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The name of Magnus Carlsen is everywhere - reasonably so given his record FIDE ELO rating of 2872, his wins at the London Chess Classic 2012, Tata Steel 2013 and the FIDE Candidates’ tournaments, and his consequential status as World Championship challenger and favourite. At Wijk aan Zee, Hao and Carlsen reached a Queen ending with five passed pawns but Carlsen won without drama or even a pawn conversion. Two silicon endings take different routes. FinalGEN (Romero, 2012), given its initial concept of ‘at most one piece per side’, also finds a two-Queens win. In contrast, the Lomonosov tables (MVL, 2012), with a freedom and fearlessness born of complete EGT knowledge, show a quintet of Queens skirmishing briefly on the main road to mate.

Hao–Carlsen, Tata Steel 2013 (9), ECO C44: 8/1k5p5/8/p1d6/6q1/8p2/4QK2 w, Fig. 1a: 50. Qe5 Qc4+ 51. Kg2 Qc6+ 52. Kf1 b4 53. f4 b3 54. f5 Kd6 55. Qa1+ Kb6 56. Qb8 Qc1+ 57. Kg2 Qc2+ 58. Kh1 b2 59. Qb8+ Ka5 60. Qa7+ Kb4 61. Qb7+ Ka3 62. Qf3+ Kb3 63. Qd5+ Qa4 64. Qf3+ Ka2 65. Qd5+ Ka1 66. Qe5 c5 67. Resigns 0-1.

Romero FinalGEN line, SP+/SP-, dtp =-25²-3 50. Qe5" Qc4+" 51. Kg2" Qe6+" 52. Kh3" {diverging from the game} Qf3+=G 53. Kh4! Qx2+-G (KQKQPP, dtm =-29) 54. Kg5 (SM/SM ) 54. Kg4 Qg2+ 55. Kh4 Qc6 56. Kg4 Qc4+ 57. Kg3 b4 58. Kf6 "Qc1+" 59. Kg7 "b2" 60. Qe5+ "Kh5" 63. Qf7+ "Qe6" 64. Qd3 "Kb4" 65. Qd4+ "Kb3" 66. Qd1 "Kc1" 67. Qc2 "Qc3" 68. Kh6 "Qd5" 69. Qe5+ "Kai" 70. Qe7 "c5" 71. Qe5 "Qa3" 72. Qe6 b1=Q' (dtm =-10) 54... Qb6 55. Kg5 "Qc6" 56. Qb2 "Kh6" 57. Qg4 "Qe4+" 58. Kh3 "b4" 59. Kh2 "c5" 60. Qf6+ "Kh5" 61. Qf7+ "Qc2" 62. Kg3 "Qd3+" 63. Kh2 "b3+" 64. Qe8+ "Kc4" 65. Qa4+ "Kc3" 66. Qa5+ "Kb2" 67. Qa4 "c4" 68. Qa7 "c3" 69. Qg7 "Kc2" 70. Qg4 "b2" 71. Qa4+ "Kb1" 72. Qb3 "Qc2+" (dtm =-8, Fig. 1b) 73. Qxc2+ "Kx2"" 74. Kg3 b1=Q' (dtm =-6) 0-1.

MVL line, SM+/SM-, dtm =-3: 50. Qc3" b4" 51. Qd3 "Kh6" 52. b3 "Qf4" 53. Kg2" Qd6" 54. Qc3" c5" 55. f4 "Qd5+" 56. Kg3 "Ka5" 57. Kh4 "c4" 58. Qa7 "Kb5" 59. Qb8+ "Kd4" 60. Qe8+ "Kh3" 61. Qe1 "Qd3" 62. f5 "c3" 63. f6 "e2" 64. Kg5 "Qc3" 65. Qe1+ "Ka2" 66. Kg6 "b3" 67. f5 "b2" 68. Qf4 "Qe6+" 69. Kg7 "c1=Q" 70. f8=Q" Qc1+ 71. Qf6 b1=Q" (KQKQPP, Fig. 1c) 72. Qg8 "Qbb3" 73. Qxb3+ "Kxb3" 74. Qxc3+ "Kxc3"" (dtm =-6) 0-1.

Figure 1: Three positions related to the finale of Hao–Carlsen, Tata Steel, Round 9, 2013.

‘MVL’ completed their 4-3 and 5-2 DTM(ate) EGTs with a flourish in August 2012 when left alone with their university’s supercomputer during the Moscow holidays.\(^2\) MVL also provided an SM+/SM- line for the KBPKNP position 2n5/7k/5B1p/2K4P/6P1/8/8/8 w (Bryant, 2012) which had proved to be a ‘CZ’ Cyclic Zugzwang (Haworth, 2012),\(^3\) i.e., a position where the loser can force the winner back to the same position but with loser to move. Team member Vladimir Mikhailychev admitted to being ‘pretty much frightened’ by the position and line. ‘I was already saying good-bye to the 100TB of our results and thinking of new tests for 7-man generator when Victor [Zakharov] mercifully indicated to me that the colors [of the sides to move] are different.’\(^4\)

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1. The University of Reading, Berkshire, UK, RG6 6AH. email: guy.haworth@bnc.oxon.org.
2. SP+/SP = White is maximising Depth to Pawn-conversion or mate, and Black is minimising it.
3. "Usual notation: '=' = only optimal move, '/' = only value-preserving move, and '=' = only move.
4. Some ChessOK products (2013) currently provide free access during 2013 to a subset of these Lomonosov EGTs.
5. Haworth and Rusz (2011) are data-mining for sub-6-man CZs using evolved versions of FREEZER and FINALGEN.

However, Bryant’s position is a far the deepest CZ known with a DTC/M/Z-zugdepth of 36 moves, 71 plies.
The 12 maxDTC and 1 maxDTZ positions in Bourzutschky and Konoval (2012b, 2013).

<table>
<thead>
<tr>
<th>BK#</th>
<th>Endgame EG GR</th>
<th>FEN position</th>
<th>DTC 1 of.</th>
<th>Note</th>
</tr>
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<tr>
<td>03.</td>
<td>KQPKRPP~</td>
<td>1300.12 4r2Q/8/K6p/5K2/8/4P6/6K7 w 585317</td>
<td>1 maxDTC KQKRP (1-0, wtm) = 14</td>
<td></td>
</tr>
<tr>
<td>04.</td>
<td>KQPKRPP~</td>
<td>1300.12 329333</td>
<td>1-0 7.Kd6 Qc6+! = 4.0 1995, C96, Karaklajc-Witkowski</td>
<td></td>
</tr>
<tr>
<td>05.</td>
<td>KPPPKNP~</td>
<td>0003.31 53…Na5+? …Kg4!! = 1.0 2000, A15, Bruk-Tsesarsky</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06.</td>
<td>KRPPKQP~</td>
<td>3100.21 46…Rf4</td>
<td>5 5 similar positions; maxDTC KPPKN (1-0, wtm) = 30</td>
<td></td>
</tr>
<tr>
<td>07.</td>
<td>KRPPKQP~</td>
<td>3100.21 50b Res. Conc.</td>
<td></td>
<td></td>
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</table>

The 21 games with 7-man errors selected for Bourzutschky and Konoval (2012b, 2013).

<table>
<thead>
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<th>FEN position</th>
<th>HH#</th>
<th>Stip.</th>
<th>val.</th>
<th>but.</th>
<th>res. conc.</th>
<th>date, ECO, players</th>
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</table>

Table 3: the 22 faulted studies selected for Bourzutschky and Konoval (2012b, 2013).
The excellent Bourzutschky-Konовал series (2006, 2011a/b, 2012a/b, 2013) is now concluded. It highlighted a selection of positions studied using their 7-man DTC(conversion) EGTs. The 56 record, game and study positions chosen for Parts 4 and 5 are listed here in, respectively, Tables 1-3 with annotation and notes by MB-YK and this author.6,7 The relevant EGTs, computed with the familiar P=Q conversion constraint denoted by ‘~’, are for K(B/N/P)PPKRP, KPPPK(B/N)P, KRNPKRB and KRPPKQP.8

The maxDTC or maxDTZ positions BK4.02/09/25 feature three endgame phases longer than 50 moves. BK4.02 involves an amazing escape after first 23 and then 31 consecutive checks. BK.25 is not a maxDTC position with dce = 265 but it is the DTZ-deepest P-ful position known. It is even deeper than the record-depth 6-man position, Stiller’s KRKNKN 6k1/5n2/8/8/5n2/1RK5/1N6 w, which has maxDTC/Z = 243 and maxDTM = 262. Table 1 includes maxDTC figures showing the varying effect of removing a Pawn from each side.

Over the board, the occasional half-point is conceded but it is still impressive that this happens so rarely at the top level. BK4.26 has Carlsen and Shirov conceding DTC-depth in handfulls but the game-result is the same as the original ‘7-man’ theoretical value. After BK4.03, the game ended when Black agreed a draw in a won position. BK4.27 is the title-deciding Anand-Gelfand KRNPKRB position previously discussed (Haworth, 2012).

From the studies, BK4.24 identifies a previous dual as the only solution but Liburkin’s aesthetics, and therefore the study’s quality, do not survive intact. BK5.29 features a dual in the study rather than a cook. While the usual EGT-effect is to discover flaws, it is a pleasure to note that a famous Behting study9 which recently came under suspicion has in fact been proved sound with the help of Bourzutschky’s KNNPKQP EGT (van der Heijden, 2012). This and some 9,950 other studies could be examined with the Lomonosov EGTs.

My thanks to Eiko Bleicher (2013), Marc Bourzutschky, John Bryant, Yakov Konoval, Victor Zakharov and the MVL team, Pedro Pérez Romero, Árpád Rusz, and Emil Vlasák for their contributions reported here.

References
Bryant, J. D. (2012). http://www.youtube.com/watch?v=2h_b0puS8Vk KBPPKNP position analysis.

6 ‘conc.’ = total points conceded in the sub-8m-endgame; ‘HH#’ = study index number in van der Heijden (2010).
7 Two errors in EG: BK4.08 should have the br on f2, not f1. BK4.11 should start on move 59 rather than move 58.
8 Endgames visited overall ranged from the improbable but possible KQQQKQQ (!) to the most likely, KRPPKRP.