 Bc5 29. Qd2 Qb6 30. Be5 d4 31. Rcd1 d3 32. Bc3 Bxf2 33. h4 Bb7 34. Rhf1 Be3 35. Qh2 cxb3 36. cxb3 Ba6 37. Rf3 Bd4 38. Qf4 a4 39. bxa4 f6 40. Bxd4 Rxd4 41. Qe3 Rb8 42. Rf2 Rxa4 43. Qxb6 Rxb6 44. Nc3 Rd4 45. gxf6 Rxf6 46. Rxf6 gxf6 47. h5 Kg7 48. Kb2 Kh6 49. a3 Kxh5 50. Na2 Bb5 51. Nb4 Kg5 52. Kc3 Rg4 53. Nxd3 Rg3 54. Kd4 h5 55. Nc5 Rxa3 56. Ne4+ Kf4 57. Nxf6 h4 58. Nd5+ Kf3 59. Rh1 Ra4+ 60. Kc5 Be8 61. Nb4 Kg3 62. Rg1+ Kh2 63. Rg7 Bh5 64. Kb5 Ra3 65. Rh7 Be2+ 66. Kc5 h3 67. Nd5 Ra4 68. Rg7 Kh1 69. Rg3 h2 70. Ne3 Re4 71. Kd6 Rd4+ 72. Ke5 Rh4 73. Kf5 Rh8 74. Ke5 Rh5+ 75. Kf6 Rh6+ 76. Ke5 Rh7 77. Kf6 Rc7 78. Rg2 Bh5 79. Rb2 Rc1 80. Rf2 Rg1 81. Kf5 Be8 82. Kf4 Bd7 83. Nf1 Rg4+ 84. Kf3 Kg1 85. Nxh2 1/2-1/2

MChess 7.1 – DarkThought: [0 – 1] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 a5 13. h4 Rd8 14. Qe3 Ba6 15. f3 Bb5 16. e5 dxe5 17. Bxe5 Qb7 18. Nxb5 cxb5 19. c3 b4 20. Rxd8+ Rxd8 21. Rd1 Rxd1+ 22. Bxd1 Nd5 23. Qe4 bxc3 24. bxc3 Ba3+ 25. Kd2 Qb2+ 26. Qc2 Qb6 27. Bd4 Qb8 28. Qe4 Qh2 29. Qg4 g6 30. Bb3 h5 31. Qh3 Qd6 32. Kc2 Nb4+ 33. cxb4 Qxd4 34. Bxe6 Bxb4 35. Bxf7+ Kxf7 36. Qc8 Be7 37. Qc3 Qxc3+ 38. Kxc3 Bxh4 39. Kd4 Kf6 40. Ke4 Kg5 41. Ke3 a4 42. Ke2 Kf4 43. g4 Kg3 44. gxh5 gxh5 45. f4 Bd8 46. Kf1 h4 47. Kg1 Bb6+ 48. Kh1 Bc5 49. f5 h3 50. f6 Ba3 51. Kg1 h2+ 52. Kh1 Kh3 53. f7 Kg3 54. f8=Q Bxf8 55. a3 Bb4 56. axb4 a3 57. b5 a2 58. b6 a1=Q# 0-1

DarkThought – Mephisto Meisterschach: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 a5 14. f3 Nh5 15. Qd2 Be6 16. Bf2 Bxb3 17. axb3 Rfd8 18. g4 Nf4 19. Be3 d5 20. Bxf4 dxe4 21. Qe3 exf4 22. Qxe4 Bd6 23. Rhe1 Rab8 24. h4 Bc5 25. Kb1 Rxd1+ 26. Rxd1 Bf2 27. h5 Be3 28. h6 gxh6 29. Rh1 Qd6 30. g5 Qe6 31. Rxh6 Qxe4 32. Nxe4 Rb6 33. Rd6 Kg7 34. Ka2 Bc1 35. Ka3 Be3 36. Ka4 Ra6 37. c3 Rb6 38. Rh6 Ra6 39. Nd6 Bc5 40. Ne8+ Kg8 41. Nf6+ Kg7 42. Nxh7 Be7 43. Nf6 Bd8 44. Nh5+ Kg8 45. g6 fxg6 46. Rxg6+ Kf7 47. Rg7+ Kf8 48. Rg4 Ke7 49. Nxf4 Kf6 50. Nd3 Be7 51. Rf4+ Kg5 52. Re4 Bd6 53. Re6 Bg3 54. Nc5 Rb6 55. Re7 Kf6 56. Ra7 Bb8 57. Rxa5 Ke7 58. b4 Bd6 59. Ra7+ Ke8 60. Ne4 Bb8 61. Ra8 Ke7 62. c4 Be5 63. Nc5 Bd4 64. Ra7+ Ke8 65. Na6 c5 66. Ra8+ Kd7 67. b5 Rf6 68. b4 Rf5 69. b6 cxb4 70. b7 Be5 71. Nxb4 Bg3 72. Rc8 Ke6 73. c5 Rxf3 74. c6 Rc3 75. Na6 Bd6 76. c7 Kf7 77. b8=Q Ra3+ 78. Kb5 Rb3+ 79. Nb4 Rxb4+ 80. Kc6 Rxb8 81. Rxb8 Bxc7 82. Kxc7 1-0

Mephisto Meisterschach – DarkThought: [0 – 1] (Test Game, Nunn Position #2, July 1998)

1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 a5 13. Kb1 Ba6 14. Qd2 Rfd8 15. f3 Qb7 16. Na4 c5 17. c4 d5 18. cxd5 c4 19. Bc2 exd5 20. e5 Ne8 21. Qxa5 Bb5 22. Qb6 Qc6 23. Qxc6 Bxc6 24. Nb6 Ra6 25. Be3 Nc7 26. Bf5 Rb8 27. Nc8 Ba3 28. Bc1 Bxb2 29. Bxb2 c3 30. Kc2 Rxb2+ 31. Kxc3 Raxa2 32. Kd4 Ra4+ 33. Kc3 Rab4 34. Na7 Ba4 35. Rc1 g6 36. Bc8 Nb5+ 37. Nxb5 Bxb5 38. Rc2 d4+ 39. Kd2 d3 40. Rxb2 Rxb2+ 41. Kc3 Rc2+ 42. Kb4 d2 43. Rd1 Be2 44. Rxd2 Rxd2 45. Kc3 Rd3+ 46. Kc2 Re3 47. f4 Bf1 48. g3 Re2+ 49. Kd3 Rxe5+ 50. Kd4 Rb5 51. Ke3 Rb2 52. h4 Re2+ 53. Kf3 Rc2 54. Bd7 Bg2+ 55. Ke3 Bb7 56. g4 Rc3+ 57. Kd2 Rf3 58. f5 Rf4 59. Kd3 Rxg4 60. fxg6 Rg3+ 61. Ke2 hxg6 62. Kf2 Rf3+ 63. Ke2 Rf4 64. h5 gxh5 65. Bh3 h4 66. Ke1 Bc6 67. Ke2 Rf3 68. Bg2 Rf2+ 69. Kxf2 Bxg2 70. Kxg2 Kh7 71. Kh3 Kg7 72. Kxh4 Kf6 0-1

DarkThought – Mephisto Shredder: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 Bb7 13. h4 Rfd8 14. g4 Nd7 15. g5 Nc5 16. Bc4 Qa5 17. f3 d5 18. exd5 cxd5 19. Bxd5 Bxd5 20. Nxd5 Qxa2 21. Nxe7+ Kh8 22. c3 Qa1+ 23. Kc2 Qa4+ 24. Kb1 Qxf4 25. Rxd8+ Rxd8 26. Rd1 Rf8 27. Nc6 Qxh4 28. Qe5 Qa4 29. Qd6 Rg8 30. Ne7 Ne4 31. fxe4 Qxe4+ 32. Qd3 Qxd3+ 33. Rxd3 Re8 34. Rd6 h5 35. g6 fxg6 36. Nxg6+ Kg8 37. Nf4 h4 38. Ng6 h3 39. Rd3 Kf7 40. Nf4 h2 41. Rh3 g5 42. Nd3 Kg6 43. Rxh2 a5 44. Ne5+ Kf5 45. Nc4 Kf4 46. Rf2+ Kg3 47. Rf7 a4 48. Ra7 g4 49. Rxa4 Kf2 50. Ra2 Rc8 51. b3+ Kf3 52. Rc2 g3 53. Ne5+ Kf4 54. Nd3+ Ke3 55. Ne1 e5 56. Ng2+ Kf3 57. c4 e4 58. c5 Rb8 59. Kb2 e3 60. Ne1+ Ke4 61. Rc4+ Kd5 62. c6 Kd6 63. c7 Rc8 64. Kc3 Rxc7 65. Rxc7 Kxc7 66. b4 Kc6 67. Kc4 Kb6 68. Ng2 e2 69. b5 Kb7 70. Kc5 Kc7 71. b6+ Kb7 72. Ne1 Kb8 73. Kc6 g2 74. Nxg2 Kc8 75. b7+ Kd8 76. Kb6 Ke7 77. b8=Q Kf6 78. Qf4+ Kg7 79. Qg5+ Kf7 80. Ne1 Ke6 81. Kc6 Kf7 82. Kd7 Kf8 83. Ke6 Ke8 84. Qe7# 1-0

Mephisto Shredder – DarkThought: [0 – 1] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. f4 d5 13. e5 Nd7 14. g4 c5 15. Bf2 Bb7 16. Rhf1 c4 17. Ba4 Nc5 18. f5 Nxa4 19. Nxa4 Qa5 20. f6 gxf6 21. Nc3 Qc7 22. Bh4 fxe5 23. Bxe7 Qxe7 24. Qxe5 f6 25. Qe3 Rad8 26. Qa7 Kh8 27. Kb1 Qb4 28. a3 Qe7 29. h3 Rd7 30. Qf2 f5 31. Ne2 Rdd8 32. Qe3 fxg4 33. hxg4 e5 34. Nd4 Rde8 35. Nf5 d4 36. Nxe7 dxe3 37. Rxf8+ Rxf8 38. Re1 Rf4 39. Rxe3 e4 40. Rg3 Rf1+ 41. Ka2 Rf3 42. Rg1 e3 43. Re1 Be4 44. Nf5 Bxf5 45. gxf5 Kg7 46. b3 cxb3+ 47. Kxb3 Kf6 48. Kc4 h5 49. Kd4 Kxf5 50. c4 h4 51. c5 Ke6 52. Ke4 Rg3 53. Re2 Kd7 54. Rh2 e2 55. Rxe2 Kc6 56. Kd4 Rg4+ 57. Ke3 h3 58. Kf3 Rh4 59. Rh2 Rc4 60. Re2 Kxc5 61. Re5+ Kd6 62. Re3 Rh4 63. Re1 h2 64. Rh1 Kc5 65. Kg3 Rh5 66. Kg2 Kc4 67. Rc1+ Kb3 68. Kh1 a5 69. Re1 Kxa3 70. Re3+ Kb4 71. Re4+ Kb5 72. Re8 a4 73. Rb8+ Ka5 74. Rf8 Rc5 75. Kxh2 a3 76. Ra8+ Kb4 77. Kg2 Ra5 78. Rb8+ Ka4 79. Rb1 a2 80. Rf1 Kb3 81. Rf3+ Kc4 82. Rf4+ Kc3 83. Rf3+ Kd4 84. Rf4+ Ke5 85. Rf8 a1=Q 86. Re8+ Kd4 87. Kf2 Rf5+ 88. Kg2 Rg5+ 89. Kf2 Qg1+ 90. Ke2 Rg2+ 91. Kf3 Rf2# 0-1

DarkThought – Nimzo 98: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 a5 14. f3 Nh5 15. Qd2 Be6 16. Bf2 Nf4 17. g3 Nh3 18. Be3 Bxb3 19. axb3 Rfd8 20. Qg2 Ng5 21. h4 Ne6 22. h5 Bg5 23. Bxg5 Nxg5 24. f4 Ne6 25. f5 Nd4 26. g4 h6 27. g5 hxg5 28. Qxg5 f6 29. Qg4 Kf8 30. h6 Qf7 31. Rdg1 Ke7 32. h7 Rh8 33. Qxg7 Nf3 34. Rg6 Rae8 35. Qh6 Qf8 36. Rg7+ Kd8 37. Qg6 Ng5 38. Na4 Rxh7 39. Rhxh7 Nxh7 40. Ra7 Re7 41. Ra8+ Kd7 42. Rxf8 Nxf8 43. Nb6+ Kc7 44. Qxf6 Rh7 45. Nc4 Rh1+ 46. Kd2 Rh2+ 47. Ke1 Nd7 48. Qxd6+ Kc8 49. Qxc6+ Kd8 50. f6 Rh1+ 51. Kf2 Rh2+ 52. Kg3 Rh6 53. Qa8+ Kc7 54. Qa7+ Kd8 55. Qxa5+ Nb6 56. Qxb6+ Ke8 57. Qe6+ Kd8 58. Qe7+ Kc8 59. Nd6+ Kb8 60. Qb7# 1-0

Nimzo 98 – DarkThought: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. h4 Na5 12. g4 Nxb3+ 13. Nxb3 b5 14. g5 Nd7 15. a3 Bb7 16. h5 d5 17. h6 g6 18. exd5 Bxa3 19. bxa3 Qxc3 20. dxe6 Bxh1 21. exd7 Rad8 22. Bb6 Bf3 23. Qd2 Qxd2+ 24. Rxd2 Bg4 25. Nc5 Bf3 26. Nxa6 Bg4 27. Nc5 f6 28. gxf6 Kf7 29. Rd6 Bf5 30. Kb2 g5 31. Bxd8 Rxd8 32. c4 bxc4 33. Kc3 Kg6 34. a4 Bh3 35. a5 Bg4 36. Nb7 Rxd7 37. Rxd7 Bxd7 38. a6 Kxf6 39. a7 Kg6 40. a8=Q Kh5 41. Nd6 Kg6 42. Qd5 Kxh6 43. Qf7 Bh3 1-0

DarkThought – Nimzo 99a: [1 – 0] (Test Game, Nunn Position #2, January 1999)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 a5 14. f3 Nh5 15. Qd2 Be6 16. Bf2 Bxb3 17. axb3 Nf4 18. Be3 Ng6 19. g3 f5 20. h4 f4 21. gxf4 exf4 22. Bf2 Ne5 23. Qe2 Qc8 24. Bd4 Qa6 25. Qg2 c5 26. Bxe5 dxe5 27. h5 Kh8 28. Rhg1 Rg8 29. Rd7 Bf6 30. Qg4 Qc6 31. Kb1 Rad8 32. Ra7 Ra8 33. Qd7 Qxd7 34. Rxd7 Rad8 35. Rd5 Rxd5 36. exd5 Rd8 37. Rd1 Be7 38. Ne4 g6 39. hxg6 hxg6 40. d6 Bf8 41. Rd5 Kg7 42. c4 Kh6 43. Kc2 Kg7 44. Rxc5 Bxd6 45. Rxa5 Be7 46. Rxe5 Kf7 47. c5 Rb8 48. Kc3 Rh8 49. b4 Bf6 50. Nxf6 Kxf6 51. Re4 Rh3 52. Kc4 Rxf3 53. c6 Rf1 54. Kb3 Rc1 55. Rxf4+ Ke5 56. Rc4 Rxc4 57. Kxc4 Kd6 58. Kb5 Kc7 59. Ka6 Kxc6 60. b5+ Kc7 61. Ka7 Kd6 62. b6 g5 63. b4 Kd5 64. b7 Kd4 65. b8=Q 1-0

Nimzo 99a – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #2, January 1999)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Rxd4 e5 13. Rc4 Qd8 14. g5 Nd7 15. Qh5 b5 16. Rb4 d5 17. Bxd5 Bxb4 18. Bxa8 Bxc3 19. bxc3 Qc7 20. Kb2 Nb6 21. Bxb6 Qxb6 22. Bd5 Be6 23. Bxe6 Qxe6 24. Rd1 Qb6 25. Qf3 f6 26. gxf6 Qxf6 27. Qg4 h6 28. Rd7 Rf7 29. Rxf7 Kxf7 30. Qd7+ Kg6 31. Qg4+ Kf7 32. Qc8 g5 33. c4 bxc4 34. Qxc4+ Kg6 35. Qe2 Qb6+ 36. Kc1 Qa5 37. Qd2 Qxa2 38. Qd6+ Kh5 39. Qxe5 Qa3+ 40. Kd2 Qf3 41. Qf5 Qxf5 42. exf5 g4 43. Kc3 Kg5 44. Kb4 Kxf5 45. c4 Ke4 46. Kc5 Kd3 47. Kd5 a5 48. c5 a4 49. c6 a3 50. c7 a2 51. c8=Q a1=Q 52. Qc4+ Kd2 53. Qxg4 Qa8+ 54. Ke5 Qh8+ 55. Kf4 Qb8+ 56. Kf3 Qxh2 57. Qd4+ Kc2 58. Qe4+ Kd2 59. Qe3+ Kc2 60. Kg4 Qg2+ 61. Qg3 Qxg3+ 62. Kxg3 1/2-1/2

DarkThought – Rebel 8: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 Be6 14. f3 Nh5 15. Bf2 Bxb3 16. axb3 Nf4 17. Qf1 f5 18. g3 Ng6 19. h4 fxe4 20. fxe4 Rf3 21. h5 Bg5+ 22. Kb1 Nf8 23. Bb6 Qf7 24. Qe2 Rf6 25. Ba5 h6 26. Bb4 c5 27. Ba5 Rf2 28. Qd3 Ne6 29. Rhf1 Nd4 30. Rxf2 Qxf2 31. Bc7 Rf8 32. Bxd6 Rf3 33. Qc4+ Rf7 34. Ka2 Qxc2 35. Bxc5 Bd2 36. Nd5 Qxc4 37. bxc4 Nf3 38. Ne7+ Kh7 39. Ng6 Rc7 40. Be7 Rc8 41. Rf1 Nd4 42. Bd6 Ne6 43. Rf5 Ng5 44. Rxe5 Be3 45. Be7 Nf3 46. Rd5 Nd4 47. e5 Nf5 48. Bh4 Bd4 49. b4 Bg1 50. e6 Nd4 51. e7 Nc6 52. Rd8 Nxe7 53. Bxe7 Rxd8 54. Bxd8 Bf2 55. Ne7 Be1 56. Kb3 Bxg3 57. c5 Bb8 58. c6 g5 59. hxg6+ Kg7 60. c7 Bxc7 61. Bxc7 Kf6 62. Bd6 h5 63. Ka4 h4 64. Ka5 h3 65. Kxa6 h2 66. Bxh2 Kxe7 67. Be5 Ke6 68. g7 Kxe5 69. g8=Q Kd4 70. Qg3 Ke4 71. b5 Kd5 72. b6 Ke6 73. b7 Kd5 74. b8=Q Kd4 75. Qbe5+ Kc4 76. Qgc3# 1-0

Rebel 8 – DarkThought: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Rxd4 e5 13. Rc4 Qd8 14. g5 Nd7 15. Qd2 Nc5 16. Nd5 b5 17. Rb4 Rb8 18. a4 Be6 19. Nxe7+ Qxe7 20. Bxe6 Qxe6 21. Rd1 a5 22. Rxb5 Rxb5 23. axb5 Qa2 24. Qd5 Qa1+ 25. Kd2 Qxb2 26. Qc4 Ne6 27. Qb3 Qxb3 28. cxb3 Rb8 29. Kc3 Rxb5 30. Rxd6 Kf8 31. Rd5 Nd4 32. Rxb5 Nxb5+ 33. Kc4 Nc7 34. Bb6 Ne6 35. h4 f6 36. gxf6 gxf6 37. Bxa5 Ke8 38. b4 Kd7 39. b5 h5 40. Bd2 Nd4 41. Bh6 Nf3 42. Bg7 Nxh4 43. Bxf6 Ng6 44. Kd5 h4 45. Bxh4 Nxh4 46. Kxe5 Ng6+ 47. Kf5 Ne7+ 48. Kf6 Nc8 49. e5 Ke8 50. Ke6 Nb6 51. f4 Nc8 52. f5 Nb6 53. Kd6 Nc4+ 54. Kc7 Nxe5 55. b6 Ke7 56. b7 Nd7 57. f6+ Nxf6 58. b8=Q Ke6 59. Qb6+ Ke5 60. Qe3+ Kd5 61. Qg5+ Ke6 62. Kc6 Ke7 63. Qe3+ Kf7 64. Kd6 Ne8+ 65. Ke5 Ng7 66. Qf2+ Kg6 67. Qf6+ Kh7 68. Qg5 Ne8 69. Qe7+ Kh6 70. Qxe8 Kg5 71. Qg8+ Kh4 72. Kf4 Kh3 73. Qg3# 1-0

DarkThought – Rebel 9: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 e5 13. Bg3 Be6 14. f3 Nh5 15. Bf2 Bxb3 16. axb3 Nf4 17. Qf1 Qa5 18. Kb1 Rab8 19. g3 Ne6 20. Qc4 Rfc8 21. h4 Kh8 22. Qe2 Rd8 23. Rd2 Rd7 24. Qc4 Rc7 25. Rhd1 Rb4 26. Qf1 Rc8 27. Be3 Rf8 28. h5 Rfb8 29. Qe2 Nd4 30. Bxd4 exd4 31. Na2 R4b6 32. h6 Bf6 33. hxg7+ Bxg7 34. Rh1 h6 35. g4 Kg8 36. Qg2 Rb5 37. Nc1 Re8 38. Qh2 d5 39. exd5 Rxd5 40. Nd3 Re3 41. f4 Rd6 42. Qf2 Rde6 43. Rh5 Qd8 44. b4 f6 45. Qh4 Re7 46. Rd1 Re2 47. g5 hxg5 48. fxg5 R7e4 49. Qg3 R2e3 50. Qg1 f5 51. Qf2 Qe8 52. Rhh1 Qg6 53. Qh2 Re2 54. Qc7 Qxg5 55. Qc8+ Re8 56. Qxc6 Qf6 57. Qxf6 Bxf6 58. Rdf1 Rc8 59. Rxf5 Rc6 60. Rg1+ Kf7 61. Rgf1 Kg6 62. Rc5 Rxc5 63. Nxc5 Re7 64. Nxa6 Rb7 65. Rf3 Rb6 66. Nc7 Bd8 67. Nd5 Rb5 68. Nf4+ Kf5 69. Nd3+ Ke4 70. Rf7 Ke3 71. Ka2 Rb6 72. Rd7 Bf6 73. Kb3 Kd2 74. Nc5 Bh8 75. c3 Ke3 76. c4 Rh6 77. b5 Kd2 78. Na4 Rh3+ 79. Kb4 Kc2 80. c5 d3 81. c6 Be5 82. b6 Rh4+ 83. Kb5 Rh5 84. Ka6 Rh6 85. c7 Bxc7 86. Rxc7+ Kd2 87. Nc3 Kc2 88. Ka7 d2 89. b7 Rh8 90. b8=Q Rxb8 91. Kxb8 Kxb2 92. Nd1+ Kb3 93. Kb7 Ka2 94. Kc6 Kb3 95. Kb5 Ka2 1-0

Rebel 9 – DarkThought: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. g4 Nxd4 12. Rxd4 e5 13. Rc4 Qd8 14. g5 Nd7 15. Qd2 Nc5 16. Rd1 Be6 17. Nd5 b5 18. Rb4 Nxb3+ 19. Rxb3 Bxd5 20. exd5 f6 21. h4 fxg5 22. hxg5 Rf3 23. Rc3 Qd7 24. Rg1 Rc8 25. Rxc8+ Qxc8 26. Qb4 Kh8 27. Qe4 Qh3 28. Kd2 a5 29. Ke2 Rf8 30. Qg4 Qxg4+ 31. Rxg4 Kg8 32. a4 b4 33. Rc4 Ra8 34. Rc7 Kf8 35. f4 exf4 36. Bxf4 Ke8 37. Kd3 Kd8 38. Rb7 Ke8 39. c3 bxc3 40. bxc3 Rd8 41. Ra7 Rb8 42. Rxa5 Rb1 43. Ra8+ Kf7 44. Ra6 Rd1+ 45. Kc4 Kg6 46. Bxd6 Bxd6 47. Rxd6+ Kxg5 48. Rb6 h5 49. Rb2 Kf5 50. a5 Ra1 51. Kb5 g5 52. Rd2 Rb1+ 53. Kc6 Rc1 54. d6 Rxc3+ 55. Kb7 Rb3+ 56. Ka7 Re3 57. d7 Re7 58. Kb6 Re6+ 59. Kc5 Re3 60. d8=Q Rc3+ 61. Kb4 Rf3 62. Qd5+ Kg4 63. Rg2+ Rg3 64. Rf2 Re3 65. Qd4+ Kg3 66. Qxe3+ Kh4 67. Rh2+ Kg4 68. Qe4+ Kg3 69. Rg2+ Kh3 70. Qf3+ Kh4 71. Rh2# 1-0

DarkThought – Shredder 2: [1 – 0] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. Bf4 Bb7 13. h4 e5 14. Bg5 h6 15. Rd2 Rab8 16. g3 a5 17. Bxf6 Bxf6 18. Rhd1 Be7 19. Kb1 Bc8 20. f3 Rb4 21. Qe3 Rb7 22. Qd3 Rd8 23. Ka1 Rb4 24. Ne2 Qa7 25. Qc3 Bd7 26. Nc1 Rdb8 27. a3 Be8 28. Kb1 R4b7 29. a4 Bd7 30. Ka1 c5 31. Bd5 Rb4 32. b3 Rd4 33. Ne2 Rxd2 34.

Qxd2 Rb4 35. Nc3 Rd4 36. Qe2 Qb6 37. Rh1 Bf6 38. Ka2 Qb8 39. Rh2 Rb4 40. Bc4 Rb7 41. Rh1 Be7 42. Qd2 Qa7 43. Nd5 Bf8 44. Rd1 Qb8 45. Ba6 Ra7 46. Be2 Be6 47. Bc4 Qd8 48. Qe3 Rb7 49. Qd3 Bd7 50. Ka1 Rb8 51. Qd2 Rb7 52. Be2 Rb8 53. Ka2 Bc6 54. Bc4 Bd7 55. Ne3 Qb6 56. Qd5 Be6 57. Qd3 Bd7 58. Nd5 Qd8 59. Qc3 Rb7 60. h5 Bc6 61. Qd2 Bd7 62. Ba6 Rb8 63. Bd3 Bc6 64. Bc4 Rb7 65. Be2 Bd7 66. Ka1 Rb8 67. Ka2 Rb7 68. Qc3 Bc6 69. Ne3 Qc7 70. Bc4 Rb4 71. Qd3 Rb8 72. Nf5 Rd8 73. Qd2 Bd7 74. Nh4 Bc6 75. Ng6 Rd7 76. g4 Qd8 77. Bd5 Bxd5 78. Qxd5 c4 79. Nxe5 cxb3+ 80. cxb3 Rc7 81. Nc4 Qf6 82. Qd3 Rc5 83. Qe3 Qh4 84. Rd3 Be7 85. Qg1 Qh3 86. Qf2 Qh1 87. Qe2 Qc1 88. Qd1 Qf4 89. Rd4 Qh2+ 90. Kb1 Qg3 91. Rd2 Qf4 92. Rd3 Qh2 93. Qc2 Qg1+ 94. Ka2 Qe1 95. Qd1 Qf2+ 96. Kb1 Qh2 97. Rd2 Qf4 98. Ka2 Qg3 99. Qe2 Qf4 100. Rd5 Qc1 101. Qd1 Qc3 102. Rd3 Qb4 103. Nxd6 Bf6 104. f4 Be7 105. Rd4 Qb6 106. Nc4 Qc6 107. Qe2 Qe6 108. e5 Qc8 109. f5 Qc6 110. e6 Kf8 111. Rd7 Ke8 112. Ra7 fxe6 113. Qxe6 Qxe6 114. fxe6 Rc8 115. Ne3 Bc5 116. Rxg7 Bf8 117. Rb7 Bd6 118. g5 Be5 119. Nc4 Bh2 120. gxh6 Rc5 121. h7 Rxh5 122. b4 axb4 123. a5 b3+ 124. Kb2 Bb8 125. a6 Rh2+ 126. Ka3 Rxh7 127. Rxh7 b2 128. Kxb2 Kf8 129. Rf7+ Kg8 130. Kb3 Ba7 131. Rxa7 Kf8 132. Rf7+ Kg8 133. a7 Kh8 134. a8=Q# 1-0

Shredder 2 – DarkThought: [0 – 1] (Test Game, Nunn Position #2, July 1998)
1. e4 c5 2. Nf3 Nc6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 d6 6. Bc4 e6 7. Be3 a6 8. Qe2 Qc7 9. O-O-O Be7 10. Bb3 O-O 11. Nxc6 bxc6 12. f4 d5 13. e5 Nd7 14. Qd3 Bb7 15. Ba4 Nb6 16. Bxb6 Qxb6 17. Qg3 c5 18. f5 Kh8 19. Bd7 Rad8 20. Rhf1 Rxd7 21. f6 Rg8 22. fxe7 Rxe7 23. Qg5 Rd7 24. Ne4 Bc6 25. Nd6 f6 26. exf6 Qb8 27. Nc4 dxc4 28. Rxd7 Bxd7 29. fxg7+ Rxg7 30. Qxc5 Kg8 31. g3 Qc8 32. Qd4 Qc6 33. Qf6 h5 34. Rd1 Kh7 35. Qe5 Be8 36. a3 Bg6 37. Qc3 Rf7 38. Qd4 Qb7 39. Kb1 Qb3 40. Rc1 Rb7 41. Qf6 Qxa3 42. Rd1 Qa4 43. Qc3 Rf7 44. h3 Rf3 45. Qd2 Rd3 46. Qe2 Rxg3 47. Qf2 c3 48. Rd7+ Qxd7 49. Qxg3 e5 50. Qxc3 Qd1+ 51. Ka2 Qxc2 52. Qb3 Qxb3+ 53. Kxb3 h4 54. Kc4 Be4 55. Kc3 Bf5 56. Kd2 Bxh3 57. Ke3 Bd7 58. Kf3 h3 59. Kg3 e4 60. b3 Be6 61. b4 e3 62. Kf3 a5 63. bxa5 Kg6 64. a6 Kg5 65. Kxe3 h2 66. Kd4 Kf4 67. Kc5 h1=Q 68. Kb6 Ke5 69. a7 Kd6 70. a8=Q Qxa8 71. Kb5 Qb8+ 72. Ka4 Bc4 73. Ka3 Qb3# 0-1

Games Played by DarkThought from Nunn Position #3 (ECO C19)

DarkThought – Chessmaster 4000 Turbo: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 Nxe5 19. gxf5+ Rxf5 20. Qg3 Rxf4 21. Nxe6+ Rg4 22. Nxc7 Rh8 23. Nxd5 dxc3 24. f4 Rxg3+ 25. hxg3 Ng4 26. a5 Rh5 27. Rfd1 Kh7 28. Ne7 Be6 29. axb6 axb6 30. Rd6 Bf7 31. Rc6 Rh2 32. Rxc3 Rd2 33. Rb1 g6 34. Ra1 b5 35. Rc7 Kg7 36. Nc6 Rxc2 37. Raa7 Nh6 38. Rxf7+ Nxf7 39. Ne5 Kg8 40. Rxf7 Re2 41. Rf6 g5 42. Rg6+ Kf8 43. Rxg5 b4 44. Nd7+ Ke7 45. Re5+ Rxe5 46. Nxe5 b3 47. Nd3 Kf6 48. Kf2 Kf7 49. Kf3 Kg7 50. Ke4 Kf6 51. f5 Kf7 52. g4 Kf6 53. Nb2 Kg7 54. Ke5 Kf7 55. g5 Ke7 56. f6+ Kf7 57. Kf5 Kf8 58. Na4 Kg8 59. Ke6 Kh7 60. Kf7 b2 61. Nxb2 Kh8 62. Nc4 Kh7 63. Ne5 Kh8 1-0

Chessmaster 4000 Turbo – DarkThought: [0 – 1] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Qd2 O-O 14. Ba3 Rfe8 15. Bd6 Qc8 16. Qg5 Nf5 17. Qh5 g6 18. Qh3 h5 19. Bb4 Qc7 20. Rfc1 Nc4 21. Rcb1 Rec8 22. Bxf5 exf5 23. Qh4 Re8 24. Qg5 Kh7 25. Qf6 Kg8 26. Ng5 Be6 27. Nxe6 Rxe6 28. Qg5 Kh7 29. Rb3 Re8 30. f3 Rc6 31. Ra2 Re8 32. f4 Rc8 33. Rf3 Na5 34. c3 Nb7 35. Rh3 Re8 36. Re2 Qd7 37. Ree3 Qd8 38. Qg3 a5 39. Ba3 Rc4 40. Qf2 Rxa4 41. Qb2 Re6 42. Qb3 Qd7 43. Re1 Rc4 44. Qb2 Rec6 45. Rf3 Nd8 46. Qd2 Ne6 47. Rb1 Qc8 48. Bb2 Qc7 49. Rff1 Qe7 50. Rf3 Rc8 51. Ba1 Qa3 52. Rff1 R8c6 53. Rb5 Nxd4 54. Bb2 Qa4 55. Rxd5 Nb3 56. Qf2 Nc5 57. Qh4 Rc7 58. Qf6 Ne6 59. Rfd1 Qa2 60. R5d2 Rxf4 61. Bc1 Qc4 62. Rd5 Re4 63. Bh6 Re1+ 64. Rxe1 Qxd5 65. Be3 b5 66. Rc1 b4 67. Re1 Qe4 68. cxb4 Rc1 69. Qxf7+ Ng7 70. Rxc1 Qxe3+ 71. Kf1 Qxc1+ 72. Ke2 Qb2+ 73. Kf1 axb4 74. e6 Qc1+ 75. Kf2 Qf4+ 76. Ke2 Qc4+ 77. Kf2 b3 78. Qb7 Qc2+ 79. Kg3 b2 80. e7 h4+ 81. Kf3 Qe4+ 82. Qxe4 fxe4+ 83. Kxe4 b1=Q+ 84. Kd5 Qb7+ 85. Kd4 Qxg2 86. Kc4 Ne8 87. Kd3 h3 88. Kd4 Qxh2 89. Kc5 Qc2+ 90. Kb6 h2 91. Kb5 h1=Q 92. Kb6 Qb3+ 93. Ka5 Qa1# 0-1

DarkThought – Comet A.90: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O c4 12. Be2 O-O 13. Ba3 Qb7 14. a5 bxa5 15. Bxe7 Nxe7 16. Rxa5 Rfb8 17. Ng5 Qb2 18. Qa1 h6 19. Nh3 Nc6 20. Ra2 Qxa1 21. Rfxa1 a5 22. f4 Ra6 23. Nf2 a4 24. Nd1 Ne7 25. Nb2 Bc6 26. Bg4 Ra7 27. Bh5 Nf5 28. Kf2 Kf8 29. Bg4 Ne7 30. Ke3 Kg8 31. Kd2 Ra6 32. h3 Ra7 33. g3 Ra6 34. Ke3 Ra5 35. Bh5 Nf5+ 36. Kf2 Rb6 37. Bf3 Ne7 38. Bg4 Ra7 39. h4 Kh7 40. Bf3 Nf5 41. h5 Ne7 42. g4 Rb5 43. Ke2 Ra8 44. Kd2 Rb6 45. Kc1 Ra5 46. Ra3 f5 47. exf6 gxf6 48. R1a2 Nc8 49. Ra1 Nd6 50. R3a2 Kg8 51. Nd1 f5 52. g5 Ra7 53. g6 Kg7 54. Kd2 Rab7 55. Ke3 Rb1 56. Rxb1 Rxb1 57. Nb2 Ne4 58. Bxe4 dxe4 59. Nxc4 Kf6 60. Ne5 Be8 61. c4 Re1+ 62. Kf2 Rh1 63. c5 Rxh5 64. Kg3 Rh1 65. c6 Bxc6 66. Nxc6 Rg1+ 67. Kf2 Rxg6 68. Ne5 Rg7 69. Rxa4 Rc7 70. c4 Rb7 71. Ra6 Rb2+ 72. Kg3 Ke7 73. d5 exd5 74. cxd5 Rb3+ 75. Kh4 Rb1 76. d6+ Kf8 77. Ra8+ Kg7 78. d7 Rh1+ 79. Kg3 Rg1+ 80. Kf2 Rd1 81. d8=Q Rxd8 82. Rxd8 h5 83. Ke3 h4 84. Rd7+ Kf6 85. Rh7 Ke6 86. Ng6 h3 87. Rxh3 Kf6 88. Nh4 Ke6 89. Nxf5 Kxf5 90. Rh4 Kg6 91. Kxe4 Kf6 92. Rh6+ Ke7 93. Ke5 Kd7 94. f5 Kc7 95. f6 Kb6 96. f7+ Ka5 1-0

Comet A.90 – DarkThought: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ba3 Nc4 14. Bxe7 Kxe7 15. Qb1 Ke8 16. c3 h5 17. Qb4 Rc8 18. Rfb1 Qd8 19. Re1 Rc7 20. Rec1 h4 21. h3 Rh5 22. Be2 Rf5 23. Ra2 Rc8 24. Rca1 Na5 25. Ba6 Rc7 26. Kh2 Nc6 27. Qa3 Rh5 28. g4 hxg3+ 29. fxg3 Na5 30. Rf1 Nc4 31. Qc1 f5 32. h4 Rh8 33. Ng5 Kf8 34. Rf3 Kg8 35. Kg1 Rh6 36. Qb1 Na5 37. Qb4 Qe8 38. Qd6 Rc6 39. Qa3 Kh8 40. Qb4 Nc4 41. Qb3 Rh5 42. Raf2 Rc7 43. Qb4 Rh6 44. Bb5 Rc8 45. Qb3 Kg8 46. Ra2 Rc7 47. Qb1 Qc8 48. Raf2 Be8 49. Qb4 Bh5 50. Rd3 Bg4 51. Rg2 Na5 52. Re3 Bh5 53. Re1 Nc4 54. Rc1 Kh8 55. Ba6 Qd8 56. Re1 Qe8 57. Rf2 Kg8 58. Qb3 Qd8 59. Rg2 Be8 60. Rh2 Bd7 61. Rf2 Qe8 62. Ra1 Na5 63. Qb4 Kh8 64. Raa2 Nc4 65. Bb5 Kg8 66. Rf3 Qd8 67. Raf2 g6 68. Qb1 Qe8 69. Qb3 Kh8 70. Qa2 Rc8 71. Qb1 Rh5 72. Qb3 Kg8 73. Ra2 Rc7 74. Rh2 Qe7 75. Rhf2 Qe8 76. Kg2 Kg7 77. Rc2 Rh8 78. Kg1 Rg8 79. Ra2 Kh8 80. Kh2 Rg7 81. Kh3 Re7 82. Raf2 Qd8 83. g4 Qe8 84. Ra2 Rc8 85. Ba6 Rc6 86. Kg3 Qd8 87. Qc2 Bc8 88. Bb5 Rcc7 89. Qh2 Rg7 90. Ra1 Qe7 91. Qe2 a6 92. Bxc4 Rxc4 93. Rb1 Qd8 94. Qa2 Rc6 95. Qa1 Bd7 96. Rb3 b5 97. axb5 Rb6 98. Qa5 Qb8 99. Rb2 Bxb5 100. Rh2 Kg8 101. Rg2 Bc4 102. Rf4 Rc6 103. Kh2 Kh8 104. Rff2 Qe8 105. Qa4 Bb5 106. Qc2 Qc8 107. Rg3 Rb6 108. Qd2 Rbb7 109. Qf4 Qg8 110. h5 Be8 111. hxg6 Bxg6 112. gxf5 Bxf5 113. Qh4+ Bh7 114. Rfg2 Qe8 115. Qh6 a5 116. Nxe6 Rxg3 117. Rxg3 Rb2+ 118. Kh3 Qf7 119. Nf4 Qf5+ 120. Rg4 Rh2+ 121. Kxh2 Qxg4 122. e6 Kg8 123. e7 Bg6 124. Nxg6 Qe2+ 125. Kg3 Qe6 126. Qf8+ Kh7 127. Ne5 Qh6 128. Qxh6+ Kxh6 129. e8=Q a4 130. Qg6# 1-0

DarkThought – Crafty 16.4: [1 – 0] (Test Game, Nunn Position #3, January 1999)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 Nxe5 19. gxf5+ Rxf5 20. Qg3 Kf6 21. Kg2 dxc3 22. Rfe1 Qb7 23. Bxe5+ Ke7 24. Bd6+ Kf6 25. f4 Qc6 26. Qh4 Rg8 27. Kf2 Qc8 28. Nxe6+ g5 29. Qh6+ Rg6 30. Qh7 Qe8 31. Nc7 Rxf4+ 32. Bxf4 Qf7 33. Nxd5+ Qxd5 34. Qe7+ Kf5 35. Re5+ Kg4 36. Rg1+ Qg2+ 37. Rxg2+ Kh5 38. Qh7+ Rh6 39. Rgxg5+ Kh4 40. Qxh6# 1-0

Crafty 16.4 – DarkThought: [1 – 0] (Test Game, Nunn Position #3, January 1999)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ba3 Nc4 14. Bxe7 Kxe7 15. Qc1 Na5 16. Ng5 h6 17. Nf3 Kf8 18. Qa3+ Kg8 19. Nd2 Rc8 20. f4 h5 21. Ba6 Rd8 22. Rac1 h4 23. c4 Qc6 24. Bb5 Qa8 25. c5 h3 26. gxh3 Nc6 27. Qc3 a6 28. Bxc6 Qxc6 29. cxb6 Qxb6 30. a5 Qb7 31. Nb3 Bb5 32. Rf3 Be2 33. Rg3 Rb8 34. Nc5 Qb2 35. Qxb2 Rxb2 36. Rg2 Ra2 37. Re1 Bc4 38. Rxa2 Bxa2 39. Nxa6 Bc4 40. Nc5 Rxh3 41. Ra1 Rh4 42. a6 Bxa6 43. Rxa6 Rg4+ 44. Kf2 Rxf4+ 45. Ke3 Rh4 46. Ra2 Kf8 47. Rf2 Ke7 48. Rg2 Kf8 49. Kd3 Rh3+ 50. Kd2 Rh4 51. Kc3 Rh3+ 52. Kb4 Rh4 53. Nb3 Rf4 54. Kc5 Rf3 55. Na5 Ra3 56. Nc6 g6 57. Kd6 Ra6 58. Rb2 Kg7 59. Rf2 Kf8 60. Kd7 Ra1 61. Nd8 Ra7+ 62. Kc6 Re7 63. h4 Kg8 64. Rxf7 Rxf7 65. Nxf7 Kxf7 66. Kd7 1-0

DarkThought – Fritz 3.10: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O c4 12. Be2 f6 13. exf6 gxf6 14. Bh6 Nf5 15. Qd2 Bc8 16. Kh1 Rg8 17. Bf4 Qg7 18. g3 Na5 19. Rfe1 Nb7 20. Ng1 Qf7 21. Bf3 Ne7 22. Qe2 Bd7 23. Bg2 Rc8 24. Bh3 Rc6 25. Bb8 Kd8 26. Rab1 a6 27. Qe3 Qg6 28. Qc1 Rg7 29. Ne2 Qf7 30. Nf4 Na5 31. Qa3 Nb7 32. a5 Kc8 33. Rxb6 Kxb8 34. Bxe6 Qe8 35. Nh5 Nf5 36. Nxf6 Rxe6 37. Nxd7+ Qxd7 38. Qf8+ Qc8 39. Qxc8+ Kxc8 40. Rexe6 Nxa5 41. Rxa6 Nb7 42. Re5 Ne7 43. f4 Rf7 44. g4 Nd8 45. f5 Ndc6 46. Re6 Kb7 47. Ra2 Nd8 48. Rh6 Ndc6 49. Rb2+ Kc7 50. Rb5 Kd7 51. h3 Kc7 52. Rc5 Kd7 53. Kg2 Kc7 54. Kg3 Kd7 55. Kh4 Nd8 56. Rb5 Kc7 57. Kg5 Rg7+ 58. Kf4 Rf7 59. Ra6 Ndc6 60. Kg5 Rf8 61. Kh6 Rf7 62. Ra8 Nd8 63. Kg5 Kd7 64. Ra7+ Ke8 65. Ra6 Ndc6 66. Ra8+ Nd8 67. Rb6 Kd7 68. Rf6 Nec6 69. Rxf7+ Nxf7+ 70. Kf6 Nd6 71. Kg7 h5 72. f6 hxg4 73. hxg4 Ke6 74. Ra6 Nb8 75. Rb6 Nd7 76. Rxd6+ Kxd6 77. Kf7 Nb6 78. g5 Na4 79. g6 Nxc3 80. g7 Ne4 81. Kg6 Nxf6 82. Kxf6 c3 83. g8=Q 1-0

Fritz 3.10 – DarkThought: [0 – 1] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nh7 Rh8 16. Qg4 Rg8 17. Qh4 Ng6 18. Qh5 O-O-O 19. Bxg6 fxg6 20. Qxg6 Nc4 21. Ba3 Nxa3 22. Rxa3 Kb8 23. a5 bxa5 24. c3 a4 25. Rfa1 Ka8 26. R1a2 Be8 27. Qxe6 Rh8 28. Nf6 gxf6 29. Qxf6 Rb8 30. h3 Rg8 31. Ra1 h5 32. Qf3 Qc4 33. Re1 Rg7 34. e6 Rgb7 35. Raa1 Rb5 36. e7 Rc8 37. Re3 Qb3 38. Rc1 Qb2 39. Ree1 Qa2 40. Qf5 Qc4 41. Kh2 Rcb8 42. Ra1 Qxc3 43. Qe5 Qc2 44. Re2 Qc4 45. Ree1 Rb4 46. Red1 Bf7 47. Rac1 Qa6 48. Rc5 R4b7 49. Re1 a3 50. Qf4 Be8 51. Qe5 a2 52. Ra1 Bf7 53. Rc2 Qe6 54. Rcxa2 Qxe5+ 55. dxe5 Rxe7 56. f4 Bg6 57. Kg3 Bf5 58. Kh4 d4 59. Rd2 d3 60. Ra6 Rh8 61. g3 Rg7 62. Rd6 Rhg8 63. Rg2 Kb8 64. Rg1 Kb7 65. Rf6 Be4

66. Rd6 Ka8 67. Re1 Bf5 68. Rg1 Rd7 69. Rxd7 Bxd7 70. Rd1 Bf5 71. e6 Rg7 72. Kxh5 Rxg3 73. e7 Rg8 74. Re1 Re8 75. Kg5 Bxh3 76. Rd1 Rxe7 77. Rxd3 Bc8 78. Rf3 a5 79. Ra3 Rg7+ 80. Kf6 Ra7 81. f5 a4 82. Kg6 Bd7 83. f6 Be8+ 84. Kf5 Kb7 85. Ke5 Kb6 86. Kd5 Kb5 87. Kd6 Bf7 88. Ke5 Ra6 89. Ra1 a3 90. Kf5 Kc4 91. Kg5 a2 92. Kh6 Rxf6+ 93. Kg7 Rf2 94. Rxa2 Rxa2 95. Kxf7 Ra6 96. Kg7 Re6 97. Kf7 Kd5 98. Kf8 Kd6 99. Kf7 Kd7 100. Kf8 Re7 101. Kg8 Ke8 102. Kh8 Kf7 103. Kh7 Re6 104. Kh8 Rh6# 0-1

DarkThought – Fritz 5.03: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O c4 12. Be2 f6 13. exf6 gxf6 14. Bh6 Nf5 15. Qd2 e5 16. dxe5 fxe5 17. Bg5 h6 18. Qxd5 hxg5 19. Nxg5 Nh6 20. a5 Rc8 21. axb6 axb6 22. Rfd1 Rd8 23. Bxc4 Ne7 24. Qe4 Rc8 25. Ra8 Rxa8 26. Qxa8+ Qc8 27. Qe4 Qc7 28. Ne6 Bxe6 29. Bxe6 Nf7 30. Qf3 Rf8 31. Bd7+ Qxd7 32. Rxd7 Kxd7 33. Qb7+ Ke8 34. Qxb6 Rh8 35. Qb5+ Kf8 36. g3 Rh6 37. h4 Rd6 38. c4 Kg7 39. Kg2 Nf5 40. Qb7 Rd2 41. Qe4 N5d6 42. Qg4+ Kf8 43. c5 Ne8 44. Qc4 Rd4 45. Qe6 Nc7 46. Qb6 Ne8 47. c3 Rc4 48. h5 Rg4 49. Qb3 Ke7 50. c6 Ned6 51. c7 Rg8 52. c4 Rc8 53. Qb8 Rf8 54. c5 Nc8 55. Qb1 Rg8 56. Qf5 Re8 57. g4 Kf8 58. h6 Ne7 59. Qf6 Rc8 60. h7 Ke8 61. g5 Rxc7 62. g6 Nxg6 63. Qxg6 Ke7 64. Qb6 Rd7 65. c6 Rd8 66. Qc7+ Ke6 67. Qxd8 Nxd8 68. c7 Nf7 69. h8=Q Nxh8 70. c8=Q+ Kd5 71. Qg8+ Ke4 72. f4 Kxf4 73. Qxh8 Ke4 74. Qf6 Kd5 1-0

Fritz 5.03 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nf3 Rh8 16. Qg4 Kf8 17. Ba3 Re8 18. Bd6 Qd8 19. Bb4 Nac6 20. Ba3 Kg8 21. Rfb1 Bc8 22. Rb2 Bb7 23. Rab1 Qd7 24. Nd2 Qc8 25. Bb5 Nf5 26. a5 bxa5 27. Nb3 Qc7 28. Bd3 Ba8 29. c3 Nce7 30. Nc5 h5 31. Qg5 Rh6 32. h3 h4 33. Na6 Qxc3 34. Rb3 Qxd4 35. Nc7 Rc8 36. Bxe7 Qxe5 37. Nxa8 f6 38. Qd2 Nxe7 39. Rb7 Ng6 40. Rxg7+ Kxg7 41. Rb7+ Ne7 42. Rxe7+ Kf8 43. Rxa7 Qg5 44. Qxg5 fxg5 45. Nc7 Kg8 46. Ba6 Rf8 47. Bd3 Rc8 48. Ba6 Rf8 49. Bd3 Rc8 1/2-1/2

DarkThought – Fritz 5.32b: [1 – 0] (Test Game, Nunn Position #3, January 1999)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O c4 12. Be2 f6 13. exf6 gxf6 14. Bh6 Nf5 15. Qd2 e5 16. dxe5 fxe5 17. Bg5 h6 18. Qxd5 hxg5 19. Nxg5 Nh6 20. a5 Rc8 21. axb6 axb6 22. Rfd1 Rd8 23. Bxc4 Ne7 24. Qe4 Rc8 25. Ra8 Rxa8 26. Qxa8+ Qc8 27. Qe4 Qc7 28. Ne6 Bxe6 29. Bxe6 Nf7 30. Qf3 Rf8 31. Bd7+ Qxd7 32. Rxd7 Kxd7 33. Qb7+ Kd6 34. Qxb6+ Kd7 35. Qb7+ Ke6 36. Qb6+ Kd7 37. c4 Rc8 38. c5 Rc6 39. Qb4 Nd8 40. Qd2+ Ke8 41. Qc3 Ng6 42. Qe3 Nf7 43. Qe4 Ne7 44. Qb4 Nd5 45. Qa4 Nd8 46. Qe4 Nc7 47. Qxe5+ Nde6 48. f4 Rxc5 49. Qe4 Kf7 50. f5 Ng7 51. g4 Rd5 52. h4 Nge8 53. c4 Nf6 54. Qf4 Rd1+ 55. Kh2 Nce8 56. g5 Ng8 57. c5 Rd7 58. h5 Kf8 59. c6 Rf7 60. h6 Ne7 61. c7 Nd5 62. Qh4 Nexc7 63. g6 Nf6 64. h7 1-0

Fritz 5.32b – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #3, January 1999)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nf3 Rh8 16. Qg4 Kf8 17. Ba3 Re8 18. Bd6 Qd8 19. Bb4 Nac6 20. Bd2 Kg8 21. Ra2 Qc7 22. Rc1 Rd8 23. c4 dxc4 24. Bxc4 Bc8 25. Rac2 Qb7 26. Bb5 Bd7 27. Qe4 Rc8 28. Nh4 Qa8 29. Be2 Rd8 30. Bf3 Be8 31. Qg4 Qb7 32. Rc4 Qa6 33. Be3 Nb8 34. Be2 Qa5 35. Nf3 Bc6 36. Nd2 Bxa4 37. Rc7 Rd7 38. Nc4 Qb4 39. Bd2 Qb3 40. Nd6 Rxc7 41. Rxc7 Nbc6 42. Bf1 Qb1 43. Qf4 Bc2 44. Qxf7+ Kh7 45. Bxh6 Kxh6 46. Qxe6+ Kh7 47. d5 Nd4 48. Qg4 Ndf5 49. Rxe7 Nxe7 50. Qh5+ Kg8 51. Qf7+ Kh7 52. Ne8 Rxe8 53. Qh5+ Kg8 54. Qxe8+ Kh7 55. Qh5+ Kg8 56. d6 Bd3 57. Qe8+ Kh7 58. Qh5+ Kg8 59. Qe8+ 1/2-1/2

DarkThought – Genius 3: [1/2 – 1/2] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f6 15. Nxe6+ Kf7 16. Nxc7 Bxg4 17. exf6 Kxf6 18. Nxa8 Rxa8 19. dxc5 bxc5 20. Ba3 c4 21. f4 Bf5 22. Rf2 Rb8 23. Rd2 g6 24. Kf2 Be4 25. g4 Ke6 26. h4 Ng8 27. Kg3 Nf6 28. Re1 Rb6 29. Ra1 Rb8 30. Re1 Rb6 31. Ra1 Rb8 1/2-1/2

Genius 3 – DarkThought: [0 – 1] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nh7 Rh8 16. Qg4 Rg8 17. Qh4 Ng6 18. Qh5 O-O-O 19. Bd2 Nc4 20. Bb4 Be8 21. Qg4 Kb8 22. Bxg6 fxg6 23. Nf8 g5 24. a5 Bf7 25. axb6 axb6 26. Nxe6 Qc8 27. Nxd8 Qxg4 28. Nxf7 Qxd4 29. Ra2 Kb7 30. c3 Qf4 31. e6 Qf6 32. Re2 Re8 33. h3 h5 34. Rfe1 Kc7 35. Kh2 g4 36. hxg4 hxg4 37. Kh1 Qh4+ 38. Kg1 Qh7 39. g3 Qf5 40. Re3 Qc2 41. R3e2 Qg6 42. Ne5 Nxe5 43. Rxe5 Qh7 44. R5e3 Qh3 45. f4 Rh8 46. Kf2 Qh2+ 47. Kf1 Qc2 48. R1e2 Rh1+ 49. Kf2 Qd1 50. Re1 Rxe1 51. Rxe1 Qf3+ 52. Kg1 Qxg3+ 53. Kf1 Qf3+ 54. Kg1 g3 55. Rf1 Qe2 56. Rf3 Qxf3 57. Bc5 bxc5 58. e7 Qf2+ 59. Kh1 Qh2# 0-1

DarkThought – Genius 5: [1/2 – 1/2] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O c4 12. Be2 O-O 13. Ba3 Be8 14. Qd2 f6 15. exf6 Rxf6 16. Rfe1 Bg6 17. Ng5 h6 18. Nh3 Re8 19. Kh1 Nc8 20. f4 Nd6 21. Bxd6 Qxd6 22. Bf3 Ref8 23. g3 Qc7 24. Nf2 Qd7 25. h4 Bf5 26. Qe2 R6f7 27. h5 Re7 28. Ra2 Qd6 29. Ng4 Ree8 30. Ne5 Nxe5 31. Qxe5 Rd8 32. Qe2 Rf7 33. a5 b5 34. Rb1 a6 35. Re1 Rf6 36. Qg2 Rdf8 37. Re3 b4 38. cxb4 Qxb4 39. c3 Qb1+ 40. Kh2 Bd3 41. Qd2 Rb8 42. Re1 Qb7 43. Qc1 Qb3 44. Qa1 Qb5 45. Rf2 Qb7 46. Qa3 Qc7 47. Re5 Rb5 48. Ra2 Rb3 49. Qc1 Qb7 50. Re1 Rb1 51. Qd2 Rb5 52. Be2 Bb1 53. Ra1 Rb2 54. Qe3 Qb3 55. Kg1 Be4 56. Rec1 Ra2 57. Bf3 Bxf3 58. Qxf3 Qb2 59. Rxa2 Qxa2 60. Qf2 Qxa5 61. Qb2 Qb5 62. Qxb5 axb5 63. Re1 Kf7 64. Kf2 Ke7 65. Kf3 Rf8 66. Kg4 Kf6 67. Rb1 Ra8 68. Rxb5 Ra3 69. f5 Rxc3 70. fxe6 Kxe6 71. Rb6+ Ke7 72. Kf4 Rd3 73. Ke5 Rxg3 74. Rb7+ Kd8 75. Kxd5 c3 76. Kd6 Ke8 77. Re7+ Kf8 78. Rc7 g5 79. Ke5 Rh3 80. Ke6 Re3+ 81. Kf5 Ke8 82. Rc6 Kd7 83. d5 g4 84. Kf4 Rf3+ 85. Ke4 c2 86. Rxc2 Rh3 87. Rc6 Rxh5 88. Kf4 Rxd5 89. Rxh6 Rd4+ 90. Kg3 Ke7 91. Rh4 Kf6 92. Rxg4 1/2-1/2

Genius 5 – DarkThought: [0 – 1] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nf3 Rh8 16. Qg4 Kf8 17. Bd2 Nec6 18. Rfe1 Kg8 19. Reb1 Bc8 20. Ra3 Bb7 21. Nh4 h5 22. Qf4 Qe7 23. Raa1 Rc8 24. Nf3 Rc7 25. Qg3 Qd8 26. Bg5 Qc8 27. Bf6 Qf8 28. Rb2 Ba8 29. Rb5 Ne7 30. Nh4 Rc3 31. Qg5 Nec6 32. Nf3 Bb7 33. Rbb1 Rh6 34. Qg3 Rxd3 35. cxd3 Rg6 36. Bg5 f6 37. h4 Ba6 38. exf6 gxf6 39. Rb2 fxg5 40. hxg5 Rg7 41. Qh3 Re7 42. Rd1 Qf4 43. Qxh5 Bxd3 44. Nh2 Rh7 45. Qe8+ Kg7 46. Qd7+ Kf8 47. Qc8+ Ke7 48. g3 Qxg5 49. Rxd3 Qc1+ 50. Kg2 Qh6 51. Kf1 Qxh2 52. Rbd2 Rf7 53. Qc7+ Ke8 54. Qc8+ Nd8 55. Re3 Rf6 56. Rc3 Nc4 57. Rxc4 Qh1+ 58. Ke2 Qf3+ 59. Ke1 Rh6 60. Re2 Qd3 61. Kf1 dxc4 62. Qa8 c3 63. Qe4 Qxe4 64. Rxe4 c2 65. Ke2 c1=Q 66. Rh4 Rxh4 67. gxh4 a5 68. h5 b5 69. axb5 a4 70. f4 a3 71. h6 a2 72. h7 Nf7 73. Kf3 a1=Q 74. h8=Q+ Nxh8 0-1

DarkThought – Hiarcs 6: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 Nxe5 19. gxf5+ Rxf5 20. Qg3 Qxc3 21. Nf3+ Kh7 22. Bxe5 g5 23. Nxd4 Qxg3+ 24. fxg3 Rxe5 25. Rf7+ Kg6 26. Rxd7 Rc8 27. Rd6 Rc4 28. c3 Rxc3 29. Nxe6 Kh5 30. Ng7+ Kg4 31. Rf1 Ree3 32. Rdf6 Re7 33. Rg6 Rf3 34. h3+ Kxg3 35. Rxg5+ Kh4 36. Rh5+ Kg3 37. Nf5+ Rxf5 38. Rhxf5 Kxh3 39. Rg5 Re4 40. Rf7 Rg4+ 41. Rxg4 Kxg4 42. a5 b5 43. Rxa7 Kf4 44. Rb7 d4 45. Rb8 d3 46. Rxb5 Ke3 47. Rd5 Ke2 48. a6 d2 49. Rxd2+ Kxd2 1-0

Hiarcs 6 – DarkThought: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nf3 Rh8 16. Qg4 Kf8 17. Bd2 Nec6 18. Bc3 Kg8 19. Rfb1 Bc8 20. Bd2 Bb7 21. h4 Qc8 22. Bb5 Ba6 23. h5 Nc4 24. Qf4 N6a5 25. Bb4 Bb7 26. Qg4 Qc7 27. Nh4 Rd8 28. Kh2 Kh7 29. Bxa5 Nxa5 30. Bd3+ Kg8 31. Kg1 Nc6 32. Nf3 Rc8 33. Qh4 Na5 34. Rb4 Qc6 35. Rab1 Qe8 36. Qg4 Rc3 37. Qf4 Rc7 38. Qd2 Qc8 39. Qe2 Rc3 40. Ra1 Qf8 41. Rbb1 Qd8 42. Qd2 Rc7 43. Qf4 Rc8 44. Qg3 Rc7 45. Qg4 Nc6 46. Rb2 Qe7 47. Rab1 Qa3 48. Bb5 Na5 49. Qh4 Rc8 50. Ne1 Qf8 51. Qg3 Rc7 52. f4 Ba8 53. Ra2 Qc8 54. Bd3 Bb7 55. Qh4 Rc3 56. Qh3 Kf8 57. Raa1 Nc6 58. Qe3 Qc7 59. Qf2 Bc8 60. g4 Kg8 61. Nf3 Nd8 62. Kg2 Nb7 63. Ng1 Qd8 64. Ne2 Rc6 65. c3 Rc7 66. Rb4 Na5 67. Rab1 Nc6 68. R4b3 Bd7 69. Kg1 Ne7 70. Ra1 Rc8 71. Ba6 Rb8 72. Rb4 Nc6 73. Rb2 Bc8 74. Bd3 Na5 75. Ng3 Bd7 76. Ba6 Qc7 77. Ne2 Bc8 78. Bb5 Qe7 79. Nc1 Bd7 80. Nb3 Nc6 81. Bd3 Qd8 82. Raa2 Rc8 83. Qe1 Qc7 84. Rc2 Re8 85. c4 dxc4 86. Rxc4 Qb8 87. a5 b5 88. Rc1 Ne7 89. Nc5 Bc6 90. Qf2 Qd8 91. Raa1 Qd5 92. Be4 Qd8 93. Nxe6 Qd7 94. Bxc6 Nxc6 95. d5 Nb4 96. Nc7 Qxg4+ 97. Qg2 Qxg2+ 98. Kxg2 Rc8 99. Kf3 Nd3 100. Rc6 Nb4 101. Rc3 Na6 102. Nxb5 Rxc3+ 103. Nxc3 Kh7 104. Nb5 Rd8 105. d6 Rd7 106. f5 Nc5 107. Rc1 Nd3 108. e6 Rd8 109. e7 Re8 110. Nc7 Rc8 111. e8=Q Rxe8 112. Nxe8 1-0

DarkThought – Junior 4.6: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O Na5 12. Ba3 O-O 13. dxc5 bxc5 14. Bxh7+ Kxh7 15. Ng5+ Kg8 16. Qh5 Rfe8 17. Qxf7+ Kh8 18. f4 Nf5 19. Rf3 Nh6 20. Rh3 Bxa4 21. Qxc7 Bxc2 22. Nf7+ Kh7 23. Nxh6 Bf5 24. Nxf5+ Kg6 25. Qxg7+ Kxf5 26. Qg5+ Ke4 27. Re1# 1-0

Junior 4.6 – DarkThought: [0 – 1] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nh7 Rh8 16. Qg4 Rg8 17. Qh4 Ng6 18. Qh5 O-O-O 19. Bd2 Nc4 20. Bb4 Be8 21. Qg4 Kb8 22. h4 h5 23. Qxh5 Rh8 24. Rfb1 Ka8 25. a5 bxa5 26. Be1 a4 27. Rb4 a5 28. Rbxa4 Bxa4 29. Rxa4 Rb8 30. Ra1 Rb5 31. Bxg6 fxg6 32. Qxg6 Qd7 33. Ng5 Rb6 34. Bxa5 Ra6 35. Bc3 Rxa1+ 36. Bxa1 Rh6 37. Qd3 Rxh4 38. Bc3 Qe8 39. Qf3 Qe7 40. Qg3 Rh6 41. Nf3 Qf8 42. Bd2 Rh5 43. Bc1 Qh8 44. Nh2 Rh4 45. Bf4 Qh5 46. f3 Kb8 47. c3 Kc8 48. Bc1 g6 49. Bf4 Kd7 50. Bc1 Kc6 51. Bf4 Kb5 52. Bc1 Ka4 53. Bf4 Kb3 54. Bc1 Kxc3 55. Bf4 Kb3 56. Bc1 Rxd4 57. Bg5 Rd1+ 58. Nf1 d4 59. Bf4 Qf5 60. Bh6 Ne3 61. Qh3 Rxf1+ 62. Kh2 Qxe5+ 63. f4 Qe4 64. Kg3 Rg1 65. Kh4 Rxg2 66. Bg5 Ka4 67. Qg3 Nf5+ 68. Kh3 Rxg3+ 69. Kh2 Qg2# 0-1

DarkThought – Junior 5.0: [1/2 – 1/2] (Test Game, Nunn Position #3, December 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Nb4 13. Ba3 Nxd3 14. cxd3 Nf5 15. Qd2 Qd8 16. Bb4 a5 17. Bc3 Rc8 18. Qb2 O-O 19. Rfc1 Rc6 20. Rab1 Nh4 21. Nxh4 Qxh4 22. Bd2 Rfc8 23. Rxc6 Rxc6 24. f3 h6 25. Rf1 Kh7 26. f4 Qh5 27. Qb3 Be8 28. Re1 Qg4 29. Kh1 h5 30. Kg1 h4 31. Rf1 h3 32. g3 f5 33. exf6 gxf6 34. Qa3 Rc7 35. Qb2 Qe2 36. Rf2 Qd1+ 37. Rf1 Rc2 38. Qa3 Qh5 39. Rf2 Kg7 40. Qa1 Bxa4 41. f5 exf5 42. Qf1 f4 43. Bxf4 Rxf2 44. Kxf2 Kg6 45. Qe2 Qxe2+ 46. Kxe2 Bc2 47. Kd2 Bb1 48. Bc7 a4 49. Bxb6 a3 50. Ba5 Kf5 51. Bc3 Kg4 52. Ke3 Bc2 53. Ke2 Ba4 54. Bb4 a2 55. Bc3 Bb5 56. Bb2 Ba6 57. Ba1 f5 58. Ke3 Bb5 59. Bc3 Ba4 60. Bb2 Be8 61. Bc3 Bb5 62. Ba1 Bd7 63. Bc3 Be8 64. Bb2 Kg5 65. Ba1 Bd7 66. Kf3 Ba4 67. Ke3 Bb3 68. Kf3 Bd1+ 69. Ke3 Kg4 70. Kd2 Ba4 71. Ke3 Bc2 72. Bc3 Bd1 73. Ba1 Kg5 74. Bc3 Bh5 75. Ba1 Bf7 76. Bc3 Be6 77. Ba1 Bc8 78. Kf3 Bd7 79. Bc3 Ba4 80. Ba1 Bb5 81. Ke3 Be8 82. Kf3 f4 83. gxf4+ Kh4 84. Ke2 Kg4 85. Ke3 Bg6 86. Bb2 Kf5 87. Kf3 Be8 88. Ba1 Bb5 89. Ke3 Bc6 90. Kf3 Ba4 91. Bc3 Bb5 92. Ke3 Be8 93. Ba1 Bf7 94. Kf3 Bh5+ 95. Ke3 Kg4 96. Bc3 Bf7 97. Ba1 Be8 98. Bc3 Ba4 99. Bb2 Kf5 100. Kf3 Bd7 101. Ba1 Bc8 102. Bb2 Ba6 103. Ke3 Kg6 104. Bc3 Bc8 105. Kd2 Bg4 106. Kc1 Kf5 107. Kb2 Kxf4 108. Kxa2 Kf3 109. Ba5 Ke3 110. Bb6 Bd1 1/2-1/2

Junior 5.0 – DarkThought: [0 – 1] (Test Game, Nunn Position #3, December 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nh7 Rh8 16. Qg4 Rg8 17. Qh4 Ng6 18. Qh5 O-O-O 19. Bxg6 fxg6 20. Qxg6 Nc4 21. Ba3 Nxa3 22. Rxa3 Kb8 23. a5 bxa5 24. Rfa1 a4 25. Rh3 Ka8 26. c3 Rb8 27. Rg3 Qb7 28. Re3 Rh8 29. Rae1 Be8 30. Qxe6 Rxh7 31. c4 dxc4 32. Qxc4 Bc6 33. f3 g5 34. Rc3 Bb5 35. Qc5 Rd7 36. e6 Rd5 37. Qb4 Be8 38. Qc4 Rd6 39. Rcc1 Qb6 40. Rcd1 Bb5 41. Qc5 Rxe6 42. Qd5+ Rc6 43. Qe4 Rd8 44. Kh1 Qb7 45. Rd2 Rcd6 46. Qe3 Qb6 47. Red1 Bc4 48. Qc3 Qb3 49. Qc1 a3 50. h3 a2 51. Kh2 Rb8 52. Re1 Rdb6 53. Rdd1 Bf7 54. Qd2 Qb4 55. Qc2 Qd6+ 56. Kh1 Qc6 57. Qxc6+ Rxc6 58. d5 Rcb6 59. d6 Be6 60. Ra1 Rb1 61. Kh2 Rxe1 62. Rxe1 Rb1 63. Rxe6 a1=Q 64. Re8+ Rb8 65. d7 Qd1 66. h4 gxh4 67. Rxb8+ Kxb8 0-1

DarkThought – MChess 5: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 Ne3 19. fxe3 Nxe5 20. Qh3 Rh8 21. Qg3 Qxc3 22. h4 Rhf8 23. h5+ Kf6 24. Qh4 Nf3+ 25. Nxf3+ Kf7 26. h6 Kg8 27. Ne5 Qxc2 28. hxg7 Qh7 29. gxf8=Q+ Rxf8 30. Bh6 Rxf1+ 31. Rxf1 Qg6 1-0

Mchess 5 – DarkThought: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nf3 Rh8 16. Qg4 Kf8 17. Ba3 Re8 18. Bd6 Qd8 19. Bb4 Nac6 20. Ba3 Kg8 21. c3 Bc8 22. Rfb1 Bb7 23. Bb5 Qc7 24. Bd6 Qc8 25. Nh4 Rd8 26. Qh5 Rd7 27. f4 Rd8 28. Qf3 g6 29. a5 bxa5 30. Bxe7 Nxe7 31. Rxa5 a6 32. Ba4 Bc6 33. Qd3 Bxa4 34. Rxa4 Kh7 35. Rxa6 Qc7 36. Rba1 Rb8 37. g4 Rb3 38. Ra7 Rb7 39. Rxb7 Qxb7 40. f5 Rg8 41. fxe6 fxe6 42. Rf1 Rg7 43. Rf6 Qb6 44. Ng2 Ng8 45. Rf1 Ne7 46. Rf8 Nc6 47. Kh1 Rb7 48. Nf4 Qb1+ 49. Qxb1 Rxb1+ 50. Kg2 Rb2+ 51. Kg1 Rb1+ 52. Kf2 Rb2+ 53. Ke1 Rc2 54. Rf7+ Kg8 55. Rd7 Rxc3 56. Nxe6 Rc2 57. h3 Rc1+ 58. Kf2 Rc2+ 59. Kg3 Rd2 60. Rg7+ Kh8 61. Rxg6 h5 62. Rh6+ Kg8 63. Rxh5 Nxd4 64. Nc7 Rd3+ 65. Kf2 Rd2+ 66. Ke3 Rd1 67. h4 Nc6 68. Ke2 Rd4 69. Rg5+ Kh8 70. Kf3 Ne7 71. Ne8 Rd3+ 72. Kf4 Rd1 73. Rh5+ Kg8 74. Kg5 Kf7 75. Nc7 Rc1 76. Rh7+ Kf8 77. Ne6+ Ke8 78. Nf4 Re1 79. e6 Kd8 80. Rh8+ Kc7 81. h5 Re5+ 82. Kf6 Re4 83. g5 Nc6 84. Rh7+ Kb6 85. Nxd5+ Kc5 86. Rd7 Nd4 87. e7 Kc6 88. Rd8 Re6+ 89. Kf7 Re2 90. Nf4 Rxe7+ 1-0

DarkThought – MChess 7.1: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 Ne3 19. fxe3 Nxe5 20. Qh3 Rh8 21. Qg3 Qxc3 22. h4 Nf3+ 23. Nxf3 Kh7 24. Ng5+ Kg8 25. Be5 Rc8 26. Rae1 Rf8 27. Rxf8+ Kxf8 28. Bxd4 Qc6 29. Qf4+ Ke7 30. Bxg7 Qc4 31. Bxh8 Qxf4 32. exf4 Kf8 33. h5 Bxa4 34. Nxe6+ Ke8 35. Nc5+ Kf8 36. Nxa4 d4 37. Bxd4 Kf7 38. g5 Kf8 39. g6 b5 40. h6 bxa4 41. h7 a3 42. h8=Q# 1-0

MChess 7.1 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Qd2 O-O 14. Ba3 Rfe8 15. Bd6 Qc8 16. Qe2 Nf5 17. Bb4 Nc6 18. Bc3 Qc7 19. Rfb1 Rec8 20. Qd1 Rab8 21. Qc1 Qd8 22. Ra3 Nh4 23. Nxh4 Qxh4 24. Qd2 Kh8 25. Ba6 Rg8 26. Bb2 Qd8 27. Rh3 Ne7 28. Ba3 Ra8 29. Bxe7 Qxe7 30. Bd3 g6 31. a5 bxa5 32. Qxa5 Rgb8 33. Rxb8+ Rxb8 34. Bf1 Bc6 35. Rc3 Rb6 36. g3 Kg8 37. Ra3 Rb7 38. Ra1 Qc7 39. Qa6 g5 40. Bd3 Bd7 41. Kg2 h6 42. f4 gxf4 43. gxf4 Qb8 44. f5 Kh8 45. h3 Rc7 46. Qd6 Bb5 47. Bxb5 Qxb5 48. Qd8+ Kh7 49. Qxc7 Qe2+ 50. Kg1 Qe3+ 51. Kf1 Qf3+ 52. Ke1 Qe4+ 1/2-1/2

DarkThought – Mephisto Meisterschach: [1 - 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 Qd8 18. g4 Nfxd4 19. Qd3+ Nf5 20. h4 Rh8 21. h5+ Rxh5 22. gxh5+ Kxh5 23. Qh3+ Nh4 24. Nf3 Kg6 25. Nxh4+ Kf7 26. Qg4 Qh8 27. Rad1 Kg8 28. c4 Nd4 29. Bg3 Be8 30. Rxd4 cxd4 31. Qxe6+ Bf7 32. Qc6 Rf8 33. cxd5 Qh5 34. e6 Be8 35. Qc4 g5 36. Ng2 Qf3 37. Be5 Qe4 38. Re1 b5 39. axb5 Qf5 40. Bxd4 g4 41. Re5 Qf6 42. d6 g3 43. d7 Bg6 44. e7+ Kh7 45. Rh5+ Bxh5 46. Bxf6 gxf2+ 47. Kf1 Rxf6 48. e8=Q Be2+ 49. Qcxe2 Rf5 50. Q2e7+ Kh6 51. Qh8+ Kg6 52. Nh4# 1-0

Mephisto Meisterschach – DarkThought: [0 – 1] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nh7 Rh8 16. Qg4 Rg8 17. Qh4 Ng6 18. Qh5 O-O-O 19. Bxg6 fxg6 20. Qxg6 Nc4 21. c3 Kb8 22. Qb1 Ka8 23. Ra2 Na5 24. Ra3 Be8 25. c4 Qxc4 26. Be3 Rc8 27. Ra2 Bxa4 28. Rc1 Qb3 29. Rxc8+ Rxc8 30. Qa1 b5 31. Nf6 gxf6 32. exf6 Qd3 33. Bxh6 Nb3 34. Qe1 Nxd4 35. Bg5 Nc2 36. Qc1 a6 37. h3 Qc4 38. Rb2 Rf8 39. Rb1 b4 40. Qb2 d4 41. Qc1 e5 42. Qd1 Na3 43. Qf3+ Bc6 44. Qb3 a5 45. Qxc4 Nxc4 46. Kh2 Be4 47. Re1 b3 48. Rxe4 b2 49. Re1 a4 50. f4 a3 51. fxe5 a2 52. e6 Nd6 53. Bh6 Rxf6 54. Bg7 Ne8 55. Bxf6 Nxf6 56. Rf1 b1=Q 57. Rg1 d3 58. e7 Qxg1+ 59. Kxg1 a1=Q+ 60. Kf2 d2 61. e8=R+ Nxe8 62. Kg3 Qe5+ 63. Kf2 d1=Q 64. g4 Qde2+ 0-1

DarkThought – Mephisto Shredder: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 Nxe5 19. gxf5+ Rxf5 20. Qg3 Rxf4 21. Nxe6+ Rg4 22. Nxc7 Rh8 23. Nxd5 Nf3+ 24. Kg2 Nh4+ 25. Kh1 Rxg3 26. fxg3 Bc6 27. c4 Nf5 28. Kg1 Bxd5 29. cxd5 Rd8 30. a5 b5 31. Rf4 Rxd5 32. Rd1 b4 33. g4 Ne3 34. Rdxd4 Rxa5 35. Rxb4 Ra1+ 36. Kf2 Nxc2 37. Rbc4 Ra2 38. Ra4 Rb2 39. Rxa7 Nd4+ 40. Ke3 Ne6 41. Rf5 Rb3+ 42. Kd2 Rb4 43. Ra6 Re4 44. Kd3 Re1 45. h4 Kh7 46. Rb6 Kg8 47. h5 Kh7 48. g5 Nc7 49. Rf7 Re6 50. Rb7 Rd6+ 51. Ke4 Ne6 52. Ke5 Ra6 53. Rf6 Ra5+ 54. Kxe6 Rxg5 55. h6 Rg1 56. Rxg7+ Rxg7 57. hxg7 Kxg7 58. Kf5 Kh7 59. Rg6 Kh8 60. Kf6 Kh7 61. Kf7 Kh8 62. Rh6# 1-0

Mephisto Shredder – DarkThought: [0 – 1] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ba3 Nc4 14. Bxe7 Kxe7 15. Qb1 Ke8 16. c3 h5 17. Rc1 h4 18. h3 Rc8 19. Qa2 Kf8 20. Bxc4 Qxc4 21. Qa3+ Kg8 22. Qe7 Qc7 23. Nxh4 Re8 24. Qg5 Rh6 25. Nf3 Rg6 26. Qd2 Rc8 27. Qe2 Qd8 28. Qa6 Rc7 29. a5 b5 30. Rab1 Bc6 31. Rb4 Kh8 32. Re1 Qg8 33. Re3 Qh7 34. Kf1 Rh6 35. Rb2 Rg6 36. Ne1 Qh4 37. Nd3 Qg5 38. f4 Qh4 39. Rf2 Qd8 40. Nb4 Qe8 41. Rb2 Bd7 42. Qd6 Qc8 43. Rb3 Kg8 44. Kf2 Be8 45. f5 exf5 46. Qxd5 a6 47. Qf3 Bc6 48. Nxc6 Rgxc6 49. d5 Rc4 50. d6 R7c5 51. Kg1 Ra4 52. Rb1 f4 53. Rd3 Qd8 54. Re1 Qd7 55. Qa8+ Kh7 56. Qxa6 Qf5 57. Qb6 Rxe5 58. Red1 Re2 59. Qc6 Raa2 60. Qf3 Qg5 61. g4 Qc5+ 62. Rd4 Re3 63. Qxf4 Qxc3 64. R4d3 Rxd3 65. Qe4+ g6 66. Qxd3 Qc5+ 67. Qd4 Qc2 68. Rd2 Qxd2 69. Qxd2 Rxd2 70. a6 Rxd6 71. a7 Ra6 72. Kf2 Rxa7 73. Ke3 Rd7 74. h4 Kh6 75. Ke4 b4 76. Ke5 b3 77. Ke4 Kh7 78. Kf4 f6 79. g5 b2 80. h5 Rd3 81. gxf6 b1=Q 82. hxg6+ Kxg6 83. Ke4 Qb5 84. f7 Qf5# 0-1

DarkThought – Nimzo 98: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 Nxe5 19. gxf5+ Rxf5 20. Qg3 Kf6 21. Kg2 Qd8 22. Bxe5+ Rxe5 23. Nh7+ Kf7 24. Qxe5 Kg6 25. cxd4 Kxh7 26. a5 bxa5 27. Kh1 Qf6 28. Qxf6 gxf6 29. Rxa5 a6 30. Rfa1 Bc8 31. Rg1 e5 32. dxe5 fxe5 33. Rg5 Rb8 34. Rxe5 Kg6 35. Re8 Kf7 36. Rd8 Rb1+ 37. Kg2 Bb7 38. Rb8 Ke7 39. f4 Rb6 40. Kg3 Kd6 41. f5 Ke5 42. Kg4 Rb1 43. Kg5 Rg1+ 44. Kh6 Rb1 45. Kg6 Rb6+ 46. Kg5 Rb1 47. f6 Rg1+ 48. Kh5 Kxf6 49. Rxb7 Rg5+ 50. Kh4 Rg2 51. Rb6+ Ke5 52. c4 Rxh2+ 53. Kg3 Rd2 54. Rxd5+ Rxd5 55. cxd5 Kxd5 56. Rxa6 1-0

Nimzo 98 – DarkThought: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nf3 Rh8 16. Qg4 Kf8 17. Ba3 Re8 18. Bd6 Qd8 19. Bb4 Nac6 20. Ba3 Kg8 21. c4 dxc4 22. Bxc4 Na5 23. Bd3 Nd5 24. Bb2 Bc6 25. Nd2 Qd7 26. Bc2 Qe7 27. Ne4 Nc4 28. Bc1 Rc8 29. Bd3 Na5 30. Nd6 Rc7 31. Ra3 h5 32. Qd1 h4 33. h3 f5 34. Qe1 Rh7 35. Be2 Kh8 36. Bf3 Qf8 37. Qd2 Rd7 38. Bb2 Qe7 39. Rc1 Rd8 40. Rc2 g6 41. Qc1 Bb7 42. Bc3 Nxc3 43. Raxc3 Ba6 44. Bc6 Nxc6 45. Rxc6 Rg7 46. a5 g5 47. d5 Bb7 48. Rc7 Rd7 49. Rxd7 Qxd7 50. dxe6 Qxe6 51. Nxb7 Rxb7 52. Rc6 Qe7 53. axb6 axb6 54. Rf6 Qe8 55. Qxg5 Rg7 56. Qxh4+ Rh7 57. Qf4 Kg8 58. Rxb6 Rg7 59. Qxf5 Qa8 60. Rg6 Qa1+ 61. Kh2 Rxg6 62. Qxg6+ 1-0

DarkThought – Nimzo 99a: [1 – 0] (Test Game, Nunn Position #3, January 1999)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 dxc3 19. Qh3 Nh4 20. Qxh4 Rh8 21. Qg3 Nxe5 22. Bxe5 Qc4 23.

f4 Rae8 24. f5+ Kxg5 25. Qe3+ Kh4 26. Bg3+ Kxg4 27. Rf4+ Kg5 28. Rxc4+ Kf6 29. fxe6 Bxe6 30. Be5+ Kg6 31. Qg3+ Bg4 32. Qxg4+ Kh6 33. Rc6+ Re6 34. Rxe6+ g6 35. Qxg6# 1-0

Nimzo 99a – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #3, January 1999)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nf3 Rh8 16. Re1 Rc8 17. Qg4 Kf8 18. Ba3 Bc6 19. c3 Kg8 20. Nd2 Qd7 21. Bb4 Nb7 22. a5 bxa5 23. Bxa5 Bb5 24. Bxb5 Qxb5 25. Reb1 Qd7 26. Bb4 Nc6 27. Ra6 Kh7 28. Ba3 Rb8 29. Ra1 Rhc8 30. Qg3 Kh8 31. Nb3 Ra8 32. Bc1 Qc7 33. Bd2 Nbd8 34. Qg4 Nb8 35. R6a2 Nd7 36. Qf3 Nb6 37. Ra6 Nc6 38. Nc5 Nc4 39. Bf4 Rab8 40. Qd1 Rb5 41. Bc1 Qb8 42. f4 N6a5 43. Qa4 Rc6 44. Rxc6 Nxc6 45. Nd7 Qb7 46. Nc5 Qb6 47. Qc2 a5 48. Kh1 Ne7 49. h3 Qc7 50. g4 Qb6 51. Kh2 Nc6 52. h4 Qd8 53. Kg3 h5 54. Qa4 Rb6 55. f5 exf5 56. gxf5 Ne7 57. Qc2 f6 58. e6 Qg8 59. Nd7 Rb7 60. Qd3 Qh7 61. Kf4 Nd6 62. Nc5 Ne4 63. Qh3 Nxc5 64. dxc5 Rb5 65. Qd3 Rxc5 66. Ke3 Qxf5 67. Qxf5 Nxf5+ 68. Kd2 Rc6 69. Rxa5 Rxe6 70. c4 Nxh4 71. cxd5 Nf3+ 72. Kd3 Ne5+ 73. Ke4 Re8 74. Kf5 Kh7 75. d6 Nc4 76. Rd5 Nb6 77. Ra5 Re2 78. Kf4 g5+ 79. Kf5 Nd7 80. Bxg5 fxg5 81. Kxg5 Rg2+ 82. Kxh5 Nf6+ 83. Kh4 Kg6 84. Kh3 Rd2 85. Kg3 Rxd6 1/2-1/2

DarkThought – Rebel 8: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O h6 12. Ba3 Na5 13. c4 Nxc4 14. Bxc4 dxc4 15. dxc5 Bxa4 16. cxb6 axb6 17. Bd6 Qd7 18. Qb1 Nd5 19. Qb2 b5 20. Nd4 Qb7 21. Rfb1 Ra5 22. Ra3 c3 23. Qc1 Qb6 24. Ne2 Qc6 25. Qe1 f6 26. Nxc3 Nf4 27. Ne4 fxe5 28. Qxa5 Qxe4 29. Rf3 Qxc2 30. Re1 Qc6 31. Bxe5 Nd5 32. Bxg7 Rg8 33. Qa7 Ne7 34. Qb8+ Qc8 35. Qf4 Bc2 36. Qf7+ Kd8 37. Bf6 Re8 38. Ra3 Ba4 39. Bxe7+ Rxe7 40. Rd1+ Bxd1 41. Qf8+ Kd7 42. Rd3+ Kc7 43. Rc3+ Kd6 44. Rxc8 Ke5 45. f4+ Ke4 46. Qxe7 Bb3 47. Qd6 b4 48. Kf2 Kf5 49. Rg8 Ke4 50. Rg3 Bc4 51. Qe5# 1-0

Rebel 8 – DarkThought: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ba3 Nc4 14. Bxe7 Kxe7 15. Qe2 Na5 16. Rfb1 Kf8 17. Ba6 Bc8 18. Bb5 Bb7 19. Ra3 Rc8 20. Ne1 Kg8 21. Rg3 Qd8 22. Qg4 Qf8 23. Qf4 h6 24. Bd3 Bc6 25. Ba6 Rc7 26. Bb5 Qc8 27. Qf6 Rh7 28. Ba6 Qe8 29. Bd3 Kh8 30. Qf4 g6 31. Rh3 Bxa4 32. Rxh6 Rxh6 33. Qxh6+ Kg8 34. Ra1 Bb5 35. Bxb5 Qxb5 36. Nf3 Qe2 37. Re1 Qxc2 38. Ng5 Qd2 39. Rf1 Rb7 40. g3 Nc6 41. Qh7+ Kf8 42. Nxe6+ fxe6 43. Qxb7 Qc3 44. Qc8+ Ke7 45. Kg2 g5 46. h4 g4 47. f3 Qc2+ 48. Kg1 Nxd4 49. Qxc2 Nxc2 50. fxg4 Ne3 51. Ra1 Nxg4 52. Rxa7+ Kf8 53. h5 b5 54. Rb7 Nxe5 55. Kf2 b4 56. Ke2 Nf7 57. g4 b3 58. Rxb3 Kg7 59. Rb8 Ng5 60. Rb1 Kf6 61. Rf1+ Ke7 62. Ke3 Nh3 63. Kf3 Ng5+ 64. Kg3 Nf7 65. Kh4 Nh6 66. Re1 d4 67. Kg5 Nf7+ 68. Kg6 d3 69. h6 d2 70. Rd1 Kf8 71. Rxd2 Ne5+ 72. Kh5 Kg8 73. g5 Kf8 74. g6 Nd3 75. Rxd3 e5 76. h7 Ke7 77. h8=Q Ke6 78. Qe8+ Kf5 79. Qf7+ Ke4 80. Qf3# 1-0

DarkThought – Rebel 9: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O h6 12. Ba3 Na5 13. c4 Nxc4 14. Bxc4 dxc4 15. dxc5 Bxa4 16. cxb6 axb6 17. Bd6 Qd7 18. Qb1 Nd5 19. Qb2 b5 20. Nd4 Qb7 21. Rfb1 Ra5 22. Ra3 Nf4 23. f3 Qb6 24. Kh1 Kd7 25. Qb4 Nd5 26. Qe1 Rha8 27. c3 h5 28. f4 g6 29. Ra2 Kc8 30. Rab2 R8a7 31. Bb4 Nxb4 32. Rxb4 Qc5 33. Qe4 Rd7 34. Qf3 Rd5 35. Qf2 Ra7 36. Qf1 Rb7 37. Qe1 Rbd7 38. Nxb5 Bxb5 39. Rxb5 Qxb5 40. Rxb5 Rxb5 41. h4 Kd8 42. Qa1 Rc7 43. Kh2 Rcc5 44. Qa8+ Ke7 45. Kh3 Rc7 46. Kh2 Rb3 47. Kg1 Kd7 48. Qa4+ Kd8 49. Qa5 Rb8 50. Kf1 Kd7 51. Ke2 Rcc8 52. Qa4+ Kd8 53. Kf3 Ra8 54. Qb4 Ke8 55. g4 hxg4+ 56. Kxg4 Rab8 57. Qd6 Rd8 58. Qa3 Ra8 59. Qb4 Rdc8 60. Kg5 Rab8 61. Qa4+ Kf8 62. Kf6 Rb7 63. h5 gxh5 64. Qc2 Ke8 65. Qh7 Re7 66. Qxh5 Kd8 67. Qh8+ Re8 68. Qh7 Re7 69. Qg8+ Re8 70. Qxf7 Rc7 71. Qh5 Rc6 72. Qh7 Rf8+ 73. Kg5 Rf5+ 74. Kg4 Rc7 75. Qg8+ Kd7 76. Qa8 Rf7 77. Qa4+ Rc6 78. Kf3 Re7 79. f5 exf5 80. Kf4 Ree6 81. Kxf5 Ke7 82. Qa7+ Ke8 83. Ke4 Rc8 84. Kd5 Re7 85. Qa4+ Kf8 86. e6 Rh7 87. Qa6 Rd8+ 88. Ke5 Kg7 89. Qb7+ Kg8 90. Qg2+ Kh8 91. Qg5 Re8 92. Qf6+ Rg7 93. Kd6 Rb8 94. Qh4+ Rh7 95. Qd4+ Kg8 96. e7 Re8 97. Qf6 Rg7 98. Qe6+ Kh7 99. Kd7 Rf8 100. Qe4+ Kh6 101. Qxc4 Rfg8 102. Qxg8 Rxg8 103. e8=Q 1-0

Rebel 9 – DarkThought: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ba3 Nc4 14. Bxe7 Kxe7 15. Qe2 Na5 16. Rfb1 Kf8 17. Ba6 Bc8 18. Bb5 Bb7 19. Ra3 Rc8 20. Ne1 Kg8 21. h3 h5 22. f4 Rh6 23. Ra2 h4 24. Nf3 Kh8 25. Bd3 Qd8 26. Nh2 Kg8 27. Ng4 Rh8 28. f5 exf5 29. Bxf5 Rc7 30. e6 f6 31. c3 Qe8 32. Re1 Re7 33. Qd3 Qc6 34. Ne3 Kf8 35. Bg4 Kg8 36. Rae2 Nc4 37. Nxd5 Qxd5 38. Bf3 Qa5 39. Bxb7 Qxa4 40. Bd5 Nd6 41. Ra2 Qe8 42. c4 Rh6 43. Rea1 Nc8 44. Ra6 Kh8 45. Qf3 Rc7 46. Qf4 Qe7 47. R1a2 g5 48. Qe3 Nd6 49. Ra1 Nf5 50. Qd3 Ng3 51. R6a4 Rh7 52. Re1 Qe8 53. Ra3 Rhe7 54. Qb1 Rg7 55. Ra1 f5 56. Qb3 Qe7 57. Qd3 Qf6 58. Re5 Rg8 59. Ra6 g4 60. hxg4 fxg4 61. Re1 Rf8 62. Ra2 Qf4 63. Qd2 Re7 64. Rd1 Rf6 65. Qxf4 Rxf4 66. Rf2 Kg7 67. Rxf4 Ne2+ 68. Kh2 Nxf4 69. g3 Nxe6 70. Bxe6 Rxe6 71. gxh4 Re3 72. d5 Rh3+ 73. Kg2 Rxh4 74. Kg3 Rh8 75. Kxg4 Kf6 76. Re1 Rc8 77. Re6+ Kf7 78. Kf5 Rxc4 79. Rh6 Rd4 80. Ke5 Ra4 81. Rh7+ Ke8 82. Ke6 Re4+ 83. Kd6 Ra4 84. Rh8+ Kf7 85. Kd7 Kf6 86. Rh2 Rd4 87. d6 Kf7 88. Rf2+ Kg6 89. Ke7 Re4+ 90. Kd8 Rc4 91. d7 Rc3 92. Ra2 a5 93. Ke7 Re3+ 94. Kd6 Rd3+ 95. Kc7 Rc3+ 96. Kxb6 Rd3 97. Kc7 Rc3+ 98. Kd8 a4 99. Rxa4 Kf7 100. Rf4+ Kg6 101. Ke7 Rc5 102. d8=Q Kg5 103. Rd4 Kh5 104. Qh8+ Kg6 105. Qf6+ 1-0

DarkThought – Shredder 2: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O O-O 12. Bxh7+ Kxh7 13. Ng5+ Kg6 14. Qg4 f5 15. Qg3 f4 16. Bxf4 Nf5 17. Qf3 cxd4 18. g4 Nxe5 19. gxf5+ Rxf5 20. Qg3 Rxf4 21. Nxe6+ Rg4 22. Nxc7 Rh8 23. Nxd5 Nf3+ 24. Kg2 Nh4+ 25. Kh1 Rxg3 26. fxg3 Bc6 27. c4 Nf5 28. Kg1 Bxd5 29. cxd5 Rd8 30. a5 b5 31. Rf4 Rxd5 32. Rd1 Rc5 33. Rd2 b4 34. a6 Kg5 35. h4+ Kg6 36. Rdf2 Ra5 37. Kh2 Rd5 38. Kh3 Ra5 39. R2f3 Rd5 40. Rb3 Ne3 41. Rf2 Ra5 42. Rxb4 Rxa6 43. Rxd4 Ra1 44. g4 a5 45. h5+ Kh6 46. Kh4 a4 47. Rd6+ Kh7 48. Re6 a3 49. Rf8 Ng2+ 50. Kg3 Re1 51. Ra6 Ne3 52. Raa8 Kh6 53. Rh8+ Kg5 54. Ra5+ Kf6 55. Ra6+ Kf7 56. Ra7+ Kf6 57. Rf8+ Ke6 58. Re8+ Kf6 59. Kf2 Rf1+ 60. Ke2 Rg1 61. Rxe3 Rxg4 62. Rexa3 Rg2+ 63. Kd3 Rg3+ 64. Kd4 Rg4+ 65. Kc3 Rf4 66. R3a6+ Kg5 67. Rxg7+ Kxh5 68. Rg1 Rf8 69. Rd6 Rc8+ 70. Kd2 Rf8 71. Rd3 Rf2+ 72. Kc1 Rf4 73. Rdg3 Ra4 74. Kd2 Rd4+ 75. Ke3 Rh4 76. Rg8 Rh3+ 77. Kf2 Rh2+ 78. Ke1 Re2+ 79. Kxe2 Kh6 80. Rh1# 1-0

Shredder 2 – DarkThought: [1 – 0] (Test Game, Nunn Position #3, May 1998)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Qc7 7. Nf3 Ne7 8. a4 b6 9. Bb5+ Bd7 10. Bd3 Nbc6 11. O-O cxd4 12. cxd4 Na5 13. Ng5 h6 14. Qh5 Rf8 15. Nf3 Rh8 16. Qg4 Kf8 17. Ba3 Re8 18. Qf4 Kg8 19. Bd6 Qc8 20. Rfc1 Nc4 21. Rcb1 h5 22. Bxe7 Rxe7 23. Rb4 Na5 24. Qe3 Be8 25. c3 Rc7 26. Ra3 Bc6 27. Ng5 Bb7 28. Qf3 Nc6 29. Rb1 Ba6 30. Bc2 Qd7 31. Ra2 Na5 32. Qh3 Rh6 33. Re1 Qc6 34. Ra3 Qe8 35. f4 Qf8 36. Raa1 Qe7 37. Qg3 h4 38. Qe3 Rc6 39. Rac1 Nc4 40. Qe2 Bb7 41. Bd3 Qd8 42. Qg4 Qc8 43. Qh3 Nb2 44. Bc2 Ba6 45. Qf3 Rc7 46. Qe3 Nc4 47. Qh3 Na3 48. Bh7+ Kh8 49. f5 Qe8 50. fxe6 fxe6 51. Bd3 Bxd3 52. Qxd3 Rh5 53. Nh3 Nc4 54. Rf1 Kg8 55. Rf3 Qxa4 56. Nf4 Rh6 57. Ng6 Qe8 58. Rf8+ Qxf8 59. Nxf8 Kxf8 60. Rf1+ Rf7 61. Rxf7+ Kxf7 62. Qb1 a5 63. Qb5 Kg6 64. Kf2 Kh7 65. Qc6 Kg8 66. Kf3 Kf7 67. g4 hxg3 68. hxg3 Rg6 69. g4 Kg8 70. g5 Kh7 71. Kf4 Nd2 72. Qxb6 a4 73. Qa5 Ne4 74. c4 Nxg5 75. cxd5 exd5 76. Qxd5 Ne6+ 77. Ke3 a3 78. Qa2 Rh6 79. d5 Rh3+ 80. Ke4 Rh4+ 81. Kf3 Nd4+ 82. Kg2 g5 83. Qb1+ Kh6 84. d6 Rg4+ 85. Kf2 Rh4 86. Ke3 Nb3 87. d7 Rh3+ 88. Kf2 Rh2+ 89. Kg3 a2 90. Qxb3 a1=Q 91. Qe6+ Kh5 92. Qe8+ Kh6 93. Kxh2 Qb2+ 94. Kg3 1-0

Games Played by DarkThought from Nunn Position #4 (ECO C97)

DarkThought – Chessmaster 4000 Turbo: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 Bb7 13. d5 Nd7 14. Nf1 f5 15. exf5 Nc4 16. Ne3 Ncb6 17. h4 Nf6 18. Ng5 Qd7 19. Ne6 Rfc8 20. h5 Nbxd5 21. Nxd5 Bxd5 22. Bg5 Qb7 23. h6 Bxg2 24. Re3 Bd5 25. hxg7 Ra7 26. Rh3 Bg2 27. Rh6 Bf3 28. Qf1 Be4 29. Bxf6 Bxc2 30. Qh3 Bxf6 31. Rxf6 Qf7 32. Rxf7 Rxf7 33. f6 Re8 34. Ng5 Rxf6 35. Qd7 Bg6 36. Rd1 e4 37. Rxd6 Rxd6 38. Qxd6 Kxg7 39. Ne6+ Kg8 40. Qd5 h6 41. Qd6 Kf7 42. Nxc5 Bf5 43. Qxa6 h5 44. Qxb5 Re7 45. Qc6 Kg7 46. b4 Kf7 47. b5 e3 48. fxe3 Re8 49. b6 Ke7 50. b7 Kf7 51. Qxe8+ Kxe8 52. b8=Q+ Kf7 53. Qc7+ Kf6 54. Nd7+ Ke6 55. Qe5+ Kxd7 56. Qd5+ Kc7 57. Qxf5 h4 58. Qe6 h3 59. Kh2 Kb7 60. c4 Kc7 61. c5 Kd8 62. Qf7 Kc8 63. c6 Kd8 64. Qd7# 1-0

Chessmaster 4000 Turbo – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Nc6 15. Nb3 Rfe8 16. Bd2 d5 17. dxe5 Nxe5 18. Nxe5 dxe4 19. Bf4 exd3 20. Rc1 Qd8 21. Qxd3 Qxd3 22. Nxd3 Bd5 23. Ndc5 a5 24. Nd4 b4 25. Nf5 Bf8 26. Be5 Bxc5 27. Rxc5 Bxa2 28. Rcc1 Be6 29. Bxf6 Bxf5 30. Be7 Be6 31. Rc7 Reb8 32. f3 h6 33. Re4 Rc8 34. Rc5 Rxc5 35. Bxc5 Ra6 36. Be7 Rc6 37. Bd8 Rc1+ 38. Kh2 Rc5 39. Rd4 Kh7 40. Rd2 Kg6 41. g4 a4 42. Be7 Rc4 43. Kg3 f5 44. Bd6 Kf6 45. Kf2 g5 46. Ke3 b3 47. Ke2 Bf7 48. Kf2 Rc2 49. Ke1 Bc4 50. Bb4 Ke6 51. Rd6+ Ke5 52. Rd2 Bd5 53. gxf5 Bxf3 54. f6 Kxf6 55. Rf2 Rxf2 56. Kxf2 Bd5 57. Kg3 h5 58. h4 g4 59. Kf4 Ke6 60. Bc5 Bf3 61. Kg3 Ke5 62. Be7 Kf5 63. Bd6 Bd5 64. Bb4 Be4 65. Kf2 Bb7 66. Bd6 Bc6 67. Kg3 Be4 68. Be7 Bc2 69. Bb4 Ke4 70. Kf2 Kf4 71. Bd6+ Kf5 72. Kg3 Ke4 73. Kf2 Bd3 74. Ba3 Kf4 75. Bd6+ Kf5 76. Kg3 Ke4 77. Kf2 Bb1 78. Ba3 Bd3 79. Bd6 Bc4 80. Ba3 Kf5 81. Kg3 Be6 82. Kg2 Kf4 83. Bd6+ Ke3 84. Ba3 Bc4 85. Bc5+ Kf4 86. Bd6+ Kf5 87. Ba3 Bd3 88. Kf2 Be4 89. Bb4 Bc6 90. Ba3 Kf4 91. Bd6+ Ke4 92. Ba3 Bd5 93. Kg3 Be6 94. Kf2 Bc4 95. Kg2 Kd5 96. Kf2 Ke5 97. Kg3 Be2 98. Kg2 Kf4 99. Bd6+ Ke3 100. Ba3 Kd3 101. Kg3 Ke4 102. Kg2 Kf5 103. Kf2 Bf3 104. Kg3 Ke4 105. Kf2 Kf4 106. Bd6+ Kf5 1/2-1/2

DarkThought – Comet A.90: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 Bd7 13. d5 c4 14. Nf1 Rfb8 15. Ng3 b4 16. Nd2 bxc3 17. bxc3 Qc5 18. Ba4 Bc8 19. Qe2 Rb7 20. Qe3 Qxe3 21. Rxe3 Rab8 22. Ba3 h5 23. Bb4 Rxb4

24. cxb4 Rxb4 25. Bc2 Bd8 26. Rb1 Rxb1+ 27. Bxb1 h4 28. Ne2 Nd7 29. Rc3 Nb6 30. Ra3 Na8 31. Ra4 Bd7 32. Rb4 Nb6 33. Nc3 Kf8 34. a3 Kg8 35. Ba2 Kf8 36. Nf3 Bc8 37. Nxh4 Nb7 38. Nf3 a5 39. Rb5 Nc5 40. Nxe5 Ba6 41. Rxa5 Bf6 42. f4 g5 43. Ne2 c3 44. Rxa6 Nxa6 45. Ng4 Bg7 46. fxg5 Nc5 47. e5 c2 48. Ne3 c1=Q+ 49. Nxc1 Bxe5 50. Ne2 Bb2 51. Nc2 Ne4 52. h4 Ke7 53. Kh2 Be5+ 54. g3 Na4 55. Ne3 Nd2 56. Bc4 Nc5 57. Bb5 Kd8 58. a4 Nce4 59. a5 Nf3+ 60. Kg2 Ne1+ 61. Kf1 Nf3 62. Be8 Nfd2+ 63. Kg2 Nc3 64. Nxc3 Bxc3 65. Bxf7 Bxa5 66. h5 Ne4 67. g6 Ke7 68. h6 Bc3 69. Be6 Kf8 70. Nf5 Ke8 71. g7 Bxg7 72. hxg7 Nf6 73. g4 Kd8 74. g5 Ng8 75. Bxg8 Kc7 76. Bh7 Kb8 77. g8=Q+ Kb7 78. Qd8 Ka6 79. Nxd6 Ka7 80. Qc7+ Ka8 81. Qb7# 1-0

Comet A.90 – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Nc6 15. Nb3 Rfe8 16. Bd2 d5 17. exd5 Nxd4 18. Nxe5 Nxb3 19. axb3 Qc5 20. Nc6 Qxd5 21. Nxe7+ Rxe7 22. Bf1 Rd7 23. Bb4 Qf5 24. Qe2 h5 25. Qe5 Qg6 26. Qe3 Re8 27. Qb6 Rxe1 28. Rxe1 Qf5 29. f3 Nd5 30. Qc5 Rd8 31. Ba5 Rc8 32. Qa7 Qd7 33. Bd3 Bc6 34. Qc5 Ba8 35. Qd4 Bc6 36. Re5 g6 37. Re1 Kh7 38. Bd2 Rd8 39. Bg5 Nc7 40. Qh4 Qd4+ 41. Qxd4 Rxd4 42. Re7 Nd5 43. Rxf7+ Kg8 44. Bxg6 Be8 45. Rg7+ Kxg7 46. Bxe8 Rd1+ 47. Kh2 Rb1 48. Bxh5 Rxb2 49. Bg4 Rxb3 50. Be6 Rd3 51. Bf5 Rd4 52. h4 a5 53. h5 a4 54. h6+ Kh8 55. Bc1 b4 56. Bb2 Nc3 57. Bc1 a3 58. Be6 Rh4+ 59. Kg3 Ne2+ 60. Kxh4 Nxc1 61. g4 a2 62. Bxa2 Nxa2 63. g5 b3 64. f4 b2 65. g6 b1=Q 66. Kg5 Nc3 67. g7+ Kg8 68. Kf6 Qe4 69. h7+ Kxh7 70. g8=Q+ Kxg8 71. Kg5 Kg7 72. Kh5 Ne2 73. f5 Kf6 74. Kh6 Qh1# 0-1

DarkThought – Crafty 16.4: [1 – 0] (Test Game, Nunn Position #4, January 1999)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 Ra7 13. b3 exd4 14. cxd4 c4 15. bxc4 bxc4 16. Ba3 Re8 17. Ba4 Bd7 18. Bxd7 Qxd7 19. Rc1 Qb5 20. Rb1 Qd7 21. e5 dxe5 22. Bxe7 Qxe7 23. Rxe5 Qd8 24. Qa4 c3 25. Ne4 Rxe5 26. Nxf6+ gxf6 27. dxe5 fxe5 28. Rd1 Qb6 29. Qe8+ Kg7 30. Rd8 Nc4 31. Rc8 Kf6 32. Rxc4 Qb5 33. Qh8+ Ke6 34. Rxc3 Qd5 35. Ng5+ Ke7 36. Nxh7 Ra8 37. Qf6+ Kd7 38. Qb6 Ke7 39. Rc7+ Qd7 40. Rxd7+ Kxd7 41. Nf6+ Ke7 42. Nd5+ Kd7 43. Qc7+ Ke6 44. Qc6+ Kf5 45. g4+ Ke4 46. Qc4+ Kf3 47. Qd3# 1-0

Crafty 16.4 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #4, January 1999)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Nf1 Rac8 15. Bd3 Nc6 16. Be3 Nb4 17. Ng3 Nxd3 18. Qxd3 Qc2 19. Qxc2 Rxc2 20. Rec1 Rxc1+ 21. Rxc1 Nxe4 22. Rc7 Nxg3 23. Rxb7 Nf5 24. dxe5 dxe5 25. Nxe5 Rd8 26. Bb6 Rd1+ 27. Kh2 Bd6 28. Bc7 Bf8 29. g4 Nd4 30. Kg2 Ne6 31. Bb6 Rd2 32. Ra7 f6 33. Nd7 Bb4 34. Be3 Rxb2 35. Ra8+ Kf7 36. Rxa6 Bd2 37. Kf3 Bxe3 38. Kxe3 Rc2 39. Ra7 Ke8 40. Nb6 Rc3+ 41. Ke4 Ng5+ 42. Kd4 Rxh3 43. Nd5 Rh4 44. Ra8+ Kf7 45. Ra7+ Kg8 46. Ra8+ Kf7 1/2-1/2

DarkThought – Fritz 3.10: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 exd4 14. Nb3 Nxb3 15. Bxb3 Bb7 16. Qxd4 Qc5 17. Qd3 Rae8 18. Bf4 d5 19. Be3 Qc6 20. e5 Ne4 21. Red1 Rc8 22. Bxd5 Qxd5 23. Qxd5 Bxd5 24. Rxd5 Rc2 25. Rb1 Re8 26. e6 fxe6 27. Re5 Nd6 28. Rxe6 Nf5 29. Bg5 h6 30. Ne1 Rc7 31. Bd2 Rd7 32. Bc3 Rd6 33. Re5 Nh4 34. Re4 Kf7 35. g3 Ng6 36. h4 Rdd8 37. Nf3 Bf6 38. Rxe8 Rxe8 39. Bxf6 Kxf6 40. Rc1 Re2 41. Rc6+ Kf7 42. Rxa6 Rxb2 43. a3 Ra2 44. Ra7+ Kg8 45. Nd4 Ne5 46. Nxb5 Ng4 47. Ra8+ Kh7 48. Rf8 g5 49. Rf3 gxh4 50. gxh4 Ne5 51. Rf6 Kg7 52. Rf5 Nc4 53. Rf3 Kg6 54. Kg2 Ne5 55. Rf8 Rb2 56. Nd6 Rb6 57. Re8 Rxd6 58. Rxe5 Ra6 59. Re3 Kf5 60. Kh3 Kf4 61. Rd3 Kf5 62. Kg3 Rg6+ 63. Kf3 Ra6 64. Re3 Ra4 65. Kg3 Rg4+ 66. Kh3 Ra4 67. f3 Ra6 68. Kg2 Ra7 69. Kg3 Rg7+ 70. Kf2 Ra7 71. Rc3 Ra6 72. Rd3 Ra4 73. Kg3 Ke6 74. Re3+ Kf5 75. Rc3 Ra6 76. Rc4 Rxa3 77. Rc6 Ra1 78. Rxh6 Rg1+ 79. Kf2 Rh1 80. Kg2 Rc1 81. Rd6 Rb1 82. Rd5+ Kf4 83. Rd4+ Kf5 84. Rg4 Kf6 85. Rg5 Rc1 86. Rg3 Rc2+ 87. Kh3 Kf5 88. h5 Rc1 89. Kh2 Rc2+ 90. Rg2 Rc5 91. Rg6 Kf4 92. h6 Rc2+ 93. Kh3 Rc1 94. Rg2 Rc8 95. h7 Rh8 96. Rg7 Kf5 97. Kh4 Kf6 98. Rb7 Kg6 99. Kg4 Ra8 100. f4 Kh6 101. Ra7 Rb8 102. f5 Rh8 103. Kf4 Rf8 104. Ke5 Re8+ 105. Kd6 1-0

Fritz 3.10 – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. d5 Rac8 15. Bd3 Nd7 16. a4 Nc5 17. Bc2 f5 18. b4 Nxe4 19. Bxe4 fxe4 20. Nxe4 Nc4 21. axb5 axb5 22. Nfg5 Bxg5 23. Nxg5 Rf5 24. Qd3 g6 25. Ne4 Kh8 26. Be3 Qf7 27. g4 Rf3 28. Ng5 Qf4 29. Nxf3 Qxf3 30. Rad1 Qxh3 31. Qe4 Qh4 32. Qf3 Kg8 33. Ra1 Rf8 34. Qg2 e4 35. Ra7 Bxd5 36. Rc1 Rf3 37. g5 Bc6 38. Rxc4 bxc4 39. Ra6 Bb5 40. Rxd6 c3 41. Rd4 Be2 42. Qh2 Qg4+ 43. Qg2 Qf5 44. Rd8+ Kg7 45. Ra8 Qd5 46. Ra7+ Kh8 47. Ra5 Qd1+ 48. Kh2 Bc4 49. Ra8+ Kg7 50. Ra7+ Bf7 51. Ra6 c2 52. Rc6 Be6 53. b5 Bd7 54. Rxc2 Qxc2 55. b6 Qb2 56. b7 Kf7 57. Bd4 Qxb7 58. Be5 h5 59. Bg3 Qb3 60. Kg1 h4 61. Kh1 Qd1+ 62. Kh2 e3 63. Bxh4 Rh3+ 64. Qxh3 Bxh3 65. Kxh3 Qf3+ 66. Kh2 e2 67. Bg3 e1=Q 68. Kh3 Qeh1# 0-1

DarkThought – Fritz 5.03: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Rfc8 15. a4 b4 16. Nb3 Nxb3 17. Qxb3 exd4 18. Nxd4 d5 19. e5 Ne4 20. e6 Bf6 21. Bxe4 dxe4 22. Nf5 Rd8 23. Ng3 Rd3 24. exf7+ Qxf7 25. Qxb4 Rc8 26. Be3 Rb3 27. Qd6 Rd8 28. Qf4 Qe6 29. Rad1 Rbd3 30. Rb1 Rb3 31. Red1 Rbd3 32. Rdc1 Be5 33. Qg5 Qd6 34. Re1 Bxg3 35. Qxg3 Qxg3 36. fxg3 Rb3 37. Re2 a5 38. Bf2 Rdd3 39. Be1 Rd4 40. Bc3 Rxa4 41. Rd1 Bc6 42. Rd8+ Kf7 43. Rc8 Rc4 44. Rc7+ Ke6 45. Rxg7 a4 46. Rxh7 a3 47. Rf2 Rbxc3 48. bxc3 Rxc3 49. Rh6+ Ke5 50. g4 Kd4 51. Rd6+ Ke5 52. Rd1 e3 53. Rf5+ Ke4 54. Ra5 Kf4 55. Re1 Rc2 56. Rf5+ Ke4 57. Rf3 a2 58. Rfxe3+ Kd4 59. Re6 Bd5 60. Ra6 Rxg2+ 61. Kf1 Rh2 62. g5 Bc4+ 63. Kg1 Rxh3 64. Ra5 Rc3 65. Kf2 Rc2+ 66. Kf3 Bd5+ 67. Kg4 Bb3 68. g6 Rg2+ 69. Kh5 Rb2 70. Ra1 Rg2 71. Ra7 Ke5 72. Re1+ Kf6 73. Ra6+ Kf5 74. Ra5+ Kf6 75. Rf1+ Ke6 76. Rc1 Kf6 77. Ra6+ Kf5 78. Rf1+ Ke5 79. Ra7 Rh2+ 80. Kg5 Rg2+ 81. Kh6 Bc4 82. Ra5+ Ke6 83. Rf3 Rg1 84. Rf4 Bd5 85. Ra6+ Ke5 86. Rfa4 Rh1+ 87. Kg7 Rh2 88. R6a5 Rb2 89. Kh6 Rh2+ 90. Kg5 Rf2 91. Rg4 Rf1 92. g7 a1=Q 93. Rxd5+ Kxd5 94. g8=Q+ Kd6 95. Qb8+ Kd7 96. Qb5+ Kd6 97. Qd3+ Ke6 98. Re4+ Qe5+ 99. Rxe5+ Kxe5 100. Qxf1 1-0

Fritz 5.03 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Nc6 15. Nb3 Nb4 16. Bg5 Nxd3 17. Qxd3 Rac8 18. Rac1 Qb8 19. d5 Rxc1 20. Bxc1 Nd7 21. Na5 Nc5 22. Qd2 Ba8 23. b4 Na4 24. Qd3 Rc8 25. Nd2 Rc3 26. Qb1 f5 27. Bb2 Rc7 28. Ba1 Qc8 29. Nc6 Bxc6 30. dxc6 fxe4 31. Qxe4 Rxc6 32. f4 Nc3 33. Bxc3 Rxc3 34. fxe5 dxe5 35. Nf3 Qc6 36. Qxc6 Rxc6 37. a3 Bd6 38. Kf1 Rc3 39. Rd1 Bc7 40. Rd7 h6 41. Nh4 Rc4 42. Nf5 Rf4+ 43. Ke2 Rxf5 44. Rxc7 Rg5 45. g4 Rg6 46. Re7 h5 47. Rxe5 hxg4 48. hxg4 Rxg4 49. Re6 a5 50. bxa5 Ra4 51. Ra6 Rxa3 52. Ra8+ Kh7 53. a6 g5 54. a7 Kg7 55. Kf2 b4 56. Kg2 b3 57. Kf2 Kh7 58. Kg2 b2 59. Rb8 Rxa7 60. Rxb2 1/2-1/2

DarkThought – Fritz 5.32b: [1 – 0] (Test Game, Nunn Position #4, January 1999)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 exd4 15. Nxd4 Rfe8 16. a4 b4 17. N2f3 Bf8 18. Bd2 Qb6 19. Qb1 d5 20. e5 Ne4 21. Be3 Nc4 22. a5 Qg6 23. Bf4 Bc5 24. Ra4 Red8 25. Qc2 Rac8 26. Qe2 Qh5 27. Kh2 g5 28. g4 Qh6 29. Bg3 Qg6 30. b3 Na3 31. h4 gxh4 32. Bxh4 Re8 33. Kh1 Rc7 34. Kh2 Bc8 35. Nf5 Bd7 36. Bxe4 dxe4 37. Qxe4 Bxa4 38. bxa4 Bf8 39. N3d4 Rc3 40. Re2 b3 41. f4 Rec8 42. Be7 b2 43. Rxb2 Nc4 44. Re2 Nxa5 45. Bxf8 Kxf8 46. e6 Qxg4 47. e7+ Ke8 48. Nd6+ Kd7 49. e8=Q+ Rxe8 50. Qxe8+ Kxd6 51. Qe5+ Kd7 52. Qd5+ Kc7 53. Nb5+ axb5 54. Re7+ Kb8 55. Qxb5+ Ka8 56. Qxa5+ Kb8 57. Qa7+ Kc8 58. Re8# 1-0

Fritz 5.32b – DarkThought: [1 – 0] (Test Game, Nunn Position #4, January 1999)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Re3 Rac8 15. Rc3 Qb6 16. Rxc8 Rxc8 17. d5 Qc7 18. Bd3 Nd7 19. Nf1 f5 20. Ng3 fxe4 21. Bxe4 h6 22. b3 Ba8 23. Bf5 Nb7 24. Ng5 Nbc5 25. Ne6 Nxe6 26. Bxe6+ Kh8 27. Nf5 Bf8 28. Nh4 Nf6 29. Ba3 g5 30. Rc1 gxh4 31. Rxc7 Rxc7 32. f4 exf4 33. Qd2 Bxd5 34. Bxd5 Nxd5 35. Qxd5 f3 36. Qxf3 Bg7 37. Qa8+ Kh7 38. Qxa6 Bd4+ 39. Kf1 Rf7+ 40. Ke2 Rf2+ 41. Kd3 Bg7 42. Bxd6 Rxg2 43. Qb7 Rg5 44. Bf8 Rg3+ 45. Ke4 b4 46. Qxb4 Kg8 47. Bxg7 Rxg7 1-0

DarkThought – Genius 3: [1/2 – 1/2] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Nc6 14. Nb3 Bb7 15. Bd2 exd4 16. Rc1 Qb6 17. Nfxd4 Nxd4 18. Be3 Ne2+ 19. Qxe2 Qd8 20. f3 d5 21. e5 Nd7 22. Qd3 g6 23. f4 Rc8 24. Red1 Nb6 25. Na5 Ba8 26. Bd4 Nc4 27. Nb3 Bb7 28. g3 Rc7 29. Kh2 Qd7 30. Rf1 Bc8 31. f5 gxf5 32. g4 f6 33. Qxf5 Qxf5 34. Bxf5 Bxf5 35. gxf5 fxe5 36. Bxe5 Rd7 37. Rg1+ Kf7 38. Bd4 Bf6 39. Rc2 Re8 40. Rf2 Rc7 41. Bxf6 Kxf6 42. Rd1 Ne3 43. Rd3 Re4 44. Nd2 Ree7 45. Nb3 Re5 46. Nd4 b4 47. Nf3 Re4 48. Nd2 Re8 49. Nb3 Re5 50. Nd4 Rc4 51. Nf3 Re8 52. Nd4 Re4 53. Nb3 Re5 54. Nd4 a5 55. a4 bxa3 56. bxa3 a4 57. Rb2 Nxf5 58. Rf2 h5 59. Rd1 h4 60. Rd3 Kg6 61. Nf3 Ree4 62. Rxd5 Rf4 63. Ne5+ Kf6 64. Ng4+ Kg6 65. Ne5+ Kf6 1/2-1/2

Genius 3 – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Nf1 Rac8 15. Re2 Nc6 16. d5 Nb4 17. Bb3 a5 18. Bd2 Na6 19. Rc1 Nc5 20. Ng3 Nfd7 21. Nf5 Bf6 22. Bc2 Ba6 23. b4 axb4 24. Bxb4 g6 25. Nh6+ Kh8 26. Bb1 Bg7 27. Ng4 Ra8 28. Qd2 Qa7 29. Qg5 f6 30. Qh4 Bb7 31. Ne3 Rfc8 32. Rec2 Qa4 33. a3 Qa6 34. Rc3 Ra7 35. Nd2 Kg8 36. Ba2 Raa8 37. Nb3 Qb6 38. Kh1 Kh8 39. R1c2 Na6 40. Rxc8+ Rxc8 41. Rxc8+ Bxc8 42. Bd2 Nac5 43. Nc1 Qa7 44. Bb4 Nb6 45. Kg1 Bd7 46. Kh2 Qc7 47. Ne2 Nd3 48. Ba5 Qa7 49. Bxb6 Qxb6 50. Bb1 Nb2 51. Ng4 h5 52. f4 Be8 53. fxe5 dxe5 54. Qf2 Qxf2 55. Nxf2 Bf8 56. g4 hxg4 57. Nxg4 Kg7 58. Kg3 Bxa3 59. Ne3 Bb4 60. Ng4 Bd7 61. Kg2 Nc4 62. Ng3 Be1 63. Bd3 Bxg3 64. Kxg3 f5 65. Nf2

Nd2 66. exf5 gxf5 67. Bc2 Kf6 68. Nd3 f4+ 69. Kg2 Bf5 70. Nb4 e4 71. h4 Ke5 72. h5 Kd4 73. h6 Nc4 74. Bb3 Ne3+ 75. Kg1 Ng4 76. Nc6+ Kc5 77. Nd8 e3 78. Bd1 Nxh6 79. Ne6+ Bxe6 80. dxe6 Kd6 81. Bf3 Nf5 82. e7 Kxe7 0-1

DarkThought – Genius 5: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Nc6 14. Nb3 Bb7 15. Bd2 Rac8 16. Rc1 Qd7 17. d5 Nb8 18. Qe2 Ne8 19. Na5 Ba8 20. Bb3 Nf6 21. Qd3 Qa7 22. Be3 Qd7 23. Ng5 Rxc1 24. Rxc1 Bd8 25. Bd2 Bb6 26. Bb4 h6 27. Nf3 Rc8 28. Rxc8+ Qxc8 29. Qc2 Qd8 30. Nc6 Nxc6 31. dxc6 a5 32. Bd2 Qc7 33. Bd5 Kh8 34. b4 a4 35. Nh4 h5 36. Bg5 Nh7 37. Qc1 g6 38. Nf3 Kg8 39. Be3 Bxe3 40. Qxe3 Nf6 41. Qh6 Nxd5 42. exd5 Bxc6 43. Qc1 Kf8 44. Qxc6 Qxc6 45. dxc6 Ke7 46. Ng5 Kd8 47. Nxf7+ Kc7 48. Nh8 Kxc6 49. Nxg6 Kd7 50. g4 hxg4 51. hxg4 Ke6 52. f4 exf4 53. Nxf4+ Ke5 54. Ne2 d5 55. Nc3 Kf4 56. Nxb5 Kxg4 57. Nd6 Kf4 58. Ne8 Ke5 59. b5 Ke6 60. b6 Kd7 61. b7 Kxe8 62. b8=Q+ 1-0

Genius 5 – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Nf1 Rac8 15. Re2 Nc6 16. d5 Nb4 17. Bb3 a5 18. Bd2 Na6 19. Rc1 Nc5 20. Ng3 Nfd7 21. Nf5 Bf6 22. Bc2 Ba6 23. b4 axb4 24. Bxb4 g6 25. Nh6+ Kh8 26. Bb1 Bg7 27. Ng4 Qa7 28. Qd2 Bb7 29. Re3 f5 30. Ra3 Qb8 31. exf5 gxf5 32. Ne3 Bh6 33. Nh4 Bxe3 34. Rxe3 f4 35. Rec3 Nf6 36. Bxc5 dxc5 37. Bf5 c4 38. Bxc8 Rxc8 39. Re1 Bxd5 40. Qe2 b4 41. Rcc1 c3 42. Qa6 Nd7 43. Red1 Rc5 44. Rc2 Nb6 45. Qd3 Qf8 46. Qf5 Qxf5 47. Nxf5 Ra5 48. Re2 Rxa2 49. Rxe5 Ra8 50. Nd4 Rg8 51. g4 fxg3 52. Re3 gxf2+ 53. Kxf2 Rg2+ 54. Kf1 Rh2 55. Rde1 c2 56. Re8+ Kg7 57. R8e7+ Kf6 58. Nxc2 Rxc2 59. Rxh7 Nc4 60. Rh5 Bg2+ 61. Kg1 Bf3 62. Rh6+ Kg7 63. Rhe6 Rg2+ 64. Kh1 b3 65. Re7+ Kh6 66. R7e6+ Kg5 67. Re8 Rc2+ 68. Kg1 b2 69. Rg8+ Kh4 70. Rh8+ Kg3 71. Rg8+ Kxh3 72. Rb1 Bg4 73. Re8 Kg3 74. Re4 Bf3 75. Re7 Rg2+ 76. Kf1 Bg4 77. Rd1 Nd2+ 78. Rxd2 b1=Q+ 79. Rd1 Qxd1+ 80. Re1 Be2# 0-1

DarkThought – Hiarcs 6: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 Bb7 13. d5 Nd7 14. Nf1 Nb6 15. Ng3 Bc8 16. h4 Bg4 17. h5 h6 18. Qd3 c4 19. Qf1 Nb7 20. Nh2 Bd7 21. Qe2 a5 22. Ng4 Nc5 23. Ne3 Bh4 24. Qf3 Bxg3 25. Qxg3 Kh8 26. Rd1 Qd8 27. Bd2 Qf6 28. Re1 Rfe8 29. Nf1 Nba4 30. Reb1 Kg8 31. b3 Nb6 32. Be3 Rac8 33. Nd2 Rc7 34. bxc4 Nxc4 35. Nxc4 bxc4 36. Rb6 Rcc8 37. Bxc5 Rxc5 38. Rab1 Rec8 39. Ra6 Rd8 40. Ra7 Be8 41. Qe3 Qh4 42. Rb6 Rcc8 43. Bd1 a4 44. Rab7 Ra8 45. Be2 a3 46. Qf3 Qg5 47. Bxc4 Rac8 48. Bf1 Qd2 49. c4 Ra8 50. Qb3 Qg5 51. Rb8 Raxb8 52. Rxb8 Qe7 53. Rb7 Ba4 54. Qb4 Qe8 55. f3 Bd1 56. c5 dxc5 57. Qxa3 Qf8 58. Ra7 Rb8 59. Qc1 c4 60. Qxc4 Rc8 61. Rc7 Rb8 62. Qc6 Rd8 63. Rb7 Qa3 64. Kh2 Rf8 65. d6 Bxf3 66. Rxf7 Rxf7 67. Qe8+ Kh7 68. Qxf7 Bxh5 69. Qxh5 Qxd6 70. Qf5+ Kh8 71. Qc8+ Kh7 72. Bc4 h5 73. Qg8+ Kg6 74. Qf7+ Kh6 75. Qe6+ 1-0

Hiarcs 6 – DarkThought: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Rfc8 15. a4 b4 16. Nb3 Nxb3 17. Qxb3 exd4 18. Bf4 Qb6 19. a5 Qc5 20. Ng5 d5 21. Rec1 Qa7 22. e5 Nh5 23. Bd2 g6 24. Qa4 Ng7 25. Nf3 Ne6 26. Bxb4 Nc5 27. Bxc5 Bxc5 28. Qd7 Re8 29. Qg4 Rac8 30. Qh4 Bf8 31. Ng5 h6 32. Nxf7 Kxf7 33. Qf6+ Kg8 34. Bxg6 Re7 35. e6 Rg7 36. Bf7+ Kh7 37. e7 Bxe7 38. Qf5+ Kh8 39. Rxc8+ Bxc8 40. Qxc8+ Kh7 41. Qf5+ Kh8 42. Rc1 Bf8 43. Bxd5 Rg8 44. Bxg8 Kxg8 45. Qg6+ Qg7 46. Qxa6 Qd7 47. Qg6+ Kh8 48. Qg4 Qxg4 49. hxg4 d3 50. Rc8 Kg7 51. Kf1 Kg8 52. a6 d2 53. Ke2 Kg7 54. a7 d1=Q+ 55. Kxd1 Bd6 56. a8=Q 1-0

DarkThought – Junior 4.6: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Nc6 15. Nb3 d5 16. exd5 Nxd4 17. Nbxd4 exd4 18. Bg5 h6 19. Bh4 Nxd5 20. Bxe7 Nxe7 21. Nxd4 Rfd8 22. Qg4 Rd5 23. Rac1 Qd6 24. Qe4 Ng6 25. Nf5 Qd7 26. Bb1 Rd8 27. Qg4 Kh8 28. h4 Rg8 29. h5 Ne5 30. Qf4 f6 31. Qg3 Rd2 32. Nh4 Rd8 33. Ng6+ Kg8 34. Nxe5 fxe5 35. Qxe5 Rd5 36. Qe7 Rg5 37. Qxd7 Rxd7 38. Bg6 Rxg2+ 39. Kf1 Rd8 40. Re7 Rf8 41. Rcc7 Rgxf2+ 42. Ke1 Rf1+ 43. Kd2 R8f2+ 44. Ke3 Bg2 45. Ra7 Rf6 46. Re8+ Rf8 47. Rxf8+ Kxf8 48. Rxa6 Ra1 49. Kd4 Rd1+ 50. Kc5 Rd5+ 51. Kb4 Bh3 52. Ra8+ Ke7 53. Rg8 Kf6 54. Rf8+ Kg5 55. Rf7 Rd2 56. Kc3 Rd7 57. Rxd7 Bxd7 58. b3 Kh4 59. Kb4 Bg4 60. a4 bxa4 61. bxa4 Be2 62. Kc5 Bf1 63. Be8 Kg3 64. Bb5 Bh3 65. Kb6 Bc8 66. a5 Kf4 67. Kc7 Bg4 68. a6 Bf3 69. a7 Kg5 70. Bc6 Bxc6 71. Kxc6 Kxh5 72. Kd5 g5 73. Ke5 Kg4 74. Ke4 Kg3 75. a8=Q g4 76. Qa2 h5 77. Ke3 Kh3 78. Kf4 h4 79. Qe2 g3 80. Kf3 g2 81. Qxg2# 1-0

Junior 4.6 – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Re3 Rac8 15. Rc3 Qb6 16. d5 Rxc3 17. bxc3 Rc8 18. Bb2 Nd7 19. Rb1 Qc7 20. a4 bxa4 21. Bxa4 f5 22. Bc2 Kh8 23. Ba1 Nb6 24. Rb4 Ba8 25. Nf1 Nac4 26. Ne1 Bb7 27. Ng3 fxe4 28. Bxe4 g6 29. Rb1 Bh4 30. Nf1 Rf8 31. Bf3 a5 32. Rb5 Bc8 33. Nd2 Qa7 34. Ne4 Bf5 35. Nd3 Qd7 36. Rb1 Nxd5 37. Qe2 Ndb6 38. Nd2 Qe7 39. Nxc4 Nxc4 40. Re1 Qa7 41. Kh1 Bxd3 42. Qxd3 Qxf2 43. Rf1 Qc5 44. Rb1 Bg5 45. Bd5 Nd2 46. Rd1 Qf2 47. Bc6 Nf1 48. Qxd6 Ng3+ 49. Kh2 Qf4 50. Qxe5+ Qxe5 51. c4 Bf4 52. Bxe5+ Bxe5 53. Re1 Nf1+ 54. Kh1 Ne3 55. Bb5 Bd4 56. Rc1 Rf2 57. Bc6 Bb2 58. Re1 Be5 59. c5 Rc2 60. Ba4 Rxc5 61. g4 Rc3 62. Kg1 Ra3 63. Bd7 Ra2 64. g5 a4 65. Be6 Rc2 66. Kh1 Bf4 67. Ra1 a3 68. Bf7 a2 69. Bb3 Rb2 70. Bxa2 Nf5 71. Re1 Rxa2 72. h4 Kg7 73. h5 gxh5 74. g6 Ng3+ 75. Kg1 Bd6 76. Rc1 Bb8 77. Rf1 Ba7+ 78. Rf2 Rxf2 79. gxh7 Re2# 0-1

DarkThought – Junior 5.0: [1/2 – 1/2] (Test Game, Nunn Position #4, December 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Rac8 15. a4 b4 16. Qe2 Ra8 17. b3 Nh5 18. g3 Qd7 19. h4 Qg4 20. Kh2 Bc8 21. Bb2 Qh3+ 22. Kg1 Bg4 23. Qf1 Qxf1+ 24. Bxf1 Bxf3 25. Nxf3 Nxb3 26. Rad1 exd4 27. Nxd4 Nxd4 28. Rxd4 Rfb8 29. e5 dxe5 30. Rxe5 Bf6 31. Rxh5 Bxd4 32. Bxd4 Rd8 33. Bb6 Rd1 34. Re5 Ra1 35. a5 b3 36. Re2 Rb1 37. Bd4 Rd8 38. Kg2 h6 39. Rd2 Ra1 40. Bxg7 Rxd2 41. Bxa1 b2 42. Bxb2 Rxb2 43. Bxa6 Ra2 44. g4 Rxa5 45. Be2 Kg7 46. f4 Ra3 47. Bf3 Ra2+ 48. Kg3 Ra4 49. g5 Rd4 50. Kg4 Rb4 51. Bd5 hxg5 52. hxg5 1/2-1/2

Junior 5.0 – DarkThought: [1 – 0] (Test Game, Nunn Position #4, December 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. a4 Nc6 15. Nb3 Nb4 16. Bb1 Rfc8 17. Bd2 bxa4 18. Rxa4 Nc2 19. Re2 Bxe4 20. dxe5 Bxf3 21. gxf3 dxe5 22. Ba5 Qc6 23. Rh4 Nd4 24. Rxd4 exd4 25. Rxe7 Qd6 26. Re3 Rab8 27. Rd3 Qe5 28. Bd2 Rc4 29. f4 Qc7 30. Ba2 Qd7 31. Bc3 Qa4 32. Bxd4 Ne8 33. Be5 Rbc8 34. Bb1 f6 35. Bd4 Kh8 36. Qh5 g6 37. Qe2 Ng7 38. Bxf6 Re8 39. Qd2 Rc7 40. Be5 Rce7 41. Nc5 Qc4 42. b4 a5 43. Rd4 Qb5 44. Bd3 Qc6 45. Rd6 Qc8 46. Bb5 Qxh3 47. Bxe8 Qg4+ 48. Kf1 Qh3+ 49. Ke1 Qh1+ 50. Ke2 Qh5+ 51. Kd3 Rxe8 52. Rd7 Rxe5 53. fxe5 1-0

DarkThought – MChess 5: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 exd4 13. cxd4 Bb7 14. Nh4 Rfe8 15. d5 Nd7 16. Nf5 Bf6 17. Nf3 Ne5 18. Nxe5 Bxe5 19. Rb1 Bc8 20. Nh4 Bf6 21. Nf3 Nc4 22. Bd3 Ne5 23. Nxe5 Bxe5 24. Bd2 Bd7 25. Qc2 Qd8 26. Qc1 Qh4 27. Bg5 Qh5 28. Bf4 Qg6 29. Bxe5 Rxe5 30. Re3 Rae8 31. Rg3 Qh5 32. Qc3 Qh6 33. Qa5 Bc8 34. Re1 f5 35. Rge3 Bb7 36. Qb6 f4 37. Rf3 R5e7 38. Rc1 Qf6 39. Rc3 Qe5 40. a4 b4 41. Rc2 a5 42. Re2 Ra8 43. Bb5 Kh8 44. Bc6 Bxc6 45. dxc6 Qd4 46. Kh2 Rf7 47. c7 Rc8 48. Qa6 Rfxc7 49. Rxf4 Qe5 50. g3 c4 51. Rf5 Qe7 52. Rxa5 c3 53. bxc3 bxc3 54. Qd3 Rc6 55. Rc2 Qc7 56. Rb5 Rf8 57. f3 Ra8 58. h4 Rf8 59. h5 h6 60. Kg2 Ra8 61. Rb3 Rc8 62. g4 Qa5 63. Qb5 Qa7 64. Rb4 Qe3 65. Qf1 Rf8 66. Qf2 Qd3 67. Rd4 Qa6 68. Qe3 Qa5 69. Qc1 Qa6 70. Rd5 Qc4 71. a5 Rb8 72. Kh3 Rb3 73. Kg3 Rb8 74. g5 hxg5 75. h6 Rg8 76. Rh2 g6 77. Qxg5 Qf1 78. Qf6+ Kh7 79. Qf7+ Kh8 80. h7 Qg1+ 81. Rg2 Qxg2+ 82. Kxg2 Rg7 83. Qe8+ Kxh7 84. Qxc6 c2 85. Rxd6 c1=Q 86. Qxc1 g5 87. Qh1+ Kg8 88. Qh6 g4 89. Rd8+ Kf7 90. Rd7+ Ke8 91. Qe6+ Kf8 92. Rd8# 1-0

MChess 5 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Re3 Rac8 15. Rc3 Qb6 16. d5 Rxc3 17. bxc3 Rc8 18. Bb2 Nd7 19. a4 bxa4 20. Rb1 Qc7 21. Bxa4 f5 22. Bc2 Nf6 23. Ng5 fxe4 24. Ne6 Qd7 25. Nxe4 Qb5 26. Nxf6+ Bxf6 27. Be4 g6 28. Qf3 Be7 29. Ba3 Qa4 30. Bb4 Nc4 31. Qd3 Kh8 32. Bxg6 Bxd5 33. Qxd5 hxg6 34. Bxd6 Qc6 35. Bxe5+ Kg8 36. Nf4+ Qxd5 37. Nxd5 Bd8 38. Bd4 Nd6 39. Nf4 Kf7 40. Nd3 Nb5 41. Ne5+ Kf6 42. Kf1 g5 43. Nf3+ Nxd4 44. cxd4 a5 45. Rb5 a4 46. Nxg5 Rc1+ 47. Ke2 a3 48. Ne4+ Ke6 49. Re5+ Kf7 50. Rc5 Rg1 51. Rc2 Rxg2 52. Ra2 Be7 53. Nc5 Rg5 54. Rxa3 Bxc5 55. dxc5 Rxc5 56. f4 Rh5 57. Kf2 Rh8 58. Kg3 Rg8+ 59. Kf3 Kg6 60. Ra1 Kh5 61. f5 Rb8 62. Kf4 Rb4+ 63. Ke5 Rb5+ 64. Ke6 Rb6+ 65. Ke7 Rb7+ 66. Kd6 Kg5 67. Rf1 Kf6 68. h4 Rb3 69. Kc5 Rh3 70. Rf4 Ke5 71. Rc4 Kxf5 1/2-1/2

DarkThought – MChess 7.1: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 exd4 13. cxd4 Bb7 14. Nh4 Nc6 15. d5 Nd4 16. Ndf3 Nxc2 17. Qxc2 g6 18. Bh6 Rfe8 19. Qc3 Bd8 20. Nd2 Nh5 21. Nhf3 Bf6 22. Qa3 Re7 23. g4 Bg7 24. Bxg7 Nxg7 25. Qg5 a5 27. Rac1 Qd8 28. Re3 a4 29. Kh2 Qd7 30. Qf6 h5 31. g5 Bc8 32. Nh4 Kh7 33. Ng2 Qc7 34. Nf4 Kg8 35. Kh1 Qd8 36. Rce1 Ba6 37. Nf3 Bb7 38. Nd2 Kh7 39. Rf3 Qa5 40. Rd1 Qc7 41. Re3 Bc8 42. Rc1 Qd8 43. Rf3 Kg8 44. Rg3 Qa5 45. Rc2 Qb6 46. Re3 Qd8 47. Nf3 Bb7 48. Rc1 Qd7 49. Nd2 Re5 50. Rce1 Rd8 51. Nd3 Re7 52. Qc3 b4 53. Qf6 Ne8 54. Qf3 Nc7 55. Nc4 Ree8 56. Qf4 Ba6 57. b3 axb3 58. axb3 Nb5 59. Ra1 Bb7 60. Kh2 Bc8 61. e5 dxe5 62. Ndxe5 Qxd5 63. Ra5 Bb7 64. Qxf7+ Qxf7 65. Nxf7 Kxf7 66. Rxe8 Kxe8 67. Rxb5 Bf3 68. Ne5 Be4 69. Rxc5 Rd2 70. Rc4 Rxf2+ 71. Kg1 Rg2+ 72. Kf1 Bb7 73. h4 Rd2 74. Rxb4 Ba6+ 75. Kg1 Rd6 76. Re4 Re6 77. Kf2 Bc8 78. b4 Ba6 79. Kg3 Kd8 80. Rd4+ Ke7 81. Rd7+ Ke8 82. Rd5 Rb6 83. b5 Bxb5 84. Nxg6 Bd7 85. Nf4 Bg4 86.

Rd3 Kf7 87. Ra3 Rb7 88. Ra6 Rb3+ 89. Kg2 Rb2+ 90. Kg1 Rb1+ 91. Kf2 Rb3 92. Ra7+ Kf8 93. Nd5 Bf5 94. Ra6 Bg4 95. Nf6 Rb2+ 96. Kg3 Rb3+ 97. Kf4 Rb4+ 98. Ke5 Rb5+ 99. Nd5 Kg7 100. Kd4 Bf3 101. Ra7+ Kh8 102. Nf6 Bb7 103. Nxh5 Kh7 104. Nf4 Kg8 105. g6 Kg7 106. h5 Kh6 107. Ne6 Rd5+ 108. Kc3 Rb5 109. g7 Kh7 110. h6 Bd5 111. Ra6 Bxe6 112. Rxe6 Rb8 113. Kd4 Ra8 114. Rf6 1-0

MChess 7.1 – DarkThought: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. d5 Rac8 15. Bb1 Nd7 16. Nf1 f5 17. Ng3 f4 18. Nf5 Bd8 19. a3 Kh8 20. Bd3 g6 21. Nh6 Nc5 22. Bc2 Bf6 23. Ng4 Be7 24. Bd2 Nc4 25. Bc3 Nd7 26. Bb3 Qb6 27. Qe2 Rc7 28. a4 h5 29. a5 Qc5 30. Ngh2 Kh7 31. Rec1 Rg8 32. Be1 Qa7 33. Bd1 g5 34. b3 g4 35. bxc4 gxf3 36. Qxf3 Nf6 37. cxb5 Rxc1 38. Rxc1 axb5 39. Qd3 Bc8 40. Rc6 Bd7 41. Rc2 Rg7 42. Bb4 Qb8 43. Nf1 Qe8 44. Nd2 Qg6 45. Qf3 Qe8 46. a6 Qa8 47. Ra2 Qa7 48. Kf1 Rg6 49. Qa3 Be8 50. Be2 h4 51. Rc2 Bd7 52. Bd3 Ne8 53. Qa5 Kh6 54. Bxb5 Bxb5+ 55. Qxb5 Nc7 56. Qd7 Qxa6+ 57. Rc4 Nxd5 58. exd5 f3 59. gxf3 Bg5 60. Qc8 Qxc8 61. Rxc8 Bxd2 62. Bxd2+ Kg7 63. Rc4 Kf7 64. Rxh4 Rg8 65. Rh7+ Kg6 66. Rh6+ Kf5 67. Rxd6 e4 68. Ke2 Ke5 69. Rd7 exf3+ 70. Kxf3 1-0

DarkThought – Mephisto Meisterschach: [1/2 – 1/2] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Nc6 15. Nb3 Nb4 16. Bg5 h6 17. Bh4 Nxd3 18. Qxd3 Rac8 19. Rac1 Qb8 20. Rxc8 Rxc8 21. Bg3 Nd7 22. dxe5 Nxe5 23. Qd1 Nc4 24. Re2 Qa8 25. Nfd4 Bf6 26. f3 Re8 27. Kh1 Qc8 28. Qe1 Qd8 29. Qb4 Qb6 30. Nf5 a5 31. Qe1 Bc8 32. Bf2 Qd8 33. Nbd4 Bxf5 34. exf5 Rxe2 35. Qxe2 Qd7 36. a4 d5 37. b3 Nd6 38. axb5 Bxd4 39. Bxd4 Nxb5 40. Bb6 Nd6 41. f6 a4 42. bxa4 Qxa4 43. fxg7 Qa1+ 44. Bg1 Nf5 45. Kh2 Nxg7 46. f4 Qc3 47. Qa6 Nf5 48. Qa8+ Kg7 49. Qxd5 Qg3+ 50. Kh1 Qxf4 51. g4 Ne3 52. Qc6 Kh7 53. Bxe3 Qxe3 1/2-1/2

Mephisto Meisterschach – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Nf1 Rac8 15. Re2 Nc6 16. Ng3 Kh8 17. d5 Nb4 18. Bb3 a5 19. Bd2 Na6 20. Rc1 Nc5 21. Be3 Nfd7 22. Bc2 Qb8 23. Nf5 Bf6 24. Bb1 g6 25. Nh6 Bg7 26. Rec2 Nb6 27. Ng4 Nc4 28. Bxc5 Rxc5 29. b3 f5 30. bxc4 fxg4 31. hxg4 b4 32. Qd3 Qd8 33. a3 Bc8 34. axb4 axb4 35. Qd2 Bxg4 36. Nh2 Bc8 37. Rb2 g5 38. Qxb4 g4 39. Bd3 Qg5 40. Qe1 Bh6 41. Rd1 Qg7 42. Ra1 Bf4 43. Nf1 Bg5 44. Ra8 Rc7 45. Ng3 Ra7 46. Rab8 Ra3 47. Bb1 Qh6 48. Nf5 Bxf5 49. Rxf8+ Qxf8 50. Qb4 Ra8 51. exf5 g3 52. fxg3 Be3+ 53. Kf1 Qh6 54. Ra2 Qh1+ 55. Ke2 Rxa2+ 56. Bxa2 Bc5 57. Qb8+ Kg7 58. f6+ Kf7 59. Qc7+ Kxf6 60. Qd8+ Kf7 61. Qd7+ Kf6 62. Qe6+ Kg5 63. Qg8+ Kf6 64. Qf8+ Kg6 65. Qf3 Kg5 66. g4 Qg1 67. Qf5+ Kh4 68. Qxh7+ Kxg4 69. Qg6+ Kf4 70. Qf6+ Kg3 71. Qf3+ Kh4 72. Qh3+ Kg5 73. Qg3+ Kh5 74. Bb3 Qd4 75. Qf3+ Kg5 76. Ke1 Qf4 77. Qxf4+ Kxf4 78. Bc2 e4 79. g4 e3 80. Bd1 Bb6 81. Kf1 Ke4 82. Be2 Bd4 83. Ke1 Be5 84. Kd1 Bf6 85. Kc2 Bd4 86. Kb3 Bc5 87. Ka4 Kf4 88. Kb5 Ke5 89. Kc6 Ke4 90. Kd7 Kf4 91. Ke7 Kg5 92. Kf7 Bb4 93. Ke8 Kf6 1/2-1/2

DarkThought – Mephisto Shredder: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Re8 14. b3 exd4 15. Bb2 Nc6 16. Nxd4 Nxd4 17. Bxd4 Bb7 18. Bd3 Nd7 19. a4 bxa4 20. Rxa4 Bf6 21. Qa1 Nc5 22. Bxf6 Nxd3 23. Re3 Ne5 24. Rg3 g6 25. Rc3 Qb8 26. Rd4 Nd7 27. Bg5 Nc5 28. Bh6 f6 29. Rf3 Nd7 30. b4 Re7 31. Kh1 Qc7 32. Rc3 Qb6 33. Be3 Ne5 34. f3 Rae8 35. Qc1 Re6 36. Nb3 Qb5 37. Qa1 f5 38. Rd1 Nc6 39. Bh6 R6e7 40. exf5 Nxb4 41. Nd4 Qb6 42. Qb1 d5 43. fxg6 hxg6 44. Rc6 Bxc6 45. Qxg6+ Kh8 46. Bg5 Re1+ 47. Kh2 Qc7+ 48. f4 R1e7 49. Bf6+ Rg7 50. Nf5 Ree7 51. Nxe7 Qxe7 52. Qh6+ Kg8 53. Bxe7 Rxe7 54. f5 Be8 55. Qg5+ Rg7 56. Qd8 Kh7 57. Rd4 Bh5 58. Rh4 Rxg2+ 59. Kxg2 Kg7 60. Rxh5 a5 61. Qh8+ Kf7 62. Rh7# 1-0

Mephisto Shredder – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. a4 Nc6 15. axb5 axb5 16. Rxa8 Rxa8 17. Nb3 Ra4 18. Qe2 exd4 19. Qxb5 Rb4 20. Qe2 Qb6 21. Nbd2 Ne5 22. b3 Ba6 23. Qd1 d3 24. Bb1 Nfd7 25. Bb2 Bf6 26. Nh2 Bh4 27. Rf1 Bg5 28. Nhf3 Nxf3+ 29. Nxf3 Bh6 30. Re1 Rxb3 31. Bd4 Qb4 32. Ba2 Ra3 33. Bd5 d2 34. Re3 Bxe3 35. Bxe3 Nf6 36. Qxd2 Qxd2 37. Nxd2 Nxd5 38. exd5 Rd3 39. Nf3 Rxd5 40. Nd4 f5 41. Nc6 Kf7 42. Kh2 Bb5 43. Nb4 Rd1 44. Kg3 h6 45. f4 Rb1 46. Nc2 Bd3 47. Nd4 Be4 48. h4 g6 49. Nf3 Rb2 50. Bd4 Rb3 51. Kf2 Bxf3 52. gxf3 Ra3 53. Ke2 Ra2+ 54. Ke1 Ra4 55. Be3 Ra3 56. Kf2 Rxe3 57. Kxe3 Kf6 58. Kd4 g5 59. fxg5+ hxg5 60. h5 Kg7 61. Kd3 Kh6 62. Kd4 d5 63. Kxd5 f4 64. Kd4 Kxh5 65. Kd3 Kh4 66. Kd4 Kg3 67. Ke4 g4 68. fxg4 Kxg4 0-1

DarkThought – Nimzo 98: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 exd4 13. cxd4 Bb7 14. Nh4 Rfe8 15. d5 Nxd5 16. exd5 Bxh4 17. Rxe8+ Rxe8 18. Qh5 Re1+ 19. Kh2 Bf6 20. Qxh7+ Kf8 21. Ne4 Ke7 22. Nxf6 gxf6 23. Qh6 Re5 24. Bf4 Bxd5 25. Bxe5 fxe5 26. f4 Nc6 27. Bh7 Nd4 28. b3 Be6 29. fxe5 dxe5 30. Qg7 e4+ 31. Qg3 Qxg3+ 32. Kxg3 f5 33. Kf4 Kf6 34. g4 c4 35. bxc4 bxc4 36. Bxf5 Bxf5 37. gxf5 e3 38. Re1 e2 39. Ke4 Nxf5 40. Rxe2 Ng3+ 41. Kf3 Nxe2 42. Kxe2 Kg5 43. Kd2 Kh4 44. Kc3 Kxh3 45. Kxc4 Kg3 46. Kb4 Kf4 47. Ka5 Ke5 48. Kxa6 1-0

Nimzo 98 – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. a4 Nc6 15. Nb3 Nb4 16. Bb1 Rfc8 17. Bd2 bxa4 18. Bxb4 axb3 19. Qxb3 exd4 20. Nxd4 Bf8 21. Nf5 Re8 22. Qf3 d5 23. Bxf8 Kxf8 24. Qa3+ Kg8 25. Qd6 Rac8 26. Qxc7 Rxc7 27. Nd6 Rd8 28. e5 Ne8 29. Bf5 g6 30. Nxb7 Rxb7 31. Bd3 Nc7 32. Ra2 Re8 33. Re2 Rb3 34. Bc2 Rb4 35. Bd3 Ne6 36. Bxa6 Nd4 37. Re3 Nc6 38. Re2 Rb6 39. Bd3 Rxe5 40. Rd2 Re1+ 41. Kh2 Rb4 42. Be2 Nd4 43. Bd1 Kg7 44. Ra5 Re5 45. f4 Re4 46. Rxd5 Rxf4 47. Rd3 h5 48. b3 h4 49. Rd7 Kh6 50. Kg1 Nc6 51. Rc7 Ne5 52. Re3 f6 53. Be2 Rb8 54. Rc1 Rd4 55. Rc2 Ra8 56. Rec3 Kg5 57. Rb2 Ra1+ 58. Kf2 Rf4+ 59. Bf3 Rb4 60. Be2 Ra3 61. Bd1 Rd4 62. Ke2 Re4+ 63. Kf2 Rf4+ 64. Kg1 Rd4 65. Be2 Re4 66. Rc5 Ra1+ 67. Kf2 Rb4 68. Ke3 Re1 69. Ra5 Kf5 70. Kd2 Rg1 71. Kc3 Rb8 72. b4 Kg5 73. Ba6 Rd1 74. Kb3 Rbd8 75. Rc5 R8d4 76. b5 Kh6 77. Rc8 Nd3 78. Rbc2 Rb4+ 79. Kc3 Ra4 80. Bb7 Ne5 81. Kb3 Rda1 82. Rh8+ Kg5 83. Rc5 R4a3+ 84. Kb4 Ra7 85. Bc6 Rb1+ 86. Kc3 Ra3+ 87. Kc2 Raa1 88. Rd5 Rb4 89. Ra8 Rg1 90. Kc3 Rgb1 91. Ra2 Rc4+ 92. Kd2 Rbc1 93. Ba8 Rg1 94. Ke3 Rc3+ 95. Kf2 Rb1 96. Re2 Rcc1 97. Ra2 Kh5 98. Bb7 g5 99. Ba8 Kh6 100. Bb7 Re1 101. Bc6 g4 102. Re2 Rf1+ 103. Ke3 gxh3 104. gxh3 Rf3+ 105. Ke4 Rxh3 106. Kf5 Rf1+ 107. Ke6 Rc3 108. Rd6 Rb3 109. Ke7 Kg7 110. Rg2+ Ng6+ 111. Kd7 h3 112. Re2 Ne5+ 113. Ke6 Rc1 114. Be8 Rbb1 115. Rd4 Re1 116. Rde4 Rxe2 117. Rxe2 Nf3 118. Kd6 h2 119. Rxh2 Nxh2 120. Kc7 Kf8 121. Bc6 Ng4 122. b6 Ke7 123. b7 Ne5 124. Be4 Rc1+ 125. Kb6 Nd7+ 126. Kb5 Ke6 127. Bf3 Rb1+ 128. Kc6 Ne5+ 129. Kc7 Nxf3 130. b8=Q Rxb8 131. Kxb8 f5 132. Kc7 f4 133. Kc6 Ne5+ 134. Kc5 f3 135. Kd4 f2 136. Kc3 Kd5 137. Kb3 f1=Q 138. Kc3 Qd3+ 139. Kb4 Kc6 140. Ka4 Kc5 141. Ka5 Qa3# 0-1

DarkThought – Nimzo 99a: [1/2 – 1/2] (Test Game, Nunn Position #4, January 1999)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 exd4 13. cxd4 Bb7 14. Nh4 Rfe8 15. d5 g6 16. Ndf3 Nh5 17. Bh6 Bf6 18. g4 Ng7 19. Qc1 Nc4 20. Rb1 Nb6 21. Ng2 Nd7 22. g5 Be5 23. Nxe5 Nxe5 24. Kh1 Nf3 25. Re3 Nd4 26. Bd3 Nh5 27. b4 Qb6 28. bxc5 dxc5 29. Rb2 Qd6 30. Qe1 Nf4 31. Bf1 Rad8 32. Qc3 Rc8 33. Rd2 Qc7 34. Qc1 Nxg2 35. Bxg2 Qf4 36. Rb2 a5 37. Re1 Qh4 38. Qd2 a4 39. a3 Ba8 40. Rbb1 Bb7 41. Kg1 Re5 42. Qa5 Qf4 43. Qb6 Ba8 44. Re3 Ree8 45. Qa6 Rb8 46. Rd1 Rbd8 47. Kh1 Rc8 48. Rc3 Ne2 49. Rf3 Qe5 50. Qxb5 Nd4 51. Qxa4 Nxf3 52. Bxf3 f5 53. gxf6 Qxf6 54. Qb3 c4 55. Qe3 c3 56. Bg5 Qd6 57. Qd3 Qe5 58. Be3 c2 59. Rc1 Rc3 60. Qe2 Rec8 61. Kg1 R8c4 62. Bd2 Rc5 63. a4 Bb7 64. Bg4 Ra3 65. Be3 Ra1 66. Be6+ Kg7 67. Qd2 Rc4 68. Bh6+ Kf6 69. Qa5 g5 70. Qd8+ Kg6 71. Bf5+ Kxh6 72. Qf8+ Qg7 73. Qd6+ Qg6 74. Qf8 Qg7 1/2-1/2

Nimzo 99a – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #4, January 1999)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Nc6 15. Nb3 Rfe8 16. Bd2 d5 17. Rc1 dxe4 18. Bxe4 Nxe4 19. Rxe4 exd4 20. Nbxd4 Qd7 21. Nb3 Rad8 22. Qc2 Rc8 23. Qd1 Nd8 24. Re3 Ne6 25. Bc3 Qxd1+ 26. Rxd1 Nf4 27. Rd7 Bxf3 28. Rxf3 Ne2+ 29. Kf1 Nxc3 30. Rxc3 Rxc3 31. bxc3 Ba3 32. Rc7 Kf8 33. Nd4 Bb2 34. f3 h5 35. Kf2 Rd8 36. Ke3 b4 37. Ne2 bxc3 38. Nxc3 h4 39. Ke2 Ba3 40. Rc4 Be7 41. Rc6 a5 42. Ke3 g6 43. a4 Bg5+ 44. f4 Be7 45. Rc4 Kg7 46. Ne4 Rb8 47. Kd3 Rb7 48. Rc6 Rb3+ 49. Rc3 Rb6 50. Rc7 Bd6 51. Nxd6 Rxd6+ 52. Ke3 Rb6 53. Ra7 Rb3+ 54. Ke2 Rb4 55. Rxa5 Rxf4 56. Ra7 Re4+ 57. Kf3 Rc4 58. a5 Ra4 59. a6 g5 60. Ra8 Kg6 61. a7 Kf6 62. Ke2 Kf5 63. Kd2 Kf4 64. Kc3 f5 65. Kd3 Kg3 66. Rg8 Rxa7 67. Rxg5+ Kf2 68. Kd4 Re7 69. Kd5 Re3 70. Rg7 Rg3 71. Rh7 Rxg2 72. Ke5 Kg3 73. Kxf5 Kxh3 1/2-1/2

DarkThought – Rebel 8: [1/2 – 1/2] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Rfc8 15. a4 b4 16. Nb3 Nc4 17. Qc2 exd4 18. Bf4 Ne5 19. Qxc7 Nxf3+ 20. gxf3 Rxc7 21. Rac1 Rxc1 22. Rxc1 Bc8 23. Nxd4 Nh5 24. Be3 Bxh3 25. a5 d5 26. exd5 Nf6 27. Nc6 Bf8 28. Bc4 Bc8 29. Bg5 Bd6 30. Kg2 Bb7 31. Bxf6 gxf6 32. Bd3 Rc8 33. Be4 Kg7 34. Rh1 Rh8 35. Rh4 h5 36. f4 Bc7 37. Bf3 Bxc6 38. dxc6 Bxa5 39. Rxh5 Rxh5 40. Bxh5 Bb6 41. Be2 a5 42. Bd1 f5 43. Kf3 Kf6 44. Ba4 Ke6 45. Ke2 Kd5 46. Kd3 Bc7 47. Ke3 Bb6+ 1/2-1/2

Rebel 8 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Re3 Rac8 15. Rc3 Qb6 16. Rxc8 Rxc8 17. d5 Qc7 18. Ne1 Nd7 19. Nf1 Kh8 20. b3 Ba8 21. Bd2 Nb7 22. b4 Nb6 23. a4 f5 24. axb5 axb5 25. Qe2 Nc4 26. exf5 Bf6 27. Be3 Qf7 28. Be4 Nd8 29. Ra7 Bb7 30. Nd2 Qc7 31. g3 Nf7 32. Nxc4 bxc4 33. b5 Qb8 34. b6 Kg8 35. Nf3 c3 36. Qc2 Rc4 37. Ra3 Qe8 38. Rxc3 Rxc3 39. Qxc3 Qa8 40. Qc7 Bd8 41. Qd7 Bf6 42. Nd2 Qc8 43. Qxc8+ Bxc8 44. Nc4 Be7 45.

Na5 Nd8 46. Bd3 Bb7 47. Nxb7 Nxb7 48. Kg2 Bd8 49. Bc4 Kf8 50. Kf3 Nc5 51. Bxc5 dxc5 52. Ke4 Bxb6 53. Kxe5 Ba5 54. Kd6 Be1 55. g4 Bxf2 56. Kc7 Bg3+ 57. d6 Ke8 58. Bb5+ Kf7 59. Kc6 h6 60. Kxc5 Bh2 61. Kc6 Bf4 62. Bc4+ Kf8 63. Kc7 Bg3 64. Bd5 Be5 65. Be6 Bf4 66. Bb3 Ke8 67. h4 Bg3 68. Ba2 Kf8 69. Bd5 Be5 70. Bc4 Ke8 71. h5 Bg3 72. Bd5 Be5 73. Be6 Bf4 74. Ba2 Be5 75. Bb3 Bh2 76. Bg8 Be5 77. Bd5 Bh2 78. Bb3 Be5 79. Bc2 Kf7 80. Bd1 Ke8 81. Be2 Kf8 82. Bc4 Bf4 83. Bb3 Bg3 84. Bd5 Ke8 85. Bc4 Bh2 86. Bb5+ Kf7 87. Kd7 Be5 88. Kc6 Bc3 89. d7 Ba5 90. Kb7 Kf6 91. Bd3 Kf7 92. Be4 Kf6 93. Bf3 Kf7 94. Bd1 Kf6 95. Kc8 Ke7 96. Bf3 Bb6 97. Be4 Ba5 98. Bg2 Bb6 99. Bc6 Ba5 100. Ba4 Bb6 101. Bb3 Ba5 102. Bd5 Bb6 103. Bg2 Ba5 104. Bc6 Bb6 105. Bb5 Ba5 106. Bd3 Bb6 107. Bc4 Ba5 108. Bb3 Bb6 109. Ba2 Ba5 110. Be6 Bb6 111. Bg8 Ba5 112. Bc4 Bb6 113. Bd3 Ba5 114. Be4 Bb6 115. Bd5 Ba5 116. Bb7 Bb6 117. Ba6 Ba5 118. Bb5 Bb6 119. Ba4 Ba5 120. Bc2 Bb6 121. Bb1 Ba5 122. f6+ gxf6 123. Bd3 Bb6 124. Bg6 Ba5 125. Bb1 Bb6 126. Bh7 Bd8 127. Bf5 Bb6 128. Be4 Ba5 129. Bd5 Bb6 130. Bc4 Bd8 131. Bb3 Ba5 132. Ba2 Bd8 133. Be6 Ba5 134. Bb3 Bd8 135. Bd1 Ba5 136. Bf3 Bb6 137. Bb7 Bd8 138. Bc6 Bb6 139. Bg2 Bd8 140. Bb7 Ba5 141. Ba6 Bb6 142. Bd3 Bd8 143. Bb5 Bb6 144. Bc6 Bd8 145. Ba4 Bb6 146. Bb5 Ba5 147. Bf1 Bd8 148. Be2 Ba5 149. Bd1 Bd8 150. Bc2 Ba5 151. Be4 Bd8 152. Bh7 Ba5 153. Bg8 Bd8 154. Bc4 Ba5 155. Be2 Bd8 156. Bf1 Ba5 157. Bh3 Bd8 158. Kb8 Ba5 159. Kb7 Kd6 160. Kc8 Ke7 161. Kb8 Kd6 162. Kb7 Bd8 163. g5 fxg5 1/2-1/2

DarkThought – Rebel 9: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 Rfc8 15. a4 b4 16. Nb3 Nc4 17. Qc2 exd4 18. Bf4 Ne5 19. Qxc7 Nxf3+ 20. gxf3 Rxc7 21. Rac1 Rxc1 22. Rxc1 Nh5 23. Bh2 Bc8 24. Rc4 Bxh3 25. Rxb4 d5 26. Rb7 dxe4 27. fxe4 Bf6 28. Bc4 Be6 29. Bxe6 fxe6 30. e5 Bg5 31. Nxd4 Nf4 32. b4 Rc8 33. Bxf4 Bxf4 34. Rb6 Rc1+ 35. Kg2 Rb1 36. Nc6 Rb2 37. Rxa6 Be3 38. Kf3 Bxf2 39. Ra8+ Kf7 40. a5 h5 41. Rh8 Kg6 42. a6 Bb6 43. Rb8 Bg1 44. Rb7 Ra2 45. a7 Ra6 46. b5 Ra3+ 47. Kg2 Bc5 48. b6 Ra2+ 49. Kf1 Rf2+ 50. Ke1 Ra2 51. Rb8 h4 52. a8=Q Rxa8 53. Rxa8 Bxb6 54. Rh8 Kg5 55. Ke2 Kg4 56. Rg8 g5 57. Nd8 Bxd8 58. Rxd8 Kf5 59. Ke3 Kxe5 60. Kf3 Kf5 61. Rf8+ Kg6 62. Kg4 Kg7 63. Ra8 Kf6 64. Rg8 Ke5 65. Rg6 h3 66. Rh6 h2 67. Rxh2 Kf6 68. Rh5 Ke5 69. Kxg5 Kd4 70. Kf6 e5 71. Rxe5 1-0

Rebel 9 – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Re3 Rac8 15. Rc3 Qb6 16. d5 Rxc3 17. bxc3 Rc8 18. Bb2 Nd7 19. Rb1 Qc7 20. Nh2 f5 21. Nhf1 Nb6 22. Ne3 fxe4 23. Bxe4 g6 24. Bf3 Kh8 25. Bg4 Rf8 26. Be6 Bg5 27. Ne4 Bxe3 28. fxe3 Nac4 29. Qd3 Qe7 30. Ba1 Bc8 31. Bxc8 Rxc8 32. Rf1 Rf8 33. Rxf8+ Qxf8 34. Nf2 Qh6 35. e4 Nd7 36. Ng4 Qc1+ 37. Qf1 Qxf1+ 38. Kxf1 Nd2+ 39. Ke2 Nxe4 40. Ne3 Nb6 41. Kd3 Ng3 42. c4 Nf5 43. c5 dxc5 44. Bxe5+ Kg8 45. Nxf5 gxf5 46. Bd6 Nxd5 47. Bxc5 Kf7 48. Ke2 Ke6 49. Bd4 Nb4 50. a3 Kd5 51. Bb2 Nc6 52. Kd1 Ke4 53. Ke2 Nd4+ 54. Kd2 f4 55. Ke1 a5 56. Kf2 b4 57. axb4 axb4 58. Kf1 Kd3 59. Ke1 Ne2 60. Kd1 Ke3 61. Bf6 Kf2 62. Kc2 Kxg2 63. Bh4 Kxh3 64. Be1 Kg2 65. Bxb4 f3 66. Kd3 Nf4+ 67. Ke4 Nd3 68. Kxd3 h5 69. Be7 f2 70. Ke4 f1=Q 0-1

DarkThought – Shredder 2: [1 – 0] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. Bd3 exd4 15. Nxd4 Rfe8 16. a4 b4 17. N2f3 Bf8 18. Bd2 Qb6 19. Qb1 d5 20. e5 Ne4 21. Be3 Nc4 22. a5 Qg6 23. Bf4 Rac8 24. b3 Na3 25. Qd1 Be7 26. Qe2 Rc5 27. Rac1 Rxa5 28. e6 fxe6 29. Nc6 Bxc6 30. Ne5 Qf6 31. Nxc6 Rc5 32. Bxe4 dxe4 33. Qxe4 Rxc1 34. Rxc1 Nb5 35. Be5 Qf8 36. Nxe7+ Qxe7 37. Qc6 Qd8 38. Rc4 h6 39. Rg4 Re7 40. Bf6 Qd1+ 41. Kh2 Qxg4 42. hxg4 gxf6 43. Qxa6 Nc7 44. Qd6 Nd5 45. f4 Kf7 46. Kg3 Kf8 47. f5 Nc7 48. fxe6 Nxe6 49. Qxb4 Kf7 50. Qa5 Ng5 51. b4 Ne4+ 52. Kh4 Re5 53. Qa4 Ke7 54. b5 Nc5 55. Qd4 Nd7 56. b6 Rb5 57. b7 Kd8 58. Qa7 Ke7 59. Qa6 Rb3 60. Kh5 Ne5 61. Qa7 Nd7 62. Kxh6 Kd6 63. Qd4+ Ke7 64. Kg7 Kd8 65. Qa7 Ke7 66. Qa4 Rb6 67. Qa3+ Rd6 68. Qa7 Ke6 69. b8=Q Nxb8 70. Qxb8 Rd7+ 71. Kg6 Ke7 72. Qb2 Rd6 73. Qb4 Ke6 74. g5 1-0

Shredder 2 – DarkThought: [0 – 1] (Test Game, Nunn Position #4, October 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. a4 Nc6 15. axb5 axb5 16. Rxa8 Rxa8 17. Nb3 Nb4 18. Bb1 Nd7 19. Be3 Bf6 20. d5 Nb6 21. Nbd2 Bd8 22. Qb3 Ra4 23. Bd3 Ba6 24. Be2 Nd7 25. Rb1 f6 26. Nh4 g6 27. Bh6 Nc5 28. Qg3 Kh8 29. Bd1 Ra2 30. Bb3 Nxb3 31. Qxb3 Ra4 32. Nhf3 Bb7 33. Rd1 Qd7 34. Nb1 Na6 35. Qc2 f5 36. Nfd2 Nc5 37. Nc3 Ra8 38. b4 Na4 39. Ne2 Bb6 40. Qb3 Qe7 41. Be3 Bxe3 42. Qxe3 fxe4 43. Nxe4 Nb2 44. Rb1 Nc4 45. Qd3 Bc8 46. N2c3 Bf5 47. Rc1 Bd7 48. Qd1 Rc8 49. Ra1 Bf5 50. Ng3 Qb7 51. Nxf5 gxf5 52. Qh5 f4 53. Qf5 Rg8 54. Qf6+ Qg7 55. Qxg7+ Kxg7 56. Ra7+ Kg6 57. Rb7 Ra8 58. Nxb5 Ra1+ 59. Kh2 Nd2 60. h4 Ne4 61. h5+ Kxh5 62. Rxh7+ Kg6 63. Ra7 Rf1 64. Ra3 Kg5 65. Nc7 Rxf2 66. b5 Rb2 67. Ne6+ Kh4 68. Nc7 Nd2 69. Kg1 e4 70. Rh3+ Kg4 71. Rh7 f3 72. Rg7+ Kf4 73. Rf7+ Ke3 74. Ne6 Rb1+ 75. Kh2 f2 76. Rxf2 Kxf2 77. Nf4 Rb3 78. Nh3+ Rxh3+ 79. Kxh3 Nc4 80. b6 Nxb6 81. Kg4 e3 82. Kf5 e2 83. Ke6 e1=Q+ 0-1 84. Kxd6 Kxg2 0-1

Games Played by DarkThought from Nunn Position #5 (ECO D36)

DarkThought – Chessmaster 4000 Turbo: [0 – 1] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Ne4 12. Bxe7 Qxe7 13. Bxe4 dxe4 14. Nd2 f5 15. d5 Rd8 16. dxc6 bxc6 17. Rfd1 Ba6 18. Rbc1 Bd3 19. Qa4 c5 20. Nb3 Rac8 21. Rd2 f4 22. Rdd1 Ng6 23. Na5 fxe3 24. fxe3 Qg5 25. Kh1 Nh4 26. Rd2 Qxe3 27. Nc4 Qg5 28. Re1 Rd4 29. Qa6 Qg4 30. h3 Qd7 31. Rxe4 Bxe4 32. Nxe4 Qc6 33. Qxc6 Rxc6 34. Rxd4 cxd4 35. b3 Rg6 36. g4 Re6 37. Ned2 Re1+ 38. Kh2 Re2+ 39. Kg1 d3 40. a3 g5 41. a4 Ng2 42. Nf3 Nf4 43. Kf1 Kg7 44. a5 Kf6 45. Nfd2 Nxh3 46. Nb1 Rf2+ 47. Ke1 Rc2 48. Nd6 Rc1+ 49. Kd2 Rxb1 50. Ke3 Nf4 51. Nc4 Re1+ 52. Kf3 Re2 53. Ne3 h5 54. b4 hxg4+ 55. Nxg4+ Ke6 56. Ne3 d2 57. Nd1 Kf5 58. Kg3 g4 59. Ne3+ Rxe3+ 60. Kf2 Re2+ 61. Kg3 Nh5+ 62. Kh4 Rh2# 0-1

Chessmaster 4000 Turbo – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Nh4 Ng4 13. Bxe7 Qxe7 14. Nf5 Qc7 15. Ng3 Qd6 16. Rfd1 Qe7 17. Re1 Bd7 18. Nf5 Bxf5 19. Bxf5 Nh6 20. Bd3 Ng4 21. Bxg6 hxg6 22. Qe2 Nf6 23. f3 Rad8 24. Qf2 Qd7 25. Na4 Re7 26. Nc5 Qd6 27. Qh4 Rde8 28. Rc3 Qc7 29. Nb3 Qb6 30. Qg3 Qa6 31. Qf2 g5 32. Nc5 Qxa2 33. Ra3 Qc4 34. Qd2 b6 35. Rc1 Qb5 36. Rb3 Qa5 37. Qxa5 bxa5 38. Kf2 g4 39. Ra3 gxf3 40. gxf3 g6 41. Na6 Rb7 42. b3 Kg7 43. Rc3 Rh8 44. Kg2 Ne8 45. Rxa5 Nd6 46. Nc5 Re7 47. Ra4 Rhe8 48. Kf2 f6 49. b4 Nc4 50. e4 Nd6 51. Ra6 dxe4 52. fxe4 Rxe4 53. Rxa7+ R4e7 54. Rxe7+ Rxe7 55. Rd3 Ne4+ 56. Nxe4 Rxe4 57. d5 cxd5 58. b5 Rb4 59. Rxd5 g5 60. h3 Rb3 61. Kg2 Kg6 62. Rc5 Rb2+ 63. Kf3 Rb4 64. Kg2 Rb3 65. Rd5 Rb2+ 66. Kf3 Kf7 67. Rc5 Rb4 68. Rc7+ Kg6 69. Rc5 f5 70. Rc6+ Kh5 71. Rb6 Rb3+ 72. Kg2 Rb2+ 73. Kf3 Rb4 74. Rb7 Rb3+ 75. Kg2 Kh6 76. b6 Rb1 77. Rb8 Kg6 78. b7 Rb2+ 79. Kf3 Rb3+ 80. Ke2 Kg7 81. Kf2 Rb2+ 82. Ke3 Rb4 83. Kd2 Rb3 84. Kc2 Rb4 1/2-1/2

DarkThought – Comet A.86: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Ng6 12. b4 a6 13. Na4 Bd6 14. Nc5 Qe7 15. Bf5 b6 16. Bxf6 gxf6 17. Bxc8 Rexc8 18. Nd3 Qe4 19. Rb3 b5 20. Ra3 Ra7 21. Rc1 Ne7 22. Nd2 Qg6 23. Nb3 Qg5 24. g3 Qf5 25. Na5 Kg7 26. Rc3 Rac7 27. Nb3 Qh3 28. Nbc5 Ra8 29. a4 Nf5 30. Ra3 Rcc8 31. Qa2 Nh6 32. axb5 Ng4 33. f3 Nxe3 34. b6 Rcb8 35. b7 Ra7 36. f4 h6 37. Ra1 Qh5 38. Qf2 Nf5 39. Kg2 Re8 40. Re1 Rb8 41. h3 Qg6 42. Rea1 Bxc5 43. Nxc5 Rbxb7 44. Nxb7 Rxb7 45. Qd2 Nd6 46. Rf3 Rb6 47. f5 Qh5 48. Rf4 Kg8 49. Raf1 Kh7 50. h4 Ne4 51. Qe1 Rb8 52. g4 Rg8 53. Kh3 Rxg4 54. Rxg4 Ng5+ 55. Kg3 Ne4+ 56. Rxe4 dxe4 57. Qxe4 Kg7 58. Qe8 a5 59. bxa5 c5 60. a6 Kh7 61. a7 c4 62. a8=Q Qxf5 63. Qxf7# 1-0

Comet A.86 – DarkThought: [0 – 1] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rfc1 Bd6 12. Qb3 Ng6 13. Rc2 h6 14. Bxg6 hxg5 15. Bd3 g4 16. Nd2 Nh5 17. g3 Qf6 18. Ne2 Qe6 19. Rac1 Be7 20. Nc3 Qh6 21. Re1 Bd8 22. Qb4 Nf6 23. e4 a5 24. Qb3 b5 25. e5 a4 26. Qa3 Bd7 27. Qd6 Re6 28. Qa3 Ba5 29. b4 axb3 30. Nxb3 b4 31. Qc1 bxc3 32. Qa3 c5 33. Nxa5 c4 34. Be2 Rea6 35. exf6 Qxf6 36. Qxc3 Rxa5 37. Qa1 Bf5 38. Rb2 Ra3 39. Bf1 c3 40. Rbe2 Qxd4 41. Bg2 Qc5 42. Re8+ Rxe8 43. Rxe8+ Kh7 44. Re1 d4 45. Qc1 c2 46. Qg5 g6 47. Bf1 Kg7 48. Qd2 d3 49. Qc1 Qb4 50. Bxd3 Rxd3 51. Rf1 Qa4 52. Qb2+ Kh7 53. h4 gxh3 54. Qb7 Qc4 55. Kh2 Rd1 56. Qb3 c1=Q 57. Qc2 Qxf1 58. Qc6 Qg1# 0-1

DarkThought – Crafty 16.4: [1/2 – 1/2] (Test Game, Nunn Position #5, January 1999)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Ne4 12. Bxe7 Qxe7 13. Bxe4 dxe4 14. Nd2 f5 15. d5 Rd8 16. dxc6 bxc6 17. Rfd1 Ba6 18. Rbc1 Bd3 19. Qa4 c5 20. Nb3 Rac8 21. Rd2 Ng6 22. Ne2 c4 23. Na5 f4 24. Kh1 f3 25. gxf3 Bxe2 26. Rxe2 exf3 27. Ree1 Ne5 28. Rg1 Qh4 29. Nb7 Ng4 30. Rxg4 Qxg4 31. Rg1 Qd7 32. Qb4 a5 33. Nxa5 Qc7 34. Qc3 Rd3 35. Qf6 Kh8 36. Qg5 c3 37. bxc3 Rxc3 38. Nb3 Rc2 39. Rf1 Rxa2 40. Nd4 Ra6 41. Qg4 Qc1 42. Qg1 Qc4 43. Re1 Qd5 44. Qg4 Rf8 45. Rc1 Kg8 46. Rg1 Rg6 47. Qh3 Rgf6 48. Qg3 R6f7 49. Qg4 Re8 50. Qg3 Kh8 51. Rb1 Qa2 52. Rc1 Qb2 53. Qg1 Qa3 54. Ra1 Qc5 55. h3 Kg8 56. Qg3 Qb6 57. Rc1 Ref8 58. Kh2 Rf6 59. Qc7 Qb2 60. Rc2 Qa3 61. Rc6 R6f7 62. Qg3 Qb2 63. Rc5 Qa2 64. Rb5 Qa7 65. Ne6 Qd7 66. Rb6 Re8 67. Nd4 Qc8 68. h4 Qa8 69. h5 Ref8 70. Rb5 Qc8 71. Rg5 Qd7 72. Rc5 Qa7 73. Rg5 Rf6 74. Qg4 Qf7 75. Qg3 Kh8 76. Kh1 Rc8 77. Kh2 h6 78. Rb5 g6 79. hxg6 Rxg6 80. Qe5+ Kg8 81. Qe4 Re8 82. Qxf3 Qxf3 83. Nxf3 Rf8 84. Nh4 Rxf2+ 85. Kh3 Rg5 86. Rxg5+ hxg5 87. Kg3 Re2 88. Nf3 Rxe3 89. Kf2 Ra3 90. Nxg5 1/2-1/2

Crafty 16.4 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #5, January 1999)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Rce1 Be6 13. Ne5 Bd6 14. f4 Bc8 15. Nf3 Bb4 16. f5 Nh8 17. e4 dxe4 18. Rxe4 Be7 19. Re5 Ng4 20. Bxe7 Rxe7 21. Rxe7 Qxe7 22. Re1 Qd8 23. Qd2

Bd7 24. Qf4 Nf6 25. Qd6 Qb8 26. Qe5 Qc8 27. Ne4 Nxe4 28. Qxe4 Qf8 29. Ne5 Re8 30. Re3 Qb4 31. Qf4 Qd2 32. Nc4 Qc1+ 33. Kf2 Rf8 34. f6 Ng6 35. Qc7 Bc8 36. fxg7 Kxg7 37. a4 b5 38. axb5 cxb5 39. Bxg6 bxc4 40. Qe5+ f6 41. Qe7+ Kxg6 42. Qxf8 Qd2+ 43. Re2 Qf4+ 44. Ke1 Qc1+ 45. Kf2 Qf4+ 1/2-1/2

DarkThought – Fritz 3.10: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Bg4 12. Ne5 Bc8 13. b4 a6 14. a4 Bd6 15. Nf3 Bg4 16. b5 axb5 17. axb5 h6 18. Bh4 Qe7 19. bxc6 bxc6 20. Na4 Qe6 21. Bg3 Bxg3 22. hxg3 N8d7 23. Rfc1 Qd6 24. Nb6 Ra3 25. Nxd7 Nxd7 26. Be2 Rb8 27. Rxb8+ Nxb8 28. Ne5 Bxe2 29. Qxe2 Ra6 30. Rb1 Ra7 31. Rb6 f6 32. Ng6 Ra1+ 33. Kh2 Ra7 34. Qg4 Qd8 35. Qe6+ Kh7 36. Qf5 Kg8 37. Qb1 Ra8 38. Rb7 Na6 39. Ne7+ Kh8 40. Nxc6 Qe8 41. Ne7 Qd8 42. Ng6+ Kg8 43. Re7 Qc8 44. Qb6 Nb8 45. Rc7 Qg4 46. Rc8+ Kh7 47. Nf8+ Kh8 48. Ne6+ Kh7 49. Qb1+ f5 50. Nf4 Nd7 51. Rxa8 Qg5 52. Qb7 Qe7 53. Qxd5 Nf8 54. Qxf5+ g6 55. Qxf8 Qxf8 56. Rxf8 h5 57. Ne6 g5 58. f4 gxf4 59. gxf4 Kh6 60. f5 Kh7 61. Kg3 h4+ 62. Kxh4 Kh6 63. Rh8# 1-0

Fritz 3.10 – DarkThought: [0 – 1] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. h3 Be6 12. Rfc1 Bd6 13. Ne2 Ng6 14. a3 a5 15. Nc3 Kh8 16. Qb3 Rb8 17. Ne2 h6 18. Bxg6 hxg5 19. Bd3 Ne4 20. Nc3 f5 21. Qc2 Qe7 22. Qd1 Bd7 23. Rc2 Nxc3 24. Rxc3 g4 25. hxg4 fxg4 26. Ne1 Rf8 27. Rc2 Rf6 28. g3 Rbf8 29. Ng2 Qf7 30. e4 dxe4 31. Bxe4 Be6 32. Qe2 Rh6 33. b4 Bf5 34. Bxf5 Qxf5 35. Nh4 Qh5 36. Qe4 g5 37. Ng6+ Rxg6 38. Qh1 Qxh1+ 39. Kxh1 axb4 40. axb4 Rgf6 41. Kg2 Rf3 42. Rb2 Rd3 43. Ra7 b5 44. Re2 Rf6 45. Re8+ Bf8 46. d5 Rd2 47. Kf1 Rdxf2+ 48. Ke1 cxd5 49. Rd7 Rf1+ 50. Kd2 R6f2+ 51. Ke3 Rg2 52. Rb8 Rxg3+ 53. Ke2 Rf5 54. Rd6 Rgf3 55. Rxf8+ Rxf8 56. Rh6+ Kg7 57. Rh5 Kg6 58. Rh1 Ra3 59. Rg1 g3 60. Rf1 Rxf1 61. Kxf1 0-1

DarkThought – Fritz 5.00: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 h6 12. Bxf6 Bxf6 13. b4 Bg4 14. b5 Bxf3 15. gxf3 Qd7 16. bxc6 bxc6 17. Ne2 Reb8 18. Rfc1 Rxb1 19. Qxb1 Be7 20. Bf5 Ne6 21. Nf4 Ba3 22. Rc3 Bd6 23. Nxe6 fxe6 24. Bh3 Qe8 25. Qb7 Rc8 26. Qxa7 Rc7 27. Qb6 e5 28. Rc1 Qg6+ 29. Kh1 exd4 30. Qxd4 Qf7 31. f4 c5 32. Qa4 d4 33. Qa6 Qf8 34. Rb1 Kh8 35. Rb6 Be7 36. Qb5 Bd8 37. Rb8 Qg8 38. Bf5 Re7 39. Qxc5 dxe3 40. fxe3 Re8 41. Rb3 Be7 42. Qc6 Rd8 43. Bc2 Bd6 44. Be4 Qe6 45. Rd3 Qh3 46. Bg2 Qf5 47. Bf1 Qf6 48. Rd5 Qa1 49. Qc4 Bc7 50. Rxd8+ Bxd8 51. Kg2 Qb2+ 52. Be2 g5 53. f5 Kg7 54. e4 Bb6 55. a3 h5 56. Qd3 g4 57. h3 Bd4 58. hxg4 hxg4 59. Kg3 Qc3 60. Kxg4 Qxd3 61. Bxd3 Kf6 62. a4 Bc3 63. Bb5 Bd2 64. Bc4 Ba5 65. Kf4 Bd2+ 66. Kf3 Ke5 67. Ke2 Bb4 68. Bd5 Bc3 69. Kd3 Ba5 70. Kc4 Be1 71. Kb5 Kd6 72. f6 Bc3 73. f7 Ke7 74. a5 Bd4 75. a6 Kf8 76. Kc6 Ke7 77. e5 Bf2 78. Bc4 Be3 79. Kb7 Kf8 80. Bb3 Bd4 81. e6 Ke7 82. a7 Bxa7 83. Kxa7 Kf8 84. Kb7 Ke7 85. Kc6 Kf8 86. Kd7 Kg7 87. e7 1-0

Fritz 5.00 – DarkThought: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rfe1 Ng6 12. Ne5 Bd6 13. Nxg6 hxg6 14. h3 Rb8 15. e4 dxe4 16. Nxe4 Be6 17. Nxd6 Qxd6 18. Bxf6 gxf6 19. Bxg6 Bxa2 20. Rf1 Be6 21. Rxa7 Qxd4 22. Bh7+ Kh8 23. Ra4 Qe5 24. Bd3 Rbd8 25. Rh4+ Kg7 26. Re4 Qg5 27. f4 Qd5 28. Re3 Qd4 29. Qf2 Bb3 30. Rfe1 Rxe3 31. Rxe3 Kf8 32. Bh7 Rd6 33. Rd3 Qxf2+ 34. Kxf2 Rxd3 35. Bxd3 Be6 36. f5 Bd5 37. Be2 Bb3 38. Bf3 Bc2 39. g4 Bb3 40. Ke3 Ba4 41. b4 b6 42. Be2 Bb3 43. Kd4 Ke7 44. Bc4 Bc2 45. Bd3 Bd1 46. Ke3 Bb3 47. Ba6 Kd6 48. h4 Ke7 49. Be2 c5 50. bxc5 bxc5 51. Kd3 Bd5 52. Kc2 Kf8 53. Kb2 Kg7 54. Ka3 Bc6 55. Kb3 Bd5+ 56. Ka4 Kh7 57. Kb5 c4 58. Kb4 Bb7 59. Bd1 Bd5 60. Kc5 Bh1 61. Kxc4 Be4 62. Be2 Kg7 63. Kc5 Bc2 64. Kd6 Bb3 65. Ke7 Bd5 66. Bd3 Bf3 67. g5 Bh5 68. gxf6+ Kg8 69. Bc4 Kh7 70. Bxf7 Bxf7 71. Kxf7 Kh6 72. Kg8 Kh5 73. f7 Kxh4 74. f8=Q Kh3 75. f6 Kg3 76. Qd6+ Kh3 77. f7 Kg4 78. f8=Q Kh3 79. Qf3+ Kh4 80. Qdg3# 1-0

DarkThought – Fritz 5.32b: [1/2 – 1/2] (Test Game, Nunn Position #5, January 1999)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 h6 12. Bxf6 Bxf6 13. b4 Bg4 14. b5 Bxf3 15. gxf3 Ne6 16. bxc6 bxc6 17. Rfd1 Rc8 18. Na4 Qd6 19. Rb7 Rc7 20. Rxc7 Qxc7 21. Bf5 Rb8 22. Bxe6 fxe6 23. f4 Qf7 24. f3 Rb4 25. Nc5 Rc4 26. Qd3 Be7 27. Nd7 Bd6 28. Ne5 Bxe5 29. dxe5 Qh5 30. Kg2 Rb4 31. Rb1 Rxb1 32. Qxb1 Qf7 33. Qb8+ Kh7 34. Qc8 Qg6+ 35. Kf2 Qc2+ 36. Kg3 Qxa2 37. Qxe6 Qb1 38. Qxc6 Qg1+ 39. Kh3 Qxe3 40. Qxd5 Qxf4 41. Qd3+ Kg8 42. e6 Qf6 43. Qd5 Qe7 44. f4 g6 45. Kg3 a5 46. h4 h5 47. Qc6 a4 48. Qd5 a3 49. Kg2 Kf8 50. Qa8+ Kg7 51. Qd5 Qe8 52. Qe5+ Kg8 53. Kg3 a2 54. e7 a1=Q 55. Qxa1 Qxe7 56. Qe5 Kf7 57. Qxe7+ Kxe7 1/2-1/2

Fritz 5.32b – DarkThought: [0 – 1] (Test Game, Nunn Position #5, January 1999)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Ne5 Bd6 13. Nxg6 hxg6 14. h3 Be6 15. Na4 Qc7 16. Bxf6 gxf6 17. Nc5 f5 18. b4 a6 19. a4 Bd7 20. Rb1 Re7 21. Rfc1 f4 22. e4 dxe4 23. Nxe4 f3 24. b5 axb5 25. axb5 Bh2+ 26. Kh1 fxg2+ 27. Kxg2 Bf4 28. Ra1 Rd8 29. Re1 Kg7 30. Nc5 Rxe1 31. Rxe1 cxb5 32. Qb2 Bc6+ 33. d5+ Kg8 34. dxc6 Qxc6+ 35. Kg1 Qxc5 36. Qxb5 Qxb5 37. Bxb5 Bg5 38. Re8+ Kg7 39. Rxd8 Bxd8 40. Kf1 g5 41. Ke2 f5 42. Bd7 Kf6 43. f4 gxf4 44. Kf3 Ke5 45. Ba4 Bf6 46. Bb5 Bh4 47. Ba4 Bg5 48. Bd7 Be7 49. Bb5 Bf6 50. Be8 b6 51. Bd7 Bh4 52. Be8 Be7 53. Bd7 Bc5 54. h4 Bd6 55. Bb5 Be7 56. h5 Bf8 57. Bc6 Bh6 58. Bb5 Kf6 59. Bc6 Kg5 60. Be8 Bg7 61. Bd7 Be5 62. Be8 Bd6 63. Kg2 Kg4 64. h6 f3+ 65. Kf1 Be5 66. h7 Bd4 67. Ke1 f2+ 68. Kf1 Kf4 69. Ke2 Kg3 70. Kf1 Kf3 71. Bb5 Kf4 72. Ke2 Kg5 73. Be8 f4 74. Bb5 Kh6 75. Bd3 Kg7 76. Kf3 Be3 77. Kg4 Bd2 78. Kf3 f1=Q+ 79. Bxf1 Kxh7 80. Ke4 Kh6 81. Bb5 Kg5 82. Bd7 Be3 83. Kf3 Kf6 84. Ke4 Ke7 85. Bc6 Kd6 86. Be8 Bc1 87. Bh5 b5 88. Kd4 Be3+ 89. Ke4 Kc5 90. Kd3 Kd5 91. Bf3+ Ke5 92. Bc6 b4 93. Kc4 Bd2 94. Bf3 Be1 95. Bc6 Kf5 96. Bf3 Kg5 97. Kd3 Kh4 98. Be4 Kg3 99. Ke2 Bf2 100. Bd5 Bd4 101. Kd3 Bg7 102. Ke2 Be5 103. Ba2 f3+ 104. Kf1 Kf4 105. Kf2 Bd4+ 106. Kf1 Ke3 107. Be6 Kd2 108. Bd5 f2 109. Bb3 Kc3 110. Bd5 Bc5 111. Be4 b3 112. Ke2 Bb6 113. Bf5 Kb2 114. Be6 Kc2 115. Bf5+ Kc1 116. Be4 Ba7 117. Bf5 Bc5 118. Be4 b2 119. Bf5 b1=Q 120. Bxb1 Kxb1 0-1

DarkThought – Genius 3: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Bg4 12. Ne5 Bh5 13. Ne2 Bg6 14. Nxg6 Nxg6 15. b4 a6 16. Bxf6 Bxf6 17. a4 Be7 18. b5 cxb5 19. Bxg6 hxg6 20. axb5 a5 21. Qa2 Qd7 22. Rfc1 Bb4 23. Nf4 Red8 24. h4 Kf8 25. b6 Qd6 26. Rc7 Qxb6 27. Rc5 Bxc5 28. Rxb6 Bxb6 29. Nxd5 Ra6 30. Nxb6 Rxb6 31. Qxa5 Rbd6 32. Qb4 R8d7 33. e4 Ke8 34. d5 f6 35. Qc5 b6 36. Qa3 Kf7 37. f3 Ke7 38. Kf2 Kf7 39. Ke3 Rd8 40. Qa4 Rc8 41. Qa7+ Kf8 42. Qb7 Rcd8 43. Kf4 R8d7 44. Qb8+ Kf7 45. Kg4 Rd8 46. Qb7+ Kf8 47. Qa7 R8d7 48. Qa6 Rc7 49. Qa8+ Kf7 50. Qb8 Rcd7 51. Qc8 Rd8 52. Qa6 R8d7 53. Qa3 Ke7 54. Qa8 Rd8 55. Qa4 R8d7 56. Kh3 Rc7 57. Qa3 Kd7 58. Qa8 Rc8 59. Qa3 Rc7 60. Qa6 Ke8 61. Kg3 Kd7 62. f4 Rc3+ 63. Kh2 Rc7 64. Qa2 Rc5 65. Qa4+ Kd8 66. Qa7 Rc7 67. Qb8+ Kd7 68. Qg8 b5 69. e5 fxe5 70. fxe5 Rb6 71. Qxg7+ Kc8 72. Qf8+ Kd7 73. h5 gxh5 74. e6+ Rxe6 75. Qf5 b4 76. dxe6+ Kc6 77. Qf8 Rb7 78. e7 Rxe7 79. Qxe7 Kb5 80. Qe2+ Ka4 81. Qc4 Ka3 82. Kg3 Ka4 83. Kf3 h4 84. Ke4 h3 85. gxh3 Ka3 86. Kd3 Ka4 87. h4 Ka5 88. Qc6 b3 89. Kc4 b2 90. Qb5# 1-0

Genius 3 – DarkThought: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. a3 Ng6 12. Nh4 Ng4 13. Bxe7 Qxe7 14. Nxg6 hxg6 15. Ne2 Qh4 16. h3 Nf6 17. b4 g5 18. b5 g4 19. g3 Qh6 20. h4 Bd7 21. bxc6 Bxc6 22. Nf4 Red8 23. Rfc1 Rac8 24. Qc5 Ra8 25. Rab1 Nh5 26. Nxh5 Qxh5 27. a4 Rdc8 28. a5 Rc7 29. Qd6 Rd7 30. Rxc6 Rxd6 31. Rxd6 b6 32. axb6 axb6 33. Rbxb6 g6 34. Kg2 Rc8 35. Rd7 Rf8 36. Rbd6 f5 37. Rxd5 Kh8 38. R5d6 g5 39. Rd8 Rxd8 40. Rxd8+ Kg7 41. Rd7+ Kg8 42. hxg5 Qg6 43. Kg1 Qxg5 44. Rd5 Kg7 45. Rxf5 Qg6 46. Be4 Qh6 47. Rf4 Qe6 48. Bf5 Qb3 49. Bxg4 Qa2 50. Kg2 Qc4 51. Bf3 Qc3 52. g4 Kh6 53. d5 Qc5 54. e4 Qb4 55. Rf5 Kh7 56. e5 Kg8 57. d6 Qd4 58. Kg3 Qd2 59. Ba8 Qc3+ 60. Kh4 Qc5 61. f4 Qf2+ 62. Kh5 Qh2+ 63. Kg5 Kg7 64. Rf6 Qa2 65. Bc6 Qa5 66. Re6 Qd2 67. d7 Qd4 68. Rd6 Qb6 69. d8=Q Qxd8+ 70. Rxd8 Kf7 71. Re8 Kg7 72. e6 Kh7 73. Kf6 Kh6 74. Rh8# 1-0

DarkThought – Genius 5: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Bg4 12. Ne5 Bc8 13. b4 Bd6 14. b5 Bxe5 15. dxe5 Rxe5 16. bxc6 bxc6 17. Bf4 Re6 18. Ne2 Nh5 19. Rb8 Rxb8 20. Bxb8 Ba6 21. Bxa6 Qxb8 22. Nd4 Rh6 23. Rb1 Qe5 24. Nxc6 Qc7 25. Rc1 Nf6 26. h3 Ne4 27. Bd3 Re6 28. Nd4 Qxc2 29. Bxc2 Re7 30. Bb3 Nf6 31. Rc8 g6 32. Nc6 Rb7 33. g4 Kg7 34. Ra8 Rb6 35. Ne7 Ra6 36. g5 N6d7 37. Nxd5 Ra5 38. h4 Nc5 39. Nf6 Nxb3 40. axb3 h5 41. Kg2 Ra1 42. Ne8+ Kg8 43. Nd6 Kg7 44. b4 Ra6 45. Ne8+ Kg8 46. Nf6+ Kg7 47. Kg3 Ra3 48. Ne8+ Kg8 49. b5 Ra5 50. Nd6 Kg7 51. Re8 Ra4 52. Re7 Rg4+ 53. Kh3 Ra4 54. Nxf7 Kg8 55. Nh6+ Kh8 56. Rf7 Ne6 57. Rf6 Ng7 58. Rxg6 Kh7 59. Rf6 Ra5 60. f4 Ra3 61. Rf7 Rxe3+ 62. Kg2 Re2+ 63. Kf1 Rb2 64. f5 Rb1+ 65. Ke2 Rb2+ 66. Kd1 Rb1+ 67. Kc2 Rf1 68. f6 Rf2+ 69. Kd1 Rf1+ 70. Ke2 Rxf6 71. gxf6 Kxh6 72. Rxg7 a6 73. b6 a5 74. b7 1-0

Genius 5 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Nh4 Ng4 13. Bxe7 Qxe7 14. Nf3 Nf6 15. Nd2 Be6 16. Na4 Bg4 17. h3 Bc8 18. a3 Ne4 19. Bxe4 dxe4 20. Nc5 f5 21. Qc4+ Kh8 22. Rc3 Nh4 23. Kh1 Rd8 24. Rfc1 Qg5 25. Rg1 Qf6 26. a4 Ng6 27. Rgc1 Qh4 28. Kg1 Qg5 29. Nf1 a5 30. Ng3 Qe7 31. Qb3 Qc7 32. Ne6 Bxe6 33. Qxe6 Rf8 34. Qb3 Rae8 35. Qc2 Qd8 36. Rf1 Ne7 37. Rb3 Qa8 38. f3 Qb8 39. Ne2 exf3 40. Rxf3 Qc7 41. Qc5 Rf7 42. e4 Ng6 43. e5 Qd8 44. Ng3 Nh4 45. Rf2 Qd7 46. Ne2 Ng6 47. Rbf3 Ra8 48. Qc4 Re8 49. Rf1 Rff8 50. Qc5 Ra8 51. Ng3 Nh4 52. Rf4 g5 53. R4f2 f4 54. Ne4 Qg7 55. Nd6 Nf5 56. Nxf5 Rxf5 57. Re2 Qf8 58. Qxf8+ Raxf8 59. Re4 Kg7 60. Kf2 Kf7 61. Rc1 Ke6 62. Kf3 h5 63. Rc5 g4+ 64. hxg4 hxg4+ 65. Kxg4 f3 66. gxf3 Rg8+ 67. Kh3 Rxf3+ 68. Kh2 Rf2+ 69. Kh3 Rg1 70. Rh4 Rh1+ 71. Kg3 Rxh4 72. Kxf2 Rxd4 73. Rxa5 Rb4 74. Ke3 b6 75. Ra6 Kxe5 76. a5 bxa5 77. Rxa5+ Kd6 78. Ra2 Kd5 79. Kd3 c5 80. Kc3 Re4 1/2-1/2

DarkThought – Hiarcs 6: [1 – 0] (Test Game, Nunn Position #5, June 1998)

1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Bg4 12. Ne5 Bh5 13. Ne2 Bxe2 14. Bxe2 Ne4 15. Bxe7 Qxe7 16. Bf3 f6 17. Nd3 Ng5 18. Bh5 g6 19. Bd1 Nfe6 20. b4 Rac8 21. Rc1 a6 22. Qb2 Rcd8 23. a4 Qd6 24. b5 cxb5 25. axb5 Rc8 26. Rxc8 Rxc8 27. bxa6 bxa6 28. Qb4 Qc7 29. Qa3 Qb6 30. Nb4 Nc7 31. Bb3 Rd8 32. Rc1 Nge6 33. h3 Rd6 34. Ba4 Kg7 35. Rc6 Rxc6 36. Nxc6 Kh6 37. Qe7 Qb1+ 38. Kh2 g5 39. Nd8 Nxd8 40. Qxc7 Ne6 41. Qd6 Ng7 42. Qxf6+ Qg6 43. Qc6 Qe6 44. Qc5 Qf7 45. Bb3 Nh5 46. Qc6+ Nf6 47. Bxd5 Qg6 48. Bf3 Ne8 49. Qa4 Kg7 50. Bb7 Qd6+ 51. Kg1 Nc7 52. Qa5 h6 53. Qf5 Ne8 54. Be4 Qf6 55. Qh7+ Kf8 56. Bd5 Qg7 57. Qf5+ Qf6 58. Qc8 Qg6 59. e4 Qd6 60. Bc6 Qe7 61. e5 a5 62. e6 Kg7 63. Bxe8 Kf6 64. d5 Qb4 65. Bc6 Qa3 66. Qh8+ Kf5 67. g4+ Ke4 68. e7 Qc1+ 69. Kg2 Kd3 70. e8=Q Qf4 71. Qg6+ Qe4+ 72. Qxe4+ Kxe4 73. Qc3 a4 74. Qe3# 1-0

Hiarcs 6 – DarkThought: [0 – 1] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Ne5 Bd6 13. f4 Be7 14. Rfe1 Ng4 15. Bxe7 Qxe7 16. Qe2 Qh4 17. g3 Qh3 18. Qg2 Nf6 19. Na4 Qxg2+ 20. Kxg2 Ne7 21. Nc5 Rb8 22. b4 Bf5 23. Be2 Ne4 24. Nxe4 Bxe4+ 25. Kf2 Nf5 26. Nd7 Rbc8 27. g4 Nd6 28. f5 Rc7 29. Nc5 h5 30. h3 g6 31. fxg6 hxg4 32. Bxg4 fxg6 33. Nd7 Kg7 34. Rg1 Nc4 35. Rc3 Kh6 36. a4 Bf5 37. Bxf5 gxf5 38. Nc5 Rce7 39. Rg3 Nd2 40. Kg2 Kh7 41. Rd3 Nc4 42. Kf2 b6 43. Nb3 Nb2 44. Rd2 Nxa4 45. Rc2 Rf8 46. Rf3 Rf6 47. Nc1 b5 48. Ne2 Nb6 49. Ng3 Nc4 50. Ra2 a5 51. bxa5 b4 52. a6 Rff7 53. Rf4 b3 54. Ra1 b2 55. Rh4+ Kg8 56. Rb1 Ra7 57. Rg1 Rg7 58. Rb1 Rxa6 59. Nxf5 Rg5 60. Ne7+ Kf8 61. Nxc6 Rxc6 62. Rf4+ Ke7 63. h4 Rg8 64. Rf5 Rcg6 65. Ke2 Rg1 66. Rxb2 R1g2+ 67. Rf2 Rxf2+ 68. Kxf2 Nxb2 69. Kf3 Rf8+ 70. Ke2 Rh8 71. h5 Rxh5 72. Kf3 Rh3+ 73. Kf2 Nd1+ 74. Ke1 Nxe3 75. Kf2 Nc4 76. Kg2 Rd3 77. Kf2 Kf6 78. Ke2 Re3+ 79. Kf1 Kf5 80. Kf2 Kg4 81. Kg2 Rf3 82. Kh2 Ne3 83. Kh1 Kh3 84. Kg1 Rf1# 0-1

DarkThought – Junior 4.6: [1/2 – 1/2] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 a5 12. Na4 Bg4 13. Ne5 Bh5 14. Bf4 Ne6 15. Bg3 Rc8 16. Nc5 Nxc5 17. dxc5 d4 18. e4 Ng4 19. Nf3 Nh6 20. Rfd1 Bxf3 21. gxf3 Kh8 22. Rbc1 Bh4 23. f4 Rc7 24. e5 g6 25. Bf1 Rd7 26. Bh3 Rd5 27. Qb3 Qe7 28. Rc4 Red8 29. Qb6 Bxg3 30. hxg3 g5 31. fxg5 Qxg5 32. e6 fxe6 33. Bxe6 Re5 34. Bh3 Red5 35. Rcc1 Rf8 36. Rf1 Qh5 37. Kg2 Nf7 38. f3 Ne5 39. Bg4 Qe8 40. Rce1 Qg6 41. Qxb7 Rxc5 42. Qc7 Nxg4 43. fxg4 Rc2+ 44. Kg1 Rxf1+ 45. Rxf1 Qe8 46. Rf8+ Qxf8 47. Qe5+ Kg8 48. Qg5+ Kf7 49. Qf5+ Ke8 50. Qxc2 Qf3 51. Kh2 d3 52. Qc3 Qe2+ 53. Kg1 Qe4 54. Kf2 Kd7 55. Qg7+ Kc8 56. Qh6 Qe2+ 57. Kg1 Qd1+ 58. Kh2 Qc2+ 59. Kh3 d2 60. Qe6+ Kb7 61. Qe7+ Ka6 62. Qe2+ Kb6 63. Qe3+ Kb5 64. Qe5+ c5 65. Qe8+ Kb4 66. Qb8+ Kc4 67. Qf4+ Kd5 68. Qf7+ Ke5 69. Qc7+ Kf6 70. Qc6+ Ke7 71. Qc7+ Ke6 72. Qc6+ Kf7 73. Qd5+ Ke7 74. Qe5+ Kd7 75. Qd5+ Kc7 76. Qe5+ Kb6 1/2-1/2

Junior 4.6 – DarkThought: [0 – 1] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Ne5 Bd6 13. Nxg6 hxg6 14. Kh1 Rb8 15. Ne2 Bd7 16. Rfe1 Rc8 17. a3 Be7 18. f3 Qb6 19. Nc3 Rcd8 20. Na4 Qc7 21. Bf4 Bd6 22. Bxd6 Qxd6 23. Nc5 Bc8 24. Qa4 a6 25. Qa5 Re7 26. Qb6 Rde8 27. Bf1 g5 28. h3 Nh5 29. Rcd1 Ng3+ 30. Kg1 Nxf1 31. Kxf1 Qg3 32. Nd3 Bxh3 33. gxh3 Qxh3+ 34. Kg1 Qg3+ 35. Kf1 Qxf3+ 36. Nf2 g4 37. Kg1 g3 38. Ng4 Qxg4 39. Qb3 Qh4 40. Qc2 g2 41. Qxg2 Rxe3 42. Rxe3 Rxe3 43. Kf1 f5 44. a4 f4 45. Qg1 c5 46. a5 cxd4 47. Qf2 Qh1+ 48. Qg1 Qf3+ 49. Qf2 Qxd1+ 50. Kg2 Rd3 51. Qxf4 Qe2+ 52. Qf2 Qg4+ 0-1

DarkThought – Junior 5.0: [1/2 – 1/2] (Test Game, Nunn Position #5, December 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Ng6 12. b4 a6 13. Na4 Bd6 14. Nc5 Ra7 15. a4 b6 16. Bxg6 hxg6 17. Nd3 Bf5 18. Rfc1 Qb8 19. Rb3 Rc8 20. Qe2 a5 21. bxa5 Rxa5 22. Qb2 Bxd3 23. Bxf6 gxf6 24. Rxd3 Rxa4 25. Rb3 Qc7 26. Rb1 b5 27. Rc3 Rca8 28. h4 R8a6 29. Qc1 Qd7 30. Qd1 Qg4 31. Rcc1 Qf5 32. Ra1 Rxa1 33. Rxa1 Qc2 34. Rc1 Qxd1+ 35. Rxd1 f5 36. g3 Kh7 37. Rc1 Kh6 38. Ng5 Kg7 39. Kg2 b4 40. Rb1 Kf6 41. Nf3 Ra3 42. Ne1 Rc3 43. Kf3 c5 44. dxc5 Bxc5 45. Ke2 Bd6 46. Nd3 Rc4 47. Ra1 d4 48. Ra6 Ke7 49. Rb6 dxe3 50. Kxe3 Re4+ 51. Kd2 Kd7 52. Rb7+ Ke6 53. Rb5 Rd4 54. Ke3 Rc4 55. Rb7 Re4+ 56. Kf3 Rd4 57. Ke3 Rc4 58. Rb5 f6 59. Ke2 Rd4 60. Ke3 Rg4 61. Ke2 Rc4 62. Ke3 Kf7 63. Rb7+ Kf8 64. Rd7 Bc7 65. Rd5 Kg7 66. h5 f4+ 67. gxf4 Bb6+ 68. Kf3 gxh5 69. Rb5 Bc7 70. Rxh5 Kf8 71. Rb5 Bd6 72. Rb7 Ke8 73. f5 Kd8 74. Ke3 Be7 75. Kf3 Ke8 76. Ke3 Kf8 77. Nf4 Bc5+ 78. Kf3 Bd4 79. Rb8+ Kf7 80. Rb7+ Kg8 81. Nd5 Bc3 82. Rb5 Kh7 83. Ke3 Kh6 84. f4 Kh5 85. Kf3 Kh6 86. Rb6 Kg7 87. Rb7+ Kf8 88. Kg4 Ke8 89. Rb8+ Kf7 90. Rb6 Kg7 91. Rb7+ Kf8 92. Rb5 Kg7 93. Kh5 Kf7 94. Rb7+ Ke8 95. Kg6 Kd8 96. Rb8+ Kd7 97. Nb6+ Kc7 98. Rc8+ Kxb6 99. Rxc4 Kb5 100. Rc8 Bd4 101. Rd8 Kc4 102. Rc8+ Kb5 103. Rd8 1/2-1/2

Junior 5.0 – DarkThought: [0 – 1] (Test Game, Nunn Position #5, December 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Ne5 Bd6 13. f4 Be7 14. Qe2 Bb4 15. a3 Be7 16. Qd1 Qb6 17. Na4 Qc7 18. Bb1 Bd8 19. b4 a6 20. Nc3 Qd6 21. Re1 Bb6 22. Bd3 Ra7 23. Na4 Bd8 24. Rf1 Ra8 25. Kh1 Qe7 26. Nc5 Qc7 27. a4 Qd6 28. a5 Qf8 29. Rc2 Qd6 30. Qf3 Ra7 31. Rfc1 Qf8 32. Bxf6 gxf6 33. Ng4 f5 34. Nf2 Qe7 35. Nd1 Qh4 36. Qf2 Qh5 37. Kg1 Bh4 38. Qd2 Qh6 39. Nc3 Ra8 40. Rf1 Rb8 41. Rf3 Qf8 42. Rh3 Qg7 43. Rc1 Be7 44. N3a4 Bd8 45. Kh1 Kh8 46. Qd1 Rg8 47. Rc2 Nh4 48. Nb6 Bxb6 49. axb6 Ng6 50. Qh5 Ne7 51. Rf2 Qg6 52. Qh4 f6 53. Rg3 Qf7 54. Rxg8+ Nxg8 55. Rf3 Ne7 56. Rg3 Ra8 57. Qh6 Ng8 58. Qh3 a5 59. b5 cxb5 60. Bxb5 a4 61. Rf3 a3 62. Rf1 Qf8 63. Ba4 Qd8 64. Bb3 Qxb6 65. Qf3 Ne7 66. Qh5 Qb5 67. Ra1 Kg7 68. Qd1 Ra7 69. Na4 Qa5 70. Qc2 b6 71. Rg1 Bd7 72. Nc3 Rc7 73. Rc1 Qb4 74. h3 b5 75. Kh2 Kh8 76. Kg1 Nc8 77. Kf2 Nd6 78. Bxd5 Be6 79. Bf3 a2 80. d5 Rxc3 81. Qxc3 Qxc3 82. Rxc3 a1=Q 83. Rc6 Qb2+ 84. Kg3 Qb4 85. dxe6 Qe1+ 86. Kh2 Qxe3 87. e7 Qxe7 88. g3 Ne4 89. Ra6 b4 90. Bg2 Qc7 91. Ra8+ Kg7 92. Re8 b3 93. Rxe4 fxe4 94. Bxe4 Qc2+ 0-1

DarkThought – MChess 5: [1/2 – 1/2] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Bg4 12. Ne5 Bh5 13. Ne2 Ng4 14. Bxe7 Qxe7 15. Nxg4 Bxg4 16. b4 Bxe2 17. Bxe2 Ne6 18. Bd3 g6 19. b5 c5 20. dxc5 Nxc5 21. Qc3 Rac8 22. Rbc1 Nxd3 23. Qxd3 Qe5 24. h3 Qe4 25. Rxc8 Rxc8 26. Qa3 Qc4 27. Qxa7 Qxb5 28. a4 Qb2 29. Qa5 Qb3 30. Re1 b6 31. Qa7 Kg7 32. Rf1 Rc4 33. a5 bxa5 34. Qxa5 Qd3 35. Ra1 Rc2 36. Qb4 Qe4 37. Qd6 Qf5 38. Rf1 h5 39. Qa3 Kh7 40. Qa5 Rb2 41. h4 Kg8 42. Qc3 Rc2 43. Qd4 Kh7 44. g3 Qf3 45. Qd3 Ra2 46. Qb3 Re2 47. Qc3 Qf5 48. Qd4 Ra2 49. Qb4 Kg8 50. Qe1 Rc2 51. Qd1 Rb2 52. Qc1 Re2 53. Qb1 Qf3 54. Qb8+ Kh7 55. Qe5 Rc2 56. Qa1 Kg8 57. Qa4 Qf5 58. Qa5 Rb2 59. Qd8+ Kh7 60. Qg5 Qxg5 61. hxg5 Kg8 62. Rd1 Rb5 63. Rd4 Kf8 64. g4 hxg4 65. Kg2 Ke7 66. Rxg4 Rb3 67. Rd4 Kd6 68. Ra4 Ke6 69. Kg3 Rc3 70. Kf4 Rc2 71. Ra6+ Ke7 72. f3 Rg2 73. Ra7+ Ke6 74. Rb7 Rg1 75. Rb6+ Ke7 76. Rb8 Re1 77. Rb7+ Ke6 78. Rb5 Kd6 79. Rb2 Rg1 80. Rb8 Re1 81. Rf8 Ke7 82. Rc8 Kd7 83. Rc5 Kd6 84. Ra5 Re2 85. Ra7 Ke6 86. Ra1 Kd6 87. Rb1 Ke6 88. Rb6+ Ke7 89. Rb5 Ke6 90. Rc5 Kd6 91. Ra5 Ke6 92. Ra6+ Ke7 93. Ra8 Ke6 94. Ra3 Re1 95. Ra2 1/2-1/2

MChess 5 – DarkThought: [0 – 1] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Ne5 Bd6 13. f4 Bb4 14. a3 Be7 15. Qe2 Qb6 16. Kh1 a5 17. Qc2 Bd8 18. Na4 Qc7 19. Nc5 Ra7 20. Qe2 Be7 21. Qd1 Qb6 22. Na4 Qd8 23. Qe2 Nd7 24. Bxe7 Rxe7 25. Nxd7 Rxd7 26. Qc2 Nf8 27. f5 Ra8 28. f6 g6 29. Qf2 Rd6 30. Qf4 Rb8 31. Nc5 Ne6 32. Qg3 Ra8 33. Na4 Nc7 34. Nb6 Rb8 35. Rc3 Ne8 36. Rb3 Bd7 37. Kg1 Kh8 38. Bc2 Bc8 39. Qh4 Rxf6 40. Rxf6 Qxf6 41. Qh6 Kg8 42. Nxc8 Rxc8 43. Rxb7 Nd6 44. Rb6 Nb5 45. Bd3 Nxd4 46. Qh3 Re8 47. Qg3 Nf5 48. Bxf5 Qxf5 49. h3 a4 50. Qf2 Qd7 51. Ra6 Re4 52. Qc2 Rc4 53. Ra8+ Kg7 54. Qd2 Qb7 55. Re8 h5 56. Kh2 h4 57. Kg1 f6 58. Kh1 Qa7 59. Kg1 g5 60. Rc8 Qe7 61. Kh1 d4 62. e4 d3 63. e5 Qc5 64. exf6+ Kf7 65. Kh2 Rc1 66. Qxc1 Qxc1 67. Rc7+ Kxf6 68. Rd7 d2 69. g4 d1=R 70. Rxd1 Qxd1 71. Kg2 Qd2+ 72. Kf3 Ke5 73. b4 Kd4 74. b5 Kd3 75. bxc6 Qe2# 0-1

DarkThought – MChess 7.1: [1 – 0] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Ng6 12. b4 a6 13. Na4 Rb8 14. Nc5 Ne4 15. Bxe7 Qxe7 16. Bxe4 dxe4 17. Nd2 Bf5 18. Kh1 Ra8 19. a4 Nh4 20. Rfc1 Qg5 21. Rg1 b6 22. Ncb3 Re6 23. a5 Rh6 24. Nf1 Bg4 25. Nbd2 bxa5 26. bxa5 Qxa5 27. Ng3 Qg5 28. Ngxe4 Qe7 29. Ng3 Qg5 30. Rgc1 Qd5 31. f3 a5 32. Qb2 Bc8 33. Nc4 Qg5 34. Qb6 g6 35. Qc7 Be6 36. Rb8+ Rxb8 37. Qxb8+ Kg7 38. Qe5+ Qxe5 39. Nxe5 a4 40. Ra1 Bb3 41. Ng4 Rh5 42. Nxh5+ gxh5 43. Ne5 Nf5 44. Re1 Ne7 45. Rc1 a3 46. Nxc6 Nxc6 47. Rxc6 a2 48. Ra6 Bc4 49. Ra7 Kf6 50. Kg1 Ke6 51. e4 Kd6 52. Ra4 h4 53. Kf2 Bb3 54. Ra6+ Kc7 55. d5 Bc4 56. Ra4 Bb3 57. Ra3 Kd6 58. Ra6+ Kc5 59. d6 Bc4 60. Rxa2 Kxd6 61. Ra5 f6 62. Ra7 h3 63. Rxh7 hxg2 64. h4 g1=Q+ 65. Kxg1 f5 66. h5 fxe4 67. fxe4 Bd3 68. h6 Bxe4 69. Ra7 Ke6 70. Kf2 Bg6 71. h7 Bxh7 72. Rxh7 Ke5 73. Ke3 Kd5 74. Rh5+ Kd6 75. Ke4 Kc6 76. Rd5 Kb6 77. Kd4 Kc6 78. Kc4 Kb6 79. Rc5 Ka6 80. Rb5 Ka7 81. Rb3 Ka6 82. Kc5 Ka7 83. Kc6 Ka8 84. Kc7 Ka7 85. Ra3# 1-0

MChess 7.1 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Nh4 Ng4 13. Bxe7 Qxe7 14. Nf5 Qc7 15. Ng3 Qd6 16. Rfe1 Qe7 17. a3 Bd7 18. h3 Nf6 19. Nf5 Bxf5 20. Bxf5 Nh4 21. Bd3 Ne4 22. Nxe4 dxe4 23. Bf1 Red8 24. Be2 a5 25. Qc5 Qf6 26. Qb6 Rdb8 27. Rc5 Qg6 28. g3 a4 29. Qc7 Nf5 30. Qf4 Nd6 31. d5 Ne8 32. Rd1 cxd5 33. Rcxd5 Qb6 34. Qe5 Nf6 35. Rb5 Qc6 36. Rc5 Qb6 37. Bc4 Rf8 38. Rd6 Qa7 39. Rc7 Qb8 40. Qe7 Qe8 41. Rxb7 Qxe7 42. Rxe7 Rac8 43. Rd4 Rb8 44. Rd2 g6 45. Ra7 Ra8 46. Bxf7+ Kg7 47. Rxa8 Rxa8 48. Bc4 Ra7 49. Be2 Rd7 50. Rd4 Rb7 51. Rb4 Rxb4 52. axb4 Nd5 53. b5 Kf6 54. Bc4 Ke5 55. f4+ exf3 56. Kf2 Ke4 57. g4 Nb6 58. Bg8 h6 59. Bh7 Ke5 60. Bxg6 Nc4 61. Kxf3 Kd6 62. Kf4 Nxb2 63. e4 Nd3+ 64. Kg3 a3 65. Bf7 Kc5 66. Kh4 Nf4 67. e5 Kxb5 68. e6 Nd5 69. e7 Nxe7 70. Kh5 Kc5 71. Bb3 Kd6 72. Kxh6 Ke5 73. g5 Kf4 74. Kh5 Kg3 75. h4 Kf4 76. Ba2 Nf5 77. g6 Ng7+ 78. Kh6 Nf5+ 79. Kh7 Kg4 80. h5 Kxh5 81. Bb3 Kg4 82. Bg8 Kf4 83. Bf7 Kg5 1/2-1/2

DarkThought – Mephisto Meisterschach: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Bg4 12. Ne5 Bc8 13. b4 h6 14. Bh4 Bd6 15. b5 Bxe5 16. dxe5 Rxe5 17. bxc6 bxc6 18. Ne2 Bd7 19. Nd4 Rh5 20. Bg3 Ne6 21. Nxc6 Bxc6 22. Qxc6 Rc8 23.

Qxc8 Qxc8 24. Rb8 Qxb8 25. Bxb8 a5 26. Rc1 g5 27. Be5 Kg7 28. Bf5 g4 29. Bxf6+ Kxf6 30. Bxg4 Re5 31. Rd1 Ke7 32. g3 Kd6 33. Bh3 Ng5 34. Bg2 Ne4 35. Rb1 Kc5 36. Rc1+ Kb4 37. Rc7 Rf5 38. f4 Rf6 39. Rd7 Kc5 40. Bxe4 dxe4 41. Re7 Rd6 42. Rxe4 f6 43. a3 Rc6 44. Kg2 Kd5 45. Kf3 Rc3 46. Ra4 Rc5 47. g4 Ke6 48. h4 Kf7 49. Ke4 Ke7 50. Kd3 Ke6 51. Rc4 Rb5 52. Rc6+ Kf7 53. Ke4 a4 54. Ra6 Rb7 55. Rxa4 Kg6 56. Ra8 Re7+ 57. Kf3 Rc7 58. a4 Rc5 59. a5 h5 60. g5 f5 61. e4 Rc3+ 62. Kf2 fxe4 63. a6 Rf3+ 64. Ke2 Ra3 65. a7 Ra2+ 66. Ke3 Ra3+ 67. Kxe4 Kg7 68. f5 Ra5 69. Kd4 Rxf5 70. Rd8 Ra5 71. a8=Q Rxa8 72. Rxa8 1-0

Mephisto Meisterschach – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. a3 Ng6 12. b4 a6 13. Ne5 Bd6 14. Nxg6 hxg6 15. h3 Be6 16. Rab1 Qc7 17. a4 Nh7 18. Bh4 Qc8 19. e4 dxe4 20. Nxe4 Bf4 21. Rfe1 Bf5 22. Nc5 Bxd3 23. Qxd3 Rxe1+ 24. Rxe1 g5 25. Bg3 Qc7 26. Bxf4 gxf4 27. b5 axb5 28. axb5 Rd8 29. bxc6 Qxc6 30. Re7 f3 31. Qxf3 Qxf3 32. gxf3 Ng5 33. Kg2 Rxd4 34. Nxb7 Ne6 35. Re8+ Kh7 36. Kg3 Rd3 37. Kg2 Kg6 38. Na5 Rc3 39. h4 Rc5 40. Nb3 Rb5 41. Nd2 Rh5 42. Kg3 Rc5 43. Ne4 Rf5 44. Nd6 Rd5 45. Nc4 Rd4 46. Ne3 Rb4 47. Re7 Nf4 48. Re4 Nh5+ 49. Kh3 Rb2 50. Kg2 Rb1 51. f4 Rb7 52. f5+ Kh7 53. Ra4 Rd7 54. Kf3 Rd8 55. Ng4 Rd3+ 56. Ke2 Rd5 57. Ne3 Rd7 58. Rc4 Rd8 59. Rc5 Rd4 60. Ng2 Rd8 61. Rc6 Kg8 62. Ne3 Kf8 63. Rc4 Nf6 64. f3 Nh5 65. Rb4 Kg8 66. Ra4 Kh7 67. f4 Rb8 68. Kf3 Nf6 69. Rd4 Rb3 70. Rd1 Kg8 71. Rd8+ Kh7 72. Rd4 Kg8 73. Ke2 Rb2+ 74. Rd2 Rxd2+ 75. Kxd2 Kh7 76. Nc4 Nd5 77. Ke2 Nxf4+ 78. Kf3 Nd5 79. Ke4 Ne7 80. Ne5 Kg8 1/2-1/2

DarkThought – Mephisto Shredder: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Ng6 12. b4 a6 13. Na4 Qd6 14. Nb6 Rb8 15. Ne5 Qd8 16. Nxc8 Rxc8 17. Bf5 Ra8 18. a4 Qd6 19. Rfc1 Bd8 20. b5 cxb5 21. axb5 a5 22. Bc8 Re7 23. Nxg6 hxg6 24. Bf4 Qb6 25. Bg3 Ne4 26. Bg4 a4 27. Bf3 Nxg3 28. hxg3 Rd7 29. Qa2 Qe6 30. Rc5 Bb6 31. Rc3 Ra5 32. Rb4 Bd8 33. Rxa4 Rxb5 34. Ra8 Qf5 35. Rcc8 Qg5 36. Be2 Rb6 37. Qa5 Rb1+ 38. Bf1 b6 39. Qa4 b5 40. Qa2 Rxf1+ 41. Kxf1 Kf8 42. Qa5 Ke8 43. Qxb5 Ke7 44. Qb8 Ke8 45. g4 Qf6 46. f4 g5 47. Qb5 gxf4 48. Rxd8+ Qxd8 49. Rxd8+ Kxd8 50. exf4 Ke7 51. Qb4+ Ke8 52. Qb8+ Rd8 53. Qe5+ Kf8 54. f5 f6 55. Qc7 Re8 56. Qc5+ Kg8 57. Qxd5+ Kh8 58. Qb3 Rd8 59. d5 Kh7 60. Qb7 Rd6 61. Qc6 Rxc6 62. dxc6 g6 63. c7 gxf5 64. gxf5 1-0

Mephisto Shredder – DarkThought: [0 – 1] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. h3 Be6 12. Rab1 Ng6 13. b4 a6 14. Na4 Ne4 15. Bxe7 Qxe7 16. Nc5 f5 17. a4 Kh8 18. Rbc1 Bf7 19. Rfd1 Rac8 20. Re1 Rc7 21. Qe2 Nh4 22. Bxe4 fxe4 23. Ne5 Ng6 24. Nxf7+ Qxf7 25. b5 cxb5 26. axb5 a5 27. Na4 Rec8 28. Rxc7 Qxc7 29. Qg4 Rf8 30. Nc5 b6 31. Qd7 Rc8 32. Qxc7 Rxc7 33. Na4 Rb7 34. f3 exf3 35. gxf3 Ne7 36. Kf2 g6 37. e4 Kg7 38. Nc3 Rc7 39. Nxd5 Nxd5 40. exd5 Rd7 41. Re5 a4 42. Ke3 a3 43. Re8 Ra7 44. d6 a2 45. d7 a1=Q 46. d8=Q Qe1+ 47. Kd3 Qd1+ 48. Ke4 Qe2+ 49. Kd5 Qxb5+ 50. Kd6 Qb4+ 51. Ke6 Qe1+ 52. Kd6 Qg3+ 53. Kc6 Qxf3+ 54. Kxb6 Rb7+ 55. Kc5 Qc3+ 56. Kd6 Qb4+ 57. Ke5 Rb5+ 58. d5 Qc3+ 59. Kd6 Qc5+ 60. Ke5 Qe3+ 61. Kd6 Qa3+ 62. Ke5 Qg3+ 63. Kd4 Qf4+ 64. Re4 Rb4+ 65. Kc5 Rxe4 66. Kb5 Rb4+ 67. Kc6 Rc4+ 68. Kd7 Ra4 69. Qb6 Qf7+ 70. Kd6 Qf6+ 71. Kc7 Qe7+ 72. Kc6 Rc4+ 73. Kb5 Rb4+ 74. Ka5 Rxb6 75. Kxb6 Qd6+ 76. Ka5 g5 77. Ka4 g4 78. hxg4 h5 79. gxh5 Qxd5 80. Kb4 Qxh5 81. Ka4 Kf7 82. Kb4 Qd1 0-1

DarkThought – Nimzo 98: [1 – 0] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 h6 12. Bxf6 Bxf6 13. b4 a6 14. a4 Bg4 15. b5 axb5 16. axb5 Bxf3 17. gxf3 Ne6 18. bxc6 bxc6 19. Ne2 Ra3 20. Rfc1 Qa8 21. Bf5 Ra2 22. Rb2 Rxb2 23. Qxb2 Rb8 24. Qc2 Nd8 25. Nf4 Qa3 26. Nd3 g6 27. Bd7 Rb3 28. Nc5 Rb2 29. Qa4 Qxa4 30. Nxa4 Rd2 31. Kg2 Bh4 32. Rf1 f5 33. f4 Kf7 34. Nc5 Ke7 35. Bc8 Ra2 36. Kf3 Bf6 37. Re1 Ra3 38. Rd1 Ra2 39. Kg3 Kd6 40. Rc1 Ra8 41. Nb7+ Ke7 42. Nxd8 Rxc8 43. Nb7 Rc7 44. Nc5 g5 45. Ra1 g4 46. h3 gxh3 47. Ra6 Kd6 48. Kxh3 h5 49. Nd3 Kd7 50. Ne5+ Kd6 51. Rb6 Rc8 52. Rb7 Ke6 53. Ra7 Be7 54. Ra6 Kd6 55. Ra1 Bf6 56. Rg1 Ke7 57. Rg6 c5 58. dxc5 Bxe5 59. fxe5 Rxc5 60. Kh4 Rc2 61. f4 Re2 62. Rd6 Rxe3 63. Rxd5 Re1 64. Kg5 h4 65. Kxf5 h3 66. Rd2 Rh1 67. Kg4 Kf7 68. Rd6 Kg7 69. Rd7+ Kf8 70. Kg3 Kg8 71. Rd3 Kf8 72. Re3 Rf1 73. Re4 Ke7 74. e6 Rg1+ 75. Kxh3 Rh1+ 76. Kg4 Rg1+ 77. Kf5 Rc1 78. Re5 Rh1 79. Rd5 Rh5+ 80. Ke4 Rh1 81. Ke5 Re1+ 82. Kf5 Rf1 83. Rd7+ Ke8 84. Rh7 Kd8 85. Ke5 Ra1 86. f5 Ra5+ 87. Kf6 Ra6 88. Kf7 Ra7+ 89. Kg8 Rxh7 90. Kxh7 Ke7 91. Kg6 Ke8 92. f6 Kd8 93. Kg7 Kc8 94. f7 Kb8 95. f8=Q+ 1-0

Nimzo 98 – DarkThought: [1 – 0] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. a3 Ng6 12. b4 a6 13. Ne5 Bd6 14. f4 Be7 15. Qe2 Qd6 16. Rac1 Bd8 17. Na4 a5 18. b5 Qxa3 19. Nc5 a4 20. Ra1 Qb4 21. bxc6 bxc6 22. Rfb1 Qc3 23. Rc1 Qb4 24. Nxc6 Qb6 25. Nxa4 Qc7 26. f5 Nh8 27. Bf4 Qxf4 28. exf4 Rxe2 29. Bxe2 Bd7 30. Nxd8 Rxd8 31. Bd3 Nh5 32. g3 Bxa4 33. Rxa4 Nf6 34. Rca1 h5 35. Ra8 Rxa8 36. Rxa8+ Kh7 37. Kg2 Ng4 38. Be2 Ne3+ 39. Kf3 Nxf5 40. Bd3 g6 41. Bxf5 gxf5 42. Rd8 f6 43. Rxd5 Kg6 44. Rd7 Kh6 45. d5 Kg6 46. d6 Nf7 47. Ke3 Kg7 48. Kd4 Kg6 49. Kd5 Nh8 50. Ke6 h4 51. Re7 Kh6 52. d7 Ng6 53. d8=Q hxg3 54. Kxf6 1-0

DarkThought – Nimzo 99a: [1 – 0] (Test Game, Nunn Position #5, January 1999)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 h6 12. Bxf6 Bxf6 13. b4 Bg4 14. b5 Bxf3 15. gxf3 Qd7 16. bxc6 bxc6 17. Ne2 Be7 18. Bf5 Ne6 19. Rfc1 Rac8 20. Qa4 Rc7 21. Nf4 Bd6 22. Nd3 Rec8 23. f4 Qe7 24. Qd1 Qf6 25. Qg4 g6 26. Bxe6 fxe6 27. Kh1 Qf7 28. Rg1 Kh7 29. Rg2 Rg8 30. Rbg1 a5 31. h4 Rcc8 32. Rc1 Qf5 33. Nc5 Rge8 34. Nd7 Qf7 35. f3 Rg8 36. Nc5 Rb8 37. Rgc2 Rb6 38. Na4 Ra6 39. Rb1 Rg7 40. Nc5 Bxc5 41. Rxc5 a4 42. Rb2 Qe8 43. Kh2 Rc7 44. Rc1 Raa7 45. Kh1 Rcb7 46. Rg2 Rg7 47. Kh2 Rab7 48. Kh3 Rb6 49. Qg3 Qd7 50. Kh2 Qe7 51. Rc5 Qe8 52. Rcc2 Rgb7 53. Qg4 a3 54. Rc3 Ra6 55. Kh1 Qf7 56. Rcc2 Rb1+ 57. Kh2 Rab6 58. Rc3 Re1 59. Rxa3 Rbb1 60. Rc3 Qe8 61. Kg3 Ra1 62. Rb3 Qd7 63. h5 gxh5 64. Qxh5 Rh1 65. Qg4 Qf7 66. Rbb2 h5 67. Qg5 h4+ 68. Kg4 h3 69. Rg3 Rag1 70. Kh4 Rxg3 71. Qxg3 c5 72. Qg5 cxd4 73. exd4 h2 74. Kh3 Qf5+ 75. Qg4 Qxg4+ 76. fxg4 Rd1 77. Kxh2 Rxd4 78. Kg3 Ra4 79. Rb6 Ra3+ 80. Kh4 Rxa2 81. Rxe6 Kg7 82. f5 Ra4 83. Kg5 Kf7 84. Rh6 d4 85. Rh7+ Ke8 86. f6 d3 87. Re7+ Kf8 88. Rd7 d2 89. Rxd2 Kf7 90. Rd7+ Ke8 91. Re7+ Kf8 92. Kf5 Ra2 93. Rb7 Ke8 94. Kg6 Rf2 95. Ra7 Rf3 96. g5 Rf2 97. Kg7 Kd8 98. g6 Kc8 99. f7 Rd2 100. f8=Q+ Rd8 101. Qc5+ Kb8 102. Qc7# 1-0

Nimzo 99a – DarkThought: [0 – 1] (Test Game, Nunn Position #5, January 1999)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. a3 Ng6 12. b4 a6 13. Ne5 Bd6 14. f4 Be7 15. f5 Nf8 16. Rab1 Bd6 17. Nf3 N8d7 18. e4 dxe4 19. Nxe4 Be7 20. Nxf6+ Nxf6 21. Rbe1 h6 22. Bc1 Nd5 23. Ne5 Qb6 24. Qf2 Bf6 25. Bb2 Qd8 26. Be4 a5 27. b5 cxb5 28. Qf3 Nb6 29. Qb3 Nc4 30. Qxb5 Nxb2 31. Qxb2 Ra6 32. Bc2 Rb6 33. Qa1 Re7 34. Rf4 Rb5 35. Qc3 Rc7 36. Qd3 Rd5 37. Nf3 Qd6 38. Re8+ Kh7 39. g3 b5 40. h4 Qc6 41. Re2 Ba6 42. Rf2 Kg8 43. Qb3 Rd8 44. Kh2 Qc3 45. Qa2 Qe3 46. Bb1 Rc3 47. Re4 Qc1 48. Rc2 Rxc2+ 49. Qxc2 Qf1 50. Rf4 Bb7 51. Ng1 Qe1 52. Nf3 Bxf3 53. Rxf3 Bxd4 54. Qe4 Qg1+ 55. Kh3 h5 56. Rb3 a4 57. Rd3 Qxb1 58. Qf3 Bb6 59. Rxd8+ Bxd8 60. f6 b4 61. Qa8 Kh7 62. fxg7 Kxg7 63. Kg2 Qa2+ 64. Kh1 Bb6 65. axb4 a3 66. Qe4 Qa1+ 67. Kh2 a2 68. Kg2 Qb2+ 69. Qc2 Qxc2+ 70. Kf3 a1=Q 71. g4 Qf2+ 72. Ke4 Qad4# 0-1

DarkThought – Rebel 8: [1/2 – 1/2] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 h6 12. Bxf6 Bxf6 13. b4 Bg4 14. b5 Bxf3 15. gxf3 Bh4 16. bxc6 Qg5+ 17. Kh1 Qh5 18. Be2 bxc6 19. f4 Qg6 20. Bd3 Qd6 21. Na4 Rab8 22. Nc5 Rb6 23. Rg1 Reb8 24. Rb3 Rxb3 25. Nxb3 Nd7 26. Bf5 Nf8 27. Nc5 Rb6 28. a4 g6 29. a5 Rb4 30. Bd3 Kh7 31. Rc1 Rb8 32. Kg1 Kg7 33. Na6 Rc8 34. Qb2 Ne6 35. Be2 Re8 36. Bf3 Nd8 37. Nc5 Ne6 38. Nd3 Rb8 39. Qc3 Nd8 40. Nc5 Rb5 41. Be2 Rb8 42. Bd3 Qe7 43. Qc2 f5 44. Qc3 Kg8 45. Bc2 Qg7 46. Nd3 Be7 47. Kh1 Kh7 48. Ne5 Bd6 49. Bd3 Bxe5 50. fxe5 Qe7 51. f4 Qh4 52. Ba6 Kh8 53. Bf1 Qf2 54. Bg2 Rb7 55. Qc5 Kh7 56. Rf1 Qa2 57. h4 h5 58. Kh2 Qa4 59. Rb1 Rxb1 60. Qe7+ Kg8 61. Qxd8+ Kh7 62. Qe7+ Kh6 63. Qf8+ Kh7 64. Qf7+ Kh8 65. Qxg6 Qd1 66. Qf6+ Kg8 67. Qg5+ Kh8 68. Qd8+ Kg7 69. Qg5+ Kh8 70. Qf6+ Kg8 71. Qg5+ Kh8 1/2-1/2

Rebel 8 – DarkThought: [0 – 1] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rfe1 Ng6 12. Rac1 Be6 13. h3 Bd6 14. e4 dxe4 15. Nxe4 Bd5 16. Nfd2 Bf4 17. Nxf6+ gxf6 18. Rxe8+ Qxe8 19. Bxg6 fxg5 20. Bxh7+ Kh8 21. Bf5 Qe2 22. Ne4 Qxc2 23. Rxc2 Re8 24. Re2 Bxa2 25. g3 Bc7 26. Bd7 Rd8 27. Bg4 Bc4 28. Re3 Rxd4 29. Nxg5 Bb6 30. Be2 Bd5 31. Bf3 Rd2 32. Re2 Rxe2 33. Bxe2 Bd4 34. b4 f6 35. Nf3 Bc3 36. Nh2 Bxb4 37. Ng4 Bc3 38. Ne3 Be6 39. Kh2 a5 40. Bf3 a4 41. Nc2 Bb2 42. h4 a3 43. Nxa3 Bxa3 44. g4 Bd5 45. Bd1 b5 46. Kg3 Bd6+ 47. f4 c5 48. Bf3 Bxf3 49. Kxf3 c4 50. Ke3 Bc5+ 51. Kd2 Bd4 52. g5 fxg5 53. hxg5 b4 54. f5 b3 55. f6 c3+ 56. Kd3 Kg8 57. Kxd4 b2 58. Kxc3 b1=Q 59. Kd4 Qg1+ 60. Ke4 Qxg5 61. Kd3 Kf7 62. Kd4 Kxf6 0-1

DarkThought – Rebel 9: [1 – 0] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 h6 12. Bxf6 Bxf6 13. b4 a6 14. a4 Bg4 15. b5 axb5 16. axb5 Bxf3 17. gxf3 Bh4 18. bxc6 Qg5+ 19. Kh1 bxc6 20. f4 Qg4 21. Rg1 Qd7 22. Nd1 Reb8 23. Rc1 Rb6 24. Qe2 Qd6 25. Qh5 Be7 26. Nc3 Ra3 27. Bf5 Rb2 28. Nd1 Rba2 29. Bb1 Ra1 30. Nc3 Qf6 31. Ne2 Kh8 32. Qg4 Ra6 33. Ng3 g6 34. Qh3 Qh4 35. Qc8 Rb6 36. Qc7 Rb2 37. Rgf1 Ra3 38. f5 c5 39. Qe5+ Qf6 40. Qxd5 cxd4 41. Rc6 Qg7 42. Rc7 Rab3 43. Rxe7 Rxb1 44. Rxf7 Rb5 45. Qa2 Qg8 46. Qa7 Rxf1+ 47. Nxf1 Rd5 48. e4 Rd7 49. Rxd7 Nxd7 50. Qxd7 gxf5 51. Qxd4+ Qg7 52. Qxg7+ Kxg7 53. exf5 Kf6 54. Ne3 Ke5 55. Ng4+ Kxf5 56. Nxh6+ Kg5 57. Kg2 Kxh6 58. Kg3 Kg5 59. f4+ Kf5 60. Kf3 Kf6 61. Ke4 Kg6 62. Ke5 Kh6 63. f5 Kh5 64. f6 Kh6 65. Ke6 Kg5 66. f7 Kf4 67. Kd5 Kf3 68. Kd4 Kg2 69. f8=Q Kh3 70. Qg7 Kxh2 71. Ke3 Kh3 72. Kf3 Kh4 73. Qg4# 1-0

Rebel 9 – DarkThought: [0 – 1] (Test Game, Nunn Position #5, April 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Ne5 Bd6 13. f4 Bb4 14. h3 Qd6 15. a3 Bxc3 16. Qxc3 a5 17. Qc2 a4 18. Rce1 Ra5 19. Kh2 Kf8 20. Rc1 Ra8 21. g3 Kg8 22. Qg2 Rd8 23. Rc3 Qe7 24.

Re1 Re8 25. e4 dxe4 26. Bxe4 Qd6 27. Bd3 Nd5 28. Rcc1 f6 29. Nxg6 Rxe1 30. Rxe1 hxg6 31. Bh4 Bf5 32. Bxf5 gxf5 33. Qe2 Qd7 34. Qh5 Rd8 35. Re2 Rf8 36. Kg1 Nc7 37. Rd2 Re8 38. Kh2 Nd5 39. Re2 Ne3 40. Rf2 Re4 41. d5 Qxd5 42. Qf3 Qd4 43. Re2 Nc4 44. Rg2 Re1 45. Qc3 Qe4 46. Qc2 Ne3 47. Qxe4 fxe4 48. Rf2 Nf5 49. Kg2 e3 50. Rf1 Re2+ 51. Kf3 Rxb2 52. Ke4 g6 53. Ra1 Rb3 54. Bxf6 e2 55. Bd4 Nxg3+ 56. Ke5 Rxa3 57. Re1 Rf3 58. Kd6 Rd3 59. Kc5 a3 60. Bf6 a2 61. f5 gxf5 62. Kc4 Rd1 63. Rxe2 Nxe2 64. Kb3 a1=Q 65. Bxa1 Rxa1 66. Kc2 Rh1 67. Kd3 Rxh3+ 68. Kxe2 c5 69. Kd2 c4 70. Ke2 c3 71. Ke1 Rh2 72. Kd1 Rd2+ 73. Kc1 f4 74. Kb1 f3 75. Kc1 f2 76. Kb1 f1=Q# 0-1

DarkThought – Shredder 2: [1/2 – 1/2] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Bg4 12. Ne5 Bh5 13. Ne2 Bd6 14. Ng3 Bxe5 15. dxe5 Rxe5 16. Bxf6 Qxf6 17. Qb3 Bg6 18. Qxb7 Ree8 19. Bxg6 Nxg6 20. b4 Ne5 21. Qa6 Qd8 22. Rfd1 h6 23. Nf5 Qd7 24. Nd4 Rab8 25. b5 cxb5 26. Rxb5 Rxb5 27. Qxb5 Rd8 28. Qxd7 Rxd7 29. Nb5 Nc6 30. Kf1 a6 31. Nd4 Nxd4 32. Rxd4 f5 33. Rf4 g6 34. h4 h5 35. Ke2 a5 36. Ra4 Ra7 37. Rd4 Rd7 38. Kf3 Kg7 39. Ra4 Ra7 40. Kf4 Kf6 41. f3 Rc7 42. Rxa5 Rc4+ 43. Kg3 d4 44. exd4 Rxd4 45. a4 f4+ 46. Kh2 Rd2 47. Rc5 Ra2 48. a5 Ke7 49. Rc7+ Ke6 50. Rc6+ Kf5 51. a6 Ra1 52. Rd6 Ra5 53. Rb6 Ra2 54. Kg1 Ra5 55. Rc6 g5 56. hxg5 Ra1+ 57. Kh2 Kxg5 58. Re6 h4 59. Rd6 Kf5 60. Rc6 Kg5 61. Rb6 Kf5 62. Rb5+ Kf6 63. Kh3 Rxa6 64. Kxh4 Ke6 65. Kg4 Ra2 66. Kxf4 Rxg2 67. Rb6+ Ke7 68. Kf5 Rf2 69. f4 Rf1 70. Rb7+ Kf8 1/2-1/2

Shredder 2 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #5, June 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Ng6 12. b4 a6 13. h3 Ne4 14. Bxe7 Qxe7 15. Bxe4 dxe4 16. Nd2 f5 17. a4 Be6 18. Ne2 Kh8 19. Qc5 Rad8 20. Rfc1 Ba2 21. Rb2 Bd5 22. Qxe7 Nxe7 23. Ra1 Ra8 24. Rc2 Red8 25. Rac1 Be6 26. Nf4 Bg8 27. Rc5 Rd6 28. Re5 Rd7 29. f3 exf3 30. Nxf3 Bb3 31. Nd3 Bd5 32. Ng5 Bg8 33. Nc5 Rc7 34. Nge6 Bxe6 35. Nxe6 Rd7 36. Nc5 Rc7 37. Re1 Kg8 38. Kh2 Rac8 39. Re2 g6 40. g4 Ra8 41. Rf2 Rac8 42. Kg3 Kh8 43. h4 Rg8 44. e4 fxe4 45. Nxe4 Nd5 46. b5 axb5 47. axb5 Ra8 48. Rf3 Kg8 49. g5 Rd8 50. b6 Rg7 51. Nc5 Rb8 52. Rb3 Rf7 53. Re1 h5 54. Re6 Kh7 55. Rd6 Re8 56. Nd7 Ra8 57. Nf6+ Nxf6 58. gxf6 Re8 59. Rc3 Re4 60. d5 Rd4 61. Rdxc6 Kh6 62. Rd6 g5 63. hxg5+ Kxg5 64. Rf3 Rg4+ 65. Kh3 Rh4+ 66. Kg2 Rg4+ 67. Kh2 Rh4+ 68. Kg1 Rg4+ 69. Kh1 Rh4+ 70. Kg2 Rg4+ 71. Kh3 Rh4+ 72. Kg3 Rg4+ 73. Kh3 1/2-1/2

Games Played by DarkThought from Nunn Position #7 (ECO E15)

DarkThought – Chessmaster 4000 Turbo: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 Qc7 14. a4 dxe4 15. Nxe4 f5 16. Nd2 Bf6 17. Re1 e5 18. dxe5 Nxe5 19. Qc2 Rcd8 20. Rad1 Nd3 21. Re3 Nc5 22. b4 Bxc3 23. Qxc3 Ne4 24. Bxe4 fxe4 25. Rde1 Qf7 26. R1e2 Rfe8 27. Qc2 Qh5 28. Nxe4 c5 29. h3 cxb4 30. g4 b3 31. Qxb3 Qf7 32. Qc2 Qd7 33. Ng5 g6 34. Rxe8+ Rxe8 35. Rxe8+ Qxe8 36. Ne4 Qe6 37. Qd3 Qxc4 38. Qd8+ Kg7 39. Qd7+ Qf7 40. Qd4+ Kg8 41. Qd8+ Qf8 42. Qc7 Qf7 43. Qb8+ Kg7 44. Qe5+ Kf8 45. Ng5 Qd7 46. Qh8+ Ke7 47. Qxh7+ Kd8 48. Qxg6 Qxa4 49. Qd6+ Qd7 50. Nf7+ Ke8 51. Qxd7+ Kxd7 52. Ne5+ Ke7 53. h4 b5 54. Nc6+ Kf8 55. Kf1 Bc8 56. g5 a6 57. h5 Bb7 58. Ne5 b4 59. Ke2 a5 60. h6 Be4 61. g6 Bxg6 62. Nxg6+ Kg8 63. Ne5 Kh7 64. Ng4 a4 65. Kd3 a3 66. Kc2 Kg6 67. f4 a2 68. Kb2 b3 69. f5+ Kxf5 70. h7 Kxg4 71. h8=Q Kf5 72. Kxb3 Ke4 73. Kxa2 1-0

Chessmaster 4000 Turbo – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. e5 Bg5 19. f4 Be7 20. a4 Ba6 21. a5 Nb8 22. Ne4 Bb5 23. Rab1 Na6 24. Nf2 Nc7 25. Be4 h6 26. Bg2 Nd5 27. Bd2 a6 28. Ne4 c5 29. dxc5 Bxc5+ 30. Nxc5 Rxc5 31. Bc3 Ba4 32. Qf2 Rb5 33. Rxb5 axb5 34. Bxd5 Qxd5 35. Re2 Qd3 36. Qe3 Qxe3+ 37. Rxe3 Rb8 38. Bb4 Rc8 39. Kf2 Kh7 40. Rc3 Kg6 41. Rc1 Kf5 42. Kf3 h5 43. h3 Rd8 44. g4+ Kg6 45. Ke2 Rd7 46. Bc5 Rc7 47. Bb4 Ra7 48. Kd2 Kh6 49. Kc3 Rd7 50. Bd6 hxg4 51. hxg4 Kg6 52. Kb4 Ra7 53. Bc5 Ra6 54. Bd4 Rc6 55. Bc3 Kh7 56. Rh1+ Kg8 57. f5 Ra6 58. Bd4 Ra8 59. Bb6 Re8 60. f6 Ra8 61. g5 Ra6 62. Bc5 Ra8 63. fxg7 Kxg7 64. Rh6 Re8 65. a6 Bc2 66. Kxb5 Bd3 67. Kb4 c3 68. a7 c2 69. Be3 Ra8 70. Rh1 Be4 71. Rf1 Rc8 72. Kb3 Rd8 73. Bc1 Rd1 74. Rf4 Rxc1 75. Rxe4 Ra1 76. Kxc2 Rxa7 77. Kd3 Ra3+ 78. Kd2 Rg3 79. Re1 Kg6 80. Rf1 Rxg5 81. Re1 f6 82. exf6 Kxf6 83. Kd3 Rg3+ 84. Ke4 Rg4+ 85. Kf3 Rh4 86. Re4 Rh8 87. Re1 Kf5 88. Rf1 Ra8 89. Kg2+ Kg4 90. Re1 Ra2+ 91. Kg1 Kf5 92. Rf1+ Ke5 93. Re1+ Kd6 94. Rd1+ Ke7 95. Re1 Ra3 96. Re2 Kf6 97. Rf2+ Kg5 98. Kg2 e5 99. Rf7 e4 100. Kf2 Rh3 101. Rf8 Kg4 102. Rg8+ Kf4 103. Rf8+ Ke5 104. Re8+ Kd5 105. Rd8+ Kc5 106. Rc8+ Kd4 107. Rd8+ Kc4 108. Rc8+ Kd3 109. Rd8+ Kc2 110. Re8 Rh4 111. Kg3 Rh1 112. Rxe4 1/2-1/2

DarkThought – Comet A.86: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 Re8 14. a4 dxc4 15. bxc4 c5 16. d5 exd5 17. exd5 Bg5 18. Qb3 Bxd2 19. Bxd2 Ne5 20. Rac1 Nc6 21. dxc6 Qxd2 22. Rfd1 Qh6 23. a5 Rxc6 24. Bxc6 Qxc6 25. axb6 Bb7 26. f3 axb6 27. Rd3 h6 28. Rb1 Ba6 29. Rd2 Qe6 30. Rc2 Qd7 31. Kg2 Bc8 32. Rcb2 Qh3+ 33. Kg1 Qf5 34. Qc3 Qh3 35. Re1 Re6 36. Rd1 Rf6 37. Rd8+ Kh7 38. Qc2+ Bf5 39. Qd1 Bc8 40. Rf2 h5 41. Qd5 Bf5 42. Qa8 Re6 43. Rh8+ Kg6 44. Qa1 Bd3 45. g4 Qh4 46. Qd1 Re3 47. f4 f5 48. gxh5+ Kf7 49. h6 gxh6 50. Rh7+ Kg8 51. Rd7 Be4 52. Rd8+ Kf7 53. Qd7+ Qe7 54. Rb2 Re1+ 55. Kf2 Rh1 56. Rxb6 Rxh2+ 57. Kg3 Rg2+ 58. Kh3 Rg1 59. Qxe7+ Kxe7 60. Rc8 Rh1+ 61. Kg3 Rg1+ 62. Kf2 Rg2+ 63. Ke1 h5 64. Rxc5 Rg1+ 65. Kf2 Rg2+ 66. Kf1 Rd2 67. Rh6 Bd3+ 68. Kg1 Rd1+ 69. Kf2 Be4 70. Rc7+ Kd8 71. Ra7 Kc8 72. Rxh5 Rd2+ 73. Ke1 Rd8 74. c5 Re8 75. Kd2 Rg8 76. Kc3 Kb8 77. Rf7 Ka8 78. Rhh7 Kb8 79. Kc4 Rd8 80. Kb5 Rc8 81. Rf6 Re8 82. Kb6 Ka8 83. Ra7+ 1-0

Comet A.86 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. e5 Bg5 19. a4 Bxd2 20. Bxd2 Ba6 21. Bb4 c5 22. dxc5 Nxc5 23. Red1 Qb6 24. Rdb1 Rfd8 25. a5 Qb5 26. Bf1 Qd7 27. Bg2 Nb3 28. Ra3 Nd4 29. Qb2 Qb5 30. Rc3 Bb7 31. Re3 Bxg2 32. Kxg2 Rb8 33. Kg1 Qa4 34. Ra3 Qc6 35. Qa2 Nf3+ 36. Rxf3 Qxf3 37. Qxc4 Rd1+ 38. Rxd1 Qxd1+ 39. Kg2 Qa4 40. Qc7 Qxb4 41. Kh3 Qb1 42. Qxa7 Qf1+ 43. Kh4 Rb4+ 44. f4 Qg2 45. Qb6 Qxh2+ 46. Kg4 Rxb6 47. Kf3 Rb3+ 48. Ke4 Qd2 49. f5 Qb4# 0-1

DarkThought – Crafty 16.4: [1/2 – 1/2] (Test Game, Nunn Position #7, January 1999)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. exd5 cxd5 15. c5 b4 16. Bxb4 Bxf1 17. Nxf1 e5 18. Rc1 exd4 19. Qxd4 Nb8 20. Qd2 Nc6 21. Ba3 Bg5 22. f4 Bf6 23. Kh1 d4 24. b4 Ne7 25. g4 h6 26. Ng3 Qd7 27. Ne4 Bh4 28. Nd6 Rcd8 29. h3 Nc8 30. Nf5 Bf6 31. Bb2 Rfe8 32. c6 Qc7 33. Nxd4 Ne7 34. Qf2 Qb6 35. Rc4 Qa6 36. Qc2 Qxa2 37. c7 Rxd4 38. Bxd4 Qxc2 39. Rxc2 Bxd4 40. Re2 Bf6 41. Bb7 Rf8 42. Rxe7 Bxe7 43. b5 Bd6 44. c8=Q Rxc8 45. Bxc8 Bxf4 46. Kg2 g6 47. Bb7 Be5 48. Be4 Kf8 49. Kf3 Ke7 50. Bd3 Kd6 51. Bc4 f5 52. Bf7 Kc5 53. Bxg6 fxg4+ 54. Kxg4 Kxb5 55. Kh5 Bf4 56. Kg4 Bd6 57. Kh5 Bf8 58. Bd3+ Kc5 59. Ba6 Kb6 60. Bc8 a5 61. Kg4 a4 62. Kf3 Kc5 63. Ke2 a3 64. Be6 Kd4 65. Kd2 h5 66. Kc2 1/2-1/2

Crafty 16.4 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, January 1999)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. e5 Bg5 19. f4 Be7 20. f5 Nb6 21. fxe6 fxe6 22. a4 Ba6 23. Ne4 Nd5 24. Rad1 Kh8 25. Qd2 Rb8 26. Rf1 Rxf1+ 27. Bxf1 Rb3 28. Ba5 Qf8 29. Bh3 c3 30. Nxc3 Nxc3 31. Bxc3 Qf3 32. Rc1 Ba3 33. Ra1 Rxc3 34. Bxe6 Bd3 35. Qf2 Qxf2+ 36. Kxf2 Bc1 37. Bd7 h6 38. h4 Rc2+ 39. Kf3 Bb2 40. Ra2 Bc4 41. Rxb2 Bd5+ 42. Ke3 Rxb2 43. e6 Bc4 44. Kf4 Re2 45. Bxc6 Bxe6 46. d5 g5+ 47. hxg5 hxg5+ 48. Kf3 Rc2 49. Ke4 Bc8 50. Bb5 Bb7 51. Bd7 Re2+ 52. Kf5 Rd2 53. Kf6 Rxd5 54. Bf5 Bc6 55. Kxg5 Bd7 56. g4 Bxf5 0-1

DarkThought – Fritz 3.10: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. exd5 cxd5 15. c5 b4 16. Bxb4 Bxf1 17. Nxf1 Rc6 18. Be1 Qb8 19. b4 Bf6 20. Ne3 Rfc8 21. Ng4 Bg5 22. f4 Bd8 23. f5 exf5 24. Ne3 Nf6 25. Nxf5 Re6 26. Qb3 Bc7 27. Bxd5 Nxd5 28. Qxd5 g6 29. Nh6+ Kg7 30. Bd2 Rd8 31. Qc4 Bxg3 32. Rf1 Rd7 33. d5 Bxh2+ 34. Kh1 Ree7 35. c6 Rd6 36. Ng4 Be5 37. Nxe5 Rxe5 38. Bc3 f6 39. Bxe5 fxe5 40. Qh4 Qc7 41. Qf2 Rd8 42. Qf6+ Kg8 43. b5 Qc8 44. Qe6+ Kg7 45. Rf7+ Kh6 46. Qxc8 Rxc8 47. d6 Rd8 48. d7 Kg5 49. c7 Rxd7 50. Rxd7 h6 51. c8=Q Kh5 52. Qe8 a5 53. Qxe5+ g5 54. Qe4 1-0

Fritz 3.10 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Rb1 Nb6 17. Qf3 Qd7 18. Ba1 Rfd8 19. Qc3 Bf6 20. Qa5 Bb5 21. Nf3 Ra8 22. Rec1 Rab8 23. Rc2 Kh8 24. Rbc1 a6 25. Bf1 Qb7 26. Bg2 Be7 27. Rb1 f6 28. Rcc1 Qd7 29. e5 f5 30. Rd1 g5 31. Ne1 g4 32. Nc2 f4 33. gxf4 Rf8 34. Ne3 Rxf4 35. Rdc1 Qd8 36. Qd2 Bh4 37. Nd1 Bg5 38. Qe1 Nd5 39. Rc2 Be7 40. Qd2 Rf7 41. a4 Bg5 42. Qe1 Bxa4 43. Rxb8 Qxb8 44. Rb2 Qf8 45. Nc3 Nxc3 46. Qxc3 Bb5 47. Rc2 Qh6 48. Re2 Bf4 49. h3 Rg7 50. hxg4 Rxg4 51. f3 Rg8 52. Kf2 Qh2 53. Kf1 c5 54. d5 exd5 55. e6+ d4 56. Qxd4+ cxd4 57. Bxd4+ Rg7 58. e7 Qh5 59. e8=N Bxe8 60. Re4 Qb5 61. Bxg7+ Kxg7 62. Kg1 Qb6+ 63. Kf1 Bg6 64. Bh1 Bxe4 0-1

DarkThought – Fritz 5.00: [1/2 – 1/2] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 dxe4 14. Nxe4 b5 15. Qe2 bxc4 16. Rad1 Rb8 17. Nc5 Nxc5 18. dxc5 Qc7 19. bxc4 Rb7 20. Qg4 e5 21. Qe4 Bxc5 22. Bxe5 Qe7 23. Qf5 Rb4 24. Bxg7 Kxg7 25. Rd7 Bc8 26. Rxe7 Bxf5 27. Re5 Bd3 28. Rg5+ Kh8 29. Rxc5 Bxf1 30. Bxf1 Rc8 31. Ra5 Rc7 32. Bd3 Re7 33.

Kg2 Rb2 34. Kf3 Rd2 35. Be4 Rd4 36. Bxc6 Rxc4 37. Ba8 Rc3+ 38. Kg2 Rc1 39. g4 Kg7 40. Rg5+ Kf6 41. Rf5+ Kg6 42. Kg3 Rc3+ 43. f3 h6 44. Ra5 Kg7 45. Kh4 Rc2 46. h3 Rd2 47. Be4 Rd6 48. Kh5 Rde6 49. Kh4 Re5 50. Ra6 Rc5 51. Bf5 Rec7 52. Be4 Rb5 53. Bf5 Rb6 54. Ra5 a6 55. Bd3 Rcc6 56. Kg3 Kf8 57. Ra3 Rd6 58. Bc4 Rbc6 59. Bf1 Kg7 60. Ra5 Rf6 61. Be2 Rfe6 62. Bd3 Rb6 63. h4 Red6 64. Bf1 Rdc6 65. Ra3 Kf6 66. Be2 Rd6 67. Bc4 Rbc6 68. Bf1 Kg7 69. Ra4 Re6 70. Ra5 Kf8 71. Bd3 Ke7 72. Bf5 Red6 73. Be4 Rb6 74. Rc5 Rb2 75. a4 Rb4 76. Ra5 Kf8 77. Bf5 Ke8 78. Bc8 Rbb6 79. Bf5 Ke7 80. Bc8 Kd8 81. Bf5 Rb4 82. Be4 Rbd4 83. Rf5 Ke7 84. Ra5 Rb6 85. Kf2 Kd8 86. Rf5 Ke8 87. a5 Rbd6 88. Kg3 Rc4 89. Bd5 Rc7 90. Be4 Kf8 91. Rh5 Rc1 92. Kf2 Kg7 93. Re5 Rd2+ 94. Kg3 Ra1 95. Rf5 Rd6 96. Rc5 Rd4 97. Bb7 Rda4 98. Bxa6 Rxa5 99. Rxa5 Rxa5 100. Bb7 Kf6 101. f4 Ra3+ 102. Kg2 h5 103. g5+ Kf5 104. Bf3 Kxf4 105. Bxh5 Ra7 106. Kh3 Rb7 107. Kg2 Rc7 108. Kf2 Rc2+ 109. Ke1 Ke3 110. Kf1 Rh2 111. Kg1 Rxh4 112. Bxf7 Rg4+ 113. Kh2 Rxg5 114. Be8 Kf4 1/2-1/2

Fritz 5.00 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. a4 Ba6 19. Red1 c5 20. d5 Bd4 21. Nf3 Bxc3 22. Qxc3 exd5 23. exd5 Rb8 24. Nd2 Rb4 25. Ne4 Qb6 26. a5 Qb8 27. Rac1 Re8 28. Qf3 Ne5 29. Qh5 Bc8 30. h3 h6 31. Nxc5 Rb5 32. Ne4 Ba6 33. d6 Nd3 34. Qg4 Qd8 35. d7 Rf8 36. Rc2 h5 37. Qf3 Rxa5 38. Nd6 Qxd7 39. Nxc4 Rc5 40. Ne3 Rxc2 41. Nxc2 Qc7 42. Ne3 Re8 43. Qxh5 Qb6 44. Bd5 Re7 45. Qf3 Ne5 46. Qf5 Re8 47. Be4 g6 48. Qf4 Qa5 49. Bd5 Be2 50. Rb1 Qc7 51. Kh1 Qd6 52. Rb7 Re7 53. Rb2 Ba6 54. Rb4 Be2 55. Bg2 Rd7 56. Re4 f6 57. Rb4 Kg7 58. Rb2 Qa6 59. Kh2 Nd3 60. Nf5+ gxf5 61. Qxf5 Ne5 62. Be4 Bb5 63. Qh7+ Kf8 64. Qh8+ Ke7 1/2-1/2

DarkThought – Fritz 5.32b: [1/2 – 1/2] (Test Game, Nunn Position #7, January 1999)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 dxe4 14. Nxe4 b5 15. Qe2 bxc4 16. Rad1 Rb8 17. Nc5 Nxc5 18. dxc5 Qc7 19. bxc4 Rbc8 20. Be4 g6 21. Qe3 e5 22. Bd3 Rfe8 23. Kh1 Bf8 24. f4 Bg7 25. Rfe1 f6 26. fxe5 fxe5 27. Bf1 Qf7 28. Qe4 Rb8 29. g4 Re6 30. g5 Re7 31. Rd6 Qf5 32. Qe3 Rb1 33. Rdd1 Rxd1 34. Rxd1 h6 35. gxh6 Bxh6 36. Qe2 Bf4 37. Rd8+ Kg7 38. Rd6 Re8 39. Qf3 Be3 40. Bg2 Qxf3 41. Bxf3 Bxc4 42. Be4 Re6 43. Rxe6 Bxe6 44. Bxe5+ Kf7 45. a4 Bxc5 46. Bxc6 Bh3 47. Bg2 Ke6 48. Bg3 Bf5 49. h4 Bd6 50. Bf2 a5 51. Bc6 Bb4 52. Kg2 Kd6 53. Bb5 Be4+ 54. Kf1 Bf3 55. Bd3 Bd1 56. Bxg6 Bxa4 57. Bd4 Bb5+ 58. Kf2 Ke6 59. Bg7 Ke7 60. h5 Be8 61. Kg3 Bd2 62. Bb2 Bxg6 63. hxg6 1/2-1/2

Fritz 5.32b – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #7, January 1999)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. a4 Ba6 19. Rad1 Qc7 20. Bf1 c5 21. d5 Bxc3 22. Qxc3 exd5 23. exd5 Nb6 24. Nxc4 Bxc4 25. d6 Qd7 26. Bxc4 Qxa4 27. Bf1 c4 28. Rd4 Qb5 29. Ra1 Qd7 30. Ra5 Rc6 31. Qa3 Nc8 32. Bxc4 Rxd6 33. Rxd6 Qxd6 34. Qxd6 Nxd6 35. Bd5 Nc8 36. Bb7 Rd8 37. Bxc8 Rxc8 38. Rxa7 g5 39. Ra5 f6 40. Ra7 h5 41. Kg2 Rc4 42. h3 Rb4 43. Rd7 Ra4 44. Rc7 Ra5 45. h4 gxh4 46. gxh4 Ra4 47. Kh3 Rf4 48. Rc5 Rxf2 49. Rxh5 Ra2 50. Rd5 Ra4 51. Rd7 f5 52. h5 f4 53. Kg4 Ra5 54. h6 f3 1/2-1/2

DarkThought – Genius 3: [1/2 – 1/2] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 dxe4 14. Nxe4 b5 15. Qe2 bxc4 16. Rad1 Qc7 17. Nd2 Nb6 18. Nxc4 Nd5 19. Bb2 Rb8 20. Qc2 Nb4 21. Qb1 Nd5 22. Qc2 Nb4 1/2-1/2

Genius 3 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qd1 Bg5 18. Nf3 Bf6 19. a4 Ba6 20. Qd2 c5 21. e5 Be7 22. d5 exd5 23. Qxd5 Nb6 24. Qxd8 Rcxd8 25. Rec1 Rd3 26. Ne1 Rd7 27. Bh3 Rdd8 28. Nf3 Kh8 29. Nd2 f6 30. Rc2 fxe5 31. Bxe5 Rfe8 32. Bf1 Bg5 33. Nf3 Bh6 34. Bb2 Rd5 35. a5 Nd7 36. Bxc4 Bxc4 37. Rxc4 Rf8 38. Ra3 Nb8 39. Re4 Kg8 40. Re5 Rd1+ 41. Kg2 Rc8 42. Rc3 Nd7 43. Re2 Rb8 44. Rcc2 Rd3 45. Ne1 Rd1 46. f4 Rb5 47. Bc3 Rb3 48. Bd2 g6 49. Re6 Bf8 50. Rc6 Rb8 51. Nf3 Re8 52. Kf2 Nb8 53. Rc7 a6 54. Ng5 h6 55. Nf3 Rd8 56. Rb7 Nd7 57. Ke2 Ra1 58. Bc3 Ra3 59. Ne5 Nxe5 60. fxe5 Bg7 61. Rb6 g5 62. Rxa6 Re8 63. Bb2 Ra2 64. Kd1 Kh7 65. Bc3 Rxc2 66. Kxc2 Bxe5 67. Rc6 Bxc3 68. Kxc3 Re2 69. a6 Rxh2 70. Kc4 Ra2 71. Kxc5 h5 72. Kb6 h4 73. gxh4 g4 74. a7 g3 75. Rc2 Ra3 76. Rc5 Rb3+ 77. Ka6 Ra3+ 78. Kb7 Rb3+ 79. Kc8 Ra3 80. Kb8 Rb3+ 81. Ka8 Kh6 82. Rg5 Kh7 83. Rh5+ Kg6 84. Re5 Kh6 85. Re8 g2 86. Rg8 Rb2 87. Rg5 Kh7 88. Rg4 Kh6 89. Rg8 Kh5 90. Rxg2 Rxg2 1/2-1/2

DarkThought – Genius 5: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 dxc4 14. Nxc4 c5 15. d5 exd5 16. Qxd5 Bf6 17. Bxf6 Nxf6 18. Qf5 Bxc4 19. bxc4 Qd7 20. Qxd7 Nxd7 21. f4 Nb8 22. e5 Nc6 23. Bxc6 Rxc6 24. a4 Rd8 25. a5 g6 26. axb6 axb6 27. Rfe1 Rd4 28. Ra8+ Kg7 29. Rc1 h6 30. Ra7 Re6 31. Rb7 g5 32. Rf1 g4 33. Ra1 Kg6 34. h3 h5 35. hxg4 hxg4 36. Rf1 Kg7 37. Re1 Rxc4 38. f5 Rh6 39. e6 Rh3 40. Rxf7+ Kh6 41. Re2 Rc1+ 42. Kg2 Rch1 43. Kf2 Ra1 44. Ke3 Kg5 45. e7 Rh8 46. Ke4 Raa8 47. Kd5 Rae8 48. Ke6 Rhg8 49. Rh7 Rxe7+ 50. Rxe7 c4 51. Kf7 Rh8 52. f6 Rh7+ 53. Kg8 Rh3 54. R2e5+ 1-0

Genius 5 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qd1 Bg5 18. Nf3 Bf6 19. Qd2 Nb6 20. Rab1 Qc7 21. Rec1 Rfd8 22. h3 Rb8 23. Qc2 Be7 24. Ba5 Qc8 25. Bd2 Qd7 26. Be3 f6 27. e5 f5 28. Qe2 Ba3 29. Rc3 Bb4 30. Rxb4 Nd5 31. Qb2 a5 32. Rxb5 cxb5 33. Rc1 c3 34. Qe2 b4 35. Qc2 Rf8 36. Rb1 h6 37. Bc1 Rfd8 38. Ne1 Nb6 39. Be3 Nc4 40. Rc1 Na3 41. Qd3 Nb5 42. Nc2 Nc7 43. Na1 a4 44. Qc2 Kh8 45. Rb1 g5 46. Qe2 Nd5 47. Bc1 f4 48. gxf4 Nxf4 49. Bxf4 gxf4 50. Kh1 Qg7 51. Qc4 Qg6 52. Re1 Qf5 53. f3 Rg8 54. Rg1 Rg3 55. Kh2 Qg6 56. Qe2 b3 57. axb3 axb3 58. Nxb3 Rxb3 59. Qe4 Qxe4 60. fxe4 Rb2 61. h4 Rg7 62. Kh3 f3 63. Bxf3 Rxg1 64. Bd1 c2 65. Bxc2 Rxc2 0-1

DarkThought – Hiarcs 6: [1/2 – 1/2] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. exd5 cxd5 15. c5 b4 16. Bxb4 Bxf1 17. Nxf1 Rb8 18. Bc3 Qc7 19. b4 Nf6 20. Nd2 Rfc8 21. Qe2 Qb7 22. f4 Qc7 23. Kh1 h5 24. Rf1 Qd7 25. Nb3 g6 26. Rc1 Qa4 27. Rc2 Bf8 28. Qd3 Ne8 29. Na5 Nc7 30. Be1 Bg7 31. Qb3 Qb5 32. Qe3 Na6 33. a3 Nc7 34. Bc3 Qa4 35. Rc1 Nb5 36. Bb2 Bxd4 37. Bxd4 Nxd4 38. Qxd4 Qxa3 39. Ra1 Rxb4 40. Rxa3 Rxd4 41. Ra1 h4 42. c6 hxg3 43. hxg3 g5 44. f5 exf5 45. Rf1 f4 46. gxf4 gxf4 47. Nb3 Rd3 48. Nc1 Rd2 49. Nb3 Rxg2 50. Kxg2 Rxc6 51. Nd4 Rc4 52. Nf5 Kh7 53. Rd1 Rc5 54. Kf3 Kg6 55. Ne7+ Kg5 56. Nxd5 Ra5 57. Nxf4 Ra3+ 58. Nd3 f5 59. Ke2 a5 60. Rg1+ Kf6 61. Rg8 a4 62. Ra8 Ra1 63. Ne1 Kg5 64. Ng2 f4 65. Kf3 Ra3+ 66. Ke4 f3 67. Ra5+ Kg4 68. Ne3+ Kg3 69. Rf5 Rb3 70. Rxf3+ Kh4 71. Rf5 Rb4+ 72. Kf3 Kh3 73. Re5 Rh4 74. Ng2 Rh7 75. Nf4+ Kh4 76. Ra5 a3 77. Ng6+ Kh3 78. Ra8 Kh2 79. Nf4 Rf7 80. Rxa3 1/2-1/2

Hiarcs 6 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qg4 Bf6 17. Rad1 Nb6 18. e5 Be7 19. Ne4 Nd5 20. Bd2 Kh8 21. Nc5 Bb5 22. Rc1 Rb8 23. Qh3 Bxc5 24. Be4 g6 25. dxc5 f5 26. exf6 Qxf6 27. Kh1 Qxf2 28. Bxg6 Rb7 29. Rf1 Qxc5 30. Qh6 Rfb8 31. a4 Rg7 32. Rf7 Rxf7 33. Bxf7 Qd4 34. Bxe6 Qe4+ 35. Kg1 Qd4+ 36. Kg2 c3 37. Bxc3 Nxc3 38. axb5 Nxb5 39. Rxc6 Qe5 40. Bc4 Qe4+ 41. Kg1 Qd4+ 42. Kf1 Qd1+ 43. Kf2 Qc2+ 44. Be2 Qf5+ 45. Kg2 Nd4 46. Rc7 Ne6 47. Re7 Qd5+ 48. Kh3 Ng5+ 49. Kh4 Qd4+ 50. Kh5 Nf7 51. Qe6 Qc5+ 52. Kh4 Rb4+ 53. Bg4 Rb6 54. Qc8+ Qxc8 55. Bxc8 Rh6+ 56. Kg4 Nd6 57. Be6 Rxh2 58. Rxa7 Re2 59. Bd5 Rd2 60. Bf3 Rd4+ 61. Kg5 Ne4+ 62. Bxe4 Rxe4 63. g4 Re8 64. Kh6 Re6+ 65. Kh5 Re2 66. g5 Rh2+ 67. Kg4 h6 68. gxh6 Rxh6 1/2-1/2

DarkThought – Junior 4.6: [1 – 0] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. exd5 cxd5 15. c5 b4 16. Bxb4 Bxf1 17. Nxf1 Nb8 18. Bc3 e5 19. b4 exd4 20. Bxd4 Nc6 21. Bb2 Bf6 22. Bxf6 Qxf6 23. a3 Ne7 24. Ne3 Qb2 25. Bxd5 Nxd5 26. Nxd5 Rcd8 27. Ne7+ Kh8 28. Qb1 Qf6 29. Nf5 Rd2 30. Qe1 Rc2 31. Nd6 Qb2 32. Rd1 Re2 33. Qf1 Rc2 34. Nc4 Qf6 35. Rc1 Ra2 36. Qe1 a6 37. Ne5 Rc8 38. Rc3 Kg8 39. Rf3 Qe6 40. Re3 h6 41. Qb1 Rd8 42. Nd3 Qd5 43. Nb2 Kf8 44. a4 Rc8 45. a5 Rd8 46. h4 Rc8 47. Kh2 Qd2 48. Qf5 Rc7 49. Qf3 Rc8 50. Nd3 Kg8 51. Re7 Rf8 52. Rd7 Ra3 53. c6 Rc3 54. c7 Qc2 55. Qf4 Rxd3 56. c8=Q Qxc8 57. Rxd3 Qe6 58. Rd6 Qe2 59. Kg2 Rc8 60. Qf3 Qc4 61. Rb6 Re8 62. b5 axb5 63. a6 Qc5 64. Rb7 Rf8 65. a7 Qd4 66. Rxf7 Rd8 67. Rc7 b4 68. a8=Q Rxa8 69. Qxa8+ Kh7 70. h5 Qe5 71. Rc8 Qxh5 72. Rh8+ Kg6 73. Qe8+ Kf5 74. Rf8+ Qf7 75. Rxf7+ 1-0

Junior 4.6 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. Reb1 Nb6 19. a4 Nxa4 20. e5 Nxc3 21. Qxc3 Be7 22. Rxa7 Rb8 23. Bxc6 Bxc6 24. Rxb8 Qxb8 25. Rxe7 Qb6 26. Qxc4 Ra8 27. d5 exd5 28. Qf4 Be8 29. Qe3 d4 30. Qa3 Qc6 31. Ra7 Rc8 32. Qe7 h5 33. h3 Qc1+ 34. Nf1 Qe1 35. Rc7 Ra8 36. e6 Qxe6 37. Qc5 d3 38. Qd4 Qe2 39. Rc1 Ra2 40. Rc5 Ra4 41. Qc3 Ra2 42. Qd4 d2 43. Re5 d1=Q 44. Rxe8+ Qxe8 45. Qxd1 g6 46. Ne3 Qb8 47. h4 Qb2 48. Qf3 Qa1+ 49. Nf1 Qb1 50. Qc3 Ra1 51. Qc8+ Kh7 52. Qc4 Qb7 53. Qd3 Qb4 54. Qe2 Re1 55. Qd3 Qb7 56. Qc3 Rd1 57. Qc2 Qf3 58. Qc7 Qb3 59. Qf4 Kg8 60. Qc7 Qb5 61. Qc8+ Kh7 62. Qh3 Re1 63. Qg2 Qe2 64. Qh3 f5 65. Qg2 Qc4 66. f4 Re2 67. Qb7+ Kh6 68. Qa8 Qd4+ 69. Kh1 Qe4+ 70. Qxe4 fxe4 71. Kg1 e3 72. Nxe3 Rxe3 73. Kf2 Rd3 74. Kg2 g5 75. hxg5+ Kg6 76. Kh2 Rd4 77. Kh3 Kf5 78. g6 Kxg6 79. g4 Rxf4 80. Kg3 Rf7 81. Kh4 hxg4 82. Kxg4 0-1

DarkThought – Junior 5.0: [0 – 1] (Test Game, Nunn Position #7, December 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 dxe4 14. Nxe4 b5 15. Qe2 bxc4 16. Rad1 Re8 17. Rfe1 h6 18. Nc5 Nxc5 19. dxc5 Qc7 20. Qg4 Bf8 21. b4 Red8 22. Rxd8 Rxd8 23.

Bf1 Qd7 24. Qf4 Bb5 25. Bxc4 Bxc4 26. Qxc4 Qd5 27. Qa6 Qf3 28. Re3 Rd1+ 29. Be1 Qd5 30. a3 Be7 31. Qe2 Bg5 32. Re5 Qd4 33. h4 Bf6 34. Re3 Qa1 35. Kf1 Bd4 36. Rb3 Rc1 37. Qd2 e5 38. g4 Kh8 39. g5 h5 40. Rf3 Kg8 41. Rb3 a6 42. f3 Kf8 43. f4 e4 44. Rg3 Qb1 45. Rh3 Rd1 46. Qe2 Qc1 47. Qxe4 Rd2 48. Re3 Bxe3 49. Qxe3 Qc4+ 50. Kg1 Re2 51. Qc3 Qxf4 52. Qg3 Qxg3+ 53. Bxg3 Re3 54. Bd6+ Ke8 55. Bf4 Rxa3 56. Bd2 Rg3+ 57. Kf1 Rg4 58. Be1 Re4 59. Kf2 Rxh4 0-1

Junior 5.0 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, December 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Rb1 Nb6 17. a4 Rc7 18. a5 Nc8 19. Qa4 Nd6 20. Bf1 c5 21. d5 exd5 22. exd5 Qd7 23. Qa2 Rb7 24. Rbd1 Nb5 25. Be5 Nd4 26. Bxd4 cxd4 27. Bxc4 Bxc4 28. Qxc4 Rd8 29. Nf3 Qxd5 30. Qxd5 Rxd5 31. Rxd4 Rxd4 32. Nxd4 g6 33. Nc6 Kf8 34. a6 Rc7 35. Rc1 Ke8 36. Rc2 f6 37. Kg2 Rc8 38. Nd4 Rxc2 39. Nxc2 Kd7 40. f4 Kc6 41. f5 Kb6 42. Ne3 Kxa6 43. Nd5 Bc5 44. fxg6 hxg6 45. Nf4 Kb5 46. Kf1 a5 47. Ke2 Kc4 48. Kd2 a4 49. Kc2 a3 50. Ne2 f5 51. Nc1 g5 52. Nb3 Bb4 53. Nc1 f4 54. gxf4 gxf4 55. Kd1 f3 56. Na2 Ba5 57. Nc1 Kd4 58. Kc2 Ke3 59. Na2 f2 60. Kb3 Kd4 61. Ka4 f1=Q 0-1

DarkThought – MChess 5: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. exd5 cxd5 15. c5 b4 16. Bxb4 Bxf1 17. Nxf1 Bf6 18. Ne3 a5 19. Ba3 Nb8 20. f4 Nc6 21. Bb2 h5 22. Nc2 g6 23. Kh1 h4 24. g4 Bg7 25. Qd2 Qf6 26. Rf1 Qe7 27. Rf3 Rfe8 28. Bc3 Kh7 29. Rh3 Rh8 30. f5 Bf6 31. fxg6+ fxg6 32. a3 Bg5 33. Qe2 Ra8 34. b4 axb4 35. axb4 Ra2 36. b5 Na7 37. b6 Nc6 38. Qd1 Rf8 39. Qb1 Rfa8 40. Rf3 Bh6 41. Rf2 R8a4 42. Qb5 Qb7 43. Qe2 Qe7 44. Qe1 Ra8 45. Re2 Qd8 46. h3 Bf4 47. Rf2 e5 48. Qb1 exd4 49. b7 R8a6 50. Bxd4 Qb8 51. Qf1 Nxd4 52. Rxf4 Rxc2 53. Rf8 Ra1 54. Rxb8 Rxf1+ 55. Bxf1 Rb2 56. Bg2 Rb1+ 57. Kh2 Rb2 58. Kg1 Rb1+ 59. Kf2 Nc6 60. Rc8 Rxb7 61. Rxc6 Rb2+ 62. Kg1 Rb1+ 63. Kh2 Rb2 64. Rd6 Kg7 65. c6 Rc2 66. g5 Kf7 67. Kg1 Rc1+ 68. Kf2 Rc2+ 69. Kf1 d4 70. Bd5+ Ke8 71. Rxg6 d3 72. c7 Rc1+ 73. Kf2 Kd7 74. Rc6 Rxc6 75. Bxc6+ Kxc7 76. g6 Kxc6 77. g7 d2 78. Ke2 Kd7 79. Kd1 Kd6 80. g8=Q Ke7 81. Kxd2 1-0

MChess 5 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. e5 Bg5 19. f4 Be7 20. a4 Ba6 21. a5 Nb8 22. Ne4 Bb5 23. Rab1 Na6 24. Red1 Nc7 25. Nc5 Nd5 26. Be4 h5 27. Rdc1 h4 28. Bh7+ Kh8 29. Be4 Rb8 30. Rb2 Bxc5 31. dxc5 Nxc3 32. Qxc3 Qe7 33. Qe3 Rfd8 34. Rcb1 Rb7 35. Kg2 Rbd7 36. Rf2 Rd4 37. Qf3 Kg8 38. Bxc6 Rd3 39. Rxb5 Rxf3 40. Bxf3 a6 41. Rb6 Qxc5 42. gxh4 c3 43. Be4 g6 44. Bc2 Rd2 45. Rxd2 cxd2 46. Bb3 Qxa5 47. Rd6 Qb4 48. Bd1 Qxf4 49. h3 Qxh4 50. Bg4 Qg5 51. Rd3 a5 52. Kf2 a4 53. Bf3 Qxe5 54. Rxd2 a3 55. Ra2 f5 56. Re2 Qxe2+ 57. Bxe2 a2 58. Bf3 Kh7 59. Be2 e5 60. Kg2 a1=Q 61. Kf2 f4 62. h4 Qb2 63. Kf1 e4 64. Kf2 f3 65. h5 fxe2 0-1

DarkThought – MChess 7.1: [1/2 – 1/2] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. exd5 cxd5 15. c5 b4 16. Bxb4 Bxf1 17. Nxf1 Nb8 18. Bc3 Bg5 19. b4 Nd7 20. Qd3 Nf6 21. f4 Bh6 22. Ne3 g6 23. Kh1 Bg7 24. g4 Qd7 25. Qc2 Qc7 26. Rf1 a6 27. g5 Nh5 28. Qf2 f6 29. Qh4 fxg5 30. fxg5 Nf4 31. Bf3 Qc6 32. Bd1 Nh5 33. Bxh5 Rxf1+ 34. Nxf1 gxh5 35. Qxh5 e5 36. Qg4 Rf8 37. Ng3 Rf4 38. Qe2 exd4 39. Bd2 Rf7 40. a3 Qg6 41. h4 Qc2 42. h5 Qa2 43. Qe6 Qxd2 44. g6 Qd1+ 45. Kh2 hxg6 46. hxg6 Qd2+ 47. Kh1 Qh6+ 48. Kg2 Qd2+ 49. Kh1 Qd1+ 1/2-1/2

MChess 7.1 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Rb1 Nb6 17. a4 Rc7 18. a5 Nc8 19. Rb8 Rd7 20. Nf3 Bb5 21. Ne5 Bd6 22. Nxd7 Qxd7 23. Ra8 Qb7 24. Rxc8 Rxc8 25. Qc2 Be7 26. Rb1 Rd8 27. f4 Qd7 28. Kh1 Kh8 29. Qe2 Bf6 30. Rd1 Ba4 31. Rd2 Rb8 32. Bf1 Qc7 33. Kg1 Bb5 34. e5 Be7 35. Qh5 Ba3 36. Ra2 Bf8 37. Bg2 Rd8 38. Rd2 Qe7 39. Be4 g6 40. Qf3 Qc7 41. Qe2 Ba3 42. Ra2 Be7 43. Rd2 Rb8 44. Rb2 a6 45. Bg2 Rd8 46. Qd1 f5 47. Rd2 Bf8 48. Kh1 Qe7 49. Qe1 g5 50. fxg5 Qxg5 51. Re2 Be7 52. Rd2 Qh6 53. Qg1 Bg5 54. Re2 Qf8 55. Qe1 Qe7 56. Bb4 Qd7 57. Bc3 Qc7 58. Rf2 Qg7 59. Bf3 c5 60. dxc5 Rd3 61. Be2 Bc6+ 62. Kg1 Bd2 63. Qxd2 Rxd2 64. Bxd2 Qxe5 65. Bf3 Qa1+ 66. Kg2 Bxf3+ 67. Rxf3 Qb2 68. Rf2 c3 69. Bh6 c2 70. g4 c1=Q 71. Bxc1 Qxc1 72. gxf5 Qg5+ 73. Kf1 exf5 74. Rc2 Qd8 75. Kf2 Qxa5 76. Ke3 Qb4 77. Kd3 f4 78. Rc4 Qb3+ 79. Kd4 f3 80. c6 Qb6+ 81. Ke4 f2 82. c7 Qe6+ 83. Kd4 Qg4+ 84. Kd5 Qd7+ 85. Ke5 Qe8+ 86. Kd4 f1=Q 87. c8=Q Qd1+ 88. Kc3 Qc1+ 89. Kb3 Qxc8 90. Rxc8+ Qxc8 0-1

DarkThought – Mephisto Meisterschach: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. exd5 cxd5 15. c5 b4 16. Bxb4 Bxf1 17. Nxf1 a5 18. Bc3 Ra8 19. f4 Nf6 20. Nd2 Qc7 21. Kh1 Rfc8 22. Qf3 g6 23. g4 Ra6 24. g5 Nh5 25. Rf1 Ng7 26. Qe2 Ra7 27. Bh3 Bd6 28. Qf3 Bf8 29. Rf2 Ne8 30. Qg3 Nd6 31. Re2 a4 32. b4 Nb5 33. Ba1 Rb7 34. Nf3 Na3 35. Bb2 Nc4 36. a3 Qb8 37. Bc1 Rbc7 38. Ne5 Nd6 39. Bb2 Qb5 40. Qf3 Ne4 41. Qe3 Bg7 42. Ng4 Re7 43. Bg2 f5 44. gxf6 Nxf6 45. Ne5 Rf8 46. Bf3 Nd7 47. Nd3 Nb8 48. Bg4 Rf6 49. Re1 Nc6 50. Be2 Qb7 51. Ne5 Nxe5 52. fxe5 Rf8 53. Qh3 Rf4 54. b5 Qa8 55. Bg4 Qe8 56. c6 Kh8 57. Bc3 Qc8 58. Bd1 Ref7 59. Rg1 Kg8 60. Bg4 Re7 61. Bb4 Re8 62. Qc3 Bf8 63. Bd6 Rf7 64. b6 Kh8 65. c7 Rf2 66. Qd3 Bxd6 67. exd6 Qd7 68. b7 Rff8 69. Qg3 h6 70. Bh5 Qg7 71. d7 Qxd7 72. Qe5+ Qg7 73. Qxg7+ Kxg7 74. Bxg6 Kf6 75. Bxe8 Rxe8 76. c8=Q Rxc8 77. bxc8=Q 1-0

Mephisto Meisterschach – DarkThought: [0 – 1] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. a4 Ba6 19. Rad1 Qc7 20. Bb2 Nb6 21. Ba3 Rfe8 22. e5 Be7 23. Bxe7 Rxe7 24. Ne4 Rd8 25. Bf1 Nd7 26. Ng5 Nf8 27. Bxc4 Bxc4 28. Qxc4 Red7 29. Ne4 Ng6 30. Nd6 Ne7 31. Re4 Nc8 32. Nxc8 Rxc8 33. Rb1 Rd5 34. Rh4 Qd7 35. Rf4 Rd8 36. Qc3 h5 37. Rb4 c5 38. dxc5 Rd3 39. Qc4 Qc6 40. Re4 Rd1+ 41. Kg2 R1d5 42. Qb5 Qxc5 43. Qxc5 Rxc5 44. Rb7 a5 45. h4 Rdc8 46. Rf4 R8c7 47. Rxc7 Rxc7 48. Kf3 Rc3+ 49. Ke2 Rc2+ 50. Kd3 Rc5 51. Re4 Kh7 52. Re1 Rd5+ 53. Kc4 Rd2 54. Kb5 Rxf2 55. Re3 Kg6 56. Kxa5 Rb2 57. Ka6 Rb1 58. a5 Kf5 59. Rf3+ Kg6 60. Ka7 f6 61. exf6 gxf6 62. a6 e5 63. Ka8 e4 64. Rc3 Rb5 65. Re3 Kf5 66. a7 Ke5 67. Rc3 Kd6 68. Ra3 f5 69. Rc3 Kd7 70. Rc2 Rb3 71. Rc5 e3 72. Rxf5 Kd6 73. Rf4 e2 74. Re4 Rb2 75. Re3 Kc6 76. Re6+ Kd5 77. Re7 Kc4 78. Re8 Kd3 79. Rd8+ Ke3 80. Re8+ Kf2 81. Rf8+ Kg1 82. Re8 Kg2 83. Re6 Kf2 84. Rf6+ Ke1 85. Rf8 Rb3 86. Rb8 Kf2 87. Rf8+ Ke3 88. Re8+ Kd2 89. Rd8+ Rd3 90. Re8 e1=Q 91. Rxe1 Kxe1 92. Kb7 Rd7+ 93. Kb6 Rxa7 94. Kxa7 Ke2 95. Kb6 Kf3 0-1

DarkThought – Mephisto Shredder: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 Qc7 14. Re1 Rfe8 15. e5 Nf8 16. Kh1 c5 17. cxd5 exd5 18. Rc1 Ne6 19. Bxd5 cxd4 20. Bxe6 Qb7+ 21. Ne4 Rxc3 22. Rxc3 dxc3 23. Bd5 Qc7 24. Qh5 Rf8 25. Nf6+ Bxf6 26. exf6 gxf6 27. Be4 f5 28. Qg5+ Kh8 29. Qf6+ Kg8 30. Qxf5 f6 31. Kg1 Bb7 32. Bc2 Kh8 33. Re3 Qg7 34. h4 Rd8 35. Qh5 Qd7 36. Kh2 Rg8 37. Bf5 Qg7 38. Rxc3 Ba6 39. Qd1 Re8 40. Re3 Bb5 41. Qd6 Rxe3 42. fxe3 Qf7 43. e4 Kg7 44. e5 a6 45. e6 Qh5 46. g4 Qxh4+ 47. Kg2 Qh6 48. a4 Bc6+ 49. Qxc6 Qd2+ 50. Kf3 Qd1+ 51. Ke3 Qe1+ 52. Kd3 Qd1+ 53. Kc3 Qc1+ 54. Bc2 Qa1+ 55. Kc4 Qf1+ 56. Kd5 Qg2+ 57. Kd6 Qg3+ 58. Kd7 Qxg4 59. Kd8 Qd4+ 60. Qd7+ Qxd7+ 61. exd7 Kf7 62. Kc7 f5 63. d8=Q 1-0

Mephisto Shredder – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. e5 Bg5 19. a4 Bxd2 20. Bxd2 Ba6 21. Rad1 Qc7 22. Be4 h6 23. f4 Rfd8 24. f5 Nb6 25. fxe6 fxe6 26. Bb4 Nd5 27. Bc5 Kh8 28. Bg2 Qf7 29. Rd2 Rb8 30. Rf2 Qh5 31. Bxa7 Rb3 32. Bf1 Rc3 33. Qd2 Ra8 34. Bc5 Rb3 35. Qc2 Qg4 36. Bg2 Rd3 37. Qc1 Rb3 38. Be4 Qg5 39. Qxg5 hxg5 40. Ref1 Rbb8 41. Bd6 Rd8 42. Rc1 Ra7 43. h3 Rda8 44. Kh2 Rb7 45. Rcf1 Rg8 46. Rf8 Rb2+ 47. Kg1 g6 48. Bxg6 c3 49. Rxg8+ Kxg8 50. Rc1 Rd2 51. Bc5 Bd3 52. Bxd3 Rxd3 53. Kf2 Rd2+ 54. Kf3 Rd3+ 55. Kg4 c2 56. Kh5 Rxg3 57. Kh6 Rxh3+ 58. Kxg5 Rg3+ 59. Kh4 Rc3 60. a5 Nc7 61. Kg5 Kf7 62. Bb4 Rc4 63. Bd6 Nb5 64. Bc5 Nc7 65. Kf4 Rc3 66. Bd6 Na6 67. Kg5 Rc4 68. Kf4 c5 69. Ke3 Ke8 70. dxc5 Nxc5 71. Bxc5 Rxc5 72. Kd4 Rxa5 73. Rxc2 Ra1 74. Rd2 Ke7 75. Rd3 Ra4+ 76. Ke3 Ra5 77. Ke4 Ra4+ 78. Rd4 Rxd4+ 79. Kxd4 Kd8 80. Ke4 Kc7 81. Ke3 Kc6 82. Kd4 Kb5 83. Kd3 Kb6 84. Kc4 Kc6 1/2-1/2

DarkThought – Nimzo 98: [1 – 0] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. exd5 cxd5 15. c5 b4 16. Bxb4 Bxf1 17. Nxf1 e5 18. Rc1 exd4 19. Qxd4 Nb8 20. Qd2 Nc6 21. Ba3 Bg5 22. f4 Bf6 23. Kh1 d4 24. b4 Ne7 25. g4 h6 26. Ng3 Nd5 27. Bb2 d3 28. Nf5 Bxb2 29. Qxb2 Nf6 30. g5 hxg5 31. fxg5 d2 32. Rd1 Re8 33. Rxd2 Re1+ 34. Bf1 Qe8 35. Kg1 Qe6 36. Rf2 Ne8 37. Qd2 a5 38. a3 Rc7 39. c6 axb4 40. axb4 Ra7 41. b5 Raa1 42. Qf4 Rab1 43. h4 Re4 44. Qf3 Nc7 45. Kh2 Ree1 46. Qc3 Ne8 47. Qd3 Red1 48. Qf3 Re1 49. Kg2 Rb4 50. h5 Re5 51. Kh2 Rc5 52. g6 fxg6 53. hxg6 Nf6 54. Qg3 Ng4+ 55. Kg1 Nf6 56. Kh1 Qe4+ 57. Kh2 Qe8 58. Qc7 Qf8 59. Kh1 Rxf5 60. Qf7+ Qxf7 61. gxf7+ Kf8 62. Rxf5 Rb1 63. c7 Rc1 64. Rxf6 gxf6 65. b6 Kxf7 66. b7 Rxc7 67. b8=Q Rc1 68. Qb3+ Kg7 69. Kg2 Rxf1 70. Qg3+ Kf7 71. Kxf1 1-0

Nimzo 98 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. Reb1 Nb6 19. a4 Nxa4 20. Rxa4 Bxa4 21. Qxa4 Bxd4 22. Qxc4 c5 23. Nf3 Bxc3 24. Qxc3 Qd7 25. Ra1 Rc7 26. Bf1 Rb8 27. Be2 Qc6 28. Bd3 Rb4 29. Ra6 Rb1+ 30. Kg2 Rb6 31. Ne5 Qb7 32. Ra3 Rd6 33. Qc2 f6 34. Nc4 Rd8 35. Kg1 Rcd7 36. e5 Kh8 37. Bf1 fxe5 38. Nxe5 Rd5 39. Nd3 Qb6 40. Bg2 c4 41. Qxc4 Rd4 42. Qc5 Qxc5 43. Nxc5 Rc4 44.

Nd3 g5 45. Bf1 Rc7 46. Ra6 Re7 47. f3 Rd5 48. Kf2 Rb5 49. Bh3 Rb6 50. Ra5 h6 51. Ke3 Rc7 52. f4 Rc2 53. Rxa7 Rxh2 54. Bg4 h5 55. Bf3 Rb5 56. Ne5 Kg8 57. Rb7 Rxb7 58. Bxb7 h4 59. gxh4 gxf4+ 60. Kxf4 Rxh4+ 61. Kg5 Rb4 62. Bc6 Kg7 63. Ba8 Rb1 1/2-1/2

DarkThought – Nimzo 99a: [1 – 0] (Test Game, Nunn Position #7, January 1999)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 dxe4 14. Nxe4 b5 15. Qe2 bxc4 16. Rad1 Nb6 17. Nc5 Bxc5 18. dxc5 Nd5 19. Ba1 Qg5 20. bxc4 Nf6 21. Bd4 Qf5 22. f4 Rcd8 23. Be5 Nd5 24. Rc1 Rd7 25. Rfd1 Rfd8 26. Be4 Qh3 27. Qe1 f5 28. Bf3 Ne7 29. Rd6 Bc8 30. Qa5 Kf7 31. Qxd8 Rxd8 32. Rxd8 Qh6 33. Bd6 Qf6 34. Bh5+ g6 35. Be5 gxh5 36. Bxf6 Kxf6 37. Rb1 a5 38. Rb8 Ba6 39. Rd7 Ng6 40. Rd4 e5 41. Rd6+ Kg7 42. Rxc6 Bxc4 43. Rd6 exf4 44. Rb7+ Bf7 45. gxf4 Kf8 46. c6 Be8 47. c7 Ne7 48. Rf6+ Kg8 49. Re6 Kf8 50. Rxe7 Kxe7 51. c8=Q+ Kd6 52. Qxe8 1-0

Nimzo 99a – DarkThought: [1 – 0] (Test Game, Nunn Position #7, January 1999)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. e5 Bg5 19. a4 Bxd2 20. Bxd2 Ba6 21. Be4 f5 22. Bf3 Kh8 23. Rab1 Nb6 24. Bb4 Rf7 25. Bc5 g5 26. Be2 Rd7 27. a5 Nd5 28. Ra1 g4 29. Rec1 Rb8 30. Bxc4 Bb5 31. Bd6 Ra8 32. a6 Qb6 33. Qd3 Re8 34. Rcb1 Nc7 35. Qe3 Rg7 36. Bxc7 Rxc7 37. Qh6 Qxd4 38. Qf6+ Rg7 39. Bxe6 Qc5 40. Rd1 Qe7 41. Bxf5 Be2 42. Re1 Qxe5 43. Qxc6 Rf8 44. Rac1 Qxf5 45. Rxe2 Rd7 46. Rce1 Rdf7 47. Qc4 Rd7 48. Qc3+ Kg8 49. Qb3+ Rdf7 50. Rd1 Kh8 51. Qb4 Rg7 52. Rd4 Rc8 53. Rde4 Qd7 54. h4 gxh3 55. Re7 Qc6 56. Qb7 Qg2+ 57. Qxg2 Rc1+ 58. Qf1 h2+ 59. Kxh2 Rxf1 60. Kg2 Ra1 61. Rxg7 Kxg7 62. Re7+ Kg6 63. Rxa7 Ra2 64. Ra8 Kg7 65. a7 Ra1 66. f4 Ra2+ 67. Kh3 Ra1 68. f5 Rh1+ 69. Kg4 Ra1 70. f6+ Kf7 71. Rh8 Ra4+ 72. Kg5 Ke6 73. a8=Q Rxa8 74. Rxa8 1-0

DarkThought – Rebel 8: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 dxc4 14. Nxc4 c5 15. d5 exd5 16. Qxd5 Bf6 17. Bxf6 Nxf6 18. Qf5 Bxc4 19. bxc4 g6 20. Qg5 Ne8 21. Qxd8 Rxd8 22. Rfd1 Nc7 23. a4 Rd4 24. Rxd4 cxd4 25. a5 Rd8 26. axb6 axb6 27. Kf1 Ne6 28. e5 Rd7 29. Bd5 Nc7 30. Bc6 Re7 31. Ra7 Kg7 32. Rb7 g5 33. f3 Kf8 34. Kf2 Ne6 35. Rxb6 Nc5 36. f4 gxf4 37. gxf4 Re6 38. Rb8+ Kg7 39. Bd5 Re7 40. Rc8 Nd3+ 41. Kf3 Nc1 42. Rb8 Ra7 43. Ke4 d3 44. Rb2 Re7 45. Ke3 Ne2 46. Rb3 Nc1 47. Rc3 Na2 48. Ra3 Nc1 49. c5 d2 50. Bf3 Rc7 51. Rc3 Na2 52. Rc4 Nc1 53. Bd1 Na2 54. Kxd2 Nb4 55. Rxb4 Rxc5 56. Rb7 Rd5+ 57. Kc1 Rd4 58. f5 Rc4+ 59. Kb1 Rc5 60. e6 Rxf5 61. e7 Re5 62. Ba4 Re1+ 63. Kc2 Rxe7 64. Rxe7 Kf8 65. Ra7 h6 66. Bb3 f6 67. Rf7+ Ke8 68. Rxf6 h5 69. Rf7 h4 70. Kc3 Kd8 71. Kb4 Ke8 72. Kc5 Kd8 73. Be6 Ke8 74. Kd6 h3 75. Rf1 Kd8 76. Rf8# 1-0

Rebel 8 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Rb1 Nb6 17. f4 Bb5 18. Qc2 Qc7 19. Nf3 Rfd8 20. Bh3 Rb8 21. Ba5 Qd6 22. Qc3 Qa3 23. Qxa3 Bxa3 24. Bg4 Rb7 25. Kf2 Ba4 26. Re2 Be7 27. Rd2 c5 28. d5 exd5 29. exd5 Bf6 30. Ne5 Bxe5 31. fxe5 Re7 32. Bd1 Bxd1 33. Rdxd1 Rxe5 34. Bxb6 axb6 35. Rxb6 f6 36. d6 c3 37. Rc6 Re6 38. Rxc5 Rexd6 39. Rxd6 Rxd6 40. a3 Rd2+ 41. Kf3 Rxh2 42. Rxc3 Kf7 43. Rc7+ Kg6 44. a4 Ra2 45. Rc4 h5 46. Rb4 Ra3+ 47. Kf2 Ra1 48. Kf3 Kh6 49. Rf4 g6 50. Kg2 Kg7 51. Rh4 Kf7 52. Kf3 Ke6 53. Re4+ Kd6 54. Rb4 Ra3+ 55. Kf2 g5 56. Rb6+ Ke5 57. Rb4 Ra2+ 58. Ke3 Kf5 59. Rc4 Kg6 60. Rb4 g4 61. Rb1 Rxa4 62. Kf2 h4 63. gxh4 Kh5 64. Rb6 f5 65. Rb5 Rf4+ 66. Kg3 Rf3+ 67. Kg2 Kxh4 68. Ra5 f4 69. Ra8 Rc3 70. Rh8+ Kg5 71. Rg8+ Kf5 72. Rf8+ Ke4 73. Re8+ Kd3 74. Ra8 Rc2+ 75. Kg1 f3 76. Rg8 Ke3 77. Rxg4 Rc1+ 78. Kh2 f2 79. Rg3+ Ke4 80. Rg4+ Kf5 81. Rg8 f1=Q 82. Rf8+ Kg5 83. Rxf1 Rxf1 0-1

DarkThought – Rebel 9: [1 – 0] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 f5 14. exd5 exd5 15. Qe2 Nf6 16. Rae1 Rc7 17. Bh3 g6 18. Bg2 Re8 19. Kh1 Bd6 20. Qd1 Rce7 21. a4 Qc7 22. a5 bxa5 23. Rxe7 Bxe7 24. Qa1 Bd8 25. Qa4 f4 26. gxf4 Bb7 27. Nf3 Ne4 28. Be1 Qxf4 29. Bxa5 dxc4 30. Bxd8 Rxd8 31. bxc4 a6 32. Qb3 Bc8 33. Qe3 Qxe3 34. fxe3 c5 35. Ne5 Bf5 36. Kg1 Nc3 37. Bf3 Be4 38. dxc5 Bxf3 39. Rxf3 Re8 40. Nd7 Rc8 41. Rf6 Rc7 42. c6 Kg7 43. Rd6 Ne4 44. Rd4 Nc3 45. Nb8 Kf6 46. Rd7 Rxd7 47. cxd7 Ke7 48. Kf2 a5 49. Nc6+ Kxd7 50. Nxa5 Na4 51. Nb3 Nb2 52. c5 Kc6 53. Kf3 Kb5 54. Kf4 Nc4 55. e4 Kb4 56. e5 g5+ 57. Kf5 Kxb3 58. c6 Kb4 59. c7 Nb6 60. e6 Nd5 61. c8=N Nc7 62. Nd6 Kc5 63. Ne4+ Kc6 64. Ke5 Nd5 65. Nxg5 h6 66. Nf3 Ne3 67. Nd4+ Kc7 68. Kf6 Ng4+ 69. Ke7 Ne5 70. Nf5 h5 71. h3 Nc4 72. Kf8 Ne5 73. e7 Ng6+ 74. Kf7 Nxe7 75. Kxe7 Kc6 76. Ke6 Kb6 77. Ng7 h4 78. Nf5 Kc5 79. Nxh4 Kd4 80. Ng6 Ke3 81. h4 Kf3 82. h5 Ke4 83. Ne7 Kd3 84. h6 Kd2 85. h7 Kc2 86. h8=Q 1-0

Rebel 9 – DarkThought: [0 – 1] (Test Game, Nunn Position #7, March 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Rb1 Nb6 17. Qc2 Qd7 18. Nf3 Rfd8 19. Ne5 Qc7 20. Red1 Bb5 21. Qd2 Rb8 22. f4 f6 23. Nf3 Ba4 24. Rf1 c5 25. Bh3 Bd7 26. Qe3 cxd4 27. Nxd4 e5 28. Be6+ Kh8 29. fxe5 fxe5 30. Rf7 Qc5 31. Nf5 Qxe3+ 32. Nxe3 Bc5 33. Bxd7 Bxe3+ 34. Kg2 Bd4 35. Bd2 c3 36. Bg5 Rxd7 37. Rxb6 axb6 38. Rxd7 h6 39. Bc1 Rf8 40. a4 Rf2+ 41. Kh3 Ra2 42. Rc7 Kh7 43. Kg4 Ra1 44. Be3 Re1 45. Bf2 Rc1 46. Rf7 Kg6 47. Rf8 h5+ 48. Kh3 c2 49. Rc8 Bxf2 50. Rc6+ Kh7 51. Rc3 Bc5 52. a5 Rg1 53. axb6 Be7 54. Rc7 Bd8 55. Rc8 g5 56. Rxd8 c1=Q 57. Rd7+ Kg6 58. Rd6+ Kf7 59. Rd7+ Ke8 60. Rf7 Kxf7 61. b7 Qf1# 0-1

DarkThought – Shredder 2: [1 – 0] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 Qc7 14. Re1 Rfe8 15. e5 Bb7 16. Bb2 c5 17. Rc1 dxc4 18. Bxb7 Qxb7 19. Nxc4 b5 20. Nd6 Bxd6 21. exd6 c4 22. bxc4 bxc4 23. Ba3 Qb5 24. Qc2 Rc6 25. Re3 Rec8 26. Qd2 Qd5 27. Qc3 Rd8 28. f3 Rb8 29. Re2 Qg5 30. Kh1 Qf5 31. g4 Qd5 32. h3 Rb5 33. Re4 Ra5 34. Re3 h5 35. Qb2 Rb5 36. Qc3 Qg5 37. Kg2 Qh6 38. Re2 a6 39. Qc2 Ra5 40. Qc3 Qg5 41. Rec2 Rd5 42. Rb1 Rb5 43. Re1 hxg4 44. hxg4 Nb6 45. Bc5 Rbxc5 46. dxc5 Qxc5 47. d7 Rd6 48. Qe3 Qc7 49. Qa3 Nxd7 50. Re4 Nb6 51. Qxa6 Qc5 52. Qa7 Rd1 53. Qb8+ Nc8 54. Kh3 Rh1+ 55. Kg3 Rg1+ 56. Rg2 Rd1 57. Re5 Rd5 58. Re1 c3 59. Rh1 Rd2 60. Rxd2 cxd2 61. Qf4 Qd5 62. Rd1 Qxa2 63. Qc7 Na7 64. Qd8+ Kh7 65. Rh1+ Kg6 66. Rh5 Qd5 67. Rxd5 exd5 68. Qxd5 Kh7 69. Qd3+ g6 70. Kf4 Nb5 71. Qxd2 Kg7 72. Qb2+ Kf8 73. Qxb5 1-0

Shredder 2 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #7, June 1998)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. g3 Ba6 5. b3 Bb4+ 6. Bd2 Be7 7. Bg2 c6 8. Bc3 d5 9. Ne5 Nfd7 10. Nxd7 Nxd7 11. Nd2 O-O 12. O-O Rc8 13. e4 b5 14. Re1 dxc4 15. bxc4 bxc4 16. Qa4 Bb5 17. Qc2 Bf6 18. e5 Bg5 19. Ne4 Be7 20. Nd6 Bxd6 21. exd6 Nf6 22. Bb4 Qd7 23. a4 Ba6 24. Bc5 Ne8 25. Qc3 Nxd6 26. Qa5 Bb7 27. Qb4 a5 28. Qxa5 Rfd8 29. Rab1 Ra8 30. Qb6 Rdb8 31. Qb4 Ne8 32. Qxc4 Nf6 33. Ra1 Nd5 34. Qc2 Ra5 35. Be4 g6 36. Bg2 Rba8 37. Bf3 Kh8 38. Bd1 Qd8 39. Qb3 Bc8 40. Qf3 Qd7 41. Bb3 Bb7 42. Rac1 R5a6 43. Rc2 Kg8 44. Rb2 Bc8 45. Rbb1 Qd8 46. Bc2 h5 47. Bb3 Nb6 48. Rbc1 Nxa4 49. Bc4 Nxc5 50. dxc5 R6a7 51. Qxc6 Bb7 52. Qd6 Qxd6 53. cxd6 Rd8 54. Red1 Bf3 55. Rd3 Be4 56. Rd4 Bd5 57. f4 Ra4 58. Kf2 Bxc4 59. Rdxc4 Rxc4 60. Rxc4 Rxd6 61. Ke3 Kg7 62. Rc7 Rb6 63. h4 Rb3+ 64. Kf2 Kf8 65. Rc8+ Ke7 66. Rc7+ Ke8 67. Kg2 Rd3 68. Kf2 Ra3 69. Kg2 Rb3 70. Ra7 Rb1 71. Kf3 Rh1 72. Ke4 Kf8 73. Ke5 Kg7 74. Ke4 Rb1 75. Ke3 Rf1 76. Ke2 Rh1 77. Kf3 Rg1 78. Kf2 Rc1 79. Ke3 Rd1 80. Rb7 Rd8 81. Ra7 Kf8 82. Ke4 Rb8 83. Kf3 Kg7 84. Ra5 Rb3+ 85. Kg2 Rb2+ 86. Kf3 Kf6 87. Ke3 Rg2 88. Kf3 Rd2 89. Ke4 Rc2 90. Ke3 Ke7 91. Ra7+ Kf8 92. Ra3 Ke7 93. Ra7+ Ke8 94. Kd4 Rd2+ 95. Ke4 Kf8 96. Ke3 Rd1 97. Rc7 Ke8 98. Ke4 Rd5 99. Ra7 Rd7 100. Ra3 Ke7 101. Ra5 Rb7 102. Ke3 Rb3+ 103. Kf2 Rd3 104. Kg2 Kd7 105. Ra7+ Ke8 106. Ra8+ Rd8 107. Ra3 Rd7 108. Kf3 f6 109. Ke4 Ke7 110. Rb3 Kf7 111. Rb5 Kf8 112. Rb6 Re7 113. Ra6 Kf7 114. Ra5 Rb7 115. Ke3 Ke7 116. Ra3 Rd7 117. Ke4 Rd5 118. Ra7+ Ke8 119. Ra6 f5+ 120. Kf3 Kf7 121. Ra7+ Kf6 122. Ra6 Rd3+ 123. Kf2 Rc3 124. Rb6 Rc1 125. Ra6 Rc2+ 126. Ke3 Rg2 127. Kf3 Rd2 128. Ra8 Rd3+ 129. Kf2 Ke7 130. Rg8 Kf7 131. Rb8 Ra3 132. Kg2 Kf6 133. Rf8+ Ke7 134. Rc8 Rd3 135. Rg8 Kf6 136. Rf8+ Kg7 137. Ra8 Kf7 138. Kf2 Rc3 139. Rb8 Rc1 140. Rb7+ Kf6 141. Rb6 Rh1 142. Ra6 Rd1 143. Rb6 Ke7 144. Rb7+ Rd7 145. Rb8 Rd2+ 146. Ke3 Rg2 147. Kf3 Rg1 148. Rg8 Kf6 149. Rf8+ Kg7 150. Rb8 Rh1 151. Ra8 Kf6 152. Rf8+ Ke7 153. Rg8 Kf7 154. Ra8 Rg1 155. Ra7+ Kf6 156. Rb7 Rh1 157. Ra7 Rd1 158. Ra6 Rg1 159. Kf2 Rh1 160. Ke3 Rb1 161. Rc6 Rb2 162. Ra6 Rc2 163. Rb6 Rg2 164. Kf3 Rc2 165. Ke3 Ra2 166. Kf3 Ra5 167. Rc6 Rb5 168. Ke2 Rb3 169. Kf2 Rb1 1/2-1/2

Games Played by DarkThought from Nunn Position #8 (ECO E98)

DarkThought – Chessmaster 4000 Turbo: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 c5 12. dxc6 Nxc6 13. Nc2 f4 14. Bf2 Qg5 15. Kh1 Be6 16. Qd3 Rd8 17. Rfd1 Rf7 18. Nb5 b6 19. Qa3 Bf8 20. Qa4 Rfd7 21. Rd2 Bg7 22. Rad1 Qe7 23. a3 Rc8 24. b3 Rdd8 25. Nb4 Nxb4 26. axb4 a6 27. Nc3 Qb7 28. Nd5 Bxd5 29. Rxd5 Rc6 30. Bh4 Rb8 31. Be1 Ra8 32. Kg1 Kh8 33. Bh4 Rb8 34. Kf1 Kg8 35. Qa2 Rbc8 36. Qd2 Qf7 37. Ra1 Qb7 38. Kg1 Ra8 39. Ra3 Rac8 40. Bf1 Ra8 41. Qa2 Rcc8 42. Qa1 Qc6 43. Kh1 Nc7 44. Rd1 Re8 45. Ra2 Re6 46. b5 Qb7 47. bxa6 Rxa6 48. Rxa6 Nxa6 49. c5 Nxc5 50. b4 Re8 51. Rxd6 g5 52. Bxg5 Ne6 53. Bc4 Kf7 54. Qc3 Kg6 55. Bxe6 Rxe6 56. Rxe6+ Kxg5 57. Qd2 Bf6 58. Qd6 Qf7 59. Qxb6 Qf8 60. b5 Bg7 61. Qc7 Kh5 62. Rd6 Bf6 63. Qxh7+ Qh6 64. Qxh6+ Kxh6 1-0

Chessmaster 4000 Turbo – DarkThought: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. Qb3 fxe4 12. Nxe4 Nf6 13. Nxf6+ Bxf6 14. Bd3 Nf5 15. Nf3 Nxe3 16. fxe3 Kh8 17. Nd2 Bg5 18. Rae1 Rxf1+ 19. Bxf1 Bh4 20. g3 Bf6 21. Bg2 Bg7 22. Ne4 a5 23. c5 b6 24. cxb6 cxb6 25. Qa3 Bf8 26. Rc1 Bf5 27. Rc6 Bd7 28. Rc2 Rc8 29. Rc3 b5 30. Rxc8 Qxc8 31. Qxa5 Qc1+ 32. Bf1 Qxe3+ 33. Nf2 Kg8 34. Qc7 Bg4 35. Qa5 Bf3 36. Qxb5 Qd2 37. Qd3 Qxd3 38. Nxd3 Bxd5 39. Nb4 Be6 40. Bg2 Bh6 41. Nd5 Kg7 42. Kf2 Bc1 43. b4 Ba3 44.

b5 Bd7 45. Nc7 Bc5+ 46. Kf3 d5 47. a4 d4 48. Ke2 Bb6 49. Na8 Bc5 50. Kd3 Bd6 51. Nb6 Be6 52. Nd5 Bxd5 53. Bxd5 Bc7 54. Kc4 Ba5 55. Kc5 Kf6 56. b6 d3 57. Kc6 d2 58. Bb3 Bxb6 59. Kxb6 Kf5 60. a5 Kg4 61. a6 Kh3 62. g4 Kxh2 63. a7 Kh3 64. a8=Q 1-0

DarkThought – Comet A.90: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Nf6 12. Nd3 b6 13. Bg5 h6 14. Be3 Bd7 15. Kh1 Kh7 16. Rb1 c6 17. dxc6 Nxc6 18. Nf2 f4 19. Bc1 Nd4 20. b3 Qc7 21. Bb2 a6 22. Bd3 Qc5 23. Ne2 Ne6 24. Rc1 Rfc8 25. Bb1 a5 26. a4 Rab8 27. Rc2 Ne8 28. Rd2 Qc7 29. Ba3 Ra8 30. Bc2 Bc6 31. Qa1 Nc5 32. Bb2 Na6 33. Rfd1 Nb4 34. Bb1 Na6 35. Nc3 Qe7 36. Qa3 Qh4 37. Kg1 Nc5 38. Bc2 Bf8 39. Qa1 Be7 40. Nd5 Bxd5 41. Rxd5 Rc6 42. R5d2 Nf6 43. Kh1 Rac8 44. Rf1 R6c7 45. Qd1 Rc6 46. Ba3 R6c7 47. Qe2 Rd7 48. Bb2 Kg7 49. Rfd1 Qh5 50. Nd3 Rb7 51. Qe1 Ne6 52. Nf2 Rd7 53. Kg1 Ng5 54. Nd3 Rdc7 55. Qf2 Rc6 56. Kh1 Kh7 57. Qe2 R6c7 58. Nc1 Ne6 59. Na2 Rc5 60. Qd3 R5c7 61. Nc3 Nd4 62. Ne2 Ne6 63. Qc3 Nc5 64. Ba3 Rc6 65. Qa1 Ne8 66. Nc3 Nc7 67. Qc1 N7e6 68. Nd5 Bd8 69. Bb2 Ng5 70. Nc3 Be7 71. Re2 Rd8 72. Qd2 Rd7 73. Qd5 Rc8 74. Ba3 Kg7 75. Qd2 Kh7 76. Rf2 Nge6 77. Nd5 Bd8 78. Bb2 Rf7 79. Rff1 Rb7 80. Qe2 Bh4 81. Kg1 Rf8 82. Qd2 Bg3 83. h3 Qh4 84. Kh1 Rc8 85. Qe2 Rd8 86. Rd2 Rbb8 87. Rb1 Qg5 88. b4 Nd7 89. Bc3 Rdc8 90. bxa5 bxa5 91. Rb5 Rxb5 92. cxb5 Qd8 93. Rd1 Ra8 94. Qd2 Ndc5 95. b6 Nb7 96. Bd3 Nec5 97. Bb5 Qf8 98. Bc6 Ra6 99. Bxb7 Nxb7 100. Qd3 Ra8 101. Qc4 Rc8 102. Qa6 Rb8 103. Bxa5 Qc8 104. Bc3 Ra8 105. Qb5 Qf8 106. a5 Nc5 107. Nc7 Rd8 108. a6 Qe7 109. a7 Bf2 110. Qc6 Nb3 111. Ne6 Bxb6 112. Nxd8 Bxa7 113. Rxd6 Nd4 114. Bxd4 Bb8 115. Rxg6 Qe6 116. Qxe6 1-0

Comet A.90 – DarkThought: [0 – 1] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nd3 Bd7 13. c5 c6 14. dxc6 Nxc6 15. Qb3 Nd4 16. Qxb7 Bc6 17. Qa6 Nc7 18. Qc4 d5 19. exd5 Bxd5 20. Qa4 Nxe2+ 21. Nxe2 Bxf3 22. Rxf3 Qxd3 23. Nc3 e4 24. Rh3 Rfd8 25. Rd1 Qa6 26. Qb3 Ne6 27. Rxd8+ Rxd8 28. c6 Qxc6 29. Bxa7 Qd7 30. Be3 f4 31. Bf2 Ng5 32. Rh4 Qd2 33. Kf1 f3 34. gxf3 Qd3+ 35. Kg2 Qxf3+ 36. Kg1 e3 37. Qc2 Bd4 38. Qf5 gxf5 39. Rh5 Qxf2+ 40. Kh1 Qf1# 0-1

DarkThought – Crafty 16.4: [1 – 0] (Test Game, Nunn Position #8, January 1999)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 c6 12. dxc6 Nxc6 13. Nc2 f4 14. Bf2 Be6 15. Qd2 Qg5 16. Kh1 Rf7 17. Rad1 Rd7 18. Nb5 Rc8 19. Bxa7 Nxa7 20. Nxa7 Rxc4 21. Bxc4 Bxc4 22. Rf2 Bxa2 23. Qa5 Bb3 24. Qb5 Be6 25. Nd4 Nc7 26. Nxe6 Nxb5 27. Nxg5 Nxa7 28. Rc2 Bf8 29. Ra1 Nc6 30. Ra8 Re7 31. b4 h6 32. b5 hxg5 33. bxc6 bxc6 34. Rxc6 Rb7 35. Rac8 Rb1+ 36. Rc1 Rxc1+ 37. Rxc1 Kf7 38. Rc6 Ke6 39. Kg1 Be7 40. Kf2 Bd8 41. Ra6 Bc7 42. Ke2 Bd8 43. Kd3 Bf6 44. Rb6 Bd8 45. Rb1 Ba5 46. Rb8 Be1 47. Rg8 Kf7 48. Rh8 Ke6 49. Kc4 Bf2 50. Kb5 Bd4 51. Kc6 Bc5 52. Re8+ Kf7 53. Rxe5 dxe5 54. Kxc5 Ke6 55. g4 fxg3 56. hxg3 Ke7 57. Kd5 g4 58. fxg4 Kf6 59. g5+ Kxg5 60. Ke6 Kg4 61. Kxe5 Kxg3 62. Kf6 Kg4 63. e5 g5 64. e6 Kf4 65. e7 g4 66. e8=Q 1-0

Crafty 16.4 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #8, January 1999)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. exf5 Nxf5 12. Qd3 Kh8 13. Nc2 Qh4 14. Qd2 Nxe3 15. fxe3 Nf6 16. Ne1 Ng4 17. Rxf8+ Bxf8 18. Bxg4 Bxg4 19. Nd3 Bh6 20. Nf2 Rf8 21. Rc1 Bd7 22. Qe2 Qg5 23. Re1 Qe7 24. Qd3 Rf7 25. Nce4 Qf8 26. Qa3 a6 27. Qa5 Bc8 28. Qd2 Bf5 29. Qc3 Qd8 30. Ng3 Bg7 31. c5 dxc5 32. Qxc5 Bd7 33. Qb4 Bb5 34. a4 c5 35. Qxc5 Bxa4 36. d6 Bc6 37. Nd3 Qe8 38. Nb4 Bb5 39. Nd5 Qf8 40. Nc7 Bd7 41. Ne4 Rf5 42. Qb4 Bc6 43. Ne6 Qf7 44. Nxg7 Qxg7 45. Rd1 Rf8 46. Qc4 Qh6 47. Qc5 Qh5 48. Rd2 Qf5 49. Nf2 Qg5 50. Nd3 Rf5 51. b4 h5 52. Re2 Qf6 53. Rf2 Rxf2 54. Nxf2 Kh7 55. e4 Qg5 56. g3 Qf6 57. Kf1 Bb5+ 58. Kg2 Bc6 59. h3 g5 60. Kg1 Kh6 61. Kh2 Bb5 62. Qb6 Kg6 63. Kg2 h4 64. g4 Bc6 65. Qc5 Kf7 66. Kg1 Qf4 67. Qc4+ Kf6 68. Qg8 Qg3+ 69. Kh1 Qf3+ 70. Kg1 Qg3+ 1/2-1/2

DarkThought – Fritz 3.10: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 c6 12. dxc6 bxc6 13. Qd2 fxe4 14. fxe4 Rxf1+ 15. Kxf1 Qd7 16. Rd1 Bb7 17. Kg1 a6 18. Nf3 Rd8 19. Na4 Bf6 20. Nc5 Qc8 21. Bg5 Ba8 22. Nxe5 dxe5 23. Qxd8 Bxg5 24. Bg4 Qxd8 25. Rxd8 Be3+ 26. Kf1 Kf7 27. Be6+ Kf6 28. Rxe8 Bxc5 29. Bd7 Bb7 30. Rb8 Bc8 31. Bxc8 a5 32. Bd7 Kg5 33. g3 a4 34. b3 axb3 35. axb3 Bd6 36. Rb7 Bc5 37. b4 Bd4 38. b5 cxb5 39. Rxb5 h6 40. c5 Kf6 41. c6 Nxc6 42. Bxc6 Kf7 43. Rb7+ Kg8 44. Be8 g5 45. Bf7+ Kg7 46. Bh5+ Kg8 47. Bg4 Bc5 48. Rb5 Bd4 49. Rb8+ Kf7 50. Rb7+ Kg8 51. Be6+ Kf8 52. Rh7 Bc5 53. Bg4 Be7 54. Bh5 Ba3 55. Rxh6 Ke7 56. Rg6 Bc1 57. h4 gxh4 58. gxh4 Bf4 59. Be2 Kf8 60. Rf6+ Kg7 61. Rxf4 exf4 1-0

Fritz 3.10 – DarkThought: [0 – 1] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nd3 Nf6 13. c5 b6 14. c6 a5 15. Rc1 Ba6 16. Ne1 fxe4 17. Bxa6 Nf5 18. Bg5 Rxa6 19. fxe4 Nh6 20. Rc2 Qe7 21. Rcf2 Nhg8 22. Nf3 Raa8 23. Bh4 h6 24. h3 g5 25. Bg3 b5 26. Qc2 Nh5 27. Bh2 b4 28. Nd1 Ngf6 29. Ne3 Nf4 30. h4 Qf7 31. hxg5 hxg5 32. Nxg5 Qg6 33. Rxf4 exf4 34. Bxf4 Nh5 35. Ne6 Nxf4 36. Nxf4 Qh6 37. g3 Bd4 38. Qd3 Bxe3+ 39. Qxe3 Rf7 40. Qd4+ Kg8 41. Qf2 Rh7 42. Qg2 Rf8 43. Rf2 Rff7 44. Qf3 Kh8 45. Qg2 Rfg7 46. Rf3 Rg8 47. a4 bxa3 48. Rxa3 a4 49. Rf3 Rb8 50. Rf1 Rb3 51. Rf3 Qf6 52. Qf2 Rxf3 53. Qxf3 Qg5 54. Qf2 Kg8 55. Kg2 Rf7 56. Qe3 Rf8 57. Kf2 Rb8 58. Qe2 Kf7 59. Kg2 Ke7 60. Nd3 Rb3 61. Qd1 Qg7 62. Qd2 Qd4 63. Qg5+ Qf6 64. Qd2 Kd8 65. Qe2 Qg6 66. Qf3 Ke8 67. Qe2 Qg5 68. Kh2 Kd8 69. Kh3 Kc8 70. Kg2 Kb8 71. g4 Qh4 72. Nf2 Qg3+ 73. Kf1 Qe5 74. Nd1 Qf4+ 75. Ke1 Rb4 76. Ne3 Qe5 77. Nc4 Qd4 78. Kf1 Rxc4 79. g5 Rb4 80. g6 Rxb2 81. Qxb2+ Qxb2 0-1

DarkThought – Fritz 5.03: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Qd7 12. Nd3 Nf6 13. Rc1 c5 14. dxc6 bxc6 15. Qd2 Qe6 16. Rcd1 Bb7 17. Kh1 c5 18. exf5 Nxf5 19. Nf2 Rab8 20. Bd3 Nxe3 21. Qxe3 Bc6 22. b3 Bd7 23. Qd2 Rbd8 24. Nfe4 Qe7 25. Nxf6+ Qxf6 26. Be4 Be8 27. Qd5+ Kh8 28. Bb1 Bf7 29. Qb7 a5 30. Ne4 Qe6 31. Qb5 a4 32. Qxa4 Bf6 33. Nxf6 Qxf6 34. Qc6 Be8 35. Qb7 Rd7 36. Qd5 Bf7 37. Qc6 Be8 38. Rd2 Qe7 39. Be4 Rf6 40. Qa8 Rd8 41. Qa5 Rd7 42. Qb5 Rd8 43. Qb7 Rd7 44. Qc8 Rc7 45. Qa8 Rf8 46. Qa5 Ra7 47. Qb6 Rf6 48. Qb8 Kg7 49. Rfd1 Ra3 50. Bb1 Ra6 51. Qc8 Ra3 52. Be4 Bf7 53. Bd3 Rf4 54. Qb8 Rd4 55. Qb6 Qd7 56. Bb1 h6 57. Qb8 Ra7 58. Rxd4 exd4 59. Re1 Ra3 60. Re2 Ra7 61. Be4 Qe7 62. Kg1 Ra3 63. h3 Ra6 64. Qc8 Ra3 65. Kh2 Ra7 66. Qb8 Qe5+ 67. g3 Re7 68. Qd8 Re8 69. Qa5 Re7 70. f4 Qf6 71. Qe1 g5 72. f5 Bg8 73. g4 Re5 74. Qf2 Bf7 75. Qf3 Qe7 76. Kh1 Kh8 77. Kg1 Bg8 78. f6 Qe8 79. Bc6 Qg6 80. Rxe5 Qb1+ 81. Kh2 dxe5 82. Qe2 Bf7 83. Bg2 e4 84. Bxe4 Qc1 85. Kg2 Qf4 86. Qf3 Qd2+ 87. Qf2 Qd1 88. Bf3 Qd3 89. Qe1 Qc2+ 90. Kg3 Qc3 91. Qe7 Kg8 92. a4 Qa5 93. b4 Qxa4 94. bxc5 Qe8 95. c6 Qxe7 96. fxe7 Kg7 97. c7 Kf6 98. c8=Q Kxe7 99. Qc5+ Kf6 100. Bd5 Bxd5 101. cxd5 d3 102. d6 d2 103. Qd4+ Kf7 104. d7 d1=Q 105. Qxd1 h5 106. gxh5 Kg7 107. d8=Q 1-0

Fritz 5.03 – DarkThought: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nd3 Bd7 13. c5 c6 14. Qb3 fxe4 15. fxe4 Rxf1+ 16. Rxf1 cxd5 17. exd5 Nf5 18. Bf2 Bc8 19. Ne4 dxc5 20. Ndxc5 b6 21. Ne6 Bxe6 22. dxe6 Ned6 23. Bf3 Rc8 24. Qa4 Nxe4 25. Bxe4 Qe7 26. Bc6 Rf8 27. Bd7 Qd6 28. Qa3 Qxa3 29. bxa3 Ne7 30. Rc1 Bf6 31. Rc7 Ra8 32. Kf1 Nd5 33. Rb7 Ne7 34. Ke2 Nf5 35. Bc6 Rc8 36. Ba4 b5 37. Rxb5 Ng7 38. Bb3 Re8 39. Bxa7 Nxe6 40. a4 Nd4+ 41. Bxd4 exd4+ 42. Kd2 Re5 43. Rb7 Rg5 44. g3 Rh5 45. h4 Rf5 46. g4 Rf2+ 47. Kd3 Rf3+ 48. Kc4 Bxh4 49. a5 Rc3+ 50. Kb5 d3 51. a6 d2 52. Rd7 Bf2 53. Rxd2 Be3 54. Rd7 Rc5+ 55. Kb4 Re5 56. a7 Re4+ 57. Kb5 Bxa7 58. Rxa7 Rxg4 59. a4 Rd4 60. a5 Rd3 61. Kb4 Rd4+ 62. Kc5 Re4 63. a6 Re5+ 64. Bd5 Re1 65. Rd7 Rc1+ 66. Kd4 Rd1+ 67. Ke5 Re1+ 68. Be4 Ra1 69. a7 Rxa7 70. Rxa7 1-0

DarkThought – Fritz 5.32b: [1 – 0] (Test Game, Nunn Position #8, January 1999)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Qd7 12. Nd3 c5 13. dxc6 bxc6 14. Kh1 Nc7 15. Qd2 Ne6 16. Rad1 Qc7 17. Rfe1 fxe4 18. fxe4 Nd4 19. c5 Nxe2 20. cxd6 Ng3+ 21. hxg3 Qxd6 22. Bc5 Qe6 23. g4 a5 24. g5 Ba6 25. Nf2 Rae8 26. Qd7 Bc8 27. Qc7 Qf7 28. Nd3 Bg4 29. Rd2 Qe6 30. Qxa5 Bh5 31. Nf2 Rf7 32. Rd8 Rxd8 33. Qxd8+ Bf8 34. Rg1 Nc8 35. g4 Nd6 36. Qb8 Nc8 37. Be3 Rxf2 38. Bxf2 Bxg4 39. Be3 Qf7 40. Kh2 Be6 41. Rg2 Bd6 42. Qa8 Bd7 43. Qa5 Kg7 44. b3 Qf3 45. Rg3 Qf1 46. Qd8 Be6 47. Qe8 Ne7 48. Qa8 Bc8 49. Qa5 Be6 50. Qb6 Qe1 51. Qd8 Bb4 52. Nd1 Qe2+ 53. Nf2 Ba3 54. Qb8 Qb5 55. Qc7 Bf7 56. Rf3 Kf8 57. Ng4 Qe2+ 58. Kg3 Qe1+ 59. Bf2 Qxe4 60. Qd8+ Kg7 61. Nh6 Qd5 62. Rxf7+ Qxf7 63. Nxf7 Kxf7 64. Qh8 Ke6 65. Kf3 Kd5 66. Qxh7 Ke6 67. Bg3 Bc1 68. Qh8 Bb2 69. Ke4 Kd7 70. Bxe5 Bc1 71. Qh3+ Kd8 72. Bf6 Ba3 73. Qe6 Kc7 74. Bxe7 Bxe7 75. Qxe7+ Kb6 76. a4 c5 77. Kd5 c4 78. a5+ Ka6 79. Kxc4 Kxa5 80. Qa7# 1-0

Fritz 5.32b – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #8, January 1999)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nd3 Bd7 13. c5 c6 14. Qb3 fxe4 15. fxe4 Rxf1+ 16. Rxf1 cxd5 17. exd5 Nf5 18. Bf2 Bc8 19. Ne4 dxc5 20. Ndxc5 b6 21. Ne6 Bxe6 22. dxe6 Ned6 23. Qd5 Nxe4 24. Qxe4 Rc8 25. Ba6 Rb8 26. Qc6 Qe7 27. Qd7 e4 28. Re1 Re8 29. Rxe4 Bxb2 30. Bb5 Nd6 31. Bh4 g5 32. Be1 Bf6 33. Bc6 Nxe4 34. Qxe8+ Qxe8 35. Bxe8 Kg7 36. Kf1 Nc5 37. Bf7 Nb7 38. Be8 Nc5 39. Bf7 1/2-1/2

DarkThought – Genius 3: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 f4 12. Bf2 b6 13. Nd3 g5 14. Be1 a5 15. Nf2 Ng6 16. Nb5 Bd7 17. Bc3 h5 18. Qa4 Nh4 19. Rae1 Bf6 20. Qd1 Kh8 21. Kh1 Rg8 22. Rg1 Qe7 23. Bd2 Qg7 24. Ref1 g4 25. g3 Nxf3 26. Bxf3 gxf3 27. Qxf3 Bg4 28. Qd3 fxg3 29. Nxg4 hxg4 30. hxg3 Qh7+ 31. Kg2 Qh3+ 32. Kf2 Rf8 33. Rh1 Bh4+ 34. Ke1 Rxf1+ 35. Qxf1 Qxg3+ 36. Kd1 Kg8 37. Rg1 Qf2 38. Rxg4+ Ng7 39. Qxf2 Bxf2 40. Nxc7 Ra7 41. Ne8 Re7 42. Nxd6 Kh7 43. Bg5 Rd7 44. Bf6 Bd4 45. Rxg7+ Rxg7 46. Bxg7 Kxg7 47. Nf5+ Kf6 48. Nxd4 Kf7 49. Nc6 a4 50. Nxe5+ 1-0

Genius 3 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. b4 fxe4 12. Nxe4 Bf5 13. Ng3 a5 14. bxa5 Rxa5 15. Qd2 Qa8 16. Nf3 Bd7 17. Ng5 Nf5 18. Nxf5 gxf5 19. f3 Rf6 20. f4 e4 21. Bd4 Rf8 22. Rfc1 Bxd4+ 23. Qxd4 Ng7 24. Rc2 h6 25. Nh3 Kh7 26. Nf2 Ne8 27. Rb2 Nf6 28. Nd1 Ra6 29. Qe3 Ra3 30. Rb3 Rxb3 31. Qxb3 Qa7+ 32. Qe3 Ra8 33. Qxa7 Rxa7 34. Kf2 h5 35. Rb1 Ng4+ 36. Ke1 Kg6 37. h4 Nf6 38. Rb2 Kf7 39. Ne3 Kg7 40. Rb3 Kg6 41. Kf2 Be8 42. a3 Ba4 43. Rb2 Nd7 44. Rb1 b6 45. Rc1 Nf6 46. Rc3 Ra8 47. Ke1 Rg8 48. Kf2 Rh8 49. Kf1 Bd7 50. Rb3 Ba4 51. Rc3 Re8 52. Kf2 Rg8 53. Ke1 Rf8 54. Kf2 Rd8 55. Ke1 Ra8 56. Kd2 Ra5 57. Ke1 Bd7 58. Kd2 Kg7 59. Bd1 Kh6 60. Be2 Ng8 61. Nc2 Ne7 62. Ne3 Ng6 63. g3 Ne7 64. Bd1 Ng8 65. Be2 Kg6 66. Rb3 Ra8 67. Ke1 Nf6 68. Rc3 Ba4 69. Rc1 Nd7 70. Kd2 Nc5 71. Kc3 Bb3 72. Kb2 Ra7 73. Ra1 Ba4 74. Kc3 Ra5 75. Ra2 Bb3 76. Ra1 Ra7 77. Kb2 Ra6 78. Kc3 Ra5 79. Bf1 Ba4 80. Be2 Ra7 81. Rb1 Be8 82. Ra1 Ra8 83. Bd1 Ba4 84. Be2 Bb3 85. Kb4 Ra7 86. Kc3 Rb7 87. Kd2 Rb8 88. Kc3 Ba4 89. Rb1 Rg8 90. Rg1 Re8 91. Ra1 Rh8 92. Rf1 Rf8 93. Rh1 Rd8 94. Rb1 Rd7 95. Kd4 Rg7 96. Rg1 Nb3+ 97. Kc3 Rg8 98. Bd1 Nc5 99. Be2 Bd7 100. Rh1 Be8 101. Rg1 Ba4 102. Kd2 Rh8 103. Kc3 Rh6 104. Rc1 Rh7 105. Rb1 Kf6 106. Rf1 Rg7 107. Rg1 Be8 108. Nc2 Rh7 109. Kd2 Ba4 110. Ne3 Rh6 111. Rg2 Be8 112. Rf2 Ba4 1/2-1/2

DarkThought – Genius 5: [0 – 1] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 f4 12. Bf2 g5 13. c5 Ng6 14. Rc1 h5 15. cxd6 cxd6 16. Nd3 Bd7 17. Qb3 b6 18. Nb4 g4 19. Nc6 Qg5 20. Nb5 g3 21. Kh1 gxf2 22. Nbxa7 Nf6 23. Qxb6 Nh4 24. Rxf2 Nxe4 25. fxe4 f3 26. Rg1 fxe2 27. Rxe2 Qg4 28. Qe3 Qf4 29. Qxf4 exf4 30. Nb5 Rxa2 31. Nxd6 Bg4 32. Rf2 f3 33. g3 Rxb2 34. Rgf1 Bh3 35. Nc4 Rxf2 36. Rxf2 Ra8 37. N6a5 Bd4 38. Kg1 Ng6 39. Nb3 Ne5 40. Ncd2 Bb6 41. d6 Ra7 42. d7 Rxd7 43. Nf1 Ng4 44. Kh1 Bxf2 0-1

Genius 5 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. b4 a5 12. b5 fxe4 13. Nxe4 Bf5 14. f3 Nf6 15. Bd3 Kh8 16. Rc1 Bd7 17. Qd2 Nf5 18. Bg5 Qb8 19. Kh1 Qa7 20. c5 Nxd5 21. Bc4 Nf6 22. b6 cxb6 23. Nxd6 Nxd6 24. cxd6 b5 25. Bd3 e4 26. Be3 Qa6 27. fxe4 Qxd6 28. Nf3 Qb4 29. Qxb4 axb4 30. Rc7 Ng4 31. Bc5 Rfc8 32. Rxc8+ Bxc8 33. h3 Nf6 34. Ng5 Nh5 35. Rf2 b3 36. axb3 Ra1+ 37. Bf1 Ng3+ 38. Kg1 h6 39. Nf7+ Kh7 40. Nd6 Be6 41. Rf3 Be5 42. Nxb5 Rd1 43. Bb6 Nxe4 44. Re3 Bd5 45. Bc7 Bf6 46. Rd3 Nd2 47. Rxd5 Rxf1+ 48. Kh2 Rd1 49. Rc5 Nxb3 50. Rc4 Nd2 51. Rb4 Nf1+ 52. Kg1 Be7 53. Nd6 Ng3+ 54. Kh2 Rxd6 55. Bxd6 Bxd6 56. Rxb7+ Kg8 57. Rb6 Ne4+ 58. Kh1 h5 59. g4 h4 60. Kg2 Kf7 61. Ra6 Be7 62. Ra1 Ng5 63. Rf1+ Bf6 64. Rb1 Ne6 65. Rb7+ Be7 66. Kf3 g5 67. Kg2 Kf6 68. Rb6 Bc5 69. Ra6 Ke5 70. Kh2 Nf4 71. Ra5 Kd6 72. Ra6+ Kd7 73. Ra5 Kc6 74. Ra6+ Bb6 75. Ra2 Kc7 76. Rb2 Bd4 77. Rb5 Bf6 78. Rf5 Be7 79. Rb5 Bd6 80. Rf5 Kc6 81. Ra5 Kb6 82. Rf5 Bc7 83. Rf7 Kc6 84. Rf5 Bd8 85. Rf7 Bb6 86. Rf6+ Kc7 87. Rf5 Ne6 88. Kh1 Kd6 89. Kg2 Nf4+ 90. Kh2 Bd8 91. Rb5 Kc7 92. Rc5+ Kd6 93. Rb5 Be7 94. Rb6+ Ke5 95. Rb5+ Ke4 96. Rf5 Bd6 97. Rb5 Kf3 98. Rb3+ Kf2 99. Rb6 Be5 100. Rb5 Bc7 101. Rf5 Kf1 102. Rc5 Bb6 103. Rc1+ Ke2 104. Rc2+ Kf3 105. Rc3+ Be3 106. Rb3 Ke2 107. Rb5 Nd3 108. Kg2 Bc1 109. Kg1 Bd2 110. Kg2 Nf4+ 111. Kh2 Kf1 112. Rb1+ Be1 113. Ra1 Ke2 114. Ra2+ 1/2-1/2

DarkThought – Hiarcs 6: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 c5 12. dxc6 bxc6 13. Qd2 f4 14. Bc5 Be6 15. Rd1 Nc8 16. Nc2 Rf7 17. Bf2 Rd7 18. Rfe1 Qg5 19. Nb4 Ne7 20. Na6 Rc8 21. b4 Nc7 22. Nxc7 Rcxc7 23. Qc1 Nc8 24. c5 d5 25. exd5 cxd5 26. Qa3 Ne7 27. Bb5 Bh3 28. Bf1 Be6 29. Nb5 Rc8 30. Qa6 Rc6 31. Qa4 Rc8 32. Rc1 Rdd8 33. Nxa7 Ra8 34. c6 Rf8 35. b5 e4 36. fxe4 f3 37. g3 Bb2 38. Rc2 Be5 39. b6 Bb8 40. exd5 Bxd5 41. Bc4 Bxa7 42. bxa7 Bxc4 43. Qxc4+ Nd5 44. Rd1 Rf4 45. Qb3 Rf7 46. Rxd5 Qf6 47. Rc1 Rc8 48. c7 h5 49. Rd7 g5 50. Rxf7 Qg6 51. Rd7+ Kf8 52. Bc5+ Ke8 53. Re1+ Qe6 54. Qxe6# 1-0

Hiarcs 6 – DarkThought: [0 – 1] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nd3 Nf6 13. c5 b6 14. b4 a5 15. cxd6 cxd6 16. bxa5 bxa5 17. Rb1 Ba6 18. Nf2 Bxe2 19. Qxe2 fxe4 20. fxe4 Rb8 21. Qa6 Ra8 22. Qb5 Qc7 23. Na4 Rfb8 24. Nb6 Ra7 25. Qa4 Neg8 26. Nc4 Ra6 27. Bd2 Bh6 28. Rxb8 Qxb8 29. Bxa5 Qa7 30. Qb4 Nxe4 31. Bb6 Rxb6 32. Nxb6 Nxf2 33. Kxf2 Qxa2+ 34. Kg3 Qe2 35. Rf2 Qd3+ 36. Rf3 Bf4+ 37. Kh3 Qf5+ 38. g4 Qg5 39. Qxd6 Qh6+ 40. Kg2 Qxh2+ 41. Kf1 Qh1+ 42. Kf2 Qh4+ 43. Ke2 Qxg4 44. Qb4 h5 45. Qc4 Nf6 46. Qc7 h4 47. Qc8+ Qxc8 48. Nxc8 Nxd5 49. Nd6 g5 50. Ra3 g4 51. Ra5 Nc3+ 52. Kf1 h3 53. Nf7+ Kg7 54. Nxe5 g3 55. Nf3 g2+ 56. Kg1 Ne2+ 57. Kf2 Bg3+ 58. Kxe2 h2 59. Rg5+ Kf6 60. Rxg3 h1=Q 61. Rg5 Qf1+ 62. Ke3 Ke7 63. Rg4 Ke6 64. Rg6+ Kf7 65. Rg5 Kf8 66. Rg3 Ke8 67. Rg8+ Kd7 68. Rg6 Kc7 69. Rg7+ Kc6 70. Rg5 Kb6 71. Re5 g1=B+ 72. Nxg1 Qxg1+ 73. Ke4 Kc6 74. Kf5 Qb1+ 75. Kf6 Qa1 76. Ke6 Qh1 77. Ra5 Qe4+ 78. Kf6 Qd4+ 79. Kf7 Qd7+ 80. Kg6 Qd6+ 81. Kh5 Qh2+ 82. Kg6 Kd6 83. Ra6+ Ke5 84. Ra5+ Ke6 85. Ra6+ Ke7 86. Ra7+ Ke8 87. Ra8+ Kd7 88. Ra7+ Kc8 89. Rf7 Kd8 90. Kf5 Qf2+ 91. Kg6 Qg3+ 92. Kf5 Qb3 93. Kf6 Qe3 94. Kf5 Ke8 95. Rf6 Ke7 96. Rg6 Qf3+ 97. Kg5 Kf7 98. Ra6 Qd5+ 99. Kf4 Qc4+ 100. Ke5 Qxa6 0-1

DarkThought – Junior 4.6: [1/2 – 1/2] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 fxe4 12. fxe4 Rxf1+ 13. Bxf1 Nf6 14. Be2 c5 15. dxc6 Nxc6 16. Nb5 Bf8 17. Qd3 a6 18. Nc3 Ng4 19. Bxg4 Bxg4 20. Kh1 Nb4 21. Qd2 Rb8 22. Bg5 Be7 23. Bxe7 Qxe7 24. Nd1 Rf8 25. Ne3 Qg5 26. a3 Nc6 27. N1c2 Rf6 28. b4 Bc8 29. b5 Ne7 30. Qa5 Qf4 31. Qd8+ Kf7 32. bxa6 bxa6 33. Qc7 Be6 34. Qb7 a5 35. Rb1 Bxc4 36. h3 Be6 37. Qa8 Qh4 38. Rb7 Bxh3 39. Rxe7+ Kxe7 40. Nd5+ Kf7 41. Qa7+ Kg8 42. Nxf6+ Qxf6 43. Qb8+ Kg7 44. Qc7+ Kh6 45. gxh3 Qf1+ 46. Kh2 Qf4+ 47. Kg1 Qg3+ 48. Kf1 Qxh3+ 49. Ke2 Qh2+ 50. Kd1 Qg1+ 51. Kd2 Qf2+ 52. Kd3 Qf1+ 53. Kd2 Qg2+ 54. Kd3 Qf1+ 55. Kc3 Qf3+ 56. Kb2 Qxe4 57. Qxd6 a4 58. Qb4 Qf4 59. Ne1 Qg3 60. Nc2 Qf4 1/2-1/2

Junior 4.6 – DarkThought: [0 – 1] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. Nc2 fxe4 12. Nxe4 Nf6 13. Nxf6+ Rxf6 14. Bg5 Rf7 15. Ne3 h6 16. Bh4 Kh7 17. Bd3 Qe8 18. f3 e4 19. Bxe4 Bxb2 20. Rb1 Bc3 21. a3 b6 22. Qd3 Bh8 23. Rfe1 Nf5 24. Bxf5 gxf5 25. Nc2 Qa4 26. Rb4 Qa6 27. Re8 Qb7 28. Ne3 Bg7 29. Rd8 Be5 30. Bg3 Bg7 31. Bf4 Bf8 32. Rb2 Be7 33. Re8 c6 34. Re2 Bf8 35. dxc6 Qxc6 36. Nd5 Ba6 37. Rxa8 Qxa8 38. Nb4 Bb7 39. Nc2 Qc8 40. Rd2 Be7 41. Ne3 Qc5 42. Kh1 Bg5 43. Bxg5 hxg5 44. Rd1 Rf6 45. Rb1 Bc6 46. Rg1 Rf7 47. Rd1 Rf6 48. Rb1 Rf7 49. Rc1 Qe5 50. h3 Qc5 51. Rd1 Bb7 52. Rb1 Bc6 53. Rc1 Bb7 54. Rd1 Rf6 55. Rb1 Bc6 56. Nd5 Bxd5 57. cxd5 Kh6 58. Rb4 Qf2 59. Rc4 Qe1+ 60. Kh2 Qe5+ 61. f4 gxf4 62. Qf3 Rf7 63. Rxf4 Kg6 64. a4 Rg7 65. Qf2 Qxd5 66. g4 Qe5 67. gxf5+ Kf7 68. Kh1 Qc5 69. Qf1 Kf6 70. h4 Qe3 71. Qa1+ Qe5 72. Rd4 d5 73. Qc3 Rg3 74. Qc6+ Kg7 75. f6+ Kh8 76. Qc8+ Rg8 77. Qc1 Qxf6 78. Rf4 Qe5 79. Qf1 Qe3 80. Kh2 d4 81. Qf2 Qxf2+ 82. Rxf2 Rd8 83. Kg3 d3 84. Rd2 Rd4 85. Rd1 Kh7 86. Kf2 Kh6 87. a5 b5 88. Ke3 Ra4 89. Kxd3 Kh5 90. Kc3 a6 91. Rd6 Rxa5 92. Rd4 Ra2 93. Rf4 Rg2 94. Rf1 Rg4 95. Ra1 Rg6 96. Kb4 Rc6 97. Ra5 Kxh4 98. Ra3 Kg5 99. Ka5 Rc4 100. Ra1 Kf5 101. Rf1+ Rf4 102. Ra1 Ke5 103. Re1+ Re4 104. Ra1 Kd5 105. Ra2 Kc4 106. Rh2 b4 107. Ka4 a5 108. Rc2+ Kd3 109. Rh2 Re2 110. Rh1 Kc2 111. Rh3 Kb2 112. Rf3 Ka2 113. Rf5 b3 114. Re5 Rc2 115. Rxa5 b2 116. Kb4+ Kb1 117. Re5 Rc6 118. Rh5 Rd6 119. Kc3 Ra6 120. Rh2 Ka1 121. Rxb2 Rc6+ 122. Kb3 Rb6+ 123. Kc2 Rxb2+ 0-1

DarkThought – Junior 5.0: [1 – 0] (Test Game, Nunn Position #8, December 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 f4 12. Bf2 c5 13. dxc6 bxc6 14. Qd2 Be6 15. Rd1 Rf7 16. Bc5 Nc8 17. b3 Rd7 18. Ba3 Nb6 19. Qc1 Nc7 20. Nd3 Nc8 21. c5 d5 22. exd5 cxd5 23. c6 Rf7 24. Rfe1 Qe8 25. Bf1 Rf5 26. Nc5 Rf7 27. Nb7 Bf6 28. Nb5 Nxb5 29. Bxb5 Bg7 30. Bb2 Rf5 31. Ba6 Qe7 32. Nc5 Nb6 33. Nxe6 Qxe6 34. c7 Re8 35. Bb7 Rf7 36. a4 a5 37. Qc5 Bf8 38. Qxa5 Rxc7 39. Rxe5 Qxe5 40. Bxe5 Rxe5 41. Qa7 Bc5+ 42. Kh1 Kg7 43. Qa5 Bf2 44. Ba6 Rce7 45. g3 fxg3 46. hxg3 Be3 47. f4 R5e6 48. Bf1 d4 49. Bh3 Rc6 50. Qb5 Rf6 51. a5 Na8 52. Qc5 Rff7 53. b4 Nc7 54. b5 Ne8 55. b6 Nf6 56. Qc8 Ne4 57. Kg2 Nd6 58. Qc6 Rf6 59. a6 Nf5 60. Qxf6+ Kxf6 61. a7 Re8 62. b7 Nh6 63. b8=Q Rxb8 64. axb8=Q Nf7 65. Ra1 Kg7 66. Ra8 g5 67. Qf8+ Kg6 68. Ra6+ Nd6 69. Rxd6+ Kh5 70. Rh6# 1-0

Junior 5.0 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #8, December 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. Nf3 Nf6 12. Ng5 h6 13. Ne6 Bxe6 14. dxe6 fxe4 15. Re1 Nf5 16. Bg4 Re8 17. Bh3 Kh8 18. Qd2 Rxe6 19. Bxf5 gxf5 20. Bxh6 Qd7 21. Bg5 Nh7 22. h4 Rg6 23. Qd1 Nxg5 24. Qh5+ Rh6 25. Qxg5 Qf7 26. g3 Rh5 27. Qd2 Qxc4 28. Qd1 Rh6 29. Rc1 Qd4 30. Nb5 Qxb2 31. Nxc7 Rf8 32. Re2 Qb6 33. Nd5 Qa5 34. Ne7 f4 35. h5 fxg3 36. Ng6+ Rxg6 37. hxg6 Qb6 38. Rb1 gxf2+ 39. Kg2 f1=Q+ 40. Qxf1 Rxf1 41. Rxb6 Rf6 42. Rxb7 Rxg6+ 43. Kf1 d5 44. Rxa7 Rg4 45. a4 d4 46. a5 d3 47. Rh2+ Kg8 48. Rd7 Bf8 49. Rd5 Bb4 50. a6 Rf4+ 51. Kg2 d2 52. Rh4 Rf6 53. Rxe4 Ba5 54. a7 Ra6 55. Kf3 Rxa7 56. Ra4 Bb6 57. Rxa7 Bxa7 58. Rxd2 1/2-1/2

DarkThought – MChess 5: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Bd7 12. Nd3 b6 13. Qe1 Nf6 14. Qh4 f4 15. Bd2 a5 16. Nb5 Rc8 17. Bc3 Qe8 18. Qf2 Bxb5 19. cxb5 g5 20. Kh1 g4 21. Qh4 gxf3 22. gxf3 Ng6 23. Qg5 Qd7 24. Nf2 Kf7 25. Rg1 Rb8 26. Rac1 Rg8 27. Bd2 Ke8 28. Rc2 Rb7 29. Rgc1 Nh8 30. Ng4 Nxg4 31. Qh5+ Nf7 32. fxg4 Bh6 33. Rc6 Rg6 34. R1c2 Ng5 35. Be1 Kd8 36. a3 Kc8 37. R6c4 Kb8 38. h4 Nf7 39. Bf2 Qe7 40. Qf5 Rg7 41. b4 a4 42. R2c3 Nd8 43. g5 Rf7 44. Qh3 Bg7 45. Bg4 Bf8 46. Bc8 Ka7 47. Bxb7 Nxb7 48. Qc8 Qd7 49. Qxd7 Rxd7 50. Rxc7 Rd8 51. R3c6 Kb8 52. Bxb6 Re8 53. Rxh7 Be7 54. Bc7+ Kc8 55. Bxd6+ Kd7 56. Bxe7 Rxe7 57. g6 Nd8 58. g7 Rxg7 59. Rxg7+ Ke8 60. Rc8 f3 61. d6 Kf8 62. Re7 f2 63. Rxd8# 1-0

MChess 5 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nd3 Nf6 13. Qe1 f4 14. Bf2 g5 15. c5 g4 16. Bh4 gxf3 17. Bxf3 Ng6 18. Bg5 dxc5 19. Nxc5 Qd6 20. Qf2 c6 21. Rac1 b6 22. Nb3 Ng4 23. Bxg4 Bxg4 24. Nd2

Rac8 25. Kh1 h6 26. Bh4 cxd5 27. Nxd5 Rxc1 28. Rxc1 Be6 29. Nf3 Bxd5 30. Rd1 Rc8 31. Qe1 Rc2 32. Rxd5 Qc6 33. Bf2 Rxb2 34. a3 Ra2 35. h4 Qa4 36. Rd8+ Kh7 37. Bg1 Qxa3 38. Qd1 Nf8 39. Qd5 Qb2 40. Ne1 f3 41. Qf7 fxg2+ 42. Kh2 Qb4 43. Rxf8 Qxf8 44. Qxa2 Qf4+ 45. Kh3 Qxe4 46. Nxg2 Qd3+ 47. Kh2 Qd7 48. Qc2+ Kg8 49. Qe4 Qf7 50. Be3 Kh8 51. Kg1 h5 52. Bg5 Kg8 53. Ne3 Kh8 54. Nd5 Qe6 55. Qf3 Qe8 56. Kf2 Qf8 57. Qxf8+ Bxf8 58. Nf6 b5 59. Nxh5 Kh7 60. Kf3 Kg6 61. Ng3 b4 62. Bc1 a5 63. h5+ Kf7 64. Ke4 a4 65. Kd3 b3 66. Kc4 Bh6 67. Bb2 Bf8 68. Ne4 a3 69. Bxa3 Bxa3 70. Kxb3 1/2-1/2

DarkThought – MChess 7.1: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Nf6 12. Nd3 c6 13. dxc6 Nxc6 14. Ne1 Nd4 15. Nc2 Nxe2+ 16. Qxe2 fxe4 17. Nxe4 Bf5 18. Nxf6+ Rxf6 19. Kh1 Qa5 20. Rfd1 Re8 21. Rd5 Qc7 22. Na3 a6 23. Rad1 e4 24. f4 Be6 25. R5d4 Bd7 26. R4d2 b6 27. b3 Qc8 28. Rf1 Bg4 29. Qf2 Bf8 30. Rd5 Rf5 31. Bxb6 Rxd5 32. cxd5 Qb7 33. h3 Bc8 34. Rd1 Qf7 35. Nc4 Bb7 36. Qd2 Qf5 37. Ba5 Qh5 38. Bc3 Re7 39. Ne3 Bc8 40. Rf1 Bd7 41. Kh2 Rf7 42. g4 Qh6 43. f5 Bb5 44. Rf2 Be7 45. f6 Bd8 46. Qd4 Bd3 47. Nc4 Qf8 48. Nd2 Qe8 49. g5 e3 50. Rg2 e2 51. Nf3 Bb1 52. Qd2 Qe4 53. Ne1 Qf5 54. Rxe2 h6 55. Re8+ Rf8 56. Qe3 hxg5 57. Rxd8 Qf4+ 58. Qxf4 gxf4 59. Rd7 Rf7 60. Rxf7 Kxf7 61. Nf3 g5 62. Nxg5+ Kf8 63. Bb4 Bg6 64. Bxd6+ Ke8 65. f7+ Bxf7 66. Nxf7 Kxf7 67. h4 f3 68. Ba3 f2 69. Kg2 f1=Q+ 70. Kxf1 1-0

MChess 7.1 – DarkThought: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nd3 Nf6 13. c5 b6 14. cxd6 cxd6 15. Nf2 Bb7 16. Rc1 Qd7 17. Nh3 h6 18. Nf2 Rfc8 19. Qb3 g5 20. Bb5 Qd8 21. Bd3 g4 22. fxg4 fxe4 23. Bxe4 Qg8 24. Rfd1 Bf8 25. Bf3 Rd8 26. g5 hxg5 27. Nfe4 Nxe4 28. Bxe4 g4 29. Nb5 Bc8 30. Qc2 g3 31. h3 Qg7 32. Rf1 Ba6 33. Qa4 Bxb5 34. Qxb5 Kg8 35. Qe2 Ng6 36. Qh5 Qh7 37. Qg4 Bh6 38. Qe6+ Kh8 39. Rf7 Qxf7 40. Qxf7 Bxe3+ 41. Kh1 Rd7 42. Qxd7 Nf8 43. Qxd6 Bxc1 44. Qxe5+ Kg8 45. Qxg3+ Kf7 46. Qc7+ Kf6 47. Qxc1 1-0

DarkThought – Mephisto Meisterschach: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 a5 11. Nd3 f5 12. f3 f4 13. Bf2 g5 14. c5 h5 15. Rc1 Ng6 16. Nb5 Rf7 17. cxd6 cxd6 18. Na3 Bf8 19. Nc4 Ra6 20. Qb3 g4 21. a4 gxf3 22. Bxf3 Bg4 23. Bb6 Qg5 24. Kh1 Nh4 25. Qc2 Rg7 26. Bxa5 Nf6 27. Bd8 Ra8 28. Bxf6 Qxf6 29. Bxg4 hxg4 30. Ne1 Rh7 31. g3 Ng6 32. Ne3 Qg5 33. Nf5 fxg3 34. Nxg3 Rxa4 35. Rf5 Qe3 36. Nh5 Rxh5 37. Rxh5 Qxe4+ 38. Qxe4 Rxe4 39. Ng2 Ne7 40. Rc7 Rb4 41. Ne3 Rxb2 42. Rg5+ Kf7 43. Nxg4 Rb1+ 44. Kg2 Rb2+ 45. Kh3 Rb3+ 46. Kh4 Ke8 47. Nf6+ Kd8 48. Rd7+ Kc8 49. Rg4 b5 50. Ra7 Kb8 51. Ra5 Bh6 52. Ne4 Kb7 53. Nxd6+ Kb6 54. Ra8 Nxd5 55. Rb8+ Ka5 56. Rg3 Rb4+ 57. Kh5 Bc1 58. Kg6 e4 59. Rg1 Bb2 60. Rg5 Nc3 61. Re5 Ka4 62. Kf5 e3 63. Ra8+ Kb3 64. Rxe3 Rh4 65. h3 b4 66. Rf3 Rd4 67. Ke5 Rh4 68. Nf5 Re4+ 69. Kf6 Kc2 70. Rc8 Kd2 71. Kg5 Bc1 72. Kg6 Nd5 73. Rd8 Ke2 74. Rb3 Re6+ 75. Kg7 Re5 76. Nd4+ Kf2 77. h4 Be3 78. Nc6 Rh5 79. Rh8 Rxh8 80. Kxh8 Nf4 81. Kg7 Bc5 82. Kf6 Ke2 83. Kg5 Ne6+ 84. Kf5 Ng7+ 85. Kg6 Ne6 86. h5 Nf4+ 87. Kg5 Ne6+ 88. Kf6 Nf8 89. h6 Be3 90. Kg7 Ne6+ 91. Kf7 Ng5+ 92. Kg6 Ne6 93. Rxb4 Nf8+ 94. Kg7 Ne6+ 95. Kf6 1-0

Mephisto Meisterschach – DarkThought: [0 – 1] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. Rc1 fxe4 12. Nxe4 Nf6 13. Nxf6+ Bxf6 14. Bh6 Rf7 15. Bf3 Kh8 16. Be4 Bf5 17. Qe2 g5 18. Bc2 Qd7 19. Qd2 Bxc2 20. Rxc2 Rg8 21. h4 gxh4 22. Rc3 h3 23. g3 Nf5 24. Nc2 Qa4 25. Be3 e4 26. Nd4 Nxe3 27. Qxe3 Qxa2 28. Rc2 Be5 29. Rd1 Qa4 30. b3 Qd7 31. Ne6 Rf3 32. Qxe4 Qf7 33. Rb1 a5 34. Qe2 Qf5 35. Rbc1 Bxg3 36. fxg3 Rfxg3+ 37. Kh1 h2 38. Qg2 Qg4 39. Nf4 Qxf4 40. Rf1 Rxg2 41. Rxf4 Rxc2 42. Rf1 Rg1+ 0-1

DarkThought – Mephisto Shredder: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 fxe4 12. fxe4 Rxf1+ 13. Bxf1 Nf6 14. Be2 b6 15. Kh1 Qd7 16. Qd2 Bb7 17. Nf3 Ng4 18. Ng5 Nxe3 19. Qxe3 Rf8 20. Ne6 Rf7 21. Bg4 c6 22. Bh3 Qe8 23. Nc7 Qd8 24. Be6 Qxc7 25. Rf1 Nf5 26. exf5 Bc8 27. Bxf7+ Qxf7 28. Ne4 Bxf5 29. Nxd6 Qd7 30. Nxf5 gxf5 31. Qf3 cxd5 32. Qxd5+ Qxd5 33. cxd5 f4 34. Rc1 Bf6 35. Rc8+ Kf7 36. Rc7+ Kg6 37. d6 e4 38. d7 Kf5 39. Rc8 Be7 40. d8=Q Bxd8 41. Rxd8 1-0

Mephisto Shredder – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nc2 Bd7 13. Qd2 f4 14. Bf2 g5 15. Na3 Nf6 16. Qd1 Qc8 17. c5 g4 18. Nc4 gxf3 19. Bxf3 Qb8 20. a4 Rg8 21. b4 Ng6 22. Qd3 Ng4 23. Bxg4 Bxg4 24. Rfe1 f3 25. gxf3 Nf4 26. Qd1 Bh5 27. Bg3 dxc5 28. bxc5 Qf8 29. d6 cxd6 30. Nxd6 b6 31. Rf1 Rd8 32. Qc2 Ne6 33. Ne2 Nxc5 34. Nf5 Rd3 35. Kg2 Qd8 36. Qc4 Nb3 37. Nfd4 Rxd4 38. Qxb3 Rd2 39. Rf2 Rf8 40. Qb5 Rc2 41. Ra3 Qe7 42. Rd3 Ra2 43. Nc3 Rxf2+ 44. Kxf2 Qc7 45. Qb3 Bf7 46. Nd5 Qc5+ 47. Kg2 Rc8 48. Qc3 Qxc3 49. Nxc3 Bb3 50. Be1 Kg8 51. Rd7 Ra8 52. Rb7 Bc2 53. Bh4 Kh8 54. Be7 h6 55. Kf2 Kg8 56. Bd6 Rd8 57. Bb8 Rd2+ 58. Kg3 Rd3 59. Rxa7 Bb3 60. Rc7 h5 61. Rc6 Kf7 62. Ba7 Bf8 63. Bxb6 Bb4 64. Nd5 Bxd5 65. exd5 Rxd5 66. Rh6 Bd2 67. Rxh5 Bf4+ 68. Kg4 Kg6 69. Rh8 Rd2 70. Rg8+ Kf6 71. Rf8+ Kg6 72. Rxf4 exf4 73. h4 Rg2+ 74. Kxf4 Kh5 75. a5 Rg6 76. Kf5 Rh6 77. f4 Kxh4 78. Bf2+ Kh5 79. Bc5 Rc6 80. Bb6 Rh6 81. Bd4 Rc6 82. Ke5 Rh6 83. f5 Kg4 84. f6 Rh5+ 85. Ke6 Rxa5 1/2-1/2

DarkThought – Nimzo 98: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 f4 12. Bf2 c5 13. dxc6 bxc6 14. Qd2 Be6 15. Rd1 Qc7 16. Nc2 Rd8 17. Bc5 Nc8 18. Bb4 a5 19. Ba3 Nf6 20. Kh1 Rfe8 21. Rfe1 Bf8 22. b3 Be7 23. Bb2 Nb6 24. Na3 Ra8 25. Rb1 h6 26. Bd3 Kh7 27. Red1 Nfd7 28. Be2 Red8 29. Rbc1 Qb7 30. Bf1 Nc5 31. Rb1 d5 32. cxd5 cxd5 33. exd5 Nxd5 34. Nxd5 Rxd5 35. Qc3 Nd7 36. Bc4 Rc5 37. Qe1 Bf5 38. Bd3 Bxd3 39. Rxd3 Nb6 40. Rbd1 Re8 41. Nb1 Qa8 42. Nc3 a4 43. Ba3 Rc6 44. Bxe7 Rxe7 45. Qh4 Qb7 46. bxa4 Kg7 47. Rb1 Rd7 48. Rxd7+ Qxd7 49. Qe1 Qc7 50. Nb5 Qe7 51. a5 Nc4 52. Qc3 Qe6 53. Qb4 h5 54. Nc3 Ne3 55. a6 Rc8 56. Qb7+ Kh6 57. a7 Qe8 58. Ne4 Nf5 59. Nf6 Qh8 60. Nd7 Qg8 61. Nb6 Rd8 62. a8=Q Rxa8 63. Qxa8 Qxa8 64. Nxa8 h4 65. a4 h3 66. gxh3 Nd4 67. Rb6 Nxf3 68. a5 e4 69. a6 e3 70. Nc7 e2 71. Re6 Nd4 72. Rxe2 Nc6 73. Nb5 f3 74. Rc2 Nb4 75. a7 Nxc2 76. a8=Q Kg7 77. Qxf3 Ne1 78. Qf1 Kh7 79. Nd4 Nd3 80. Ne6 Nf2+ 81. Qxf2 g5 82. Qf5+ Kh6 83. Qxg5+ Kh7 84. Qg7# 1-0

Nimzo 98 – DarkThought: [0 – 1] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. b4 a5 12. b5 fxe4 13. Nxe4 Bf5 14. Ng3 Bd7 15. Nf3 Nf5 16. Nxf5 gxf5 17. Bg5 Nf6 18. Rc1 Qe8 19. Bh4 Kh8 20. Ng5 h6 21. Nf3 Ng4 22. h3 Nf6 23. a3 Qg6 24. Re1 Rg8 25. Kh1 f4 26. Bd3 e4 27. Bb1 Rae8 28. Nd4 Nh7 29. Bc2 Bf6 30. Bxf6+ Nxf6 31. Rg1 Ng4 32. Qe1 Qf6 33. Ne6 f3 34. g3 e3 35. hxg4 Rxg4 36. fxe3 f2 37. Qe2 fxg1=Q+ 38. Rxg1 Bxe6 39. dxe6 Qxe6 40. e4 Reg8 41. Qh2 R8g5 42. a4 Qf7 43. Bd1 Rh5 44. Bxg4 Rxh2+ 45. Kxh2 Qxc4 46. Bf5 Qxa4 47. Rc1 Qxb5 48. Rxc7 a4 49. Rh7+ Kg8 50. Rc7 Qb3 51. Bc8 a3 52. Bxb7 a2 53. Bd5+ Qxd5 54. exd5 a1=Q 55. Rc8+ Kf7 56. Rc2 Qd1 57. Rf2+ Ke7 58. Ra2 Qxd5 59. Re2+ Kf6 60. Rf2+ Qf5 61. Kg2 Qxf2+ 62. Kxf2 Kg5 63. Kf3 h5 64. Kf2 Kg4 65. Kg2 d5 66. Kf2 d4 67. Kg2 d3 68. Kf2 d2 69. Ke2 Kxg3 0-1

DarkThought – Nimzo 99a: [1/2 – 1/2] (Test Game, Nunn Position #8, January 1999)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 f4 12. Bf2 c5 13. dxc6 bxc6 14. Qd2 Be6 15. Rd1 Qc7 16. Nc2 Rd8 17. Bc5 Nc8 18. Bb4 Nf6 19. Na4 c5 20. Ba5 Nb6 21. Na3 Qc6 22. b3 Rd7 23. Nxb6 axb6 24. Bc3 Rff7 25. Nb5 Ne8 26. Qd3 Nc7 27. Nxc7 Qxc7 28. Rd2 h5 29. Rfd1 h4 30. Kh1 g5 31. h3 Bf8 32. Bb2 Qc6 33. Qc2 Ra7 34. a3 Kh7 35. Kg1 Be7 36. Qd3 Rf8 37. Qc3 Rc8 38. Bd3 Kh6 39. a4 Rac7 40. Bc2 Rd8 41. Qd3 Rcc8 42. Qf1 Ra8 43. Rd3 Rab8 44. Qe1 Ra8 45. R1d2 Rd7 46. Qd1 Raa7 47. Bc3 Rac7 48. Qe1 Rc8 49. Bd1 Rdc7 50. Be2 Rd7 51. Qb1 Rcd8 52. Rd1 Re8 53. R3d2 Rc8 54. Qd3 Rdd8 55. Bb2 Ra8 56. Kh1 Qc8 57. Bf1 Qc6 58. Kg1 Rdc8 59. Qc3 Rg8 60. Bd3 Rge8 61. Be2 Rad8 62. Rd3 Rg8 63. Qc1 Rb8 64. R1d2 Rbd8 65. Qd1 Qc7 66. Kh1 Rgf8 67. Qf1 Qc6 68. Qb1 Rd7 69. Qd1 Rfd8 70. Kg1 Kg7 71. Qb1 Rf8 72. Bd1 Ra8 73. Bc2 Rdd8 74. Qf1 Rab8 75. Kh1 Kh6 76. Bd1 Rf8 77. Kg1 Rfd8 78. Be2 Qc7 79. Qb1 Re8 80. Rd1 Qc6 81. R3d2 Ra8 82. Qc2 Rac8 83. Kh1 Ra8 84. Kh2 Rad8 85. Bd3 Rg8 86. Bc3 Rb8 87. Ra1 Rgd8 88. a5 bxa5 89. Qd1 Ra8 90. Bxa5 Rdb8 91. Kh1 Qb7 92. Bc2 Ra6 93. Bc3 Rxa1 94. Qxa1 Ra8 95. Qf1 Ra2 96. Qd3 Ra3 97. Bb2 Ra6 98. Rd1 Ra2 99. Bc3 Qa7 100. Kg1 Ra3 101. Qd2 Ra6 102. Kh1 Ra2 103. Kh2 Qa8 104. Kg1 Kg6 105. Rc1 Ra3 106. Qd1 Kh7 107. Ra1 Rxa1 108. Qxa1 Qxa1+ 109. Bxa1 Kg6 110. Bc3 Kf6 111. Ba5 Bf7 112. Kf2 Bg8 113. Ke2 Be6 114. Kd3 Bc8 115. b4 cxb4 116. Bxb4 Bd7 117. Ba5 Be8 118. Bd1 Kg7 119. Bb3 Bc6 120. Bc7 Kf6 121. Bb8 Be8 122. Bd1 Bd7 123. Bb3 Bc6 124. Bc7 Bb7 125. Ba4 Ke6 126. Bb5 Bf6 127. Bb6 Be7 128. Kc3 Ba8 129. Be8 Bf8 130. Bd8 Be7 131. Ba5 Bb7 132. Bg6 Kd7 133. Bf5+ Kc6 134. Be6 Ba6 135. Kc2 Kc5 136. Kd3 Kc6 137. Bd5+ Kd7 138. Bb4 Bd8 139. Kc2 Bb6 140. Kb3 Ke7 141. Ka4 Bc8 142. Kb5 Bc5 143. Ba5 Bd7+ 144. Bc6 Be6 145. Be1 Bc8 146. Ka4 Bd7 147. Bxd7 Kxd7 148. Kb5 Bd4 149. Bb4 Be3 150. c5 dxc5 151. Bxc5 Ke6 152. Kc4 Bd2 153. Bb6 Be1 154. Bc7 Bf2 155. Ba5 Kd6 156. Bd8 Kd7 157. Bxg5 Ke6 158. Bd8 Kd7 159. Ba5 Kd6 160. Bc3 Ke6 161. Bb2 Be3 162. Kd3 Bc5 163. Bc3 Bb6 164. Be1 Bd8 165. Kc4 Kd6 166. Kb5 Kd7 167. Bc3 Ke6 168. Kc6 Be7 169. Be1 Bf6 170. Bf2 Be7 171. Kb6 Bd8+ 172. Kc5 Be7+ 173. Kc4 Bd8 174. Bc5 Ba5 175. Bb4 Bb6 176. Be1 Bd8 177. Kc5 Be7+ 178. Kb5 Bf6 179. Bb4 Bd8 180. Bc5 Bf6 181. Bb6 Kd6 182. Ba5 Ke6 183. Bd2 Be7 184. Ka5 Bc5 185. Be1 Be7 186. Bf2 Kd7 187. Kb5 Bf6 188. Bc5 Ke6 189. Kb4 Kd7 190. Bf2 Be7+ 191. Ka4 Kc6 192. Be1 Bd8 1/2-1/2

Nimzo 99a – DarkThought: [0 – 1] (Test Game, Nunn Position #8, January 1999)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. b4 a5 12. b5 fxe4 13. Nxe4 Bf5 14. Ng3 Bd7 15. Nf3 Nf5 16. Nxf5 gxf5 17. Bg5 Nf6 18. Rc1 Qe8 19. Bh4 Kh8 20. Ng5 Rg8 21. Rb1 Qg6 22. Rb3 a4 23. Ra3 Bh6 24. Rg3 Ng4 25. Nh3 Rg7 26. f4 exf4 27. Nxf4 Bxf4 28. Rxf4 Qh6 29. Rgxg4 fxg4 30. g3 Kg8 31. Bf6 Rf7 32. Bxg4 Rxf6 33. Rxf6 Qxf6 34. Bxd7 Rf8 35. Qe2 Kh8 36. b6 Qd4+ 37. Kg2 Qxb6 38. Qd2 Rf6 39. Bxa4 Qb1 40. Qe2 Qf5 41. Bc2 Qe5 42. Qe4 Qxe4+ 43. Bxe4 Rf8 44. a4 Ra8 45.

Bc2 Ra6 46. Kf3 Rb6 47. Ke3 Rb2 48. Kd2 Ra2 49. g4 Ra3 50. h4 Kg7 51. Bd1 Rh3 52. h5 Ra3 53. Bc2 h6 54. Bf5 Rxa4 55. Kc3 Kf6 56. Bd7 Ra1 57. Kd4 Rg1 58. Ke4 Kg5 59. Ke3 Rxg4 60. Bxg4 Kxg4 61. Ke4 c6 62. dxc6 bxc6 63. Ke3 Kxh5 0-1

DarkThought – Rebel 8: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 c5 12. dxc6 bxc6 13. Qd2 f4 14. Bf2 Be6 15. Rd1 Qc7 16. Nc2 Bh6 17. Na4 Bg5 18. Rfe1 Rb8 19. b4 Nc8 20. b5 c5 21. Nb2 Bd8 22. a4 Qa5 23. Bxc5 dxc5 24. Qxd8 Rb6 25. Qd2 Qxd2 26. Rxd2 Rd6 27. Red1 Rxd2 28. Rxd2 Ned6 29. Na3 Rd8 30. a5 Rd7 31. Nb1 g5 32. Nc3 Kf8 33. Nd5 g4 34. Nf6 Re7 35. Nxg4 Bxg4 36. fxg4 Nxe4 37. Rd8+ Re8 38. Rxe8+ Kxe8 39. Nd3 Nc3 40. Bf1 e4 41. Nxc5 Ke7 42. Nb3 Kd7 43. c5 Ne7 44. Nd4 Kc8 45. Ne6 Ned5 46. b6 Kb8 47. Nf8 axb6 48. cxb6 Nb4 49. a6 Nc6 50. g5 Ka8 51. Nxh7 Nd5 52. b7+ Ka7 53. g6 Nde7 54. g7 Ng8 55. Bc4 Nh6 56. Nf6 Ne5 57. h3 f3 58. Ng4 Nexg4 59. hxg4 f2+ 60. Kf1 e3 61. g5 Ng4 62. Ke2 Nh2 63. Kxe3 f1=Q 64. Bxf1 Nxf1+ 65. Kd4 Nd2 66. g8=Q Nb3+ 67. Qxb3 Kb8 68. Qb5 Kc7 69. b8=Q# 1-0

Rebel 8 – DarkThought: [1/2 –1/2] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. Rc1 fxe4 12. Nxe4 Nf6 13. f3 Nf5 14. Bg5 Qe8 15. c5 Kh8 16. cxd6 cxd6 17. Nc2 Qa4 18. Bxf6 Bxf6 19. Na3 Qd4+ 20. Qxd4 Nxd4 21. Bc4 Be7 22. Bd3 Rb8 23. Nb5 Nxb5 24. Bxb5 Bf5 25. g4 Bxe4 26. fxe4 Rf4 27. Rxf4 exf4 28. Rc7 Bf6 29. b4 g5 30. Kg2 h6 31. h3 a6 32. Bd7 Bd8 33. Rc8 Rxc8 34. Bxc8 a5 35. bxa5 Bxa5 36. Bxb7 Be1 37. Kf3 Kg7 38. Ba6 Kf6 39. Bf1 Ke5 40. Ke2 Bc3 41. Kd3 Bb4 42. Kc4 Ba3 43. Bg2 Kf6 44. Kb3 Bc5 45. a4 Ke7 46. Kc4 Ba3 47. a5 Kd7 48. a6 Kc7 49. e5 dxe5 50. d6+ Kb6 51. Kd5 Kxa6 52. d7 Be7 53. Kxe5 Bd8 54. Bf3 Kb6 55. Kd5 Kb5 56. Bg2 Kb4 57. Kc6 Kc3 58. Kb7 Kd2 59. Kc8 Bf6 60. Bd5 Ke2 61. d8=Q Bxd8 62. Kxd8 Kf2 63. Ke7 Kg3 64. Ke6 Kxh3 65. Kf5 Kg3 66. Bc6 f3 67. Ba4 f2 68. Bb5 Kh4 69. Be2 Kh3 70. Bc4 Kh4 71. Be2 1/2-1/2

DarkThought – Rebel 9: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 c5 12. dxc6 bxc6 13. Qd2 f4 14. Bc5 Be6 15. Rd1 Nc8 16. Nc2 Rb8 17. b3 Rf7 18. Kh1 Bf6 19. Bf2 Bh4 20. Bxh4 Qxh4 21. Qe1 Qe7 22. Rd2 Qf8 23. Qc1 Nf6 24. Rfd1 Rc7 25. Qa3 a5 26. Ne1 Nd7 27. Nd3 Ra7 28. Na4 Rc7 29. Qc1 Qf6 30. Qc3 Ra7 31. c5 d5 32. exd5 cxd5 33. c6 Rc7 34. Qxa5 Ra7 35. Qc3 Rc7 36. Nac5 Nxc5 37. Qxc5 Rb6 38. Nb4 d4 39. Bb5 Ra7 40. Re2 Ra5 41. Nd5 Bxd5 42. Qxd5+ Qf7 43. Qd8+ Qf8 44. Bc4+ Kg7 45. Qc7+ Kh6 46. a4 Ra7 47. Qxe5 Rxc6 48. Re4 Re7 49. Qxf4+ Qxf4 50. Rxf4 Rd6 51. h4 Red7 52. Bb5 Rd8 53. Rf7 Re6 54. Rd7 Rd6 55. Rc7 d3 56. g4 g5 57. hxg5+ Kxg5 58. Rxh7 d2 59. Kg2 Kf4 60. Kf2 Rd4 61. Rf7+ Ke5 62. Rf5+ Ke6 63. Bc4+ Kd6 64. Ke3 Kc7 65. Rc5+ Kb7 66. Be2 R4d6 67. Rc2 Re6+ 68. Kf2 Red6 69. f4 Ne7 70. f5 Kb6 71. b4 Nc6 72. a5+ Ka7 73. a6 Kb6 74. b5 Na7 75. Ke3 Re8+ 76. Kf3 Red8 77. Rb2 Nc8 78. Kf4 Ne7 79. Ke3 Re8 80. Kf2 Red8 81. Ra2 R8d7 82. Rc2 Ng8 83. g5 Ne7 84. f6 Ng6 85. Rc4 Ne5 86. Rc8 Re6 87. Rb8+ Ka7 88. Rg8 Kb6 89. Rc8 Red6 90. Rb8+ Ka7 91. Re8 Nf7 92. Bg4 Rc7 93. Re7 Kb6 94. Rxc7 Kxc7 95. a7 Rd8 96. Bf3 Nxg5 97. a8=Q Rxa8 98. Bxa8 Nf7 99. Bd5 Ne5 100. f7 Nxf7 101. b6+ Kxb6 102. Bxf7 1-0

Rebel 9 – DarkThought: [0 – 1] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. Rc1 fxe4 12. Nxe4 Nf6 13. Nxf6+ Bxf6 14. Nc2 Nf5 15. Bd2 e4 16. b4 Be5 17. Qe1 Qh4 18. h3 Bd7 19. Bg4 h5 20. Bxf5 gxf5 21. f3 Qxe1 22. Rcxe1 Kh7 23. b5 a6 24. bxa6 Rxa6 25. Nb4 Ra3 26. fxe4 f4 27. h4 Bg4 28. Rb1 f3 29. gxf3 Bh3 30. Bc1 Bd4+ 31. Kh1 Bxf1 32. Bxa3 Rxf3 33. Rxf1 Rxf1+ 34. Kg2 Re1 35. e5 Bxe5 36. Nd3 Re2+ 37. Kf3 Rxa2 38. Bb4 Bf6 39. c5 dxc5 40. Bxc5 Bxh4 41. d6 cxd6 42. Bxd6 Rd2 43. Ke4 Bg5 44. Bb4 Re2+ 45. Kf5 h4 46. Kxg5 h3 47. Nf4 h2 48. Nxe2 h1=Q 49. Ng3 Qb1 50. Bd2 Qd3 51. Bf4 Qg6+ 52. Kh4 Qe6 53. Kg5 b5 54. Nh5 Qd5+ 55. Kh4 Kg6 56. Ng3 b4 57. Kh3 b3 58. Bc1 Qd7+ 59. Kh2 Qd1 60. Ba3 Qa1 61. Nf1 Kg5 62. Kg1 Qxa3 0-1

DarkThought – Shredder 2: [1 – 0] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 fxe4 12. fxe4 Rxf1+ 13. Bxf1 Nf6 14. Be2 c5 15. dxc6 bxc6 16. Bc5 Ne8 17. Qd2 Ba6 18. Rd1 Nc8 19. Ba3 Qd7 20. Nf3 Qe6 21. c5 Bxe2 22. Qxe2 Bf6 23. Qa6 dxc5 24. Nd5 Ncd6 25. Nxf6+ Nxf6 26. Qxc6 Rd8 27. Ng5 Qg4 28. Rxd6 Rxd6 29. Qxd6 Qxg5 30. Qxc5 h5 31. b3 a5 32. g3 h4 33. Qc8+ Kh7 34. Kf1 Qd2 35. Qc7+ Kg8 36. Qd6 Qxh2 37. Qf8+ Kh7 38. Qf7+ Kh6 39. Qxf6 Qxg3 40. Ke2 h3 41. Bc1+ Kh5 42. Qf3+ Qg4 43. Qxg4+ Kxg4 44. Kf2 h2 45. Kg2 h1=Q+ 46. Kxh1 Kf3 47. Bd2 Kxe4 48. Bxa5 Kd5 49. a4 Kc6 50. b4 Kb7 51. b5 g5 52. Bd8 g4 53. a5 g3 54. a6+ Ka7 55. Kg2 e4 56. Bg5 Kb6 57. Be3+ Kxb5 58. a7 Kc6 59. a8=Q+ 1-0

Shredder 2 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #8, August 1998)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Be2 O-O 6. Nf3 e5 7. O-O Nc6 8. d5 Ne7 9. Ne1 Ne8 10. Be3 f5 11. f3 Kh8 12. Nc2 Bd7 13. Qd3 Nf6 14. c5 Nh5 15. Qc4 Nf4 16. Bxf4 exf4 17. Nd4 fxe4 18. fxe4 Be5 19. Rad1 Qc8 20. Nf3 Bf6 21. Qb4 Qb8 22. Nd4 g5 23. Ncb5 Bxb5 24. Nxb5 Rd8 25. h4 a5 26. Qa3 Be5 27. hxg5 Rg8 28. Nd4 Rxg5 29. Ne6 Rg3 30. Rd3 Rxd3 31. Qxd3 Qa7 32. Qh3 Rg8 33. Rf2 a4 34. Qh5 Qa5 35. Qf7 Ng6 36. cxd6 cxd6 37. Ng5 Qe1+ 38. Bf1 Nf8 39. Nf3 Qxe4 40. Bd3 Qxd3 41. Nxe5 dxe5 42. Qf6+ Rg7 43. Qxf8+ Rg8 44. Qf6+ Rg7 45. Qxe5 Qb1+ 46. Kh2 Qg6 47. Qe2 Rg8 48. Qc4 Rg7 49. Qc8+ Rg8 50. Qc3+ Rg7 51. Qd2 Qh5+ 52. Kg1 f3 53. Qd4 Qg5 54. Rc2 Qg4 55. Qxg4 Rxg4 56. d6 Rd4 57. Rc8+ Kg7 58. Rc7+ Kg6 59. gxf3 Rxd6 60. Rxb7 Rd2 61. Rb4 h5 62. a3 Kg5 63. Rxa4 Rxb2 64. Rb4 Ra2 65. a4 h4 66. Rg4+ Kh5 67. Rd4 h3 68. Rb4 Kg5 69. Rg4+ Kh5 70. Re4 Rd2 71. Rf4 Rg2+ 72. Kh1 Rd2 73. a5 Ra2 74. a6 Rxa6 75. Kh2 Rh6 76. Rg4 Rf6 77. Rg3 Rf4 78. Kxh3 1/2-1/2

Games Played by DarkThought from Nunn Position #9 (ECO A25)

DarkThought – Chessmaster 4000 Turbo: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Qd7 11. Nd5 Bh3 12. Bxh3 Qxh3 13. Nxc7 Rac8 14. Nd5 Nxd5 15. cxd5 Nb4 16. fxe5 dxe5 17. Nc3 f5 18. a3 Na6 19. Nb5 Nc5 20. Nxa7 Rcd8 21. b4 Nxd3 22. Qxd3 e4 23. Qb1 f4 24. gxf4 Qg4+ 25. Kh1 Bxa1 26. Qa2 Qh3 27. Rf2 Bf6 28. d6+ Rf7 29. Nb5 Rc8 30. Bd2 Qh5 31. Qe6 Rd8 32. Qc4 Bh4 33. Re2 Qf3+ 34. Kg1 Bf6 35. Rf2 Qg4+ 36. Kh1 Rc8 37. Qb3 Qd7 38. a4 Qf5 39. Rg2 Bg7 40. Nc7 Qd7 41. Ne6 Bf6 42. f5 Qxd6 43. Nc5 Kf8 44. Nxe4 Qe5 45. fxg6 hxg6 46. Nc5 Rc6 47. Qd3 Rd6 48. Qc4 Qf5 49. Qf4 Be5 50. Qxf5 gxf5 51. Rf2 Ke8 52. a5 Rg6 53. Rg2 Rxg2 54. Kxg2 Rg7+ 55. Kf3 Bxh2 56. e4 fxe4+ 57. Kxe4 Bd6 58. Kd5 Bxc5 59. Kxc5 Kd7 60. Bf4 Rg4 61. Bd2 Rg6 62. Bf4 Rg4 63. Bc1 Rg1 64. Bf4 Rg4 65. Bd2 Rg2 66. Bf4 Rc2+ 67. Kb6 Rc4 68. Bd2 Kc8 69. b5 Rd4 70. Be3 Rd6+ 71. Kc5 Kd7 72. Kc4 Re6 73. Bc5 Rg6 74. Bb6 Rh6 75. Kd3 Rh5 76. Kc4 Rh4+ 77. Kd5 Rb4 78. Kc5 Ra4 79. Kd5 Ra2 80. Kc4 Ke6 81. a6 bxa6 82. bxa6 Rxa6 1/2-1/2

Chessmaster 4000 Turbo – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. d4 exd4 10. exd4 Re8 11. Bg5 h6 12. Be3 Nf5 13. Qd2 Kh7 14. Nd5 Nce7 15. Ndf4 Bc6 16. d5 Nxe3 17. fxe3 Bd7 18. Rae1 Nc8 19. Nd4 Qe7 20. Nd3 Nb6 21. b3 Rad8 22. a4 Na8 23. a5 a6 24. b4 Rf8 25. b5 axb5 26. cxb5 Rb8 27. a6 Nb6 28. Qc2 Qd8 29. Qb3 Qc8 30. axb7 Qxb7 31. Ne6 fxe6 32. Rxf8 Rxf8 33. dxe6 Qb8 34. exd7 Nxd7 35. Bc6 Ne5 36. Nxe5 Bxe5 37. Rc1 Bg7 38. Qd3 Rf6 39. Bd5 Qa7 40. g4 Rf4 41. h3 Rf8 42. Be4 Kh8 43. Kg2 g5 44. Rc2 Qa5 45. Bf3 Qb6 46. Bd5 Qa5 47. Be4 Be5 48. Qe2 Bg7 49. Bf5 Re8 50. Bd7 Ra8 51. Qd3 Rf8 52. Qc4 Qa3 53. Bf5 Qxe3 54. Qe6 Qxe6 55. Bxe6 Bd4 56. Rxc7 Rf2+ 57. Kg3 Rb2 58. Rb7 Bc5 59. Kf3 Rb4 60. Bd5 Rf4+ 61. Ke2 Rb4 62. Bc6 Rb3 63. Kd2 Bb4+ 64. Kc2 Rxh3 65. Bd5 Rc3+ 66. Kb2 Rc5 67. Be6 Bd2 68. Bd7 Be3 69. Kb3 Bd4 70. Be6 d5 71. Kb4 Rc4+ 72. Ka5 Bc3+ 73. Ka6 Ra4+ 74. Kb6 d4 75. Rd7 Ra8 76. Bf5 Kg8 77. Kb7 Rf8 78. b6 Be1 79. Be6+ Kh8 80. Rxd4 Bf2 81. Rd6 Kg7 82. Rd7+ Kf6 83. Bd5 Ke5 84. Rf7 Rxf7+ 85. Bxf7 Kd6 86. Bg6 Kd7 87. Ka6 Bg3 88. Bf5+ Ke7 89. Be4 h5 90. gxh5 Kf8 91. Bf3 Kg7 1/2-1/2

DarkThought – Comet A.86: [1 – 0] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Qd7 11. Bd2 Rfb8 12. Kh1 a6 13. Nd5 Bg4 14. Bc3 Nxd5 15. cxd5 Ne7 16. Qc2 Nf5 17. Qd2 Re8 18. e4 Nd4 19. Nxd4 exd4 20. Ba5 b6 21. Bb4 a5 22. Ba3 b5 23. b3 a4 24. Qf2 b4 25. Bxb4 Qb5 26. Qd2 Reb8 27. a3 axb3 28. Rab1 Rb6 29. f5 c5 30. dxc6 Rxc6 31. Rxb3 Qe5 32. h3 Qxg3 33. Qe1 Qxe1 34. Rxe1 Bxh3 35. Bxh3 Be5 36. fxg6 hxg6 37. Rb2 Kg7 38. Kg2 Rh8 39. Rf1 Rc7 40. Ba5 Ra7 41. Rb5 Rh5 42. Rf3 Rg5+ 43. Kf1 Rh5 44. Bd2 Rh4 45. a4 Rxa4 46. Rb7 Ra1+ 47. Kg2 Kg8 48. Rfxf7 Rh5 49. Bf4 Rb1 50. Rbe7 Rb2+ 51. Kg3 Rb8 52. Bxe5 Rxe5 53. Rg7+ Kh8 54. Rh7+ Kg8 55. Reg7+ Kf8 56. Rxg6 Rb3 57. Bf5 Rxf5 58. exf5 Rb1 59. Kf4 Rc1 60. Rgh6 Rf1+ 61. Kg5 Rh1 62. Rxh1 Kg8 63. Rh8+ Kf7 64. R1h7# 1-0

Comet A.86 – DarkThought: [0 – 1] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. f4 exf4 10. Nxf4 Kh8 11. Qb3 Rb8 12. Bd2 f5 13. Ncd5 Ne5 14. d4 Ng4 15. h3 Nh6 16. Qa3 Nc8 17. c5 c6 18. Nb4 d5 19. Kh2 Nf7 20. Rf2 Re8 21. Raf1 Ng5 22. Nbd3 Kg8 23. Qb3 Ne4 24. Bxe4 Rxe4 25. Rg2 Re8 26. Nb4 Ne7 27. Qa4 Ra8 28. Nbd3 Qc7 29. Rgf2 Rf8 30. Bc3 Kh8 31. Ne5 Qc8 32. a3 Qe8 33. b3 Bc8 34. Qa5 Ng8 35. Qc7 Nf6 36. Rc2 Ne4 37. Ba5 Bf6 38. a4 g5 39. Ne2 Qe6 40. Kg1 Kg8 41. h4 h6 42. Rf3 Bd8 43. Qxd8 Rxd8 44. Bxd8 Bd7 45. Ba5 Be8 46. Rf1 Bh5 47. Be1 Nxc5 48. Rxc5 Bxe2 49. Rf2 Bg4 50. Rh2 Re8 51. hxg5 hxg5 52. b4 Bd1 53. Rd2 Bxa4 54. Ra5 Bb5 55. Rxa7 Ba6 56. Rh2 Qf6 57. Bf2 Kg7 58. Rh5 Rh8 59. Rxh8 Kxh8 60. Ra8+ Kg7 61. Rc8 Qe7 62. Be1 Bc4 63. Bd2 Be2 64. Kf2 Bh5 65. Bc3 Qd6 66. Ke1 Bf3 67. Rh8 Qe7 68. Kd2 Bg2 69. Rh2 Be4 70. Rh5 Qf6 71. Ke2 Qd8 72. Rh6 Qe7 73. Rh5 g4 74. Ke1 Qd8 75. Ke2 Qa8 76. Rg5+ Kh6 77. Rg6+ Kh7 78. Re6 Bf3+ 79. Nxf3 Qa6+ 80. Kd2 gxf3 81. Rf6 Qe2+ 82. Kc1 Qd3 83. Be1 Qf1 84. Kb2 Qxe1 85. g4 fxg4 86. Kc2 f2 87. Rf7+ Kg6 88. Rf8 Kg7 89. Rf5 f1=Q 90. Rxf1 Qxf1 91. e4 g3 92. Kb2 g2 93. Kb3 g1=Q 94. Kc3 Qc4+ 95. Kb2 Qgc1# 0-1

DarkThought – Crafty 16.4: [1 – 0] (Test Game, Nunn Position #9, January 1999)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 f5 9. f4 Be6 10. Nd5 Rb8 11. Bd2 b5 12. Bc3 b4 13. Bd2 e4 14. dxe4 Bxb2 15. Rb1 Bg7 16. Qa4 fxe4 17. Bxe4 a5 18. a3 bxa3 19. Qxa3 Rxb1 20. Rxb1 Qd7 21. Rb7 Bxd5 22. cxd5 Nd8 23. Ra7 Nc8 24. Rxa5 Nb7 25. Ra8 Qg4 26. Nc3 Nc5 27. Bg2 Nb6 28. Rxf8+ Kxf8 29. Qa7 Bxc3 30. Qb8+ Ke7 31. Qxc7+ Nbd7 32. Bxc3 Qd1+ 33. Bf1 Qxd5 34. Qa7 Qe4 35. Bd4 Ne6 36. Bb2 Qf3 37. Qa3 Ndc5 38. Qc3 Ne4 39. Qe1 N6c5 40. Bd4 Nb3 41. Bc3 Nbc5 42. Bg2 Qh5 43. Bd4 Qg4 44. Bxc5 Nxc5 45. Qa1 h5 46. Qg7+ Kd8 47. Qd4 Ke7 48. Ba8 Ne6 49. Qa7+ Kf6 50. Qa1+ Ke7 51. Qb1 Nc5 52. Qb2 Qd1+ 53. Kg2 Nd3 54. Qg7+ Kd8 55. Qf6+ Kc7 56. Qe7+ Kb6 57. Qb7+ Ka5 58. Qd5+ Kb6 59. Qc6+ Ka5 60. Qc7+ Ka4 61. Qc4+ Ka5 62. Qe6 Kb5 63. Kh3 Nf2+ 64. Kh4 Qg4+ 65. Qxg4 Nxg4 66. Kg5 Nxe3 67. Kxg6 d5 68. f5 Kc5 69. f6 Ng4 70. f7 Ne5+ 71. Kg7 Nxf7 72. Kxf7 Kd6 73. Kf6 Kc5 74. Bxd5 Kxd5 75. Kg5 Ke4 76. Kxh5 1-0

Crafty 16.4 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #9, January 1999)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. Nd5 Kh8 10. Bd2 g5 11. Nec3 Nxd5 12. cxd5 Nb4 13. d4 exd4 14. exd4 g4 15. Qb3 a5 16. a3 Na6 17. Qc4 Qb8 18. Nb5 a4 19. Be3 Rc8 20. Rfc1 c6 21. dxc6 bxc6 22. Nc3 d5 23. Qd3 Nc7 24. Rc2 Qb3 25. Rd2 Rab8 26. f3 f5 27. Bf4 Rb7 28. Re1 Nb5 29. Nxb5 Qxd3 30. Rxd3 Rxb5 31. Rd2 Re8 32. Rxe8+ Bxe8 33. Be5 Bxe5 34. dxe5 Rb3 35. f4 Rb8 36. Bf1 Bf7 37. Be2 c5 38. Rc2 c4 39. Rd2 Kg7 40. Kf2 Kf8 41. Ke3 Ke7 42. Bd1 Ra8 43. Kd4 h5 44. h3 gxh3 45. Rh2 Rg8 46. Rxh3 Rb8 47. Rh2 Rg8 48. Kc5 Rc8+ 49. Kb4 Rb8+ 50. Kxa4 d4 51. Ka5 d3 52. Bf3 Rb3 53. Bd1 Rb8 54. a4 Kd7 55. Bf3 Kc7 56. Rg2 Be8 57. Rd2 Bf7 58. Rf2 Rg8 59. Kb5 Rxg3 60. Bc6 Rg1 61. a5 h4 62. a6 Ra1 63. Bb7 h3 64. Rh2 Ra2 65. Kb4 Bg8 66. Kc3 Ra1 67. Rxh3 Rc1+ 68. Kd2 Rc2+ 69. Ke3 Re2+ 70. Kf3 Rxb2 71. Rh6 Rb6 72. a7 d2 73. Ke2 Rb1 74. Rh1 d1=Q+ 75. Rxd1 Rb2+ 76. Ke1 Kxb7 77. Rd7+ Ka8 78. Rd8+ Kxa7 79. Rxg8 Rb4 80. Ke2 c3 81. Rc8 Rxf4 82. Rxc3 Re4+ 83. Re3 Kb6 84. Rxe4 fxe4 1/2-1/2

DarkThought – Fritz 3.10: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Re8 11. Kh1 Qd7 12. Bd2 Bg4 13. Qb3 Na5 14. Qb5 Nac6 15. Rae1 Rab8 16. Nd5 a6 17. Qb3 b5 18. Bc3 b4 19. Bd2 Nxd5 20. cxd5 Na5 21. Qc2 exf4 22. Nxf4 b3 23. Qc1 Nb7 24. h3 g5 25. hxg4 gxf4 26. axb3 fxg3 27. Qc4 Nc5 28. b4 Na4 29. Rf5 Re5 30. Rxe5 dxe5 31. g5 Nb6 32. Qc6 Qg4 33. b5 axb5 34. Qxc7 Nd7 35. Kg1 f6 36. gxf6 Bxf6 37. Rf1 Rf8 38. Be1 Bg5 39. Rxf8+ Kxf8 40. Qd6+ Kf7 41. Bxg3 Bxe3+ 42. Kh2 Bf4 43. Bxf4 Qxf4+ 44. Kg1 Qd4+ 45. Kh1 Qh4+ 46. Kg1 Qe1+ 47. Kh2 Nf6 48. Qe6+ Kg7 49. d6 Qh4+ 50. Kg1 Qd4+ 51. Kh1 Qxb2 52. Qe7+ Kg6 53. d7 Qc1+ 54. Kh2 Qf4+ 55. Kh1 Qh4+ 56. Kg1 Qd4+ 57. Kh2 Ng4+ 58. Kh3 Nf2+ 59. Kh2 Ng4+ 60. Kh3 Nf2+ 61. Kh2 Ng4+ 1/2-1/2

Fritz 3.10 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. d4 exd4 10. exd4 Re8 11. Re1 Nf5 12. d5 Ne5 13. b3 Qe7 14. Bb2 a5 15. Nf4 a4 16. bxa4 Qd8 17. Re4 Ne7 18. Qb3 Bg4 19. Nb5 g5 20. Nh3 Bf5 21. Re3 g4 22. Nf4 N7g6 23. Rae1 Bh6 24. Nxg6 hxg6 25. R3e2 Bg7 26. c5 Qd7 27. Re3 Bf6 28. cxd6 cxd6 29. Bc3 Rac8 30. Bb4 Bc2 31. Qa3 Be7 32. Nxd6 Bxd6 33. Bxd6 Nd3 34. Rxe8+ Rxe8 35. Rxe8+ Qxe8 36. Be7 Qc8 37. Bg5 Qf5 38. Be3 Qf6 39. h4 gxh3 40. Bxh3 Qa1+ 41. Kh2 Ne5 42. Bh6 Kh7 43. Qe3 Bd1 44. Bf8 Kg8 45. Bb4 Bf3 46. Qe1 Qxe1 47. Bxe1 Bxd5 48. Bg2 Nf3+ 49. Bxf3 Bxf3 50. Kh3 g5 51. Bd2 g4+ 52. Kh4 f6 53. Bc3 Kf7 1/2-1/2

DarkThought – Fritz 5.00: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 f5 9. f4 Be6 10. Nd5 Bf7 11. Bd2 Nxd5 12. cxd5 Ne7 13. Qb3 c6 14. fxe5 dxe5 15. Qxb7 Rb8 16. Qxa7 Rxb2 17. Rfd1 Nxd5 18. Rab1 Qb8 19. Qxb8 Rfxb8 20. Rxb2 Rxb2 21. e4 Ne7 22. Nc1 Bxa2 23. Nxa2 Rxa2 24. Bb4 Kf7 25. Rf1 Bh6 26. Bxe7 Be3+ 27. Kh1 Kxe7 28. exf5 gxf5 29. Rxf5 Ke6 30. Be4 c5 31. Rf1 h6 32. Bh7 Ke7 33. Rf5 Bd4 34. Rh5 Re2 35. Rxh6 e4 36. dxe4 c4 37. Rc6 c3 38. e5 Bxe5 39. Bf5 Kd8 40. Rc5 Ke7 41. Bd3 Re3 42. Ba6 Kd6 43. Rc8 Kd7 1/2-1/2

Fritz 5.00 – DarkThought: [0 – 1] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. f4 exf4 10. Nxf4 Kh8 11. Ncd5 f5 12. Qb3 Rb8 13. Bd2 Ne5 14. d4 Ng4 15. h3 Nh6 16. Bb4 Re8 17. Rac1 Nf7 18. c5 c6 19. Nf6 Bxf6 20. Qxf7 Rf8 21. Qb3 d5 22. Rf3 Re8 23. Rcf1 Ng8 24. Qc3 Nh6 25. Ba5 Qc8 26. Qd2 Nf7 27. h4 Re7 28. Bc3 Bg7 29. b3 Nh6 30. Bb2 Ng4 31. Qd3 Qe8 32. Bc1 Nf6 33. a3 Rd8 34. Bd2 Qf7 35. Nh3 Qg8 36. Ba5 Rde8 37. Bc7 Ne4 38. Bf4 h6 39. b4 Kh7 40. Nf2 g5 41. hxg5 hxg5 42. Bd6 g4 43. Nxg4 fxg4 44. Rf4 Re6 45. Rf7 Bc8 46. Be5 Rxe5 47. dxe5 Rxe5 48. Bxe4+ Rxe4 49. Re7 Kh8 50. Rxe4 dxe4 51. Qxe4 Qe6 52. Qd3 Bd7 53. Rf2 Kg8 54. Rh2 Kf7 55. Rf2+ Ke8 56. e4 Be5 57. Rf1 Qe7 58. Rd1 Kd8 59. Qb3 Kc7 60. a4 Bc8 61. Qe3 Qf7 62. b5 Qa2 63. b6+ axb6 64. cxb6+ Kb8 65. Rd8 Qxa4 66. Kg2 Qb4 67. Re8 Qb2+ 68. Qf2 Qxf2+ 69. Kxf2 Bd4+ 70. Ke2 Bxb6 71. e5 Kc7 72. Re7+ Kd8 73. Rf7 Bd4 74. Rf8+ Kc7 75. Rf7+ Kb8 76. Re7 b5 77. Re8 Kc7 78. e6 Bc5 79. Kd2 Bd6 80. Ke3 c5 81. Kd3 b4 82. Kc2 c4 83. e7 Bd7 84. Rf8 Bxe7 85. Rf4 c3 86. Rf7 Kd8 87. Rf2 Ba4+ 88. Kd3 c2 89. Rxc2 Bxc2+ 90. Kxc2 Bd6 91. Kb3 Bxg3 0-1

DarkThought – Fritz 5.32b: [1 – 0] (Test Game, Nunn Position #9, January 1999)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 f5 11. Qb3 Rb8 12. Nd5 a6 13. Bd2 Re8 14. Bc3 b5 15. cxb5 Na7 16. b6 Rxb6 17. Nxe7+ Qxe7 18. Qc2 c5 19. fxe5 dxe5 20. e4 fxe4 21. Bxe4 Nb5 22. Ba5 Rbb8 23. Kh1 Nd6 24. Nc3 Nf5 25. Rae1 Nd4 26. Qd2 Nf7 27. b3 Bh3 28. Bd5+ Ne6 29. Rf2 Rf8 30. Bc4 Kh8 31. Ne4 Nd4 32. Qb2 Bg4 33. Bc3 Rxf2 34. Nxf2 Bf3+ 35. Kg1 Bb7 36. Bxd4 cxd4 37. Ne4 Bh6 38. Nc5 Qd6 39. Nxb7 Rxb7 40. Qe2 Be3+ 41. Kh1 Qc6+ 42. Qg2 Qxg2+ 43. Kxg2 a5 44. Kf3 Kg7 45. Ke4 Re7 46. a3 Kf8 47. b4 Ke8 48. b5 Kd7 49. b6 Kd6 50. Bd5 Re8 51. Rf1 Rb8 52. Rf6+ Kd7 53. Rf7+ Kd6 54. b7 a4 55. Rxh7 Bc1 56. Rg7 g5 57. Rg6+ Kd7 58. Kxe5 Bxa3 59. Rxg5 Bd6+ 60. Kxd4 a3 61. Kc3 Be7 62. Rg6 Kc7 63. h4 Rd8 64. Be4 Kb8 65. Ra6 Kc7 66. h5 Bd6 67. g4 Rh8 68. Rc6+ Kd7 69. Kb3 a2 70. Kxa2 Bc7 71. h6 Bf4 72. g5 Rb8 73. Rc8 Rxb7 74. Bxb7 1-0

Fritz 5.32b – DarkThought: [0 – 1] (Test Game, Nunn Position #9, January 1999)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. b4 Nxb4 10. Rb1 a5 11. a3 Na6 12. Rxb7 Nc5 13. Rb2 Rb8 14. d4 Ne6 15. Rxb8 Qxb8 16. dxe5 Bxe5 17. Nd5 Nc6 18. f4 Bg7 19. e4 Re8 20. Be3 Kh8 21. f5 Ned8 22. f6 Bf8 23. Qc2 Ne6 24. Rb1 Qd8 25. Nef4 Nc5 26. Bxc5 dxc5 27. Qd2 Bc8 28. Nd3 Ba6 29. Nb2 Qd6 30. Rf1 Rb8 31. Rf2 Ne5 32. Qxa5 Nxc4 33. Qc3 Ne5 34. Bf1 c6 35. Ne3 Qd4 36. Qxd4 cxd4 37. Nec4 Ng4 38. Rc2 Rb3 39. a4 Rc3 40. Rd2 Kg8 41. Bd3 Ne3 42. Ne5 Rc1+ 43. Kf2 Bb4 44. Ke2 Rh1 45. Nf3 Bc8 46. Nc4 Bxd2 47. Kxd2 Rd1+ 48. Ke2 Bg4 49. Nce5 Bxf3+ 50. Kxf3 Rc1 51. Ke2 g5 52. Kd2 Rc3 53. Be2 c5 54. Bh5 Nc4+ 55. Nxc4 Rxc4 56. Bd1 Rc3 57. Be2 Ra3 58. Bb5 Ra2+ 59. Kc1 Rxh2 60. e5 Rg2 61. a5 Rxg3 62. Kb2 c4 63. Bxc4 Rc3 64. Be2 Re3 65. Bf1 Rxe5 66. a6 g4 67. Kb3 Ra5 68. Kb4 Ra1 69. Bb5 d3 70. Bxd3 g3 71. Be4 Rxa6 72. Bg2 Re6 73. Kc3 Re2 74. Bc6 Rf2 75. Kd4 h5 76. Ke3 h4 77. Bd7 Rb2 78. Bh3 g2 79. Kd4 g1=Q+ 0-1

DarkThought – Genius 3: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Qd7 11. Bd2 Bh3 12. Bxh3 Qxh3 13. Nd5 Rac8 14. Qb3 b6 15. Kh1 Rfe8 16. fxe5 Nxe5 17. Nef4 Qh6 18. e4 Nxd5 19. cxd5 f5 20. exf5 Ng4 21. h4 Re2 22. Bc3 Re3 23. Be1 gxf5 24. Rb1 Re7 25. Qa4 a5 26. Ne6 Qe3 27. Qd1 Ne5 28. Kh2 Rf7 29. Ng5 Rf6 30. Bf2 Ng4+ 31. Qxg4 Qxf2+ 32. Rxf2 fxg4 33. Rbf1 Rcf8 34. Rxf6 Rxf6 35. Rxf6 Bxf6 36. Ne6 Bxb2 37. Nxc7 Kf8 38. Nb5 Ke7 39. a4 Bc1 40. Kg2 Bd2 41. Kf2 Bb4 42. Ke3 h5 43. d4 Kf6 44. Ke2 Kf5 45. Kd3 Kf6 46. Nc3 Kg6 47. Ne4 Kg7 48. Ke3 Kf7 49. Kd3 Kg7 50. Nd2 Kf6 51. Nc4 Kg6 52. Ke3 Kf5 53. Kd3 Kg6 54. Nd2 Kf5 55. Ne4 Ba3 56. Nf2 Bb4 57. Ke3 Be1 58. Ne4 Bb4 59. Nf2 Be1 60. Ne4 Bb4 61. Nf2 1/2-1/2

Genius 3 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. Qb3 Rb8 10. Bd2 Kh8 11. f4 exf4 12. Nxf4 f5 13. Rac1 Ne5 14. Nb5 Nc8 15. Nd4 Re8 16. c5 dxc5 17. Rxc5 b6 18. Rcc1 c5 19. Nf3 Ng4 20. Rfe1 Nd6 21. h3 Ne5 22. Bc3 Nxf3+ 23. Bxf3 Qe7 24. Nd5 Qf8 25. Nc7 Re7 26. Kg2 Nf7 27. Nd5 Be6 28. Bxg7+ Qxg7 29. Qa3 Bxd5 30. Bxd5 Rd8 31. e4 Qd4 32. Qc3 Qxc3 33. bxc3 Ne5 34. Rcd1 fxe4 35. dxe4 Kg7 36. Rf1 Rd6 37. Rb1 Red7 38. Rb5 Nc6 39. Rb2 Kh6 40. Rbb1 Ne7 41. c4 Nc6 42. Rf8 Re7 43. Rbf1 Nb4 44. a4 Nd3 45. Rc8 Kg7 46. Rg8+ Kh6 47. Rc8 Kg7 48. Rg8+ Kh6 49. Rc8 1/2-1/2

DarkThought – Genius 5: [1 – 0] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Qd7 11. Bd2 Bh3 12. Bxh3 Qxh3 13. Nd5 Rac8 14. Qb3 b6 15. Kh1 Rfe8 16. fxe5 Nxd5 17. cxd5 Nxe5 18. Nf4 Qh6 19. e4 Ng4 20. h4 Bd4 21. Bc3 Be5 22. Rae1 a6 23. d4 Bg7 24. Qd1 Nf6 25. e5 Nh5 26. Kh2 Nxf4 27. Rxf4 Rcd8 28. Qd3 g5 29. Rg4 Qg6 30. Qxg6 fxg6 31. e6 gxh4 32. gxh4 Re7 33. Kg3 Rf8 34. Rf4 Rxf4 35. Kxf4 Bf6 36. h5 Rg7 37. hxg6 hxg6 38. Rg1 Kf8 39. Ke4 a5 40. Rf1 Ke7 41. Rh1 Bg5 42. Kf3 Kf6 43. Kg4 Be3 44. Re1 Bh6 45. Rf1+ Ke7 46. Rh1 Be3 47. Re1 Bh6 48. b3 Kf6 49. Bb2 b5 50. Rf1+ Ke7 51. Bc1 Bxc1 52. Rxc1 Kf6 53. Rf1+ Ke7 54. Kg5 Rh7 55. Kxg6 Rh2 56. Rf7+ Ke8 57. Rxc7 Rg2+ 58. Kf5 Rf2+ 59. Ke4 Re2+ 60. Kd3 Rxa2 61. Rd7 Ra3 62. Rxd6 Rxb3+ 63. Ke4 Rb2 64. Ra6 Re2+ 65. Kf5 Rf2+ 66. Ke5 Re2+ 67. Kd6 Kf8 68. Rxa5 b4 69. Ra8+ Kg7 70. e7 b3 71. e8=Q Rxe8 72. Rxe8 1-0

Genius 5 – DarkThought: [0 – 1] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. f4 exf4 10. Nxf4 Kh8 11. Qb3 Rb8 12. Bd2 f5 13. Rac1 Ne5 14. Nb5 Nc8 15. Nd4 Re8 16. Nf3 Ng4 17. Rce1 Nb6 18. Re2 Na4 19. h3 Ne5 20. Nxe5 dxe5 21. Nd5 b5 22. cxb5 e4 23. Nc3 Nc5 24. Qa3 Nxd3 25. Qxa7 Ra8 26. Qb7 Re5 27. b4 Nxb4 28. Rb1 Nd3 29. b6 cxb6 30. Qxb6 Qe8 31. Nd1 Rc5 32. Nf2 Rcc8 33. Nxd3 Rcb8 34. Nc5 Rxb6 35. Rxb6 Bb5 36. Rf2 Bc4 37. Nb3 Rxa2 38. Bc1 Rxf2 39. Kxf2 Qd8 40. Rb4 Qd3 41. Rb8+ Bg8 42. Bf1 Qc2+ 43. Be2 Be5 44. Re8 Bxg3+ 45. Kxg3 Qxe2 46. Rc8 Kg7 47. Nd4 Qe1+ 48. Kg2 f4 49. exf4 e3 50. Rxg8+ Kxg8 51. Bxe3 Qxe3 52. Nf3 Qxf4 53. h4 h5 0-1

DarkThought – Hiarcs 6: [0 – 1] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Qd7 11. Nd5 Bg4 12. Kh1 Nxd5 13. cxd5 Ne7 14. Qc2 Rae8 15. Rf2 c6 16. Nc3 cxd5 17. Nxd5 Nxd5 18. Bxd5 exf4 19. Rxf4 Bh6 20. Rf2 Bxe3 21. Bxe3 Rxe3 22. Raf1 Bf5 23. g4 Qb5 24. Bxf7+ Rxf7 25. gxf5 Qd5+ 26. Kg1 Re5 27. h3 Rexf5 28. Rxf5 Rxf5 29. Rxf5 gxf5 30. Qg2+ Qxg2+ 31. Kxg2 Kf7 32. Kf3 a5 33. Kf4 Ke6 34. a4 Kf6 35. h4 h5 36. d4 Ke6 37. Kg5 Kd5 38. Kxf5 Kxd4 39. Kg5 Ke4 40. Kxh5 Kf5 41. Kh6 d5 42. Kg7 d4 43. Kf7 d3 0-1

Hiarcs 6 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. Qb3 Rb8 10. Bd2 Kh8 11. f4 exf4 12. Nxf4 f5 13. Ncd5 Ne5 14. d4 Ng4 15. Qa3 Nc8 16. h3 Nf6 17. Nxf6 Qxf6 18. Bb4 Re8 19. Nd5 Qd8 20. Rac1 c6 21. Nf4 Qf6 22. Kh2 Qf7 23. Bxd6 Nxd6 24. Qxd6 Qe7 25. Qc7 Qd8 26. Qxd8 Rbxd8 27. Rc3 Bc8 28. b4 Bd7 29. Ra3 a6 30. Rd3 Ra8 31. a4 Bf8 32. c5 Ra7 33. a5 Raa8 34. Rfd1 Bg7 35. d5 cxd5 36. Nxd5 Bb5 37. R3d2 Rac8 38. Kh1 Ba4 39. Nb6 Bxd1 40. Nxc8 Bh5 41. Nb6 Bc3 42. Rd3 Bxb4 43. g4 fxg4 44. hxg4 Bxg4 45. Rd4 Bxc5 46. Rxg4 Rxe3 47. Re4 Ra3 48. Nc4 Ra1+ 49. Kh2 Bb4 50. Re8+ Kg7 51. Bxb7 Bxa5 52. Re6 Bc3 53. Bxa6 h5 54. Bb7 g5 55. Be4 Bf6 56. Bc6 g4 57. Nd6 Bg5 58. Nf5+ Kf7 59. Bd5 Bf4+ 60. Kg2 Ra5 61. Rd6+ Ke8 62. Ng7+ Ke7 63. Re6+ Kf7 64. Nxh5 Rxd5 65. Rf6+ Ke7 66. Rxf4 Rxh5 67. Rxg4 1/2-1/2

DarkThought – Junior 4.6: [1/2 – 1/2] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 a5 9. Kh1 Bg4 10. f3 Be6 11. f4 Bg4 12. Bd2 exf4 13. Rxf4 Ne5 14. Qb1 Bf5 15. e4 Bg4 16. Rf1 c5 17. h3 Bd7 18. g4 N7c6 19. Nf4 Qh4 20. Qe1 Qxe1 21. Bxe1 Nb4 22. Rd1 g5 23. Nh5 Nbxd3 24. Nxg7 Kxg7 25. Bg3 h5 26. gxh5 Rh8 27. Nd5 Nxb2 28. Bxe5+ dxe5 29. Rb1 Nxc4 30. Rxb7 Rad8 31. Ra7 Nd6 32. Rf6 Ne8 33. h6+ Kf8 34. Rb6 Be6 35. Rxa5 Rc8 36. Ne3 Rxh6 37. Ng4 Rh7 38. Nxe5 g4 39. Ra7 Nf6 40. Ng6+ fxg6 41. Rxh7 Nxh7 42. Rxe6 gxh3 43. Bxh3 Ng5 44. Rf6+ Ke7 45. Bxc8 Kxf6 46. a4 Nxe4 47. Bb7 Nd6 48. a5 c4 49. a6 c3 50. Kh2 c2 51. a7 c1=Q 52. a8=Q Qf4+ 53. Kg1 Nxb7 54. Qxb7 Kg5 55. Qc6 Qf5 56. Kg2 Kh4 57. Qd6 Qc2+ 58. Kf3 Qb3+ 59. Kf2 Qf7+ 60. Kg2 Qf5 61. Qg3+ Kh5 62. Qh3+ Qxh3+ 63. Kxh3 1/2-1/2

Junior 4.6 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. b4 Nxb4 10. Rb1 Nbc6 11. Rxb7 Rb8 12. Rxb8 Qxb8 13. Ba3 Qb6 14. Qa4 Nb8 15. Qb3 Na6 16. Rb1 Rb8 17. Qd1 Qa5 18. Rxb8+ Nxb8 19. Bb2 Na6 20. Nc1 Qb6 21. Nb3 Nb4 22. Be4 f5 23. Bf3 g5 24. Bg2 Kh8 25. Qh5 Ng6 26. Nd5 Qb8 27. Nxb4 Qxb4 28. Qd1 Qa4 29. a3 Bc6 30. Bxc6 Qxc6 31. Nd2 g4 32. e4 fxe4 33. Nxe4 Qd7 34. f3 Qc6 35. Bc3 gxf3 36. Bb4 f2+ 37. Kxf2 Nf8 38. Kg1 Qe8 39. Bd2 Qb8 40. Be3 a6 41. Kh1 Qb2 42. a4 Qb7 43. Kg1 Qb4 44. Ng5 h6 45. Ne4 Qa3 46. Kg2 Kh7 47. Kh3 Nd7 48. Kh4 Nf6 49. Nxf6+ Bxf6+ 50. Kg4 Kg6 51. Bg1 h5+ 52. Kh3 Qc3 53. Qb1 Qa5 54. Qc2 Qe1 55. Kg2 Qb4 56. Bf2 Qb7+ 57. Kg1 Qf3 58. h4 Kf7 59. Kh2 Ke6 60. Qd2 Kf5 61. Kg1 Kg4 62. Kh2 c6 63. Be1 Be7 64. Bf2 Bd8 65. a5 c5 66. Be1 Kf5 67. Qc2 Ke6 68. Qd2 Kd7 69. Kg1 Bc7 70. Qc2 Kd8 71. Kh2 Ke8 72. Qd2 Kd7 73. Kg1 Kc8 74. Qc2 Kb8 75. Qb2+ Ka7 76. Qc2 Bd8 77. Kh2 Qf1 78. Qd2 Kb8 79. Qe3 Bc7 80. Bc3 Kc8 81. Be1 Bd8 82. Qe4 Kc7 83. Qh7+ Kb8 84. Qe4 Bc7 85. Qe3 Kc8 1/2-1/2

DarkThought – Junior 5.0: [1 – 0] (Test Game, Nunn Position #9, January 1999)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Qd7 11. Bd2 Bh3 12. Bxh3 Qxh3 13. Nd5 Rac8 14. Qb3 b6 15. Nec3 a6 16. Ne4 Nxd5 17. cxd5 Ne7 18. fxe5 Bxe5 19. Ng5 Qg4 20. Nf3 Nf5 21. Nxe5 dxe5 22. Qd1 Qh3 23. Rc1 Nd6 24. Rc6 Rfd8 25. Bc3 Re8 26. e4 Qh6 27. g4 a5 28. Bd2 Qh4 29. Qf3 Re7 30. Kh1 Rd7 31. g5 Rcd8 32. Rg1 Nb5 33. Be3 Rd6 34. Bf2 Qf4 35. Qxf4 exf4 36. Rc4 R6d7 37. Rg4 Ra8 38. Rxf4 a4 39. Rf3 a3 40. b3 Re7 41. Be3 Nd6 42. Rc6 Nb5 43. Rf1 Na7 44. Rc4 Nb5 45. Rfc1 Ra7 46. Bf4 Rd7 47. Kg2 Nd6 48. Rc6 Rb7 49. Kf3 Ne8 50. R1c4 Ra7 51. Be5 Kf8 52. Kf4 Re7 53. Bd4 Ra8 54. Bf6 Rd7 55. Be5 Ra7 56. Rc3 Ke7 57. Rc1 Kd8 58. R1c2 Rb7 59. Rf2 Ke7 60. Bc3 Ra7 61. Bb4+ Kd8 62. Rf3 Ng7 63. Ke3 Ke8 64. Rc2 Ra6 65. Rcf2 Ra8 66. Rf1 Ra6 67. d4 Ra8 68. R3f2 Ra7 69. Rc1 Ra6 70. Rff1 Ra7 71. Rf6 Rb7 72. Rf2 Ra7 73. Rc6 Ra6 74. Rcf6 Nh5 75. Re6+ Kd8 76. Rc6 Ng7 77. Rff6 Ne8 78. Rf3 Ng7 79. Bf8 Ne8 80. Rh3 Ra5 81. Rxh7 Ra8 82. Bb4 Kc8 83. h4 b5 84. Rc2 Rb8 85. Rf2 Ra8 86. Rfxf7 Rxf7 87. Rxf7 Ra6 88. Rf8 Kd7 89. e5 Kd8 90. h5 Ra7 91. h6 c6 92. Ba5+ Rxa5 93. h7 Kc7 94. Rxe8 Ra7 95. h8=Q Kb6 96. Qf8 b4 97. Rb8+ 1-0

Junior 5.0 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #9, January 1999)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. b4 Nxb4 10. Rb1 a5 11. a3 Na6 12. Rxb7 Nc5 13. Rb2 Rb8 14. d4 Ne6 15. Ne4 f5 16. Rxb8 Qxb8 17. N4c3 e4 18. Qc2 Qb7 19. Bd2 Qa6 20. Qb3 a4 21. Qa2 Rb8 22. Rb1 Rxb1+ 23. Nxb1 Nc8 24. Bc3 Nb6 25. Nd2 c6 26. Bf1 Qa7 27. Bb4 c5 28. Bc3 cxd4 29. exd4 Na8 30. d5 e3 31. Nf3 exf2+ 32. Kg2 Nc5 33. Bxg7 Kxg7 34. Qa1+ Kg8 35. Qf6 Qb8 36. Ng5 Qf8 37. Nxh7 Qxf6 38. Nxf6+ Kf7 39. Nxd7 Nxd7 40. Nc3 Nab6 41. Nb1 Ne5 42. Nd2 g5 43. Be2 g4 44. Kxf2 Kg6 45. Ke3 Kg5 46. Kd4 Nbd7 47. Bf1 Nc5 48. h3 gxh3 49. Bxh3 Nb7 50. Kc3 Nc5 51. Kb4 Ned3+ 52. Kb5 Ne5 53. Bg2 Kg4 54. Nf1 f4 55. gxf4 Kxf4 56. Bh1 Nf7 57. Kc6 Nb3 58. Kb6 Ne5 59. Kb5 Nc5 60. Bg2 Nf7 61. Kc6 Nb3 62. Kd7 Ne5+ 63. Kxd6 Nxc4+ 1/2-1/2

DarkThought – MChess 5: [1 – 0] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Be6 9. Nd5 Bg4 10. Bd2 Nxd5 11. cxd5 Ne7 12. Rc1 Rb8 13. Ba5 b6 14. Bb4 Qd7 15. Re1 a5 16. Bd2 f5 17. Qc2 Rbc8 18. Kh1 Qb5 19. Nc3 Qe8 20. Qb3 Qd7 21. f3 Bh5 22. f4 Kh8 23. Rc2 exf4 24. gxf4 g5 25. fxg5 Ng6 26. Ne2 Bxe2 27. Rxe2 f4 28. Rf2 fxe3 29. Bxe3 Nh4 30. Qc4 Rxf2 31. Rxf2 Nxg2 32. Rxg2 Re8 33. Bg1 Qf7 34. Rf2 Qe7 35. Qg4 Qe5 36. Qg2 Kg8 37. b3 Re7 38. Rf3 Bf8 39. h4 Qe1 40. Qh3 Qe5 41. Rf5 Qe2 42. h5 Rg7 43. Bd4 Re7 44. g6 Bg7 45. Rf2 Qe1+ 46. Rf1 Bxd4 47. Rxe1 Rxe1+ 48. Kg2 hxg6 49. Qc8+ Kg7 50. Qxc7+ Kh6 51. Qxd6 Rg1+ 52. Kf3 Bc5 53. Qe6 Rf1+ 54. Ke2 Rf2+ 55. Ke1 Kxh5 56. d6 Rf8 57. Qe2+ Kh6 58. d7 Bb4+ 59. Kd1 g5 60. Qe8 b5 61. d8=Q Rxe8 62. Qxe8 Ba3 63. d4 Bb4 64. d5 a4 65. Qxb5 Be7 66. bxa4 g4 67. Qb6+ Kg7 68. d6 Bf8 69. a5 g3 70. a6 Bxd6 71. Qxd6 g2 72. Qg3+ Kf6 73. Qxg2 Ke5 74. a7 Ke6 75. a8=Q 1-0

MChess 5 – DarkThought: [0 – 1] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. Qb3 Rb8 10. Bd2 Kh8 11. f4 exf4 12. Nxf4 f5 13. Nce2 Re8 14. Rac1 Ne5 15. Bc3 Nc8 16. Bd4 c5 17. Bxe5 Rxe5 18. d4 Re8 19. dxc5 dxc5 20. Rcd1 Nb6 21. Rd3 Qf6 22. Qc3 Qf7 23. Qc1 Re5 24. b3 Be8 25. Nc3 Qe7 26. Ncd5 Nxd5 27. Nxd5 Qd6 28. Qd2 Rc8 29. Rd1 b6 30. Nf4 Qc7 31. Bd5 Qe7 32. Bf3 g5 33. Nh5 Bh6 34. Be2 Bc6 35. Bf1 Rg8 36. Qc3 Bg7 37. Nxg7 Qxg7 38. Rd6 Be4 39. Be2 Re7 40. Qd2 Qe5 41. Rf1 Bb7 42. Bf3 Bc8 43. Rd3 Be6 44. Bg2 h6 45. Rd6 Rgg7 46. Bc6 Kh7 47. Rd3 Rc7 48. Qg2 Rgf7 49. Rfd1 Rf6 50. Bb5 Bc8 51. Qd5 Qxd5 52. cxd5 Rd6 53. Kf2 Re7 54. R3d2 Kg6 55. h3 Re5 56. Be2 Bb7 57. Bf3 h5 58. h4 g4 59. Bg2 Kf6 60. a4 Re7 61. e4 fxe4 62. Ke3 Kg7 63. Bf1 Re5 64. Bc4 Rf5 65. Kxe4 Rf3 66. Ke5 Rd8 67. Re2 Kg6 68. Rdd2 Rf5+ 69. Ke4 Ba8 70. Re3 a6 71. Kd3 b5 72. Re6+ Kf7 73. Ke4 Rf3 74. axb5 axb5 75. Re5 bxc4 76. bxc4 Bb7 77. Ra2 Rxg3 78. Ra7 Rb3 79. Rxh5 Kg6 80. Rg5+ Kh6 81. Rxg4 Re8+ 82. Kf4 Rb4 83. Kg3 Re3+ 84. Kf4 Re1 85. Kf3 Rc1 86. Ke3 Rc3+ 87. Kd2 Rf3 88. Re4 Bxd5 89. Re5 Bf7 90. Ra6+ Kg7 91. Rxc5 Rb2+ 92. Kc1 Rh2 93. Rg5+ Kf8 94. Ra8+ Ke7 95. Ra7+ Kd6 96. Ra6+ Kc7 97. Rg1 Bxc4 98. Ra8 Bd5 99. Ra6 Be4 100. Kd1 Rb3 101. Ra7+ Kb6 102. Ra1 Bf3+ 103. Ke1 Rbb2 104. Ra6+ Kxa6 0-1

DarkThought – MChess 7.1: [1 – 0] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 d5 11. fxe5 Nxe5 12. cxd5 Nxd5 13. d4 Ng4 14. Bxd5 Bxd5 15. Nf4 Nf6 16. Ncxd5 Nxd5 17. Qb3 Nb6 18. Bd2 Re8 19. Rac1 Qd7 20. Nd3 Re7 21. Rf2 Rae8 22. Nc5 Qd5 23. e4 Qxb3 24. Nxb3 Rxe4 25. Rxc7 R4e7 26. Rxe7 Rxe7 27. Bg5 Re1+ 28. Kg2 f5 29. Rc2 Re4 30. Nc5 Rxd4 31. Nxb7 h6 32. Be3 Rb4 33. Bc1 Nd5 34. Nc5 Kf7 35. Nd3 Rb7 36. Rc5 Rd7 37. Bxh6 Bxh6 38. Ne5+ Ke8 39. Nxd7 Ne3+ 40. Kg1 Kxd7 41. Ra5 Kc6 42. Ra6+ Kd5 43. Rxg6 Ng4 44. Kg2 Bc1 45. b3 Ne3+ 46. Kh1 Bb2 47. h4 Ke4 48. h5 Kf3 49. h6 Nf1 50. Rg8 Nxg3+ 51. Kh2 f4 52. h7 Ke2 53. Kh3 Ne4 54. Re8 Kd3 55. h8=Q Bxh8 56. Rxh8 f3 57. Rf8 Ke2 58. b4 Nd2 59. Re8+ Kf1 60. Kh2 f2 61. a4 Nf3+ 62. Kh1 Nd2 63. a5 Nb3 64. Re5 Nd2 65. Re7 Nc4 66. Kh2 Nd6 67. Re5 Nc4 68. Re6 Nd2 69. b5 Nf3+ 70. Kh1 Nd4 71. Re5 Ne2 72. Re8 Ke1 73. Rf8 Nd4 74. Kg2 Nxb5 75. Rxf2 a6 76. Rf6 Kd2 77. Rxa6 Kc3 78. Rb6 Kc4 79. Rb7 Nd4 80. a6 Nc6 81. a7 Nxa7 82. Rxa7 1-0

MChess 7.1 – DarkThought: [1/2 – 1/2] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. f4 exf4 10. Nxf4 Kh8 11. Qb3 Rb8 12. Bd2 f5 13. Rae1 Re8 14. Qa3 a6 15. d4 Nc8 16. b4 N6e7 17. Qb3 b5 18. c5 dxc5 19. bxc5 c6 20. Ne6 Bxe6 21. Qxe6 Na7 22. Qd6 Qc8 23. g4 fxg4 24. Qf4 Qe6 25. Qc7 Ra8 26. Rf4 b4 27. Re4 Qc4 28. Nb1 Nb5 29. Qd7 Bf8 30. Qe6 Qd5 31. Re5 Qd8 32. Qxg4 a5 33. Qh3 Nd5 34. Rxe8 Qxe8 35. Rf1 Bg7 36. Kh1 Qe7 37. Qg3 Re8 38. Qh3 Nbc3 39. Bxc3 Nxe3 40. Bxc6 Nxf1 41. Bxe8 Qe4+ 42. Kg1 Ne3 43. Bb5 Qxb1+ 44. Bf1 Nf5 45. Qg2 h5 46. Bd2 Bxd4+ 47. Kh1 Be3 48. Qa8+ Kh7 49. Qb7+ Kh6 50. Qg2 Qd1 51. Bxe3+ Nxe3 52. Qf2 Nxf1 53. Qf8+ Kg5 1/2-1/2

DarkThought – Mephisto Meisterschach: [1 – 0] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. Bd2 a6 10. Kh1 Bf5 11. Ne4 Rb8 12. N2c3 b5 13. cxb5 axb5 14. g4 Bd7 15. g5 b4 16. Nf6+ Bxf6 17. gxf6 bxc3 18. fxe7 Nxe7 19. Bxc3 Nf5 20. Qd2 Nh4 21. f4 Nxg2 22. Qxg2 exf4 23. Rxf4 c5 24. Bf6 Qe8 25. e4 Qe6 26. Qg5 Qh3 27. Rg1 h6 28. Qd5 Be6 29. Qxd6 Kh7 30. Bc3 Qh5 31. Qe7 g5 32. Qxc5 Rg8 33. Rf6 Rbd8 34. Rgf1 Rd7 35. Qe5 Bh3 36. a4 Rc8 37. R1f3 Be6 38. a5 Rdc7 39. d4 Re7 40. Rf2 Rce8 41. d5 Bg4 42. Qd4 Bc8 43. a6 Bg4 44. e5 Be6 45. dxe6 fxe6 46. Bb4 Rc7 47. a7 Kg7 48. Bf8+ Kg8 49. Rxe6 Ra8 50. Qe4 Kh8 51. Rxh6+ Qxh6 52. Bxh6 Rcxa7 53. e6 Rd8 54. e7 1-0

Mephisto Meisterschach – DarkThought: [0 – 1] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. Bd2 Bf5 10. e4 Bg4 11. Qb3 Rb8 12. Bg5 Kh8 13. h3 Be6 14. Nd5 f6 15. Bd2 Rf7 16. f4 f5 17. fxe5 dxe5 18. Kh2 Ng8 19. exf5 gxf5 20. Rae1 Rd7 21. Qc2 Nce7 22. Nxe7 Nxe7 23. Nc1 c5 24. Bc3 Qc7 25. Re3 Ng6 26. Qa4 b6 27. Qc6 Qxc6 28. Bxc6 Rf7 29. a3 Rc8 30. Bg2 Rd8 31. b4 Rc7 32. Rf2 cxb4 33. axb4 b5 34. c5 a5 35. Re1

Rdc8 36. Bd2 axb4 37. Bxb4 Ne7 38. Ba3 Bf7 39. Rfe2 Ng6 40. c6 f4 41. Bd6 fxg3 42. Kxg3 Rxc6 43. Bxc6 Rxc6 44. Ba3 Bh6 45. Bb2 Bf4 46. Kf2 h5 47. Re4 Kh7 48. Rg1 Be6 49. Rb4 Bxh3 50. Ne2 Bd2 51. Re4 Bf5 52. Rh1 Bxe4 53. Rxh5 Kg8 54. dxe4 Rc2 55. Ba1 b4 56. Rh1 Kf7 57. Rh5 b3 58. Rh7 Kf6 59. Rb7 Ra2 60. Rb6 Kg5 61. Bxe5 Nxe5 62. Rxb3 Ra4 63. Ng3 Kg4 64. Kg2 Ra2 65. Ne2 Be1 66. Kf1 Bh4 67. Nd4 Rf2 68. Kg1 Rd2 69. Nf5 Bf2 70. Kf1 Nf3 71. Rd3 Nh2 72. Kg2 Rxd3 73. Kxf2 Rd2 74. Ke1 Nf3 75. Kf1 Nd4 76. Ke1 Rd3 77. Nxd4 Rxd4 78. e5 Kf3 79. e6 Ke3 80. Kf1 Rg4 81. e7 Rg8 82. e8=B Rxe8 83. Kg2 Rg8 84. Kh3 Kf4 85. Kh2 Kf3 86. Kh1 Kf2 87. Kh2 Rh8 0-1

DarkThought – Mephisto Shredder: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Bf5 10. Kh1 Qd7 11. g4 Be6 12. Qa4 a6 13. Qc2 Rad8 14. Rd1 d5 15. g5 d4 16. exd4 Nxd4 17. Nxd4 Qxd4 18. f4 Bf5 19. Qb3 b6 20. Ne2 Qd6 21. fxe5 Bxe5 22. d4 Bg4 23. Re1 Bxh2 24. Bh3 Bh5 25. Bd2 Nc6 26. d5 Bxe2 27. Rxe2 Nd4 28. Bb4 c5 29. dxc6 Qxc6+ 30. Bg2 Qc7 31. Re7 Nxb3 32. Rxc7 Bxc7 33. axb3 Rfe8 34. Bc3 a5 35. Bd5 Re3 36. b4 axb4 37. Bf6 Rc8 38. Ra7 Rg3 39. Bb7 Re8 40. Bd5 Re1+ 41. Kh2 Re2+ 42. Kh1 Bd6 43. Rd7 Rh3+ 44. Kg1 Bc5+ 45. Kf1 Rf2+ 46. Ke1 Re3+ 47. Kd1 Rg3 48. Rd8+ Bf8 49. Ke1 Rc2 50. Kf1 Re3 51. Rd7 Rc1+ 52. Kg2 Re2+ 53. Kf3 Re6 54. Bxe6 fxe6 55. Rd8 Rf1+ 56. Ke2 Rf4 57. Ke3 Rf5 58. Be7 Kg7 59. Bxf8+ Rxf8 60. Rd6 Rf5 61. Rxe6 b5 62. cxb5 Rxb5 63. Kf4 h6 64. gxh6+ Kxh6 65. Re4 Kh5 66. Kg3 b3 67. Rh4+ Kg5 68. Rf4 Rb6 69. Rf3 Kh5 70. Rd3 g5 71. Re3 Kg6 72. Kg4 Rb4+ 73. Kh3 Kf5 74. Rc3 1/2-1/2

Mephisto Shredder – DarkThought: [0 – 1] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. d4 exd4 10. exd4 Re8 11. Bg5 h6 12. Be3 Nf5 13. Qd3 h5 14. Nd5 h4 15. Rad1 Nxe3 16. fxe3 hxg3 17. Nxg3 Ne7 18. Nxe7+ Rxe7 19. Bxb7 Rb8 20. Be4 Rxb2 21. Qa3 Qb8 22. Rb1 Rb6 23. c5 dxc5 24. dxc5 Rb2 25. Rxb2 Qxb2 26. Qxa7 Bh3 27. Qa8+ Bf8 28. Rd1 Qc3 29. Kf2 Qxc5 30. a4 Re6 31. Rd4 Kh7 32. Ne2 Bh6 33. Qd5 Qe7 34. Qh5 Bf1 35. Kxf1 Rxe4 36. Qd5 Re5 37. Qc4 Rf5+ 38. Rf4 Bxf4 39. exf4 Rh5 40. Kg2 Rc5 41. Qa2 Qe4+ 42. Kg1 Kg8 43. Qd2 Rc2 44. Ng3 Qc6 45. Qd8+ Kh7 46. Qh4+ Kg7 47. Nf5+ gxf5 48. Qg5+ Qg6 49. a5 Qxg5+ 50. fxg5 c5 51. a6 c4 52. Kf1 Rxh2 53. Ke1 Ra2 54. a7 Rxa7 55. Kd1 Ra2 56. g6 fxg6 57. Kc1 f4 58. Kd1 c3 59. Kc1 Rd2 60. Kb1 f3 61. Kc1 f2 62. Kb1 f1=Q# 0-1

DarkThought – Nimzo 98: [1/2 – 1/2] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Rb8 11. Kh1 a6 12. Ne4 Nf5 13. fxe5 Nxe5 14. Nf4 Bd7 15. Qc2 c5 16. Rb1 b5 17. b3 Bc6 18. Nh5 Bh8 19. Bd2 Ng4 20. Rbe1 Nfxe3 21. Bxe3 Nxe3 22. Rxe3 gxh5 23. Ref3 Bxe4 24. dxe4 Be5 25. Qd3 h4 26. g4 Qa5 27. R3f2 Bd4 28. Re2 Rfe8 29. Rf5 Re5 30. Rf1 Rbe8 31. Rf4 Qb4 32. Rc2 R5e6 33. Rf1 Qa5 34. Re2 bxc4 35. Qxc4 Qb5 36. Qc2 d5 37. Rf4 Qb7 38. Re1 h3 39. Bxh3 Rh6 40. Qg2 Qc7 41. Ref1 Rxe4 42. g5 Rh4 43. Qxe4 dxe4 44. Rxh4 e3 45. Re4 a5 46. Bg2 Qd7 47. Re1 h6 48. gxh6 f5 49. Rf4 Be5 50. Rff1 Qd2 51. Rd1 Qxa2 52. Rd7 e2 53. Rg1 Kh8 54. Rd8+ Kh7 55. Re8 Bd6 56. Re1 Qxb3 57. R8xe2 Qc4 58. Bh3 Qd5+ 59. Bg2 Qd4 60. Rf1 Qh4 61. Bd5 Qh5 62. Bc4 Qh3 63. Rd2 Qe3 64. Rxd6 Qe4+ 65. Kg1 Qg4+ 66. Kh1 Qxc4 67. Re1 Qf7 68. h3 Qb7+ 69. Kg1 Qc7 70. Red1 Qb8 71. Kf2 Qb2+ 72. Kg3 Qe5+ 73. Kh4 Qf4+ 74. Kh5 Qf3+ 75. Kg5 Qg3+ 76. Kxf5 Qxh3+ 77. Ke5 Qh5+ 78. Kf4 Qh2+ 79. Kg4 Qg2+ 80. Kh4 Qe4+ 1/2-1/2

Nimzo 98 – DarkThought: [0 – 1] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. b3 Qc8 10. e4 f5 11. exf5 Bxf5 12. Bg5 Bh3 13. Bxh3 Qxh3 14. Nb5 Qd7 15. a3 Rf5 16. Qd2 Raf8 17. Rac1 Rf3 18. Rb1 Kh8 19. b4 Ng8 20. Nbc3 Qh3 21. Ne4 Nh6 22. Bxh6 Bxh6 23. Qc2 R8f5 24. g4 Qxg4+ 25. N4g3 Rf8 26. Rbd1 Bg7 27. Kg2 g5 28. h3 Qh4 29. Ng1 R3f7 30. N1e2 Nd8 31. f3 Ne6 32. Ne4 Qh5 33. N4g3 Qh6 34. Ne4 a6 35. Qa2 Nd4 36. Nxd4 exd4 37. Qd2 Be5 38. Rde1 Rf5 39. Qd1 c6 40. Ng3 Rf4 41. Ne4 b6 42. a4 Qh4 43. Qe2 h5 44. Ng3 g4 45. hxg4 Rxg4 46. Qxe5+ dxe5 47. fxg4 Rxf1 48. Rxf1 Qxg4 49. Rf8+ Kh7 50. Kf2 Qd1 51. Rf3 h4 52. Ne4 Qxa4 53. Rh3 Qc2+ 54. Kg1 Kg6 55. Nf2 a5 56. c5 bxc5 57. bxa5 c4 58. a6 c3 59. Rxh4 Qa2 60. Rh1 e4 61. dxe4 c2 62. Nd3 Qa3 63. Ne5+ Kf6 64. Nd7+ Ke7 65. Kg2 Kxd7 66. a7 d3 67. Rh7+ Ke6 68. Rh6+ Ke5 69. Rxc6 d2 70. Rxc2 d1=Q 71. Rc5+ Qxc5 72. Kh2 Qcg1+ 73. Kh3 Qh5# 0-1

DarkThought – Nimzo 99a: [0 – 1] (Test Game, Nunn Position #9, January 1999)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Re8 9. Qb3 Na5 10. Qa4 c5 11. Bd2 Nac6 12. Kh1 Bf5 13. Ne4 a6 14. Qb3 b5 15. f3 Rb8 16. Qa3 Nb4 17. Rac1 Nec6 18. g4 Be6 19. g5 Na5 20. cxb5 Rxb5 21. f4 Nxa2 22. Ra1 Nb4 23. N2c3 Nc2 24. Nxb5 Nxa3 25. Nbxd6 Nb3 26. Nxe8 Nxa1 27. Nxg7 Kxg7 28. bxa3 Nb3 29. Bc3 Qxd3 30. Bxe5+ Kf8 31. Re1 c4 32. Bd6+ Ke8 33. Bb4 Kd8 34. Bf3 Kc7 35. Nf2 Qc2 36. Re2 Qc1+ 37. Re1 Qb2 38. Nd1 Qc2 39. Kg1 Nd2 40. Be2 Kb6 41. Bc3 Bd5 42. Bd4+ Kc6 43. Nf2 Nf3+ 44. Bxf3 Bxf3 45. Rf1 c3 46. Be5 Qd2 47. Bxc3 Qxc3 48. Nd3 Qxd3 49. Rxf3 Qxa3 50. f5 gxf5 51. Rxf5 Qxe3+ 52. Kg2 a5 53. Rf6+ Kb5 54. h4 Qe4+ 55. Kg3 a4 56. Rxf7 Qe5+ 57. Kg4 Qe6+ 58. Rf5+ Kb4 59. Kf4 a3 60. Re5 Qf7+ 61. Rf5 Qc7+ 62. Ke4 a2 63. g6 a1=Q 0-1

Nimzo 99a – DarkThought: [0 – 1] (Test Game, Nunn Position #9, January 1999)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. b3 Qc8 10. e4 f5 11. exf5 Bxf5 12. Bg5 Bh3 13. Bxh3 Qxh3 14. Rc1 Rf7 15. Ne4 h6 16. Bxe7 Nxe7 17. Qd2 g5 18. Qa5 b6 19. Qa4 a5 20. b4 Qh5 21. Rfe1 Kh7 22. N2c3 Nf5 23. Ne2 Rff8 24. b5 Rf7 25. a3 Raf8 26. Qc2 Ne7 27. d4 Ng6 28. dxe5 Bxe5 29. Rcd1 g4 30. Qb1 Qh3 31. Qd3 Rf3 32. Qc2 R8f5 33. Nf4 Bxf4 34. Qe2 Nh4 35. Nf6+ Rxf6 36. Qe7+ Kg8 37. Qd8+ Rf8 38. Qxh4 Qxh4 39. gxh4 Be5 40. Re4 h5 41. Re3 Rxf2 42. h3 g3 43. Rde1 g2 0-1

DarkThought – Rebel 8: [1 – 0] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Bg4 11. Kh1 Qd7 12. Qb3 b6 13. Bd2 Rad8 14. Rf2 f5 15. Re1 Na5 16. Qa3 e4 17. dxe4 Nxc4 18. Qb3 d5 19. Nxd5 Nxd2 20. Nf6+ Kh8 21. Nxd7 Nxb3 22. Nxf8 Nc5 23. h3 Nd3 24. hxg4 Nxe1 25. Ne6 Rd2 26. gxf5 Nd3 27. Kg1 gxf5 28. b4 Rxa2 29. b5 a5 30. bxa6 Nxf2 31. Kxf2 c5 32. exf5 Nxf5 33. g4 Nd6 34. Bb7 Nb5 35. Kf3 Ra3 36. Kf2 c4 37. e4 Nc3 38. N2d4 Bxd4+ 39. Nxd4 b5 40. e5 b4 41. e6 Kg8 42. e7 Kf7 43. Nf5 Nd1+ 44. Ke2 Nc3+ 45. Kf1 Ra1+ 46. Kg2 Ra2+ 47. Kh3 Ra3 48. Kh4 Ra2 49. Bc6 Rh2+ 50. Kg3 Re2 51. a7 Rxe7 52. a8=Q Ne2+ 53. Kh4 Nd4 54. Bd5+ 1-0

Rebel 8 – DarkThought: [0 – 1] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. f4 exf4 10. Nxf4 Kh8 11. Qb3 Rb8 12. Bd2 f5 13. Rac1 Ne5 14. d4 N5c6 15. Ncd5 Re8 16. a3 Ng8 17. Qd3 Nce7 18. Nc3 Nf6 19. b4 a6 20. a4 Nc8 21. Rce1 Nb6 22. a5 Na4 23. Nxa4 Bxa4 24. e4 fxe4 25. Bxe4 Nxe4 26. Rxe4 Rxe4 27. Qxe4 Bd7 28. d5 Qg8 29. Qe7 Qe8 30. Re1 Kg8 31. Qxe8+ Rxe8 32. Rxe8+ Bxe8 33. Ne6 Ba4 34. Nxc7 Bb3 35. Bf4 Bf8 36. Kf2 Bxc4 37. Ke3 Kf7 38. Kd4 Be2 39. h4 Be7 40. Ke4 Bf1 41. Kf3 Bc4 42. Ke3 Bf1 43. Kd2 Bg2 44. Kd3 Bf1+ 45. Kc2 Bg2 46. Kb3 h6 47. b5 g5 48. bxa6 bxa6 49. hxg5 hxg5 50. Bd2 Bd8 51. Nxa6 Bxd5+ 52. Kb4 Ke6 53. Kb5 Bf3 54. Nb8 Kd5 55. Ka6 Kc4 56. Be1 g4 57. Nd7 Bc7 58. Bf2 d5 59. Nb6+ Kb4 60. Kb7 Be5 61. Nd7 d4+ 62. Kc8 Bh8 63. Be1+ Kb3 64. a6 d3 65. Kb8 Bd4 66. a7 Kc2 67. a8=Q Bxa8 68. Kxa8 Bc3 69. Bxc3 Kxc3 70. Nf6 d2 71. Ne4+ Kd3 72. Nf2+ Ke2 73. Ne4 d1=Q 0-1

DarkThought – Rebel 9: [1/2 – 1/2] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 d5 11. fxe5 Nxe5 12. cxd5 Nxd5 13. d4 Ng4 14. Bxd5 Bxd5 15. Nf4 Nf6 16. Ncxd5 Nxd5 17. Qb3 Nb6 18. Bd2 a5 19. Rac1 a4 20. Qd1 Re8 21. g4 c6 22. Qf3 Qg5 23. Kh1 Qb5 24. Bc3 Nc4 25. e4 Nxb2 26. a3 Nc4 27. Rb1 Qg5 28. Rxb7 Nd6 29. Rd7 Rad8 30. Rxd8 Rxd8 31. e5 Nb5 32. Ba5 Rb8 33. Ne2 c5 34. Qxf7+ Kh8 35. Nf4 Nxd4 36. e6 Rf8 37. e7 Rxf7 38. e8=Q+ Rf8 39. Nxg6+ hxg6 40. Rxf8+ Bxf8 41. Qxf8+ Kh7 42. Qf7+ Kh6 43. Qf8+ 1/2-1/2

Rebel 9 – DarkThought: [0 – 1] (Test Game, Nunn Position #9, March 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. f4 exf4 10. Nxf4 Kh8 11. Qb3 Rb8 12. Bd2 f5 13. Rac1 Ne5 14. d4 N5c6 15. Ncd5 Re8 16. c5 dxc5 17. Rxc5 Nc8 18. Rcc1 Nd6 19. Nd3 Be6 20. Kh1 Ne4 21. Bxe4 fxe4 22. N3f4 Bg8 23. Qb5 a6 24. Qc5 Bf8 25. Qc4 g5 26. Qe2 Bxd5 27. Nxd5 Qxd5 28. Qh5 Re7 29. b3 Rg7 30. Rf2 Nxd4 31. Bc3 Nf3 32. Bxg7+ Bxg7 33. Rff1 c6 34. Rfd1 Qa5 35. Rc2 Rd8 36. Rf1 Qd5 37. Rcf2 Qd7 38. Kg2 Rf8 39. b4 Qd3 40. Kh1 Qxe3 41. Qg4 Qd3 42. Qe6 Bd4 43. Qb3 Bxf2 44. Rxf2 g4 45. Qxd3 exd3 46. Kg2 d2 47. Rxd2 Nxd2 48. h3 gxh3+ 49. Kxh3 b6 50. Kg2 c5 51. bxc5 bxc5 0-1

DarkThought – Shredder 2: [1/2 – 1/2] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bg4 9. f3 Be6 10. f4 Qd7 11. Bd2 Rab8 12. Qc2 Nb4 13. Qb1 Nbc6 14. b4 d5 15. cxd5 Nxd5 16. Bxd5 Bxd5 17. Nxd5 Qxd5 18. b5 Ne7 19. fxe5 Qxe5 20. d4 Qe6 21. Nf4 Qd7 22. Qb3 Nf5 23. Rac1 Rfe8 24. Kh1 a6 25. g4 Nd6 26. bxa6 bxa6 27. Qd5 Rb2 28. Bc3 Rb5 29. Qf3 Ne4 30. Be1 Nf6 31. h3 Ne4 32. a4 Rb3 33. Ng2 Rb2 34. Qf4 c6 35. Qf3 Bf8 36. h4 c5 37. dxc5 Bxc5 38. g5 Qe6 39. Nf4 Qe5 40. Rc4 Re7 41. a5 Rb3 42. Ng2 Qe6 43. Rc1 Rd7 44. Nf4 Qe5 45. Ng2 Rbd3 46. Qe2 Qd5 47. Rf3 Qb7 48. Qc2 Nc3 49. Qf2 Bb4 50. Bxc3 Bxc3 51. Qf1 Rd8 52. Rb1 Qxb1 53. Qxb1 Rd1+ 54. Rf1 Rxb1 55. Rxb1 Bxa5 56. Nf4 Bc3 57. Kg2 a5 58. Rb7 Ra8 59. Nd5 Be1 60. Kh3 Kg7 61. e4 a4 62. e5 Kf8 63. Nf6 a3 64. e6 fxe6 65. Rxh7 Ra4 66. h5 Rh4+ 67. Kg2 Bc3 68. Rh8+ Ke7 69. Rh7+ Kd6 70. Rd7+ Kc6 71. Ra7 Bxf6 72. gxf6 Rxh5 73. Ra6+ Kd7 74. Rxa3 Rf5 75. Ra7+ Kd6 1/2-1/2

Shredder 2 – DarkThought: [0 – 1] (Test Game, Nunn Position #9, June 1998)
1. c4 e5 2. Nc3 Nc6 3. g3 g6 4. Bg2 Bg7 5. e3 Nge7 6. Nge2 O-O 7. O-O d6 8. d3 Bd7 9. d4 exd4 10. exd4 Re8 11. Bg5 h6 12. Bf4 g5 13. Be3 Nf5 14. Qd3 Kh8 15. a3 Rc8 16. b4 Nxe3 17. fxe3 f5 18. Rab1 Qe7 19. Nd5 Qe6 20. Nec3 Ne7 21. Nxe7 Rxe7 22. Rbe1 c6 23. Bh3 g4 24. Bg2 Qf6 25. Ne2 Qg6 26. Nf4 Qf7 27. d5 c5 28. bxc5 Rxc5 29. Ne6 Bxe6 30. dxe6 Qxe6 31. Bd5 Qd7 32. Rxf5 Qe8 33. e4 Rcc7 34. Ref1 b6 35. R1f4 h5 36. Qd2 Kh7 37. h3 Re5 38. Qh2 Qa4 39. hxg4 Qd1+ 40. Kg2 Rxf5 41. gxf5 Be5 42. Rf3 Qd2+ 43. Kh3 Qg5 44. Qg1 Qg4+ 45. Kg2 h4 46. Qh1 Rg7 47. Kf1 h3 48. Ke2 Qh5 49. Kf2 Bd4+ 50. Ke1 h2 51. e5 Bxe5 52. Kd2 Rg4 53. Kc1 Bxg3 54. Rf1 Be5 55. Kc2 Qh3 56. Rf3 Qg2+ 57. Kb3 Qb2+ 58. Ka4 b5+ 59. Ka5 Rh4 60. Rf1 Qd4 61. Bg8+ Kxg8 62. Qa8+ Kh7 63. Qc6 Qd3 64. Rh1 Qxa3+ 65. Kxb5 Kh6 66. Rb1 Qd3 67. Rh1 Qb3+ 68. Ka5 Rxc4 69. Qxc4 Qxc4 70. Rc1 Qxc1 71. Kb5 h1=Q 72. Ka6 Qa3+ 73. Kb5 Qd5# 0-1

1.9 DarkThought at 1st Match vs. XXXX-II (January 1998)

From January 9–11, 1998, the two German amateur chess programs DarkThought and XXXX-II (both participants of the last three World Microcomputer Chess Championships) played a uniform platform match at our institute (IPD, University of Karlsruhe, Germany). Two 500MHz DEC Alpha-21164a PC164 workstations with 256MB RAM each and Digital Unix 4.0b system software as provided by Digital Equipment Corp. under external technology research contract DE-0032-97 served as the uniform platform hosts.

Initially, Martin Zentner (the author of XXXX-II) proved that his C++ program is very well designed. With a little help by our DarkThought team he ported XXXX-II to the 64-bit DEC Unix operating system in a couple of hours. Although this was the first time for XXXX-II to use a true 64-bit environment it performed flawlessly during the whole match. Using the DEC Unix C++ compiler with heavy optimizations enabled, XXXX-II ran roughly 10% faster on the 500MHz DEC Alpha-21164a than on a 300MHz Pentium-II under Windows/NT 4.0 when being compiled by the latest version of Microsoft Visual C++.

The match itself consisted of 9 games at tournament time controls (30 moves in 60 minutes, then repeated 40 moves in 60 minutes). The first five games were played from the so-called "Nunn Positions #4 and #5" with opening books disabled. As intended by GM John Nunn, both programs felt about equal in the starting positions. DarkThought won all these five games although it accidentally played Black with a tempo less than required in the very first game. With enabled opening books the games would have progressed completely different because both programs found the starting positions in their books. Furthermore, the Nunn game setup seems to favor the faster program (in this case DarkThought) as the first 10–12 common theory moves do not contribute to the time control.

The last four games were normal tournament games with opening books enabled. Here, it quickly became obvious that XXXX-II features a much better opening library than DarkThought which had to fight hard for its three wins and just a single loss in the normal games. The overall score of the match: DarkThought = 8 points, XXXX-II = 1 point.

Games Played by DarkThought at 1st Match vs. XXXX-II

XXXX-II – DarkThought: [0 – 1] (1st Uniform Platform Match, Round 1, Nunn Position #4*, January 9, 1998)
This game was accidentally played with one tempo less for Black (12.. *).
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 * 13. dxe5 dxe5 14. b3 Rd8 15. Qe2 Nh5 16. Qe3 Nf4 17. Ba3 Bxh3 18. gxh3 Qc8 19. Nxe5 Bg5 20. Kh1 Rxd2 21. h4 Bh6 22. Nxf7 Kxf7 23. Bb1 Kg8 24. Qg3 Nh3 25. Rf1 Bf4 26. Qf3 Nxf2+ 27. Rxf2 Rxf2 28. Qxf2 Qh3+ 29. Kg1 Rf8 30. Bd3 Be3 31. Qxe3 Qxe3+ 32. Kh1 Rf2 33. Bc4+ bxc4 34. Rd1 Qxe4+ 35. Kg1 Qg2# 0-1

DarkThought – XXXX-II: [1 – 0] (1st Uniform Platform Match, Round 2, Nunn Position #4, January 9, 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 exd4 13. cxd4 Nc6 14. b3 cxd4 15. Bb2 Nb4 16. Nxd4 Bd7 17. Bb1 Rfe8 18. Nf1 Rad8 19. Ne3 Nc6 20. Ndf5 Be6 21. Qc1 Qa5 22. Rd1 Ne5 23. Nxe7+ Rxe7 24. Qd2 Qxd2 25. Rxd2 Ree8 26. f4 Nc6 27. f5 Bc8 28. Bxf6 gxf6 29. Nd5 Kg7 30. Rd3 Re5 31. a4 Bb7 32. axb5 axb5 33. Kh2 Kh8 34. Nxf6 Rc5 35. Rd5 Ne5 36. Rd1 Bc6 37. Ra7 Rc3 38. Ng4 Nxg4+ 39. hxg4 Be8 40. e5 d5 41. Be4 Rxb3 42. e6 fxe6 43. fxe6 Bg6 44. Bxg6 hxg6 45. Rc1 Re8 46. Rcc7 Re3 47. Rh7+ Kg8 48. Rag7+ Kf8 49. Rf7+ Kg8 50. e7 R3xe7 51. Rxe7 Rxe7 52. Rxe7 1-0

XXXX-II – DarkThought: [0 – 1] (1st Uniform Platform Match, Round 3, Nunn Position #4, January 10, 1998)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O b5 6. Bb3 Be7 7. Re1 O-O 8. c3 d6 9. h3 Na5 10. Bc2 c5 11. d4 Qc7 12. Nbd2 cxd4 13. cxd4 Bb7 14. d5 Rac8 15. Bd3 Nd7 16. Nf1 f5 17. exf5 Bxd5 18. Ng5 Bxg5 19. Bxg5 Nb6 20. Ne3 Nac4 21. Nxd5 Nxd5 22. Qe2 Kh8 23. Rac1 Qf7 24. Bxc4 bxc4 25. Rxc4 Nf4 26. Rxf4 exf4 27. Qxa6 Qxf5 28. Be7 Rfe8 29. Qxd6 f3 30. gxf3 Qxh3 31. b4 Qxf3 32. Qd7 Qf7 33. a3 Rc2 34. Qa7 Qg6+ 35. Kh2 Qf5 36. Rf1 Qf4+ 37. Kg2 Rc6 38. Qe3 Rg6+ 39. Qg3 Qe4+ 40. f3 Rxg3+ 41. Kxg3 Qxe7 42. f4 Qe3+ 43. Rf3 Qg1+ 44. Kh4 Re2 45. Rg3 Qh2+ 46. Kg4 h5+ 47. Kf5 Qxg3 48. a4 Qg4# 0-1

DarkThought – XXXX-II: [1 – 0] (1st Uniform Platform Match, Round 4, Nunn Position #5, January 10, 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rab1 Bd6 12. b4 h6 13. Bh4 a6 14. Na4 Bg4 15. Nc5 Bxf3 16. gxf3 Rb8 17. a4 Be7 18. Kh1 Nh5 19. Bxe7 Rxe7 20. b5 axb5 21. axb5 Nf6 22. bxc6 bxc6 23. Rxb8 Qxb8 24. Rc1 Qe8 25. Na6 Ne6 26. Qxc6 Qxc6 27. Rxc6 Rb7 28. Bf5 Nf8 29. Kg2 Ra7 30. Nc5 Ra8 31. Rd6 Rb8 32. Bc2 Ng6 33. Nd7 Nxd7 34. Rxd7 Rb5 35. Ba4 Ra5 36. Bc6 Nf8 37. Rxd5 Rxd5 38. Bxd5 Nd7 39. f4 Nb6 40. Bb3 Nc8 41. e4 Nd6 42. Kf3 Nb5 43. Ke3 Nd6 44. e5 Nb7 45. f5 Kf8 46. d5 Na5 47. Ba4 f6 48. f4 Nc4+ 49. Kd4 Nb6 50. Bb5 Ke7 51. Kc5 1-0

XXXX-II – DarkThought: [0 – 1] (1st Uniform Platform Match, Round 5, Nunn Position #5, January 10, 1998)
1. d4 d5 2. c4 c6 3. Nf3 e6 4. cxd5 exd5 5. Nc3 Nf6 6. Bg5 Be7 7. Qc2 Nbd7 8. e3 O-O 9. Bd3 Re8 10. O-O Nf8 11. Rac1 Ng6 12. Rfe1 Be6 13. Ne5 Bd6 14. f4 Bc8 15. Nf3 Bb4 16. f5 Nf8 17. Qb3 Be7 18. e4 dxe4 19. Nxe4 Nd5 20. Bd2 Nd7 21. Re2 N7b6 22. Nc3 a5 23. Na4 Nxa4 24. Qxa4 Bd7 25. Rce1 Bb4 26. Rxe8+ Bxe8 27. Bxb4 axb4 28. Qb3 f6 29. Nd2 Bf7 30. Bb1 Qb6 31. Qd3 Nc7 32. Nb3 Qa7 33. Re7 Nd5 34. Re1 b6 35. Nd2 Qd7 36. Nb3 Qd6 37. Nd2 Nf4 38. Qe3 Rd8 39. Nf3 Kf8 40. g3 Nd5 41. Qe4 Nc7 42. Qg4 Nb5 43. Qh4 Nxd4 44. Nxd4 Qxd4+ 45. Qxd4 Rxd4 46. Kf2 c5 47. Ke3 Rd8 48. Rc1 Rd5 49. h3 Rd4 50. h4 Rd7 51. b3 Bh5 52. Be4 Bg4 53. Rc2 h5 54. Rd2 Ke7 55. Rxd7+ Kxd7 56. Kf4 Kd6 57. Bg2 Be2 58. Ke3 Bd1 59. Kf4 Bc2 60. Bf3 Bb1 61. Bxh5 Bxa2 62. Bf7 b5 63. Ke3 c4 64. bxc4 bxc4 0-1

DarkThought – XXXX-II: [1 – 0] (1st Uniform Platform Match, Round 6, January 11, 1998)
1. e4 e5 2. f4 Bc5 3. Nf3 d6 4. Nc3 Nc6 5. Bb5 Bg4 6. Na4 exf4 7. d4 Bxf3 8. gxf3 Bb4+ 9. c3 Ba5 10. b4 Qh4+ 11. Ke2 Bb6 12. Nxb6 axb6 13. d5 Nge7 14. Kf1 f5 15. Qe2 Kf8 16. dxc6 Nxc6 17. Rg1 Re8 18. Qd2 g5 19. exf5 Re5 20. Bd3 Rd5 21. Qe2 Qh3+ 22. Rg2 Re5 23. Qf2

Ne7 24. c4 Nxf5 25. Bxf5 Rxf5 26. Bb2 g4 27. Qd4 Rg8 28. Kg1 g3 29. Kh1 Rg6 30. Re1 Rff6 31. Bc3 Qc8 32. Rge2 Qh3 33. Re8+ Kg7 34. Qd2 c6 35. Qb2 Kh6 36. Bxf6 1-0

DarkThought – XXXX-II: [1 – 0] (1st Uniform Platform Match, Round 7, January 11, 1998)
1. e4 e5 2. f4 exf4 3. Nf3 g5 4. h4 g4 5. Ne5 Nf6 6. d4 d6 7. Nd3 Nxe4 8. Qe2 f5 9. Nc3 Qe7 10. Nxe4 Qxe4 11. Nxf4 Nc6 12. Qxe4+ fxe4 13. Be3 Ne7 14. Nh5 Nf5 15. Bg5 Be7 16. O-O-O Kd8 17. Be2 Bxg5+ 18. hxg5 Ne3 19. Rdg1 Be6 20. Nf6 Bxa2 21. b3 Nf5 22. Bxg4 Nxd4 23. g6 Bxb3 24. cxb3 Ke7 25. Nd5+ Kf8 26. Rf1+ Kg7 27. Rf7+ Kxg6 28. Bh5+ Kh6 29. Re7 Nxb3+ 30. Kb2 Kg5 31. Rg7+ Kf5 32. Bg4+ Ke5 33. Rd1 Nd4 34. Rg5+ Nf5 35. Rxf5+ Ke6 36. Rf6+ Ke5 37. Re6# 1-0

XXXX-II – DarkThought: [0 – 1] (1st Uniform Platform Match, Round 8, January 11, 1998)
1. e4 a6 2. d4 d5 3. exd5 Qxd5 4. Nf3 Bg4 5. Nc3 Qd6 6. h3 Bh5 7. g4 Bg6 8. h4 h5 9. Ne5 Nc6 10. Nxg6 Qxg6 11. gxh5 Qd6 12. d5 Ne5 13. Bg5 Nf6 14. Bg2 Qb4 15. h6 gxh6 16. Bxf6 exf6 17. Rb1 Bc5 18. Qe2 O-O-O 19. Kf1 Qf4 20. Ne4 Bb6 21. Qd2 Qxd2 22. Nxd2 Ng4 23. Bf3 f5 24. Nc4 Ba7 25. Bxg4 fxg4 26. Ne5 Rxd5 27. Nxg4 f5 28. Ne3 Rd2 29. Rc1 Rhd8 30. Rh3 f4 31. Rf3 fxe3 32. fxe3 Rh2 33. Kg1 Rdd2 34. b3 Rxh4 35. c4 Rxa2 36. c5 Kd7 37. Rc3 Kc6 38. Rf6+ Kb5 0-1

XXXX-II – DarkThought: [1 – 0] (1st Uniform Platform Match, Round 9, January 11, 1998)
1. e4 e6 2. d4 d5 3. Nc3 dxe4 4. Nxe4 Bd7 5. Nf3 Bc6 6. Bd3 Nd7 7. c3 Be7 8. O-O Ngf6 9. Nxf6+ Bxf6 10. Bf4 O-O 11. Qe2 Bd5 12. Rad1 Kh8 13. c4 Bxf3 14. Qxf3 Qc8 15. Be4 c6 16. Qh3 g6 17. Qf3 Re8 18. Bg3 Qd8 19. d5 exd5 20. cxd5 c5 21. d6 Bxb2 22. Bxb7 Rb8 23. Bc6 f6 24. Qd5 Qc8 25. Bxd7 Qxd7 26. Qxc5 Rbc8 27. Qd5 Bc3 28. Rc1 Rf8 29. Rfd1 g5 30. Rc2 a6 31. Qd3 Ba5 32. Rxc8 Rxc8 33. Qxa6 Bd8 34. Qd3 Qa4 35. Ra1 Rc4 36. a3 Qc6 37. Qd2 Kg7 38. Re1 h5 39. h4 gxh4 40. Bf4 Ra4 41. Qe3 Qb5 42. Bh6+ Kh7 43. Bf8 Rg4 44. Qf3 Rg8 45. Be7 Qg5 46. Re6 h3 47. g3 h4 48. Kh2 hxg3+ 49. fxg3 Bxe7 50. Rxe7+ Kg6 51. Qe4+ Qf5 52. Qxf5+ Kxf5 53. d7 Rd8 54. Kxh3 Kg5 55. g4 f5 56. Re5 Rxd7 57. Rxf5+ Kg6 58. a4 Rd1 59. a5 Rh1+ 60. Kg3 Rg1+ 61. Kf3 Rf1+ 62. Ke4 Rg1 63. Rb5 Rxg4+ 64. Kd5 Kh6 65. a6 Rg5+ 66. Kc4 Rg7 67. Rc5 Rg1 68. a7 Ra1 69. Rc7 Rc1+ 70. Kd5 Rxc7 71. a8=Q Rf7 72. Ke6 Rf4 73. Ke5 Rg4 74. Qh8+ Kg5 75. Qh3 Rb4 76. Qe3+ Kg4 77. Qe2+ Kh3 78. Kf5 Rb3 79. Kf4 Rb8 80. Qd3+ Kg2 81. Qa3 Rd8 82. Qb2+ Kh1 83. Qb7+ Kh2 84. Qc7 Rf8+ 85. Ke4+ Kh1 86. Qh7+ Kg1 87. Qg7+ Kh1 88. Qxf8 Kg2 89. Qf3+ Kg1 1-0

1.10 DarkThought at 15th WMCC (October 1997)

From October 25 – November 2, 1997, DarkThought successfully participated in the 15th World Microcomputer-Chess Championship (WMCC '97). With 7.0 points out of 11 games (5x win, 4x draw, 2x loss) it finished the tournament on a shared 4th place as the best European amateur and overall 6th of 34 participants. In the accompanying speed-chess event, DarkThought blitzed its way to a shared 7th place.

The beautiful "Salon d'Honeur" inside the historic building of the "Palais de la Bourse" in Paris (France) served as a fantastic playing hall. Media coverage of the championship was excellent again. Several French TV channels and newspapers reported about the tournament on a daily basis.The championship was hosted by the International Computer Chess Association in cooperation with the sponsors Advanced Micro Devices Inc., the Paris Stock Exchange, and Titus Software Corp. Thanks to generous financial support by the Institute for Program Structures and Data Organization (Chair Prof. Tichy) and the Gunther-and-Ingrid-Schroff Foundation (administered by the Dean of the University of Karlsruhe), we experienced no need at all to worry about our travel expenses. Furthermore, we succeeded in securing a super-fast computer for DarkThought long before the championship tournament started. Digital Equipment Corp. (DEC) and KryoTech Inc. shipped two of the then world's fastest workstations from the US to Paris. These "speed demons" boasted DEC Alpha-21164a CPUs running at 767MHz, 4MB L3 cache, and 512MB SDRAM main memory. Jeff Forsythe, a DEC engineer from Boston, USA, accompanied both machines to Paris and supervised their smooth operation during the games. Both companies paid for all the bills associated with this endeavour and shunned neither costs nor work to make it a gleeming success. We are most indebted to DEC and KryoTech for their fantastic support and hope to be able to repeat similar cooperations in the future. Thank you very much indeed, DEC and KryoTech!

The story how this cooperation developed shows the blessings of the Internet at their very best. In August 1997, Ernst became aware of KryoTech Inc. and their products while browsing some news articles on the WWW. By means of uncomplicated communication via electronic mail Ernst managed to contact Rob diGiacomo, then Executive Vice President and Chief Marketing Officer of KryoTech Inc., and to raise his interest in WMCC '97 within hours after his initial "discovery" of the company. KryoTech is an NCR spin-off and was founded in 1996. The company develops and markets cooling systems that allow for accelerated operation of CMOS devices. The according patents and the registered "Cool Computing" trademark were bought from NCR. KryoTech employs standard technology as known from household refrigeratos in order to cool state-of-the-art CPUs to –40 degrees Celsius, thus enabling flawless operation at roughly 30higher clock frequencies than usual. Thence, the super-fast 767MHz DEC/KryoTech workstations contain no secret processors but they rather rely on off-the-shelf 600MHz DEC Alpha-21164a CPUs that get overclocked by 30% in a "cool" way. Both the cooling device and the main system fit into a common big-tower case such that these 767MHz "personal supercomputers" are not larger than according PCs. The chess program Ferret written by Bruce Moreland also ran on a 767MHz DEC/KryoTech speed demon during the whole tournament. Ferret achieved the same overall result as DarkThought and finished the tournament on a shared 4th place with 7 points out of 11 games.

The championship as such proved to be a real "bumper ride" for our team – much like the one in 1996. After an unlucky start in the first round against the commercial program MChess (overall WMCC '95 champion), DarkThought bravely fought its way back into the top crowd with 5 points out of the ensuing 7 games. But then we chose a much too risky opening and lost in round 9 against the French amateur program Chess Guru that ran on a normal DEC Alpha workstation. Unfortunately, this loss completely cancelled our chances to win any championship title two rounds before the end of the tournament. Our truely grave disappointment could only be partially soothed by the nice games and victories of DarkThought during the last two rounds against the Danish amateur program Gandalf and this year's commercial champion, the French program VirtualChess. Today, we feel quite happy about our third successful participation in three successive WMCCs (3x among the 7 best) and sincerely congratulate the 1997 champion Junior and its creators from Israel!

Final Standings of 15th WMCC

Rk = final rank, **Pts** = overall points, **SOP** = sum of opponents' points, **Rx** = results of each round.

Rk	Pts	SOP	Program	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11
1	9.5	69.0	Junior	b12=	w11+	b30+	w05+	b02−	w10+	w04+	b14+	w13+	b03+	b16+
2	8.0	73.0	VirtualChess	w09+	b04=	w24+	b15+	w01+	b18+	w05=	b12+	b03−	w10+	b06−
3	7.5	66.5	Shredder	w18=	b13−	w20+	w14−	b31+	b24+	w23+	b15+	w02+	w01−	b04+
4	7.0	75.0	MChess	b06+	w02=	b07+	w21+	b10=	w11=	b01−	w05+	w12=	b14+	w03−
5	7.0	73.0	Ferret	w13=	b20+	w22+	b01−	w15=	w07+	b02=	b04−	w11+	b08=	w14+
6	*7.0*	*66.0*	*DarkThought*	*w04−*	*b09+*	*w19=*	*b27=*	*w29+*	*b23=*	*w07+*	*b10=*	*w14−*	*b13+*	*w02+*
7	7.0	65.5	Toledo	w08+	b17=	w04−	b28+	w13+	b05−	b06−	w27=	w22+	b15+	w18+
8	7.0	59.5	Hydra	b07−	w12=	b11−	w33+	b30+	w19+	b14−	w23+	b27+	w05=	b10+
9	6.5	57.0	Comet	b02−	w06−	b33+	w23−	b20+	w26−	b32+	w25+	w18=	b28+	w19+
10	6.0	72.0	ChessSys.Tal	w19+	b14+	w15=	b12=	w04=	b01−	w22+	w06=	b21+	b02−	w08−
11	6.0	70.0	Arthur	w17=	b01−	w08+	b19+	w24+	b04=	w15=	b13−	b05−	w21+	w12=
12	6.0	69.5	Eugen	w01=	b08=	w23+	w10=	b21=	b27+	w18+	b02−	b04=	w16−	b11=
13	6.0	68.5	Gandalf	b05=	w03+	b21−	w30+	b07−	w16=	b25+	w11+	b01−	w06−	b26+
14	6.0	67.5	ChessGuru	b34+	w10−	w17+	b03+	w18−	b22+	w08+	w01−	b06+	w04−	b05−
15	6.0	65.5	Diep	b32+	w26+	b10=	w02−	b05=	w21+	b11=	w03−	b16=	w07−	b22+
16	6.0	64.0	Fritz	w20=	b18=	w27=	b24−	w28=	b13=	w17+	b19+	w15=	b12+	w01−
17	6.0	53.5	Kallisto	b11=	w07=	b14−	w31=	b23−	w30+	b16−	w32+	w28=	b29+	b21+
18	5.5	66.5	Crafty	b03=	w16=	b25+	w26+	b14+	w02−	b12−	w21−	b09=	w27+	b07−
19	5.5	57.0	CrazyBishop	b10−	w34+	b06=	w11−	b32+	b08−	w24+	w16−	b23+	w20+	b09−
20	5.5	52.5	IsiChess	b16=	w05−	b03−	b29−	w09−	b34+	w33+	w31+	b24+	b19−	w28+
21	5.0	62.5	Goliath	w29+	b22=	w13+	b04−	w12=	b15−	w28+	b18+	w10−	b11−	w17−
22	5.0	57.5	Woodpusher	b33+	w21=	b05−	w25=	b26+	w14−	b10−	w29+	b07−	b32+	w15−
23	5.0	56.5	XXXX	b26−	w32+	b12−	b09+	w17+	w06=	b03−	b08−	w19−	w31=	b34+
24	5.0	54.0	Stobor	b25=	w31+	b02−	w16+	b11−	w03−	b19−	b34+	w20−	w33=	b27+
25	5.0	53.0	Patzer	w24=	b28+	w18−	b22=	w27−	b29+	w13−	b09−	b26−	w30+	b33+
26	5.0	52.5	SOS	w23+	b15−	w29+	b18−	w22−	b09+	w27−	b28−	w25+	b34+	w13−
27	4.5	60.0	ChessTiger	b31+	w30−	b16=	w06=	b25+	w12−	b26+	b07=	w08−	b18−	w24−
28	4.5	55.5	AnMon	b30=	w25−	b32+	w07−	b16=	w31+	b21−	w26+	b17=	w09−	b20−
29	4.5	48.0	TechnoChess	b21−	w33+	b26−	w20+	b06−	w25−	b31+	b22−	w34+	w17−	b30=
30	3.5	53.0	Capture	w28=	b27+	w01−	b13−	w08−	b17−	w34+	b33−	w32=	b25−	w29=
31	3.0	48.5	Francesca	w27−	b24−	w34+	b17=	w03−	b28−	w29−	b20−	w33=	b23=	w32=
32	3.0	48.0	Nightmare	w15−	b23−	w28−	b34+	w19−	b33+	w09−	b17−	b30=	w22−	b31=
33	3.0	48.0	Dragon	w22−	b29−	w09−	b08−	w34+	w32−	b20−	w30+	b31=	b24=	w25−
34	0.0	49.0	Ananse	w14−	b19−	b31−	w32−	b33−	w20−	b30−	w24−	b29−	w26−	w23−

Games Played by DarkThought at 15th WMCC

DarkThought – MChess: [0 – 1] (15th WMCC, Round 1, October 26, 1997)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Ne7 7. Qg4 Qc7 8. Qxg7 Rg8 9. Qxh7 cxd4 10. Ne2 Nbc6 11. f4 Bd7 12. Qd3 dxc3 13. Nxc3 a6 14. Ne2 Rc8 15. Rb1 Na5 16. Ng3 Ba4 17. c3 Nb3 18. Nh5 Kf8 19. Nf6 Rg7 20. Bb2 Qb6 21. h4 Ng8 22. Nh5 Rc4 23. Nxg7 Re4+ 24. Be2 Bb5 25. Qxe4 dxe4 26. c4 Qa5+ 27. Kf2 Nd2 28. Rbc1 Bxc4 29. Bxc4 Qb6+ 30. Kg3 Kxg7 31. Bc3 Qe3+ 32. Kh2 Qxf4+ 33. g3 Qf2+ 34. Kh3 Qf5+ 35. Kh2 Nxc4 36. Rhf1 Qh5 37. Rce1 e3 38. Rf4 b5 39. a4 Qg6 40. Kh3 Qd3 41. Bb4 Nxe5 42. axb5 Nf6 43. bxa6 Nd5 44. Rff1 Nxb4 45. a7 Qd8 46. Rxe3 Nbd3 47. Re2 Qa5 48. a8=Q Qxa8 49. Rd2 Qe4 0-1

Comet – DarkThought: [0 – 1] (15th WMCC, Round 2, October 27, 1997)
1. c4 e5 2. Nc3 Nf6 3. Nf3 Nc6 4. g3 Nd4 5. Bg2 Nxf3+ 6. Bxf3 Bc5 7. d3 O-O 8. Bg5 c6 9. O-O Be7 10. d4 d6 11. dxe5 dxe5 12. Qc2 Bh3 13. Rfd1 Qb6 14. Bxf6 Bxf6 15. Ne4 Be7 16. c5 Qc7 17. Qc3 Rad8 18. Rac1 f5 19. Qb3+ Kh8 20. Nd6 Bxd6 21. cxd6 Rxd6 22. Rxd6 Qxd6 23. Rd1 Qe7 24. Bg2 Bxg2 25. Kxg2 f4 26. e4 fxg3 27. hxg3 g5 28. f3 h5 29. Qe3 Qf6 30. Rh1 h4 31. Kf2 Rf7 32. Ke2 b6 33. gxh4 gxh4 34. Qf2 Rh7 35. Qh2 h3 36. Qg3 Qg7 37. Rxh3 Qxg3 38. Rxg3 Rh2+ 39. Ke3 Rxb2 40. Rg5 Rb5 41. f4 exf4+ 42. Kxf4 Rxg5 43. Kxg5 Kg7 44. Kf5 Kf7 45. Ke5 Ke7 46. Kf5 b5 47. Kg4 b4 48. Kf4 c5 49. Ke5 a5 50. Kd5 a4 51. Kc4 Kf6 52. Kd5 b3 53. axb3 axb3 54. Kc4 b2 0-1

DarkThought – CrazyBishop: [1/2 – 1/2] (15th WMCC, Round 3, October 27, 1997)
1. e4 c5 2. d4 cxd4 3. Qxd4 Nc6 4. Qa4 e6 5. Nf3 Bc5 6. Bd3 d6 7. O-O Bd7 8. Qb3 Nf6 9. Bg5 h6 10. Bf4 Na5 11. Qc3 Rc8 12. Qd2 Nc6 13. Nc3 O-O 14. Na4 Ne5 15. Nxc5 Nxf3+ 16. gxf3 dxc5 17. Kh1 Nh5 18. Bd6 Qf6 19. Qe3 Rfd8 20. Rg1 e5 21. Be7 Qxe7 22. Qxh6 Be6 23. Qxh5 Qf6 24. Rg2 c4 25. Be2 Rd2 26. f4 Qxf4 27. Rag1 Rxc2 28. Rxg7+ Kf8 29. R7g5 Rc5 30. Rd1 Ke7 31. Rg4 Bxg4 32. Bxg4 Qf6 33. Rd7+ Kf8 34. Rxb7 Rxf2 35. Rb8+ Ke7 36. Rb7+ Ke8 37. Rb8+ Ke7 38. Rb7+ Kf8 39. Rb8+ Ke7 40. Rb7+ 1/2-1/2

ChessTiger – DarkThought: [1/2 – 1/2] (15th WMCC, Round 4, October 28, 1997)
1. e4 e5 2. Nf3 Nf6 3. d4 exd4 4. e5 Ne4 5. Qxd4 d5 6. exd6 Nxd6 7. Qe5+ Qe7 8. Nc3 Be6 9. Nd4 Nd7 10. Qe2 Bc4 11. Qxe7+ Bxe7 12. Bxc4 Nxc4 13. Ndb5 O-O-O 14. Nxa7+ Kb8 15. Nab5 Bf6 16. b3 Rhe8+ 17. Kf1 Nd6 18. Rb1 Nf8 19. Bf4 Nxb5 20. Nxb5 Ne6 21. Be3 Bg5 22. Bxg5 Nxg5 23. Re1 Ne4 24. f3 c6 25. fxe4 cxb5 26. Kf2 b4 27. Rhf1 f6 28. Ke3 Rc8 29. Re2 Rc7 30. Rd1 Rec8 31. Rdd2 h6 32. Kf4 Rc5 33. h4 Ka7 34. g4 R8c7 35. h5 Ra5 36. e5 fxe5+ 37. Rxe5 Rxa2 38. Ree2 Rf7+ 39. Ke4 Ra1 40. Rd4 Rc7 41. Red2 Re1+ 42. Kf5 Rc6 43. Kf4 Rf1+ 44. Ke5 Re1+ 45. Re4 Rxe4+ 46. Kxe4 g6 47. hxg6 Rxg6 48. Kf5 Rc6 49. Ke5 Rc5+ 50. Ke4 h5 51. gxh5 Rxh5 52. Rd4 Rh3 53. Rd6 Rc3 54. Rd2 Ka6 55. Kd5 Kb5 56. Rf2 Rc5+ 57. Kd4 Rc3 1/2-1/2

DarkThought – TechnoChess: [1 – 0] (15th WMCC, Round 5, October 28, 1997)
1. e4 e5 2. d4 exd4 3. Nf3 Bb4+ 4. Bd2 Qe7 5. Bd3 Nc6 6. O-O Nf6 7. e5 Ng4 8. Nxd4 Ngxe5 9. Nxc6 dxc6 10. Re1 Bc5 11. Bc3 Bg4 12. Qd2 f6 13. b4 Bb6 14. a4 a6 15. Na3 O-O 16. Nc4 Ba7 17. Nxe5 fxe5 18. Rxe5 Be6 19. Rf1 Qf7 20. Qe2 Rfe8 21. Rg5 g6 22. Bxg6 hxg6 23. Qh5 Kf8 24. Rxg6 Ke7 25. Rg7 Qxg7 26. Bxg7 b5 27. Rd1 Bd5 28. Bh6 Rg8 29. Qe5+ Kd8 30. Rxd5+ Kc8 31. Bf4 1-0

XXXX – DarkThought: [1/2 – 1/2] (15th WMCC, Round 6, October 29, 1997)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O Be7 6. Re1 b5 7. Bb3 d6 8. c3 O-O 9. h3 Bb7 10. d4 Re8 11. Nbd2 Bf8 12. Ng5 Re7 13. d5 Na5 14. Bc2 c6 15. b4 Nc4 16. dxc6 Bxc6 17. Nxc4 bxc4 18. Nf3 a5 19. a4 axb4 20. cxb4 d5 21. exd5 Qxd5 22. Bb2 Qxd1 23. Bxd1 Rea7 24. Nxe5 Bxa4 25. Bf3 Rb8 26. Nc6 Bxc6 27. Rxa7 Bxb4 28. Rc1 Bc5 29. Ra2 Bxf3 30. gxf3 Nd5 31. Rxc4 Bb6 32. Bd4 Bxd4 33. Rxd4 Ne7 34. Rad2 g6 35. Rd8+ Rxd8 36. Rxd8+ Kg7 37. f4 f6 38. Kg2 Kf7 39. Rd6 h6 40. Kh1 g5 41. fxg5 hxg5 42. Rd4 Ng6 43. Re4 f5 44. Rb4 Kf6 45. Rb6+ Kf7 46. Kg2 Kg7 47. Ra6 Kf7 48. Kg3 Kg7 49. Rb6 Kf7 50. f3 Kg7 51. Rb5 Kf6 52. Ra5 Ke6 53. Ra6+ Kf7 54. Ra4 Ke7 55. Kh2 Kf6 56. Ra6+ Kf7 57. Kg3 Kg7 58. Rb6 Kf7 59. Rb7+ Kf6 60. Rb5 Ke6 61. Rc5 Kf6 62. Rc6+ Kf7 1/2-1/2

DarkThought – Toledo: [1 – 0] (15th WMCC, Round 7, October 29, 1997)
1. e4 c5 2. Nf3 d6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 a6 6. Bg5 e6 7. f4 Nbd7 8. Qf3 Be7 9. O-O-O Qc7 10. g4 b5 11. Bxf6 Nxf6 12. g5 Nd7 13. f5 Bxg5+ 14. Kb1 Ne5 15. Qh5 Qd8 16. Nxe6 Bxe6 17. fxe6 O-O 18. Rg1 f6 19. h4 Be3 20. Rg2 Qe8 21. Qxe8 Rfxe8 22. Nd5 Rxe6 1-0

ChessSys. Tal – DarkThought: [1/2 – 1/2] (15th WMCC, Round 8, October 30, 1997)
1. e4 d5 2. exd5 Qxd5 3. Nc3 Qa5 4. d4 Nf6 5. Nf3 c6 6. Bc4 Bg4 7. h3 Bh5 8. Bd2 e6 9. Qe2 Bb4 10. g4 Bg6 11. O-O-O Nbd7 12. Kb1 O-O-O 13. a3 Bxc3 14. Bxc3 Qc7 15. Bd2 Nb6 16. Ba5 c5 17. Rhe1 cxd4 18. Ba2 Qf4 19. Bxb6 axb6 20. Ne5 Kb8 21. Qb5 Rd6 22. Qb4 Rhd8 23. f3 Nd5 24. Bxd5 Rxd5 25. Nxg6 hxg6 26. Qxb6 g5 27. Rd3 Qh2 28. Red1 e5 29. Rb3 R5d7 30. Qa5 f6 31. Rd2 Qh1+ 32. Ka2 Rc8 33. Qa4 Rdc7 34. Qb4 Qf1 35. Qd6 Ka8 36. Qb6 Qa6 37. Qxa6+ bxa6 38. Kb1 Ka7 39. Kc1 Rh8 40. Rh2 a5 41. Kd2 Rhc8 42. Kd3 Ka6 43. a4 Rc4 44. Ra3 Rb4 45. c3 Rb7 46. Rc2 Rd8 47. cxd4 Rxd4+ 48. Ke3 Rdb4 49. Rc6+ Ka7 50. Rc5 Kb6 51. Rc2 Rd7 52. Ke2 Rc7 53. Rd2 Rc1 54. Rad3 Rxa4 55. Rd6+ Kb7 56. Rd7+ Rc7 57. R7d5 Ra1 58. Ke3 a4 59. Rb5+ Kc6 60. Rc2+ Kd7 61. Rd5+ Kc8 62. Rcd2 Rf1 63. Rd8+ Kb7 64. R8d5 Kb6 65. Rd6+ Kc5 66. R2d5+ Kc4 67. Ra5 Kb4 68. Rda6 Ra1 69. Ra8 Rb7 70. R5a7 Rxa7 71. Rxa7 Kb3 72. Rb7+ Kc2 73. Rb4 Ra2 74. Ke4 Kb1 75. Kf5 Rxb2 76. Rxa4 Rh2 77. Ra7 Rxh3 78. Ke4 Rh7 79. Kd3 Kb2 80. Rc7 Kb3 81. Rb7+ Ka3 82. Rb1 Rh2 83. Rb7 Rh3 84. Ke4 Rh7 85. Rb1 Rh2 86. Rb7 Re2+ 87. Kd3 Re1 88. Rxg7 Rd1+ 89. Ke2 Rd6 90. Rb7 Rd4 91. Rb6 Rf4 92. Ke3 Ka4 93. Rb1 Ka5 94. Rb2 Rd4 95. Rb7 Ka6 96. Rb8 Rf4 97. Rb1 Rc4 98. Rb8 Rd4 99. Rb2 Ka7 100. Rb5 Rc4 101. Kd3 Ra4 102. Ke3 Rf4 1/2-1/2

DarkThought – ChessGuru: [0 – 1] (15th WMCC, Round 9, October 31, 1997)
1. e4 e5 2. f4 exf4 3. Nf3 f5 4. e5 g5 5. d4 g4 6. Bxf4 gxf3 7. Qxf3 Qh4+ 8. g3 Qg4 9. Qe3 Nc6 10. Be2 Qg6 11. Nc3 Bb4 12. d5 Nd8 13. O-O-O c6 14. e6 dxe6 15. dxc6 Nxc6 16. Nd5 Ba5 17. Be5 exd5 18. Bxh8+ Nge7 19. Bd4 Qe6 20. c3 Nxd4 21. Qxd4 Qxe2 22. Qa4+ Kf7 23. Qxa5 Be6 24. Kb1 b6 25. Qa3 Qe4+ 26. Ka1 Qc4 27. Rd4 Qc5 28. Qa6 Kg8 29. Qe2 Bf7 30. Rf1 Nc6 31. Rdf4 Re8 32. Qd1 Bg6 33. h4 Re4 34. g4 Qd6 35. Qd2 fxg4 36. Rf6 Re6 37. Rxe6 Qxe6 38. Re1 Qf5 39. Rd1 Bf7 40. Qh6 Ne5 41. Qd6 Nc4 42. Qd8+ Kg7 43. Qe7 Qf4 44. Qe2 g3 45. Re1 Qd2 46. Qxd2 Nxd2 47. Rg1 Ne4 48. a4 Kh6 49. Kb1 0-1

Gandalf – DarkThought: [0 – 1] (15th WMCC, Round 10, November 1, 1997)
1. e4 e6 2. d4 d5 3. Nc3 dxe4 4. Nxe4 Bd7 5. Nf3 Bc6 6. Neg5 Bd6 7. Bd3 h6 8. Ne4 Nf6 9. Nxd6+ Qxd6 10. O-O Nbd7 11. Qe2 O-O-O 12. Ne5 Nxe5 13. dxe5 Qd5 14. f4 Ne4 15. Re1 Nc5 16. Bc4 Qe4 17. b4 Qxe2 18. Bxe2 Na4 19. b5 Be4 20. Bh5 Bxc2 21. Bxf7 Bf5 22. h3 h5 23. Bxh5 Rxh5 24. g4 Rxh3 25. gxf5 exf5 26. Kg2 Rdd3 27. Rf1 Nc5 28. a4 Rdg3+ 29. Kf2 Rc3 30. Ke2 Rh2+ 31. Kd1 Rd3+ 32. Ke1 Ne4 33. Ra3 Nc3 34. Rxc3 Rxc3 35. Bd2 Rd3 36. Bc1 Rc2 37. Rg1 Rxc1+ 38. Ke2 Rxg1 39. Kxd3 Rf1 40. Ke3 Kd7 41. a5 0-1

DarkThought – VirtualChess: [1 – 0] (15th WMCC, Round 11, November 2, 1997)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O Be7 6. Re1 b5 7. Bb3 O-O 8. c3 d6 9. a3 Na5 10. Ba2 c5 11. d3 h6 12. Nbd2 Be6 13. Bxe6 fxe6 14. b4 Nc6 15. Qb3 Qd7 16. bxc5 dxc5 17. a4 Rab8 18. axb5 axb5 19. h3 Rfd8 20. Re3 Nh5 21. g3 Nf6 22. Bb2 Nh7 23. Qc2 Ng5 24. Kh2 Ra8 25. Rxa8 Rxa8 26. Nxg5 Bxg5 27. Re2 Rf8 28. Nb3 c4 29. dxc4 bxc4 30. Nc5 Qd6 31. Ba3 Ra8 32. Bb4 Rb8 33. Na6 Nxb4 34. Nxb4 Ra8 35. h4 Be7 36. Qc1 Qb6 37. Rb2 Bxb4 38. Qc2 Rf8 39. h5 Qd6 40. cxb4 Qd4 41. Kg2 Rc8 42. b5 Kf7 43. b6 Rb8 44. b7 c3 45. Rb3 Ke7 46. Qe2 Qa4 47. Rxc3 Rxb7 48. Qg4 Kd6 49. Rd3+ Kc5 50. Qf3 Rd7 51. Rc3+ Kb6 52. Qf8 Qxe4+ 53. Kh2 Qd5 54. Qa3 Rb7 55. Rd3 Qxd3 56. Qxd3 Rf7 57. Qd6+ Kb7 58. Kh3 Rc7 59. Qxe5 Re7 60. Qd6 Rc7 61. Qxe6 Kb8 62. f4 Ka7 63. f5 Kb7 64. Qg6 Rd7 1-0

1.11 DarkThought at 1st Karlsruher UniSchau (June 1997)

On June 7, 1997 during the first "Karlsruher UniSchau" (a public university show day), DarkThought played an exhibition match against the official student chess team from the University of Karlsruhe. While facing strong opposition by Steffen Birk (ELO 2305), Volker Duschek (ELO 2245), Boris Kargoll (ELO 2245), and Volker Klein (ELO 2225), DarkThought won the match 3.0 : 1.0 without loosing any of the four 60-moves-in-60-minutes games.

This man vs. machine event took place shortly after the "IBM Deeper Blue vs. Garry Kasparov" rematch and drew a crowd of knowledgable spectators who were fascinated by repeated high-quality play on all four boards. Interestingly, DarkThought ran on slower computers in the games it won than in the games it only drew! Playing the white pieces, DarkThought used one 433MHz Alpha-21164a workstation with 1MB off-chip L3 cache and one 300MHz Alpha-21164 workstation with 2MB off-chip L3 cache. Playing the black pieces, however, it used two 500MHz Alpha-21164a workstations with 1MB off-chip L3 cache as provided by Digital Equipment Corp. under external technology research contract DE-0032-97. Main memory amounted to 128MB RAM for each machine.

Games Played by DarkThought at 1st Karlsruher UniSchau

DarkThought – Steffen Birk (ELO 2305): [1 – 0] (Exhibition Match at 1st Karlsruher UniSchau, June 7, 1997)
1. e4 Nf6 2. e5 Nd5 3. d4 d6 4. Nf3 dxe5 5. Nxe5 g6 6. Bc4 c6 7. O-O Bg7 8. Re1 O-O 9. Bb3 Be6 10. Nd2 Nd7 11. Ndf3 Nxe5 12. Nxe5 a5 13. c3 Qc7 14. h4 Rad8 15. h5 Bf5 16. Qe2 gxh5 17. Qxh5 Bg6 18. Qh3 b5 19. Bxd5 Rxd5 20. Bf4 Qb7 21. Rad1 e6 22. Nd3 Qe7 23. Nc5 b4 24. Rc1 Ra8 25. Re3 a4 26. a3 bxa3 27. bxa3 Qa7 28. Rce1 Qb6 29. Nd3 Bxd3 30. Rxd3 Kh8 31. Rg3 Qb5 32. Qg4 Bf6 33. Bh6 1-0

Volker Duschek (ELO 2245) – DarkThought: [1/2 – 1/2] (Exhibition Match at 1st Karlsruher UniSchau, June 7, 1997)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O Be7 6. Re1 b5 7. Bb3 d6 8. c3 O-O 9. h3 Bb7 10. d4 Re8 11. a4 h6 12. Nbd2 Bf8 13. Bc2 exd4 14. cxd4 Nb4 15. Bb1 c5 16. d5 Nd7 17. Ra3 f5 18. Nh2 Nf6 19. Rg3 bxa4 20. Qf3 fxe4 21. Nxe4 Kh8 22. Ng4 Nbxd5 23. Bxh6 Nh5 24. Bg5 Qa5 25. Bd2 Qxd2 26. Nxd2 Rxe1+ 27. Kh2 Nxg3 28. Qxg3 Be7 29. Qf3 Rf8 30. Qd3 Rxb1 31. Qxb1 Bc6 32. Nf3 Nf4 33. Ne1 a5 34. Qc2 Rb8 35. g3 Ne6 36. Qg6 Nd4 37. h4 Rxb2 38. h5 Bf8 39. Qf7 Rb8 40. h6 Re8 41. hxg7+ Bxg7 42. Nf6 Bxf6 43. Qxf6+ Kh7 1/2-1/2

Boris Kargoll (ELO 2245) – DarkThought: [1/2 – 1/2] (Exhibition Match at 1st Karlsruher UniSchau, June 7, 1997)
1. d4 Nf6 2. Nf3 d5 3. c4 c6 4. e3 e6 5. Nbd2 Bd6 6. Bd3 O-O 7. O-O Nbd7 8. e4 dxe4 9. Nxe4 Nxe4 10. Bxe4 Nf6 11. Bc2 b5 12. cxb5 cxb5 13. Qd3 Bb7 14. Bg5 g6 15. Qxb5 Bxf3 16. gxf3 Rb8 17. Qd3 Rb4 18. Rad1 Be7 19. Bb3 Qd6 20. Qe3 Nd5 21. Bxd5 Bxg5 22. Qxg5 Rb5 23. Qg3 Qxd5 24. b3 Qd8 25. Kh1 Qa5 26. Qf4 Qxa2 27. Ra1 Qxb3 28. Rxa7 Rf5 29. Qe3 Rxf3 30. Qxb3 Rxb3 31. Rd7 Rc8 32. d5 exd5 33. Rxd5 Rb2 34. Kg2 Rc3 35. Rdd1 Kg7 36. Rb1 Rbc2 37. Rfd1 Rc4 38. Rb3 g5 39. Rd7 Rf4 40. Rf3 Rxf3 41. Kxf3 h5 42. h3 Rc3+ 43. Kg2 Rc4 44. Ra7 Kg6 45. Ra6+ f6 46. Rb6 Kf5 47. Ra6 h4 48. Rb6 Ra4 49. Rc6 Ra3 50. Rb6 Rd3 51. Ra6 Ke5 52. Rb6 f5 53. Rg6 Kf4 54. Rh6 Ra3 55. Rh7 Rc3 56. Rh8 Rb3 57. Rh7 Ra3 58. Rh8 Rc3 59. Rh7 Rb3 60. Rh8 Rb2 1/2-1/2

DarkThought – Volker Klein (ELO 2225): [1 – 0] (Exhibition Match at 1st Karlsruher UniSchau, June 7, 1997)
1. e4 e5 2. Bc4 Nf6 3. d3 c6 4. Nf3 d5 5. Bb3 Bb4+ 6. Bd2 Bxd2+ 7. Nbxd2 Qd6 8. O-O O-O 9. d4 Nxe4 10. Nxe4 dxe4 11. Nxe5 Bf5 12. f3 e3 13. Re1 c5 14. Nxf7 Rxf7 15. dxc5 Qxd1 16. Raxd1 Na6 17. Rxe3 Kf8 18. Bxf7 Kxf7 19. Rd5 Be6 20. Rd6 Nc7 21. c6 b5 22. a3 a5 23. f4 g6 24. Re5 h5 25. Kf2 Kf6 26. Ke3 a4 27. Kd4 Rb8 28. Rexe6+ Nxe6+ 29. Kd5 Re8 30. c7 1-0

1.12 DarkThought at 12th AEGON Man-Machine (April 1997)

Games Played by DarkThought at 12th AEGON Man-Machine

DarkThought – Nico Vromans (ELO 1810): [1/2 – 1/2] (12th AEGON Man vs. Machine, Round 1, April 16, 1997)
1. e4 d6 2. d4 e5 3. Nf3 exd4 4. Nxd4 Nf6 5. Nc3 Be7 6. g3 a6 7. Bg2 O-O 8. Be3 c5 9. Nb3 Nc6 10. h3 Be6 11. O-O Qc7 12. g4 Rad8 13. g5 Ne8 14. Nd5 Bxd5 15. Qxd5 Qc8 16. Rfd1 Nc7 17. Qd2 f6 18. gxf6 Bxf6 19. c3 Kh8 20. f4 Rfe8 21. Kh1 Ne6 22. f5 Nc7 23. c4 Ne5 24. Rac1 b6 25. Bf4 Qd7 26. Bxe5 Rxe5 27. Rc2 Qe7 28. Qd3 Bg5 29. Nc1 Bxc1 30. Rdxc1 Ne8 31. Rg1 Nf6 32. Bf3 Rg8 33. Re2 Re8 34. Reg2 Rg8 35. b3 Qc7 36. Rd1 Rd8 37. Re2 Qe7 38. Kh2 Ne8 39. Rg1 Nf6 40. Rg3 Re8 41. Reg2 Rg8 42. Rg5 Qc7 43. Kh1 Re7 44. Rd2 Rd8 45. Rgg2 Re5 46. Rd1 Qe7 47. Rdg1 Rg8 48. a4 a5 49. Rg3 Qc7 50. Qc2 Qe7 51. Qg2 Qc7 52. Rg5 Qe7 53. Qf2 h6 54. Rg6 Kh7 55. Qe2 Qb7 56. Kh2 Qc7 57. Qg2 Qe7 58. h4 Qf7 59. Qf2 Qe7 60. Qg3 Qf7 61. Kh1 Qe7 62. h5 Qf7 63. Qf2 Qe7 64. Qg2 Qf7 65. Qh3 Qe7 66. Qh4 1/2-1/2

Hebert Perez Garcia (ELO 2162) – DarkThought: [1/2 – 1/2] (12th AEGON Man vs. Machine, Round 2, April 17, 1997)
1. Nf3 Nf6 2. g3 d5 3. Bg2 c6 4. O-O Bg4 5. Ne5 h5 6. d4 Nbd7 7. Nxg4 hxg4 8. Nc3 Qb6 9. a4 O-O-O 10. a5 Qa6 11. Bd2 e5 12. e3 exd4 13. exd4 Bb4 14. Ra4 Bxc3 15. Bxc3 Rh7 16. Re1 Rdh8 17. Ra1 Rxh2 18. Re7 R2h5 19. Rxf7 g5 20. f3 gxf3 21. Qxf3 g4 22. Qf1 Qxf1+ 23. Rxf1 Ne4 24. Rg7 Nxg3 25. Rff7 Rd8 26. a6 b6 27. Rg6 Kb8 28. Rxc6 Ne2+ 29. Kf2 Nxc3 30. Rxc3 Rh6 31. Kg3 Rf6 32. Bxd5 Rd6 33. Rf5 Nf8 34. Rf7 Nd7 35. Bc6 Rxd4 36. Bxd7 1/2-1/2

DarkThought – Mathias Feist (ELO 2110): [1 – 0] (12th AEGON Man vs. Machine, Round 3, April 18, 1997)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Ne7 7. Qg4 Kf8 8. h4 Qa5 9. Bd2 Qa4 10. Kd1 b6 11. Nf3 Nbc6 12. Qf4 c4 13. h5 h6 14. g4 Bd7 15. Rg1 Ke8 16. Bh3 g5 17. hxg6 Nxg6 18. Qf6 Nce7 19. Rh1 Rh7 20. Ne1 Ng8 21. Qf3 Ke7 22. Bg2 Rh8 23. Kc1 Rf8 24. Qh3 f6 25. exf6+ Rxf6 26. Qg3 Be8 27. Nf3 Qc6 28. g5 Rf8 29. Ne5 Nxe5 30. Qxe5 Rh7 31. Re1 Kd8 32. Qb8+ Ke7 33. Qxa7+ Bd7 34. Bh3 Kd6 35. Rb1 b5 36. g6 Re7 37. g7 Rxg7 38. Rxe6+ Bxe6 39. Qxg7 Qe8 40. Qe5+ Kd7 41. Rxb5 Bxh3 42. Rb7+ Kc6 43. Qc7# 1-0

IM Sofia Polgar (ELO 2470) – DarkThought: [0 – 1] (12th AEGON Man vs. Machine, Round 4, April 21, 1997)
1. c4 c6 2. b3 Nf6 3. Bb2 e6 4. Nf3 d5 5. e3 Bb4 6. a3 Be7 7. Qc2 O-O 8. Nc3 Re8 9. d4 Nbd7 10. Be2 Nf8 11. O-O Ng6 12. Rfe1 Bd6 13. e4 dxe4 14. Nxe4 Nf4 15. Bf1 Nxe4 16. Qxe4 Bc7 17. Rad1 Bd7 18. g3 Nh5 19. Ne5 Nf6 20. Qc2 Re7 21. Bg2 Rc8 22. Ba1 Kh8 23. Qb2 Be8 24. f4 Ba5 25. Rf1 Qd6 26. Kh1 Bc7 27. g4 Rb8 28. g5 Nh5 29. Qe2 f6 30. b4 a5 31. Bc3 Qd8 32. gxf6 gxf6 33. d5 exd5 34. cxd5 Rg7 35. Ng4 axb4 36. axb4 Bd7 37. dxc6 bxc6 38. f5 Qf8 39. Bf3 c5 40. Qb2 Rb6 41. Rg1 cxb4 42. Bd4 Bc6 43. Bxc6 Rxc6 44. Qg2 Rc4 45. Qa2 b3 46. Qa1 Rc2 47. Rd3 Qe8 48. Qd1 Qe4+ 0-1

DarkThought – IM Johan van Mil (ELO 2406): [0 – 1] (12th AEGON Man vs. Machine, Round 5, April 22, 1997)
IM van Mil commented on the game as follows: "I was deeply impressed how beautifully I was outplayed by DarkThought. I was lost but the computer missed one thing. I had a potential breakthrough which was too far away for the computer to comprehend. Because of that it opted for the wrong exchange of pieces." 38. Qc5 instead of 38. Be2? keeps White's obvious advantage.
1. e4 g6 2. d4 c6 3. c3 d5 4. e5 Bg7 5. Nf3 Bg4 6. Be2 e6 7. O-O Nd7 8. Nbd2 Ne7 9. h3 Bxf3 10. Nxf3 Qb6 11. h4 h5 12. Re1 c5 13. Qa4 Nc6 14. Bd2 a6 15. Rac1 Qa7 16. Bg5 b5 17. Qc2 c4 18. Qd2 Rb8 19. Ra1 Rb7 20. Reb1 Qb8 21. b4 a5 22. bxa5 Nxa5 23. Bd1 Bf8 24. a3 Rb6 25. Qb2 Qb7 26. Bf4 Be7 27. Bd2 O-O 28. Bg5 Bxg5 29. Nxg5 Kg7 30. Qc2 Rh8 31. Qc1 Nb8 32. a4 b4 33. Qf4 b3 34. Qf6+ Kg8 35. Nxf7 Qxf7 36. Qd8+ Kg7 37. Qxb6 Nbc6 38. Be2 Qe7 39. f4 Rb8 40. Qc5 Qxc5 41. dxc5 d4 42. cxd4 Nxd4 43. Kf2 Nc2 44. Bd1 Nxa1 45. Rxa1 c3 46. Ke2 Rc8 47. Kd3 Rxc5 48. Rc1 c2 49. Bxc2 Rc4 50. g3 bxc2 51. Rxc2 Rxa4 52. Rc7+ Kf8 53. Rc8+ Ke7 54. Kc3 Kd7 55. Rg8 Nc6 56. Rxg6 Ra3+ 57. Kb2 Rf3 58. Rg7+ Ne7 59. Kc2 Ke8 60. Rg5 Nf5 61. Rxh5 Rxg3 62. Rh8+ Kf7 63. h5 Rh3 64. Rh7+ Kg8 65. Rb7 Rxh5 66. Rb8+ Kf7 67. Kd3 Rh3+ 68. Ke2 Nd4+ 69. Kd2 Rf3 70. Rb4 Nf5 71. Ke2 Ra3 72. Rb7+ Kg6 73. Kd2 Nd4 74. Rd7 Nf3+ 75. Kc1 Kf5 76. Rf7+ Ke4 77. Kb2 Ra6 78. Kc3 Rc6+ 79. Kb4 Nd4 80. Rf6 Rc8 81. Ka5 Rc7 82. Kb6 Re7 83. Kc5 Nf5 84. Rg6 Kxf4 0-1

GM Roberto Cifuentes (ELO 2539) – DarkThought: [1/2 – 1/2] (12th AEGON Man vs. Machine, Round 6, April 23, 1997)
1. c4 e5 2. Nc3 Nf6 3. Nf3 Nc6 4. e3 Bb4 5. Qc2 O-O 6. d3 Re8 7. a3 Bxc3+ 8. Qxc3 d5 9. cxd5 Qxd5 10. Be2 Rd8 11. b4 a5 12. Bb2 axb4 13. axb4 Rxa1+ 14. Bxa1 e4 15. dxe4 Qxe4 16. O-O Qxb4 17. Qc2 Qe4 18. Qc5 Qf5 19. Qc3 Qg6 20. Rc1 Bh3 21. Bf1 Bg4 22. Ne5 Nxe5 23. Qxc7 Nf3+ 24. Kh1 Rf8 25. h3 Ne4 26. gxf3 Bxf3+ 27. Kh2 Nd2 28. Qg3 Be4 29. Qxg6 hxg6 30. Bc3 Nxf1+ 31. Rxf1 Rc8 32. Rc1 Rc5 33. Bb2 Rb5 34. Bd4 Rg5 35. Rg1 Rf5 36. f4 Rh5 37. Rg5 Rh7 38. Re5 Bc6 39. Kg3 Rh6 40. e4 b5 41. Bc3 Bd7 42. h4 Bc6 1/2-1/2

1.13 DarkThought at 14th WMCC (October 1996)

From October 8–14, 1996, DarkThought successfully participated in the 14th World Microcomputer-Chess Championship. With 6.5 points out of 11 games (5x win, 3x draw, 3x loss) it finished the tournament on a shared 6th place as 7th of 27 participants. In the accompanying speed-chess event, the program blitzed its way to a shared 3rd place.

Final Standings of 14th WMCC

Rk = final rank, **Pts** = overall points, **SOP** = sum of opponents' points, **Rx** = results of each round.

Rk	Pts	SOP	Program	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11
1	9.0	73.0	Shredder	b03=	w15+	w12+	b09+	b06+	w07+	w04+	b02−	b05=	w10+	b08+
2	8.5	72.5	Ferret	b15=	w03+	b11=	w19+	b05+	w06=	b08+	w01+	b04=	w07=	b09+
3	7.5	71.5	Nimzo	w01=	b02−	b15=	w14+	b19=	w20+	b07+	w05−	b16+	w04+	b06+
4	7.0	75.0	Crafty	b05−	w08+	b14+	w11+	b18+	w12+	b01−	w06+	w02=	b03−	b07=
5	7.0	73.5	Gunda	w04+	b10+	w06−	b17+	w02−	b09=	w19+	b03+	w01=	b08−	w13+
6	6.5	75.5	VirtualChess	b14+	w07+	b05+	b18+	w01−	b02=	w10+	b04−	w08=	b09=	w03−
7	*6.5*	*71.0*	*DarkThought*	*w16+*	*b06−*	*w10+*	*b25+*	*w09+*	*b01−*	*w03−*	*b12=*	*w20+*	*b02=*	*w04=*
8	6.5	67.5	Fritz	w10−	b04−	w16+	b27+	w20+	b11+	w02−	b09+	b06=	w05+	w01−
9	6.0	71.0	Zeus	b13+	w23+	b19+	w01−	b07−	w05=	b18+	w08−	b11+	w06=	w02−
10	6.0	69.0	Gandalf	b08+	w05−	b07−	w15+	b13+	w18+	b06−	w11−	w12+	b01−	b23+
11	6.0	67.0	Comet	w22+	b12=	w02=	b04−	w17+	w08−	b14+	b10+	w09−	b13−	w19+
12	6.0	60.5	Eugen	w00+	w11=	b01−	w13=	b25+	b04−	w17+	w07=	b10−	b20+	w16=
13	6.0	60.0	Francesca	w09−	b22+	w20=	b12=	w10−	w14=	b21=	b25+	w23+	w11+	b05−
14	6.0	53.0	Centaur	w06−	b16+	w04−	b03−	w27+	b13=	w11−	b26=	w00+	w22+	b21+
15	5.5	60.5	Schach	w02=	b01−	w03=	b10−	b21=	w27+	w22=	b20−	w26+	b24+	w17=
16	5.5	57.0	Isichess	b07−	w14−	b08−	w00+	w22+	w21=	b23+	b19+	w03−	b17=	b12=
17	5.5	52.5	Interchess	b19−	w00+	w26+	w05−	b11−	w25+	b12−	w21=	b24+	w16=	b15=
18	5.5	49.5	Woodpusher	w24+	b26+	b21+	w06−	w04−	b10−	w09−	b22=	w19−	b27+	w00+
19	5.0	65.0	Breakthrgh.	w17+	b25+	w09−	b02−	w03=	b24+	b05−	w16−	b18+	w21=	b11−
20	5.0	57.0	Heureka	b23−	w27+	b13=	w21+	b08−	b03−	w24+	w15+	b07−	w12−	b25=
21	5.0	56.5	Pandix	w26=	b24+	w18−	b20−	w15=	b16=	w13=	b17=	w25+	b19=	w14−
22	4.5	48.5	Diogenes	b11−	w13−	b24=	w23=	b16−	w00+	b15=	w18=	w27+	b14−	w26=
23	4.5	46.5	Patzer	w20+	b09−	w25−	b22=	w24−	b26+	w16−	b27+	b13−	w00+	w10−
24	4.5	45.5	TheTurk	b18−	w21−	w22=	b26+	b23+	w19−	b20−	w00+	w17−	w15−	b27+
25	4.0	48.5	Nightmare	b27+	w19−	b23+	w07−	w12−	b17−	w00+	w13−	b21−	b26=	w20=
26	4.0	46.0	XXXX	b21=	w18−	b17−	w24−	b00+	w23−	b27+	w14=	b15−	w25=	b22=
27	1.0	50.0	Ananse	w25−	b20−	w00+	w08−	b14−	b15−	w26−	w23−	b22−	w18−	w24−

Games Played by DarkThought at 14th WMCC

DarkThought – Isichess: [1 – 0] (14th WMCC, Round 1, October 8, 1996)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. O-O Be7 6. Bxc6 dxc6 7. d3 Nd7 8. Bd2 O-O 9. Bc3 f6 10. d4 exd4 11. Bxd4 b5 12. Be3 Ne5 13. Nxe5 fxe5 14. Qxd8 Rxd8 15. Nd2 Be6 16. Kh1 Rd7 17. Rfc1 a5 18. a4 b4 19. Nb3 Kf7 20. Rd1 Rxd1 21. Rxd1 g5 22. h3 h5 23. Kg1 g4 24. hxg4 hxg4 25. Nc5 Bxc5 26. Bxc5 Rh8 27. Rd2 Kg6 28. Rd3 Rg8 29. Kh2 Rh8 30. Kg3 Rh1 31. c3 b3 32. Rd8 Rb1 33. Ba3 Ra1 34. Rb8 Kf6 35. Rb7 Re1 36. f3 gxf3 37. gxf3 Rg1 38. Kf2 Rg7 39. Ra7 Rh7 40. Rxa5 Rh2 41. Kg3 Rh3 42. Kg2 Rh7 43. Rc5 Rg7 44. Kf2 Bd7 45. a5 Rg8 46. a6 Ra8 47. Ra5 Bc8 48. a7 Be6 49. Bc5 Bh3 50. Ra3 Be6 51. Ra4 Kg5 52. Rb4 Kf6 1-0

VirtualChess – DarkThought: [1 – 0] (14th WMCC, Round 2, October 8, 1996)
This game revealed a toggled sign error in the evaluation function of DarkThought which made it feel really good in actually loosing positions of certain endgame situations.
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 d6 5. c4 Bd7 6. Nc3 g6 7. d4 exd4 8. Bxc6 Bxc6 9. Nxd4 Bg7 10. O-O Bd7 11. Nd5 h6 12. Re1 Ne7 13. Nf5 gxf5 14. exf5 Be5 15. f4 Nxd5 16. fxe5 Nb6 17. Qd4 Rh7 18. exd6+ Kf8 19. dxc7 Qxc7 20. Be3 Nxc4 21. Rac1 Rc8 22. b3 b5 23. bxc4 bxc4 24. Bf4 Qc6 25. Re5 Kg8 26. Rd5 Rg7 27. Be5 f6 28. Bxf6 Rf7 29. Rd6 Qc5 30. Qxc5 Rxc5 31. Bd4 Rc6 32. Rxc6 Bxc6 33. Rxc4 Bd5 34. Rc8+ Rf8 35. Rxf8+ Kxf8 36. a3 Bc6 37. Kf2 h5 38. h3 h4 39. Be3 Be4 40. f6 Bb7 41. Bg5 Bd5 42. Bxh4 Kf7 43. Bg5 Kg6 44. h4 Kf5 45. Ke3 a5 46. Kd4 Be6 47. a4 Bb3 48. Kc5 Ke6 49. Kb5 1-0

DarkThought – Gandalf: [1 – 0] (14th WMCC, Round 3, October 9, 1996)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Bxc3+ 6. bxc3 Ne7 7. h4 Nbc6 8. h5 h6 9. Nf3 Qa5 10. Bd2 cxd4 11. cxd4 Qa4 12. c4 Qxd1+ 13. Rxd1 O-O 14. c5 b6 15. Rc1 Bd7 16. Bd3 bxc5 17. Rxc5 Rab8 18. O-O Rb3 19. Rc3 Rfb8 20. Rfc1 Rb2 21. Be3 R8b3 22. Nd2 Rb8 23. Nf3 R8b3 24. Bd2 Rb8 25. Bf4 R8b3 26. Be3 Rb8 27. Bc2 a5 28. Ne1 R2b7 29. Rc5 Kf8 30. g4 Rb2 31. Nd3 Ra2 32. Rc3 Be8 33. Nc5 Na7 34. a4 Nac6 35. Rb3 Nb4 36. Bb1 Ra1 37. Bd2 Nec6 38. Bc3 Na2 39. Rxb8 Nxb8 40. Bxa1 Nxc1 41. Bb2 Ne2+ 42. Kf1 Nf4 43. Bc1 g5 44. hxg6 Nxg6 45. Bxh6+ Kg8 46. Bxg6 fxg6 47. Bd2 Kf7 48. Bxa5 Bc6 49. Bd2 Nd7 50. Nxd7 Bxd7 51. a5 Bb5+ 52. Kg2 Ke8 53. Kf3 Kd7 54. Kf4 Bd3 55. Kg5 Ke7 56. a6 Bxa6 57. Kxg6 Kf8 58. Kf6 Bc8 59. Bh6+ Kg8 60. f4 Ba6 61. Kxe6 Bc8+ 62. Kxd5 1-0

Nightmare – DarkThought: [0 – 1] (14th WMCC, Round 4, October 9, 1996)
1. e4 e5 2. Nf3 Nc6 3. d4 exd4 4. Nxd4 Nf6 5. Nxc6 bxc6 6. Bd3 Bd6 7. O-O O-O 8. Bg5 Rb8 9. Qc1 Qe7 10. Nc3 Be5 11. Rb1 Re8 12. Qe3 Ng4 13. Qc1 Bxh2+ 14. Kh1 f6 15. Bh4 g5 16. Qd1 h5 17. Be2 Be5 18. Bxg4 hxg4 19. Bg3 Bxc3 20. bxc3 Rxb1 21. Qxb1 Qxe4 22. Bxc7 Kg7 23. Kg1 c5 24. Bg3 Bb7 25. f3 gxf3 26. Rxf3 Bc6 27. Bf2 Qd5 28. Qa1 Qd2 29. Rg3 Qxc2 30. Bxc5 Re5 31. Bxa7 Rb5 32. Kh2 Rb1 33. Qxb1 Qxb1 34. a3 d6 35. Bd4 Kf7 36. Be3 Qe1 37. Bd4 f5 38. Re3 Qf1 0-1

DarkThought – Zeus: [1 – 0] (14th WMCC, Round 5, October 10, 1996)
1. e4 c5 2. Nf3 d6 3. d4 cxd4 4. Nxd4 Nf6 5. Nc3 a6 6. Bc4 e6 7. Be3 b5 8. Bb3 b4 9. Na4 Nxe4 10. Nxe6 fxe6 11. Nb6 Bb7 12. Nxa8 Bxa8 13. Qg4 Qf6 14. Qxe6+ Qxe6 15. Bxe6 Be7 16. Bd4 Kf8 17. O-O-O Ng5 18. Bb3 Bxg2 19. Rhg1 Bf3 20. Rd3 Be4 21. Re3 d5 22. f3 Nc6 23. fxe4 Nxd4 24. Rf1+ Ke8 25. exd5 Nxb3+ 26. axb3 Kd7 27. c4 Bc5 28. Re5 Bd4 29. Ree1 Bf6 30. h4 Nf7 31. h5 Nd6 32. Kc2 a5 33. h6 Rc8 34. Re2 a4 35. Rg2 axb3+ 36. Kxb3 Ke7 37. hxg7 Rg8 38. Re2+ Kf7 39. c5 Ne8 40. c6 h5 41. Rxe8 Rxe8 42. d6 Kxg7 43. c7 Rc8 44. Rxf6 Kxf6 45. d7 Rxc7 46. d8=Q+ Re7 47. Qf8+ Ke6 48. Qh6+ Kd7 49. Qxh5 Re3+ 50. Kxb4 Re1 51. Ka5 Ra1+ 52. Kb6 Re1 53. b4 Re6+ 54. Ka5 Re7 55. b5 Kd6 56. Ka6 Re1 57. Qh4 Re8 58. b6 Re7 59. b7 Rxb7 1-0

Shredder – DarkThought: [1 – 0] (14th WMCC, Round 6, October 10, 1996)
1. d4 d5 2. c4 e6 3. Nc3 c5 4. cxd5 exd5 5. Nf3 Nc6 6. g3 c4 7. Bg2 Bb4 8. O-O Nge7 9. a3 Ba5 10. e4 dxe4 11. Nxe4 O-O 12. Qe2 b5 13. Rd1 Bf5 14. d5 Nxd5 15. Nh4 Be6 16. Ng5 Qd7 17. Qh5 h6 18. Nxe6 fxe6 19. Rxd5 exd5 20. Bxd5+ Rf7 21. Bxh6 Rd8 22. Bxg7 Kxg7 23. Qg5+ Kf8 24. Ng6+ Ke8 25. Bxc6 Qxc6 26. Qe3+ Kd7 27. Ne5+ Kc7 28. Nxc6 Bb6 29. Qe5+ Rd6 30. Rd1 Rf6 31. Rxd6 Bxf2+ 1-0

DarkThought – Nimzo: [0 – 1] (14th WMCC, Round 7, October 12, 1996)
1. d4 Nf6 2. c4 g6 3. e3 Bg7 4. Nf3 O-O 5. Be2 d6 6. O-O c5 7. d5 e6 8. Nc3 exd5 9. Nxd5 Nxd5 10. Qxd5 Nc6 11. Rd1 Be6 12. Qd2 a6 13. e4 Nd4 14. Nxd4 Bxd4 15. Qc2 Qh4 16. Be3 Bxe3 17. fxe3 Rad8 18. Bf3 Qf6 19. Rd2 b5 20. Be2 Qg5 21. Qc3 b4 22. Qb3 a5 23. Bf3 Rfe8 24. a3 Re7 25. axb4 axb4 26. Kh1 Qe5 27. Qd3 Ree8 28. Qf1 Ra8 29. Rad1 Ra2 30. Qe2 Rea8 31. b3 Ra1 32. Qd3 Qc3 33. h3 R8a2 34. Kh2 Qe5+ 35. Kh1 Rxd1+ 36. Rxd1 Rb2 37. Rd2 Rxd2 38. Qxd2 h5 39. Qd3 Qg3 40. Bd1 Kf8 41. Qd2 Ke7 42. Bc2 f6 43. Bd1 Kd7 44. Qe2

Kc6 45. Qf3 Qxf3 46. Bxf3 Kd7 47. Kh2 Bf7 48. g4 Ke6 49. gxh5 gxh5 50. Kg3 Ke5 51. h4 Bg6 52. Kf2 Bxe4 53. Bd1 d5 54. cxd5 Bxd5 55. Ke1 f5 56. Ke2 f4 57. Kf2 f3 58. Bc2 Be4 59. Bd1 Ke6 60. Bxf3 Bxf3 61. Kxf3 Kd5 0-1

Eugen – DarkThought: [1/2 – 1/2] (14th WMCC, Round 8, October 12, 1996)
1. d4 Nf6 2. c4 g6 3. Nc3 Bg7 4. e4 d6 5. Nf3 O-O 6. Be2 e5 7. O-O exd4 8. Nxd4 Bd7 9. Bg5 Na6 10. f3 Nc5 11. b4 Ne6 12. Nxe6 fxe6 13. f4 Qc8 14. e5 Ne8 15. Qd2 dxe5 16. fxe5 Rxf1+ 17. Rxf1 Bxe5 18. Qe3 Bg7 19. Ne4 Nd6 20. Nf6+ Bxf6 21. Bxf6 Nf5 22. Qe5 Qf8 23. c5 Qf7 24. g4 Rf8 25. Bh8 Qe7 26. gxf5 Qg5+ 27. Kh1 Bc6+ 28. Bf3 Bxf3+ 29. Rxf3 Qc1+ 30. Kg2 Qg5+ 31. Kf1 Qc1+ 32. Ke2 Qc2+ 33. Ke3 Qc1+ 34. Kf2 Qd2+ 35. Kg1 Qg5+ 36. Rg3 Qc1+ 37. Kg2 Qd2+ 38. Kg1 Qd1+ 39. Kg2 Qd2+ 40. Kh1 Qd1+ 41. Kg2 Qd2+ 1/2-1/2

DarkThought – Heureka: [1 – 0] (14th WMCC, Round 9, October 13, 1996)
1. f4 d5 2. e3 g6 3. Nf3 Bg7 4. Be2 Nc6 5. O-O e6 6. d3 Qd6 7. Nc3 Bxc3 8. bxc3 Rb8 9. Kh1 Nf6 10. Nd2 O-O 11. Bb2 Qe7 12. g4 Ne8 13. c4 Nd6 14. g5 Nf5 15. Rf3 Qd7 16. Qf1 Nb4 17. Qh3 f6 18. gxf6 Nxc2 19. Rc1 Nb4 20. a3 Nc6 21. Rf2 d4 22. e4 Ne3 23. e5 Na5 24. Nf1 Nf5 25. Bg4 b6 26. Bxf5 exf5 27. Nd2 Bb7+ 28. Nf3 Nb3 29. Rcf1 Nc5 30. Qh6 Rfe8 31. Rd2 Ne6 32. Rg2 Qf7 33. Rg3 Kh8 34. Rh3 b5 35. cxb5 Bxf3+ 36. Rhxf3 Rxb5 37. Bc1 Rb1 38. Re1 Reb8 39. Qh4 R8b3 40. Kg1 Rc3 41. Bd2 Rxe1+ 42. Qxe1 Rxa3 43. Qb1 Ra6 44. Qb7 Ra2 45. Bc1 Qg8 46. Bb2 Nd8 47. Qb5 a6 48. Qb8 Ne6 49. Qb4 c5 50. Qb7 Nd8 51. Qb6 Qe8 52. Rf2 Ne6 53. Qb7 Kg8 54. Bxd4 Ra3 55. Bxc5 Rxd3 56. Bd6 Rd1+ 57. Kg2 a5 58. Rc2 Rd3 59. Rc8 Rd2+ 60. Kf1 1-0

Ferret – DarkThought: [1/2 – 1/2] (14th WMCC, Round 10, October 13, 1996)
1. e4 e6 2. d4 d5 3. Nd2 dxe4 4. Nxe4 Bd7 5. c4 Bc6 6. Nc3 Bb4 7. a3 Bxc3+ 8. bxc3 Nf6 9. Nf3 O-O 10. Bd3 Be4 11. O-O Bxd3 12. Qxd3 c5 13. Rb1 b6 14. Bg5 cxd4 15. cxd4 Nbd7 16. Rfe1 h6 17. Bf4 Rc8 18. Nd2 Nc5 19. Qc3 Na4 20. Qe3 Qd7 21. h3 Rfd8 22. Be5 Nh7 23. Qg3 f6 24. Bf4 Qxd4 25. Rxe6 g5 26. Be3 Qd7 27. Qg4 Kh8 28. Rc1 Nc5 29. Bxc5 Rxc5 30. Ne4 h5 31. Nxc5 Qd2 32. Nb3 Qxc1+ 33. Nxc1 hxg4 34. Ne2 gxh3 35. gxh3 Rd7 36. f4 Rf7 37. Re4 gxf4 38. h4 f3 39. Nf4 Rf7 40. Kf2 f5 41. Re6 Nf8 42. Re8 Kh7 43. Kxf3 Kh6 44. a4 Nd7 45. Re6+ Kg7 46. Nd3 Nf8 47. Rc6 Re7 48. Nf4 Nd7 49. Nd3 Nf8 50. Nf4 Nd7 51. Nh5+ Kh7 52. Kf4 Ne5 53. Rd6 Nxc4 54. Rd4 Re4+ 55. Rxe4 fxe4 56. Nf6+ Kg6 57. Nxe4 a6 58. Nc3 Kh5 59. Nd5 Kxh4 60. Ke4 Kg4 61. Kd4 b5 62. axb5 axb5 63. Kc5 Kf5 64. Kxb5 1/2-1/2

DarkThought – Crafty: [1/2 – 1/2] (14th WMCC, Round 11, October 14, 1996)
1. e4 c5 2. c3 d5 3. exd5 Qxd5 4. d4 e6 5. Nf3 Nc6 6. Na3 Bd7 7. Be3 cxd4 8. Nb5 Rc8 9. Nbxd4 Nf6 10. Nxc6 Qxd1+ 11. Rxd1 Bxc6 12. Ne5 a6 13. Nxc6 Rxc6 14. g3 Rc7 15. Bg2 Nd7 16. O-O Bc5 17. Bf4 e5 18. Rfe1 f6 19. Be3 Bxe3 20. Rxe3 Ke7 21. Re2 Re8 22. Be4 g6 23. Bg2 Nc5 24. f4 Kf7 25. fxe5 Rxe5 26. Rxe5 fxe5 27. c4 Kf6 28. b4 Na4 29. Rc1 b6 30. Rc2 a5 31. a3 Ke7 32. Bd5 h6 33. g4 axb4 34. axb4 b5 35. c5 Rd7 36. Bf3 Rd4 37. c6 Nb6 38. Rc5 Rxb4 39. Rxe5+ Kd6 40. Re8 Rc4 41. Rg8 b4 42. Rxg6+ Kc5 43. c7 b3 44. Be4 b2 45. Rc6+ Kb5 46. Rxc4 Kxc4 47. Kf2 Kc5 48. Ke3 Kd6 49. Kd4 Kxc7 50. Kc3 Na4+ 51. Kb4 Kd6 52. Kxa4 Ke5 53. Bg6 Kf4 54. h3 h5 55. gxh5 1/2-1/2

1.14 DarkThought at 11th AEGON Man-Machine (April 1996)

Games Played by DarkThought at 11th AEGON Man-Machine

Mathias Feist (ELO 2110) – DarkThought: [1/2 – 1/2] (11th AEGON Man vs. Machine, Round 1, April 10, 1996)
1. Nf3 Nf6 2. g3 e6 3. Bg2 b6 4. b3 Bb7 5. Bb2 Be7 6. O-O O-O 7. d3 Nc6 8. Nbd2 d5 9. e4 dxe4 10. dxe4 Nd7 11. e5 Re8 12. Re1 Qc8 13. Qe2 a5 14. a4 Rd8 15. Rad1 Nb4 16. Ne4 Ba6 17. c4 Bb7 18. Bc3 Ra6 19. Rd2 Bxe4 20. Qxe4 Nc5 21. Qb1 Rxd2 22. Nxd2 Nbd3 23. Re3 Qd7 24. Ne4 c6 25. Re2 Qc7 26. Nxc5 Nxc5 27. Rd2 f5 28. Qd1 Ra8 29. f4 Rd8 30. Rxd8+ Qxd8 31. Qxd8+ Bxd8 32. Bxc6 Nxb3 33. Kf2 g5 34. h3 gxf4 35. gxf4 Be7 36. Ke2 Bb4 37. Kd3 Nc1+ 38. Kd2 Bxc3+ 39. Kxc1 Be1 40. Kc2 Bg3 41. Kd3 Bxf4 42. Kd4 Bg3 43. Bb5 Kf7 44. Bd7 h5 45. Bc6 Bf2+ 46. Kd3 h4 47. Bd7 Ke7 48. Bc6 Bg3 49. Kd4 1/2-1/2

DarkThought – Henk Arnoldus (ELO 2010): [1/2 – 1/2] (11th AEGON Man vs. Machine, Round 2, April 11, 1996)
1. e4 e6 2. d4 d5 3. e5 c5 4. c3 Nc6 5. Nf3 Nge7 6. Na3 Ng6 7. Nc2 Be7 8. Bd3 c4 9. Bxg6 hxg6 10. O-O Bd7 11. Be3 f6 12. b4 b5 13. Qb1 Kf7 14. a4 a6 15. axb5 axb5 16. Qb2 Qb6 17. Rfd1 Qb7 18. h3 Rxa1 19. Rxa1 Ra8 20. Na3 Ra4 21. Qc2 Ra8 22. Kf1 Nb8 23. exf6 gxf6 24. Nh4 f5 25. Nf3 Bf6 26. Bg5 Bg7 27. Bf4 Nc6 28. Ra2 Kg8 29. Qd2 Be8 30. Qe2 Nd8 31. Ra1 Ra6 32. Ng5 Qa7 33. Qb2 Bf6 34. g3 Bxg5 35. Bxg5 Nf7 36. Bf6 Bd7 37. h4 Kf8 38. Kg2 Ke8 39. Bg7 Bc6 40. f3 Kd7 41. Bf6 Qa8 42. Kf2 Ra4 43. Kf1 Ra6 44. Kg2 Ra4 45. Qa2 Ra6 46. Kh1 Ra4 47. Qb2 Ra6 48. Kh2 Ra4 49. Ra2 Ra6 50. Qa1 Ra4 51. Kg2 Ra6 52. Qc1 Ra4 53. Kg1 Ra6 54. Kh1 Ra4 55. Kh2 Ra6 1/2-1/2

DarkThought – Jos de Waard (ELO 2025): [1 – 0] (11th AEGON Man vs. Machine, Round 3, April 12, 1996)
1. f4 b5 2. e4 Bb7 3. Bxb5 Bxe4 4. Nf3 e6 5. Nc3 Bb7 6. d4 Nf6 7. a3 Be7 8. O-O O-O 9. Bd3 c5 10. Be3 cxd4 11. Bxd4 Nc6 12. Bf2 Ng4 13. Qd2 Nxf2 14. Qxf2 Qb6 15. Qxb6 axb6 16. Rae1 Bf6 17. Nd1 d6 18. c3 Ba6 19. Bxa6 Rxa6 20. Re2 d5 21. Ne3 d4 22. cxd4 Nxd4 23. Nxd4 Bxd4 24. Rd1 Rd8 25. Kf1 b5 26. Nf5 Bf6 27. Rxd8+ Bxd8 28. g3 Bf6 29. Ne3 g6 30. Ng4 Be7 31. Rc2 b4 32. axb4 Bxb4 33. Rc7 Kg7 34. Ne5 Bd6 35. Rxf7+ Kg8 36. Rb7 Bxe5 37. fxe5 Ra5 38. b4 Rxe5 39. b5 Rc5 40. b6 Rc2 41. Rc7 1-0

GM David Bronstein (ELO 2455) – DarkThought: [1 – 0] (11th AEGON Man vs. Machine, Round 4, April 15, 1996)
1. d4 Nf6 2. Nf3 d5 3. c4 c6 4. Qb3 e6 5. g3 Nbd7 6. Bg2 Be7 7. O-O O-O 8. Bf4 dxc4 9. Qxc4 Nb6 10. Qc2 Nbd5 11. Bd2 Nb4 12. Qa4 Qb6 13. a3 Nbd5 14. Qc2 Qa6 15. e4 Nc7 16. Rd1 Bd7 17. Ne5 Nb5 18. Be3 Rfd8 19. Bf1 Qb6 20. Nc4 Qa6 21. a4 Nc7 22. Nc3 Rf8 23. Bg5 Rad8 24. Bf4 Rc8 25. Nd6 Qa5 26. Nxb7 Qb4 27. Nc5 Bxc5 28. dxc5 a5 29. Bd6 Rfe8 30. f4 Ng4 31. Qd2 f5 32. e5 Nd5 33. Nxd5 Qxd2 34. Ne7+ Rxe7 35. Rxd2 Rf7 36. Rd3 Be8 37. b4 axb4 38. Rb3 Ra7 39. a5 Nh6 40. Bc4 Kh8 41. Rxb4 Bf7 42. h3 Rca8 43. a6 1-0

DarkThought – Jan Joost Lindner (ELO 2185): [1/2 – 1/2] (11th AEGON Man vs. Machine, Round 5, April 16, 1996)
1. f4 b5 2. e4 b4 3. a3 Bb7 4. axb4 Bxe4 5. Nc3 Bb7 6. Nf3 e6 7. b5 Nf6 8. d4 Be7 9. Bc4 O-O 10. Qe2 d5 11. Bd3 c5 12. bxc6 Nxc6 13. f5 exf5 14. Bxf5 Re8 15. O-O Ne4 16. Nxe4 dxe4 17. Qxe4 g6 18. Qg4 h5 19. Qg3 Nxd4 20. Nxd4 Qxd4+ 21. Be3 Qd6 22. Bd3 Qxg3 23. hxg3 Bd6 24. Rxa7 Rxa7 25. Bxa7 Bxg3 26. Bc4 Re7 27. Bd4 Rd7 28. c3 h4 29. b4 Rc7 30. Bb3 Re7 31. b5 g5 32. Bc4 g4 33. Rf5 Re1+ 34. Bf1 Be4 35. Rg5+ Kf8 36. Bc5+ Ke8 37. Rg8+ Kd7 38. Rxg4 f5 39. Rg7+ Kc8 40. Rg8+ Kb7 41. Bf2 Bh2+ 42. Kxh2 Rxf1 43. Rg7+ Kc8 44. Bxh4 Rb1 45. c4 Rb4 46. Bg3 Rxc4 47. b6 Rb4 48. Bf2 Rb2 49. Bd4 Rb4 50. Rc7+ Kd8 51. Bf6+ Ke8 52. Re7+ Kf8 53. Re6 Kf7 54. Rd6 Rb3 55. Be5 Rb5 56. Bd4 Rb3 57. Rf6+ Ke7 58. Rh6 Kf7 59. Be5 Rb5 60. Ba1 Rb1 61. Bc3 Rb3 62. Bd4 Rb4 63. Bh8 Rb3 64. Kg1 Rg3 65. Rh2 Ke6 66. Bd4 Rb3 67. Rh4 Kd5 68. Bf2 Rb1+ 69. Kh2 Rb2 1/2-1/2

DarkThought – Corry Vreeken Bouwman (ELO 2130): [1 – 0] (11th AEGON Man vs. Machine, Round 6, April 17, 1996)
In this extremely short game, DarkThought mercilessly punished the human who began to blunder with 6.. c6.
1. e4 e5 2. Bc4 Nf6 3. f4 Nxe4 4. Nc3 Nxc3 5. dxc3 Be7 6. fxe5 c6 7. Qg4 g6 8. Qf3 f5 9. Be3 Qc7 10. O-O-O a6 11. Qf4 b5 12. Bf7+ Kd8 13. Qh6 c5 14. Nf3 Bb7 15. Qg7 Rf8 16. Bg5 Rxf7 17. Qg8+ Rf8 18. Qxf8# 1-0

1.15 DarkThought at 13th WMCC (October 1995)

From October 8–15, 1995, DarkThought successfully participated in the 13th World Microcomputer-Chess Championship. With 7.0 points out of 11 games (6x win, 2x draw, 3x loss) it finished the tournament on a shared 6th place as 7th of 34 participants.

Final Standings of 13th WMCC

Rk = final rank, **Pts** = overall points, **SOP** = sum of opponents' points, **Rx** = results of each round.

Rk	Pts	SOP	Program	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11
1	8.0	70.5	MChess	w18+	b20+	w11+	b13=	w19=	b17+	w06+	b03−	b02=	w07+	b04=
2	8.0	67.5	Genius	b14+	w03−	b29+	w26−	b12+	b11+	w27+	b13+	w01=	w06+	b07=
3	7.5	68.0	Ferret	w33+	b02+	w19−	b27+	w10+	w16=	b13+	w01+	b06−	b04=	w09=
4	7.5	65.5	Nimzo	b06−	w28+	b14=	w07−	b23+	b20+	w26+	w16+	b17+	w03=	w01=
5	7.5	64.0	VirtualChess	b23=	w08−	b18=	b30+	w20+	b10=	w17+	w09=	b16+	b13=	w06+
6	7.0	73.0	Quest	w04+	b10+	w27+	b19+	b16=	w13=	b01−	w07+	w03+	b02−	b05−
7	*7.0*	*71.0*	*DarkThought*	*w15=*	*b21+*	*w13−*	*b04+*	*b14+*	*w19+*	*b16+*	*b06−*	*w08+*	*b01−*	*w02=*
8	7.0	66.0	TheKing	w21=	b05+	b16−	w18+	b17−	w14+	b11=	w10+	b07−	w22+	w13+
9	7.0	61.5	Hiarcs	b27+	w11−	b26−	w22=	b18=	w29+	w25+	b05=	w19+	b10+	b03−
10	6.5	65.5	Kallisto	b32+	w06−	b12+	w23+	b03−	w05=	b19+	b08−	w26+	w09−	b22+
11	6.5	65.0	Gandalf	w25+	b09+	b01−	w17−	b29+	w02−	w08=	b27+	w13−	b26+	w16+
12	6.5	58.5	Junior	w29+	b27−	w10−	b28+	w02−	w22+	b14=	b26−	w23+	w17+	b19+
13	6.0	74.0	Shredder	b16=	w17+	b07+	w01=	b26+	b06=	w03−	w02−	b11+	w05=	b08−
14	6.0	58.0	Bobby	w02−	b33+	w04=	b24+	w07−	b08−	w12=	b22−	w34+	w27+	b28+
15	6.0	54.5	XXXX	b07=	w16−	b17−	w31+	b22=	w21−	b28=	b30+	w25+	w19=	b26+
16	5.5	72.0	Schach	w13=	b15+	w08+	b20+	w06=	b03=	w07−	b04−	w05−	b21+	b11−
17	5.5	70.0	IsiChess	w22=	b13−	w15+	b11+	w08+	w01−	b05−	b24+	w04−	b12−	w20+
18	5.5	60.0	Amy	b01−	w30+	w05=	b08−	w09=	w28+	b21−	b25=	w24−	w31+	b32+
19	5.0	65.0	Cheiron	b34+	w26+	b03+	w06−	b01=	b07−	w10−	w21+	b09−	b15=	w12−
20	5.0	62.5	Mephisto	b28+	w01−	b25+	w16−	b05−	w04−	b29+	b23=	w21=	w24+	b17−
21	5.0	59.5	Dragon	b08=	w07−	w22=	w25+	w27−	b15+	w18+	b19−	b20=	w16−	b30=
22	5.0	59.0	Centaur	b17=	w23−	b21=	b09=	w15=	b12−	w34+	w14+	b27+	b08−	w10−
23	5.0	54.5	Comet	w05=	b22+	w24=	b10−	w04−	b25−	b33=	w20=	b12−	w32+	b34+
24	5.0	51.0	Alpha	b26−	w32+	b23=	w14−	b28−	b31+	w30+	w17−	b18+	b20−	w29=
25	5.0	50.0	Stobor	b11−	w34+	w20−	b21−	w32+	w23+	b09−	w18=	b15−	b33=	w31+
26	4.5	68.5	ChessSys.Tal	w24+	b19−	w09+	b02+	w13−	b27=	b04−	w12+	b10−	w11−	w15−
27	4.5	63.0	Zeus	b30+	w12+	b06−	w03−	b21+	w26=	b02−	w11−	w22−	b14−	w33+
28	4.5	51.5	Mirage	w20−	b04−	b32+	w12−	w24+	b18−	w15=	b31−	b33+	w34+	w14−
29	4.0	52.0	Diogenes	b12−	w31+	w02−	b33+	w11−	b09−	w20−	b34+	w32=	b30−	b24=
30	4.5	47.5	Gromit	w27−	b18−	b34+	w05−	b33=	w32+	b24−	w15−	b31−	w29+	w21=
31	3.5	47.5	Nightmare	w09−	b29−	w33=	b15−	b34+	w24−	b32−	w28+	w30+	b18−	b25−
32	3.5	46.0	Breakthrgh.	w10−	b24−	w28−	w34+	b25−	b30−	w31+	w33+	b29=	b23−	w18−
33	3.0	47.5	Francesca	b03−	w14−	b31=	w29−	w30=	b34+	w23=	b32−	w28−	w25=	b27−
34	0.0	48.5	Ananse	w19−	b25−	w30−	b32−	w31−	w33−	b22−	w29−	b14−	b28−	w23−

MChess became World Microcomputer-Chess Champion 1995 by winning the playoff against Genius.

Games Played by DarkThought at 13th WMCC

DarkThought – XXXX: [1/2 – 1/2] (13th WMCC, Round 1, October 8, 1995)
1. e4 c6 2. d4 d5 3. Nc3 dxe4 4. Nxe4 Bf5 5. Ng3 Bg6 6. h4 h6 7. Nf3 Nd7 8. h5 Bh7 9. Bd3 Bxd3 10. Qxd3 Qc7 11. Bd2 Ngf6 12. Qe2 e6 13. O-O-O O-O-O 14. Ne5 Nb6 15. Ba5 Bd6 16. Bxb6 axb6 17. Rhe1 Kb8 18. Kb1 b5 19. Rd3 Nd5 20. Qg4 Rhg8 21. Qh4 c5 22. Rf3 Bxe5 23. dxe5 Nb6 24. Ne4 Nc4 25. Qg3 g6 26. Qf4 gxh5 27. Rd3 Rxd3 28. cxd3 Qxe5 29. Qxe5+ Nxe5 30. Nxc5 Nc6 31. g3 Kc7 32. Rh1 Rg5 33. Ne4 Rd5 34. Nc3 Rf5 35. f4 Nb4 36. d4 Kd6 37. Nd1 Nd5 38. Kc2 b4 39. Kb3 b6 40. Nf2 Nxf4 41. gxf4 Rxf4 42. Nd3 Rxd4 43. Nxb4 h4 44. a3 f5 45. Ka4 Kc7 46. Kb5 e5 47. Rc1+ Kd7 48. Nc6 Rd5+ 49. Kxb6 e4 50. b4 e3 51. Rg1 Rd2 52. Ne5+ Ke6 53. Nf3 Ra2 54. Rh1 Rf2 55. Nd4+ Kd5 56. Rxh4 f4 57. Nb5 e2 58. Nc3+ Ke5 59. Nxe2 Rxe2 60. Rh5+ Kd4 61. Rxh6 f3 62. Rf6 f2 63. Rf3 Ke4 64. Rf6 Kd3 65. Ka7 Ra2 66. b5 Rxa3+ 67. Kb7 Ke2 68. Rxf2+ Kxf2 69. Kc7 1/2-1/2

Dragon – DarkThought: [0 – 1] (13th WMCC, Round 2, October 10, 1995)
1. d4 Nf6 2. Bf4 d5 3. Nf3 c5 4. e3 e6 5. Nbd2 Nc6 6. c3 Bd6 7. Bg3 b6 8. Bb5 Qc7 9. Ne5 Bd7 10. Nxd7 Nxd7 11. Qa4 Ncb8 12. Bxd6 Qxd6 13. e4 O-O 14. e5 Qc7 15. O-O Rc8 16. Bd3 a6 17. Qa3 Nc6 18. Nf3 cxd4 19. cxd4 b5 20. Rfc1 Qa7 21. Qc3 Nb6 22. Qb3 Rc7 23. Rc3 Rac8 24. Rd1 Kh8 25. Bb1 b4 26. Rc2 Nd7 27. Rdc1 Qb6 28. Qd3 Nf8 29. a3 a5 30. a4 h6 31. b3 Kg8 32. Qe2 Qa7 33. Qb5 Qa8 34. Ba2 Na7 35. Qd3 Rxc2 36. Rxc2 Rxc2 37. Qxc2 Qc6 38. Qd1 Qc3 39. Bb1 Nd7 40. Bc2 Kf8 41. Bd3 f6 42. exf6 gxf6 43. Be2 Nc6 44. Bf1 Ke7 45. Bb5 Kd6 46. Bxc6 Kxc6 47. Nh4 Kd6 48. g3 Nb8 49. Nf3 Nc6 50. Kg2 e5 51. dxe5+ fxe5 52. Qd2 Qxd2 53. Nxd2 Kc5 54. Kf1 Kd4 55. f4 Kd3 56. Nf3 e4 57. Ne5+ Nxe5 58. fxe5 Kd2 59. Kf2 e3+ 0-1

DarkThought – Shredder: [0 – 1] (13th WMCC, Round 3, October 10, 1995)
1. f4 Nf6 2. Nf3 g6 3. g3 Bg7 4. Bg2 O-O 5. c4 d6 6. Nc3 c5 7. d3 Nc6 8. Qc2 Bg4 9. Qd1 Bxf3 10. Bxf3 e6 11. O-O Qb6 12. e3 Rad8 13. Bd2 Rfe8 14. g4 a6 15. Na4 Qc7 16. g5 Nd7 17. Qe2 b5 18. Nc3 b4 19. Na4 e5 20. Qg2 Ne7 21. fxe5 Bxe5 22. a3 a5 23. axb4 axb4 24. h4 Rf8 25. h5 Rde8 26. Be4 Bg7 27. Qh3 Nc6 28. hxg6 hxg6 29. Rf2 Rxe4 30. dxe4 Nde5 31. Raf1 Ra8 32. b3 Na5 33. Nb2 Nxb3 34. Qg2 Qc8 35. Bc1 Qe6 36. Rc2 Ra2 37. Rcf2 Nxc1 38. Rxc1 Ng4 39. Nd1 Nxf2 40. Nxf2 b3 41. Qf3 b2 42. Rd1 Ra1 43. Qe2 Qe5 44. Nd3 0-1

Nimzo – DarkThought: [0 – 1] (13th WMCC, Round 4, October 11, 1995)
1. d4 Nf6 2. c4 e6 3. Nc3 Bb4 4. e3 O-O 5. Nf3 d5 6. Bd3 c5 7. O-O Nc6 8. a3 Bxc3 9. bxc3 dxc4 10. Bxc4 Qc7 11. Bb2 e5 12. h3 e4 13. Nd2 Ne7 14. Qc2 Bf5 15. Bb3 Rfd8 16. Rfd1 Rd6 17. g4 Bg6 18. Nc4 cxd4 19. Nxd6 d3 20. Qd2 Qxd6 21. c4 Nc6 22. Qc3 Qc5 23. Ba4 a6 24. Bxc6 Qxc6 25. Qb3 Nd7 26. Bd4 Rc8 27. Qb4 f6 28. Rab1 Rc7 29. Kh2 Bf7 30. c5 Bd5 31. Kg2 Rc8 32. Kg1 Qc7 33. Rf1 Kh8 34. Qd2 Qd8 35. Rfc1 Qe8 36. Rb2 Qg6 37. Kh2 h5 38. Rg1 Qe8 39. Rc1 hxg4 40. hxg4 Kg8 41. Kh3 Qg6 42. Qd1 Kf7 43. Qa4 Rh8+ 44. Kg3 Be6 45. f3 Qh7 46. Rg1 Qh4+ 47. Kg2 Qh3+ 48. Kf2 Qxf3+ 49. Ke1 d2+ 50. Rxd2 Rh1 51. Rg2 Qxg2 52. Rxh1 Qxh1+ 53. Kd2 Bxg4 54. Qb3+ Kg6 55. Qa4 Kh5 56. Qb3 Kh4 57. a4 g5 58. a5 Qf1 59. Qg8 Qd3+ 60. Kc1 Qa3+ 61. Kc2 Nxc5 62. Qh7+ Bh5 63. Kb1 Qb4+ 64. Ka2 Qxa5+ 65. Kb1 Qb4+ 66. Ka2 Qd2+ 67. Kb1 Qd1+ 68. Kb2 Nd3+ 69. Kc3 f5 0-1

Bobby – DarkThought: [0 – 1] (13th WMCC, Round 5, October 11, 1995)
1. e4 e6 2. b3 d5 3. exd5 exd5 4. Bb2 Bf5 5. Nf3 Qe7+ 6. Be2 Nc6 7. O-O O-O-O 8. d4 Qf6 9. Ne5 Nxe5 10. dxe5 Qe6 11. Qd4 Kb8 12. Bd3 Ne7 13. Qf4 Bxd3 14. cxd3 d4 15. Bxd4 Nc6 16. Bc3 Rxd3 17. Qe4 Rd7 18. f4 Bc5+ 19. Kh1 Qg4 20. Qc4 Bb6 21. Nd2 Rhd8 22. Ne4 Rd5

23. b4 Ne7 24. Rae1 a6 25. Ng5 Qh5 26. Qe2 Qg6 27. e6 f6 28. Nf7 Re8 29. Rf3 Qf5 30. h3 h5 31. Qc4 Qc2 32. Qe2 Qxe2 33. Rxe2 Rd1+ 34. Kh2 Bg1+ 35. Kh1 Nf5 36. Rd2 Rc1 37. Rd5 Ng3+ 38. Rxg3 Bf2+ 39. Kh2 Bxg3+ 40. Kxg3 Rxc3+ 41. Kh4 Rxe6 42. Rd8+ Ka7 43. Rg8 Re4 44. Rxg7 Rxf4+ 45. Kxh5 Rxb4 46. Nd8 Ra4 47. Ne6 Rxa2 48. Nxc7 Rc5+ 49. Kh6 Re2 50. Rd7 Rxg2 51. Ne6 Rc8 52. Nc7 f5 0-1

DarkThought – Cheiron: [1 – 0] (13th WMCC, Round 6, October 12, 1995)
1. e4 Nf6 2. e5 Nd5 3. d4 d6 4. c4 Nb6 5. f4 dxe5 6. fxe5 Nc6 7. Be3 Bf5 8. Nc3 e6 9. Nf3 Qd7 10. Be2 O-O-O 11. O-O Bg4 12. c5 Nd5 13. Nxd5 Qxd5 14. Ng5 Bxe2 15. Qxe2 Nxd4 16. Bxd4 Qxd4+ 17. Kh1 Qd2 18. Qxd2 Rxd2 19. Rxf7 Bxc5 20. Nxe6 Bb6 21. Nxg7 Bd4 22. e6 Bxb2 23. e7 Bxg7 24. Re1 Re8 25. Rxg7 h6 26. Kg1 Rxa2 27. Rg6 Kd7 28. Rxh6 b5 29. Rh5 Rxe7 30. Rxe7+ Kxe7 31. Rxb5 a5 32. h4 a4 33. Ra5 a3 34. Kh2 c6 35. h5 Kf6 36. Kh3 Ra1 37. g4 c5 38. Ra6+ Kf7 39. g5 c4 40. h6 Kf8 41. Kh2 c3 42. h7 Kg7 1-0

Schach – DarkThought: [0 – 1] (13th WMCC, Round 7, October 12, 1995)
1. e4 c6 2. c4 d5 3. exd5 cxd5 4. cxd5 Nf6 5. Qa4+ Nbd7 6. Nc3 g6 7. d3 a6 8. Nh3 h6 9. Be2 Bg7 10. Nf4 O-O 11. Qb3 b5 12. Be3 g5 13. Nh5 Nxh5 14. Bxh5 Bxc3+ 15. bxc3 Nf6 16. Bf3 Bf5 17. Kd2 Rc8 18. a4 g4 19. Be2 Nxd5 20. axb5 Rxc3 21. Qb1 axb5 22. Qxb5 h5 23. Bd4 Rc8 24. f4 Rb8 25. Qc5 Rc8 26. Qa5 Qd6 27. Be5 Qe6 28. Rhe1 Rfd8 29. Rab1 Ra8 30. Qb5 f6 31. Bd4 Ra2+ 32. Rb2 Nxf4 33. Bf1 Rxb2+ 34. Qxb2 Qd5 35. Ke3 e5 36. Bb6 Rb8 37. Kf2 Qd6 38. Rb1 Nd5 39. Qc2 Rxb6 40. Ra1 Nf4 41. Qc3 Rc6 42. Qb3+ Kg7 43. Ke1 Qd4 44. Qa2 Kh6 45. Qa3 Qe3+ 46. Kd1 Qf2 47. Qf8+ Kg5 48. Qa3 Qxf1+ 49. Kd2 Qe2# 0-1

Quest – DarkThought: [1 – 0] (13th WMCC, Round 8, October 13, 1995)
1. d4 Nf6 2. c4 e6 3. Nf3 b6 4. a3 Bb7 5. Nc3 d5 6. cxd5 Nxd5 7. Qc2 Nxc3 8. bxc3 c5 9. e4 Nc6 10. Be3 cxd4 11. Nxd4 Nxd4 12. cxd4 Bd6 13. Qa4+ Kf8 14. Bd3 Qc7 15. Rc1 Qd8 16. O-O h6 17. Rc3 a6 18. Rfc1 b5 19. Qb3 Rb8 20. e5 Be7 21. a4 b4 22. Rc7 a5 23. Bb5 Kg8 24. Rd7 Qf8 25. Qc2 Bg5 26. Bxg5 hxg5 27. Qd2 Rh5 28. Rcc7 Bd5 29. Qc1 Rh8 30. Rxf7 Qxf7 31. Rxf7 Kxf7 32. Qc7+ Kg8 33. Qxb8+ 1-0

DarkThought – TheKing: [1 – 0] (13th WMCC, Round 9, October 13, 1995)
1. e4 e6 2. d4 d5 3. Nc3 Bb4 4. e5 c5 5. a3 Ba5 6. b4 cxd4 7. Qg4 Ne7 8. bxa5 dxc3 9. Qxg7 Rg8 10. Qxh7 Nbc6 11. Nf3 Qc7 12. Bf4 Bd7 13. Bg3 Qxa5 14. Bd3 O-O-O 15. O-O Qc5 16. Rfb1 a6 17. Qxf7 Rdf8 18. Qh5 Nf5 19. Bxf5 Rxf5 20. Qh4 Rf7 21. Kh1 Qf8 22. Ng5 Rf5 23. Nh3 Qg7 24. Rb6 Rh8 25. Qa4 Nxe5 26. Qb4 Bc6 27. Qxc3 Qf6 28. Rab1 d4 29. Qc5 Qg7 30. Rxb7 Qxb7 31. Rxb7 Kxb7 32. Bxe5 Rxe5 33. Qxe5 Rxh3 34. Qg7+ Kc8 35. f3 Rh4 1-0

MChess – DarkThought: [1 – 0] (13th WMCC, Round 10, October 14, 1995)
1. e4 e6 2. d4 d5 3. Nd2 dxe4 4. Nxe4 Be7 5. Nf3 Nd7 6. Bd3 Ngf6 7. Nxf6+ Bxf6 8. Qe2 O-O 9. Be3 Re8 10. Rd1 Qe7 11. c3 e5 12. dxe5 Nxe5 13. Nxe5 Bxe5 14. O-O Qh4 15. g3 Qh3 16. Be4 Bg4 17. Bf3 Bxf3 18. Qxf3 Qe6 19. Qxb7 Rab8 20. Qxa7 Rxb2 21. a4 Qc6 22. Bd4 h6 23. Bxe5 Rxe5 24. Rd8+ Kh7 25. Qd4 Rbe2 26. Qd7 Qc4 27. Qd3+ Qxd3 28. Rxd3 Ra2 29. Rd7 Kg6 30. Rxc7 Ree2 31. Rc6+ Kh7 32. Rc4 Rec2 33. Kg2 Kg6 34. h4 f6 35. Kf3 Ra3 36. Ke4 Raxc3 37. Rxc3 Rxc3 38. Ra1 f5+ 39. Kd4 Rf3 40. Ra2 Rb3 41. a5 Rb7 42. a6 Ra7 43. Kc5 Ra8 44. Kb6 Kh5 45. Kb7 Rg8 46. a7 f4 47. Ra4 g5 48. hxg5 hxg5 1-0

DarkThought – Genius: [1/2 – 1/2] (13th WMCC, Round 11, Oct. 15, 1995)
1. e4 d5 2. exd5 Qxd5 3. Nc3 Qa5 4. d4 Nf6 5. Nf3 Bf5 6. Bc4 c6 7. Ne5 e6 8. g4 Bg6 9. h4 Nbd7 10. Nxd7 Nxd7 11. h5 Be4 12. Rh3 Bd5 13. Qe2 Qb4 14. Bxd5 cxd5 15. Qd3 Be7 16. Bf4 O-O 17. h6 g6 18. O-O-O a6 19. a3 Qb6 20. Qe3 Bf6 21. Kb1 Rfc8 22. g5 Bh8 23. Ne2 Rc4 24. Qb3 Qc6 25. Rc3 b5 26. Qb4 a5 27. Qe7 Rxc3 28. Nxc3 b4 29. axb4 axb4 30. Qxb4 Qa6 31. Kc1 Nb6 32. b3 Qa1+ 33. Kd2 Qa7 34. Ke1 Nd7 35. Nb5 Qb7 36. c3 Qc6 37. Rd3 Qa6 38. Ke2 Qa5 39. Qxa5 Rxa5 40. Nc7 Ra3 41. b4 Nb6 42. Kf3 Rb3 43. Kg4 Nc4 44. Kh4 Kf8 45. Kg3 Ke7 46. Rf3 Ra3 47. Kh4 Ra2 48. Kh3 f5 49. gxf6+ Bxf6 50. Nb5 Ra1 51. Kg2 Ra6 52. Kh2 Ra8 53. Nc7 Ra3 54. Kg2 Ra7 55. b5 Rb7 56. Kh3 Rb6 57. Rg3 Kd7 58. Rg1 Be7 59. Ra1 Rb7 60. Ra8 g5 61. Bg3 Nd6 62. Bxd6 Bxd6 63. Ne8 Bf4 64. Nf6+ Ke7 65. Nxh7 g4+ 66. Kxg4 Bxh6 67. f4 Rxb5 68. Ra7+ Kd6 69. Nf6 Kc6 70. Ra6+ Rb6 71. Rxb6+ Kxb6 72. f5 exf5+ 73. Kxf5 Kb5 74. Ne8 Kc4 1/2-1/2

1.16 DarkThought at 8th WCCC (May 1995)

Final Standings of 8th WCCC

Rk = final rank, **Pts** = overall points, **SOP** = sum of opponents' points, **Rx** = results of each round.

Rk	Pts	SOP	Program	R1	R2	R3	R4	R5
1	4.0	12.0	Fritz	b11−	w15+	b18+	w14+	b03+
2	4.0	12.5	StarSocrates	b03−	w14+	b23+	w09+	b08+
3	3.5	16.5	DeepBlue Prototype	w02+	b08+	w12+	b06=	w02−
4	3.5	12.5	Frenchess	w06=	b07−	b17+	w12+	b14+
5	3.5	10.5	Junior	b08−	w16=	b24+	w19+	b11+
6	3.0	15.5	WChess	b04=	w10+	w11=	w03=	b07=
7	3.0	15.0	Genius	b10=	w04+	b09=	w11=	w06=
8	3.0	15.0	Hitech	w05+	w03−	b15+	b16+	w02−
9	3.0	14.0	Rebel	w13+	b11=	w07=	b02−	w20+
10	3.0	11.5	Zugzwang	w07=	b06−	b22=	w15+	w17+
11	2.5	16.5	Schach	w01+	w09=	b06=	b07=	w05−
12	2.5	12.0	Cheiron	b22+	w24+	b03−	b04−	w13=
13	2.5	10.5	VirtuaChess	b09−	w17+	b14−	w23+	b12=
14	*2.0*	*16.0*	*DarkThought*	*w19+*	*b02−*	*w13+*	*b01−*	*w04−*
15	2.0	13.5	Ferret	w20+	b01−	w08−	b10−	w21+
16	2.0	13.5	SOS	b18+	b05=	w19=	w08−	b09−
17	2.0	12.5	Zeus	w21+	b13−	w04−	w18+	b10−
18	2.0	11.0	Phoenix	w16−	b20+	w01−	b17−	w23+
19	2.0	11.0	Pandix	b14−	w21+	b16=	b05−	w20=
20	2.0	08.5	Ulysses	b15−	w18−	b21=	w24+	b19=
21	1.5	09.5	Nightmare	b17−	b19−	w20=	w22+	b15−
22	1.5	09.0	Gandalf	w12−	b23=	w10=	b21−	w24=
23	1.0	11.0	LChess	b24=	w22=	w02−	b13−	b18−
24	1.0	10.5	Woodpusher	w23=	b12−	w05−	b20−	b22=

Fritz became World Computer-Chess Champion 1995 by winning the playoff against StarSocrates.

Games Played by DarkThought at 8th WCCC

DarkThought – Pandix: [1 – 0] (8th WCCC, Round 1, May 25, 1995)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Ba4 Nf6 5. 0-0 Be7 6. Re1 b5 7. Bb3 0-0 8. c3 d6 9. h3 Nb8 10. d4 Nbd7 11. Nbd2 Bb7 12. Bc2 c5 13. Nf1 Re8 14. Ng3 Bf8 15. Bg5 h6 16. Bxf6 Nxf6 17. d5 Bc8 18. Qe2 Be7 19. Nd2 Qc7 20. Ndf1 Bd7 21. Ne3 g6 22. c4 Bf8 23. Bd3 Reb8 24. Rac1 b4 25. h4 b3 26. Ra1 bxa2 27. Rxa2 Rb3 28. Bc2 Rb6 29. Rea1 Qb7 30. b3 Bg7 31. h5 Qc7 32. Ra5 Ra7 33. hxg6 fxg6 34. Qe1 Ra8 35. R1a2 Qb7 36. Qd1 Rf8 37. Qa1 Bc8 38. Bd1 Qd7 39. Qc3 Bb7 40. Nc2 h5 41. Qe3 h4 42. Nf1 Kh7 43. Ne1 Bh6 44. Qd3 Kg8 45. Ne3 Rf7 46. Be2 Bf4 47. Nf3 h3 48. Bf1 hxg2 49. Nxg2 Bh6 50. Nh2 Rh7 51. Ra1 Bg5 52. Ne3 Bxe3 53. fxe3 Rh4 54. Bg2 Kg7 55. R5a3 Rb4 56. Rf1 Bc8 57. Ra5 Qc7 58. Rfa1 Qb6 59. R5a3 Qb8 60. Qc2 Bb7 61. Bf3 Qc8 62. Qd3 Nh7 63. Bg2 Ng5 64. R3a2 Qf8 65. Rd2 Nh3+ 66. Bxh3 Rxh3 67. Rg2 Qd8 68. Raa2 Qb6 69. Qf1 Rxh2 70. Rxg6+ Kxg6 71. Rxh2 Qc7 72. Qf5+ Kg7 73. Rg2+ Kh8 74. Qf6+ Kh7 75. Qh4# 1-0

StarSocrates – DarkThought: [1 – 0] (8th WCCC, Round 2, May 26, 1995)
1. e4 e5 2. Nf3 Nc6 3. Bb5 a6 4. Bxc6 dxc6 5. 0-0 f6 6. d4 Bg4 7. dxe5 Qxd1 8. Rxd1 fxe5 9. Rd3 Bd6 10. Nbd2 b5 11. b3 Ne7 12. Bb2 Ng6 13. g3 0-0 14. Kg2 Rfe8 15. h3 Bd7 16. Rd1 Rf8 17. Bxe5 Bxh3+ 18. Kxh3 Bxe5 19. Kg2 Bd6 20. Rc3 c5 21. Ne1 Ne5 22. f4 b4 23. Re3 Ng4 24. Rf3 Rad8 25. Nc4 Be7 26. Rfd3 Nf6 27. Kf3 Rxd3+ 28. Nxd3 Rd8 29. Na5 Bf8 30. e5 Ne8 31. Nc6 Ra8 32. Ke4 a5 33. Kd5 c4 34. Kxc4 Ra6 35. Kd5 Rb6 36. Nb2 Ra6 37. f5 Kh8 38. Nc4 a4 39. N4a5 axb3 40. cxb3 Ra8 41. Ke6 Bc5 42. Rd8 Rxd8 43. Nxd8 Bf2 44. Kf7 Nd6+ 45. exd6 cxd6 46. g4 d5 47. g5 Be3 48. g6 hxg6 49. fxg6 Bg5 50. Nac6 Bh4 51. Kf8 Bxd8 52. Nxd8 d4 53. Nf7# 1-0

DarkThought – VirtuaChess: [1 – 0] (8th WCCC, Round 3, May 27, 1995)
1. d4 Nf6 2. c4 e6 3. Nc3 Bb4 4. e3 0-0 5. Bd3 Nc6 6. Nge2 d5 7. cxd5 exd5 8. a3 Bd6 9. Nb5 Be7 10. 0-0 Re8 11. f3 a6 12. Nbc3 Bd6 13. Bc2 Qe7 14. e4 dxe4 15. fxe4 Bg4 16. Be3 Rad8 17. Qe1 Bxe2 18. Qxe2 Nxd4 19. Bxd4 Bxh2+ 20. Kxh2 Rxd4 21. Kh1 Qd6 22. Rad1 c5 23. Qf3 Re5 24. Kg1 Qe6 25. Qg3 Qd6 26. Rf5 Rxd1+ 27. Nxd1 Qd4+ 28. Ne3 Re8 29. Rf2 Qe5 30. Qxe5 Rxe5 31. Nc4 Re6 32. e5 Nd7 33. Rd2 Nf8 34. Bf5 Re7 35. Rd8 h5 36. Bc8 g6 37. Nd6 Rxe5 38. Bxb7 Re2 39. Nc4 Kg7 40. Bxa6 Ne6 41. Rd2 Re4 42. Nd6 Re1+ 43. Kf2 Rc1 44. Bc4 Ng5 45. Bd5 Kf8 46. Kg3 f6 47. a4 Ke7 48. Nb7 Nf7 49. a5 Ne5 50. a6 c4 51. a7 Ra1 52. Nd6 Kxd6 53. a8Q Rxa8 54. Bxa8+ Kc5 55. Rd5+ Kb4 56. Rd6 f5 57. Re6 Nd3 58. Rxg6 f4+ 59. Kh4 Nxb2 60. Rf6 Kc3 61. Rxf4 1-0

Fritz – DarkThought: [1 – 0] (8th WCCC, Round 4, May 28, 1995)
1. e4 d6 2. d4 Nf6 3. Nc3 g6 4. f4 Bg7 5. Nf3 c5 6. dxc5 Qa5 7. Bd3 Qxc5 8. Qe2 0-0 9. Be3 Qa5 10. h3 Qb4 11. 0-0 Qxb2 12. Nb5 Ne8 13. e5 dxe5 14. fxe5 Qb4 15. Nxa7 Nc6 16. Rab1 Qa3 17. Nxc8 Rxc8 18. Rxb7 Nc7 19. Bc4 Nxe5 20. Nxe5 Bxe5 21. Bb3 Bf6 22. Rd1 Qa6 23. Qf3 Nb5 24. Rdd7 Qa5 25. Rxe7 Bxe7 26. Rxe7 Qc3 27. Bxf7+ Kh8 28. Qf4 g5 29. Qxg5 Rxf7 30. Rxf7 Nd6 31. Re7 Ne8 32. Qh4 Nf6 33. Bd4 Qxd4+ 34. Qxd4 Rc6 35. Qe5 Rb6 36. Qg5 Rb1+ 37. Kh2 Ng4+ 38. hxg4 Rh1+ 39. Kxh1 h5 40. Qg7# 1-0

DarkThought – Frenchess: [0 – 1] (8th WCCC, Round 5, May 29, 1995)
1. d4 d5 2. c4 c6 3. Nf3 Nf6 4. Nc3 dxc4 5. a4 Bf5 6. e3 e6 7. Bxc4 Bb4 8. 0-0 Nbd7 9. Nh4 Bg6 10. Qb3 a5 11. g3 Qb6 12. Nxg6 hxg6 13. Rd1 0-0-0 14. Bf1 Rh5 15. Bg2 g5 16. f3 Rdh8 17. h3 Rxh3 18. Bxh3 Rxh3 19. Ne2 g4 20. fxg4 Nxg4 21. e4 Rh2 22. Bf4 Rf2 23. Nc1 g5 24. Bxg5 Nde5 25. Rd3 Nxd3 26. Qxd3 Be7 27. Qd1 Bxg5 28. Qxg4 Qxd4 0-1

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