

WCSC 2013: the 3rd World Chess Software Championship

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THE 3RD WORLD CHESS SOFTWARE CHAMPIONSHIP (WCSC 2013)Jan Krabbenbos, Guy Haworth and Jaap van den Herik¹

Amersfoort, Reading and Tilburg

WCSC 2013 continued the sequence of tournaments designed to pit authors' chess engines against each other on identical hardware platforms. It was held in parallel with WCCC 2013 from the 12th to the 18th of August and the same programs took part in a double round-robin format. The platform was an HP ELITEBOOK 8570W, with 16GB of RAM, 500GB HDD, and a 4-core Intel i7 3740QM Ivy Bridge processor supporting a potential 8 threads of activity. The game tempo was 'all/45' + 15''/move'.

The 30 games (9 White wins, 10 draws and 11 Black wins) can be consulted on the web as played (ICGA, 2013) and also with evolving comments (Krabbenbos et al., 2013b) including some from 'MU' Mark Uniacke, 'HW', Harvey Williamson, 'JZ' Johannes Zwanzger, and from 'VA' World Champion Vishy Anand (Williamson 2013). The biographies of participants and engines are referenced in (Krabbenbos et al., 2013a).

Round 1: HIARCS–JONNY ½-½, PANDIX–MERLIN 1-0 and SHREDDER–JUNIOR 0-1

HIARCS–JONNY started as a Nimzo-Indian game in which both players followed well known paths. They did not challenge each other greatly. Many pieces were exchanged and many straightforward attempts were set up but did not realize in practice. Both sides were alert and did not give each other much space to employ initiatives. This being so, they still continued their fight up to the last pawn. It was not an exciting game but it was a game that showed their fighting spirit. A draw.

The game PANDIX–MERLIN started with a psychological move **1. a4** as in the WCCC round 7. Black replied in normal mode but had to play without opening book. The game continued as a reversed Ruy Lopez. White clearly had some difficulties and although Black's play was strong it was not convincing. Despite its first move which weakened the queenside Black could not keep the advantage on the table. Slowly White came into the game and turned the tables. From that moment onwards White continued to expand space, take initiatives and create threats. For Black there was no opportunity to stop the stream of ideas and threats which came its way. Finally it lost by an elementary regrouping of pieces.

SHREDDER and JUNIOR have met each other many times. They have both been world champion with JUNIOR currently being the WCCC champion. Their contests are always interesting and this game was no exception. A quiet but still complex French start to the game resulted in Black attempting to take the initiative. SHREDDER replied cautiously but Black continued with challenging moves. The result was a complex position even though the queens had already left the board. The fight continued at close quarters, focused on a few squares. JUNIOR played quite inventively and succeeded in widening its initiative to pressure on the white position. Even with a few pawns and only a rook and a minor piece there were huge complications. Black was able to complete the series of pressure moves with a nice bishop sacrifice which could not be accepted by White. Declining the offer did not bring any relief and after five more strong moves White resigned.

Standings: 1= JUNIOR and PANDIX 1, 3= HIARCS and JONNY ½, and 5= SHREDDER and MERLIN 0

Round 2: SHREDDER–PANDIX ½-½, MERLIN–HIARCS 0-1 and JUNIOR–JONNY ½-½

SHREDDER and PANDIX both saw the opposite possibility to obtain a full point. Since they were not playing very aggressively it became a game full of subtleties. However both opponents are seasoned computer programs that know each other's tricks quite well. Although the game was of high caliber it was not very exciting for the observers. All exchanges were predictable and there was no unequal material balance. On both sides the programs proved to be fighters as they played on to the very endgame of two pawns versus two pawns. Then a draw was agreed.

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The game MERLIN–HIARCS opened in a peaceful way but soon tactics played a part. In such cases it is advisable to combine the search process with a good evaluation function. Obviously MERLIN possesses a less than fully tuned evaluation function and so it agreed with decisions that maneuvered the program into difficult positions. HIARCS played professionally and won the game accordingly.

JUNIOR played White to JONNY and had to settle for half a point. Although the program tried to find holes in the black position, JONNY continued to hold it together. A pawn sacrifice by JUNIOR did not essentially change the situation. Black was a pawn up but White had active play and the only tangible result JUNIOR could aim for was winning the pawn back and playing thereafter for another 20 moves to see whether JONNY found the correct moves. As it did so, the game ended in a draw.

Standings: 1= HIARCS, JUNIOR and PANDIX 1½, 4 JONNY 1, 5 SHREDDER ½ and 6 MERLIN 0

Round 3: JONNY–MERLIN 1-0, HIARCS–SHREDDER 1-0 and PANDIX–JUNIOR 0-1

JONNY is a strong program that is able to find weak spots in the opponent's software. In this round MERLIN came to understand this. The opening was played in an easy way by both programs but JONNY kept an eye on solving all the small obstacles which it encountered in MERLIN's opening play. So we saw that a double c-pawn was transferred into a double d-pawn, resulting in much influence in the center. That was the basis for opening up the position. Soon MERLIN saw that it was unable to defend against the penetration of the white pieces. It had to give up its queen for a rook which led to resignation.

HIARCS was playing the aggressive Sicilian with g4 and h4 against SHREDDER. Of course the whole variation was in Black's openings book too. So the game soon came to a double-edged middle game, White having the initiative but Black having more than sufficient counterplay. Black decide to sacrifice a pawn for initiative and dynamical play. Maybe it was possible to regain the pawn at the cost of losing the initiative. Now the middle game position resulted in an endgame with Black a pawn down. Even so, the game should have ended in a draw. Pawns and rooks were exchanged and a bishop ending with two black-squared bishops occurred on the board. With 57. ... Bc1 'instead of Bb4' (VA), SHREDDER miscalculated by playing the bishop to the wrong diagonal. At this point, HIARCS clearly saw its way to the win though it took a few moves.

PANDIX–JUNIOR was a game for the widest audience. After a quiet English opening, JUNIOR pushed its pawns in the direction of the white king. For JUNIOR the opponent's king always acts as a magnet for its pieces. After some time there was a black pawn on f3 and a black bishop on g2 with the white king on g1. To achieve this remarkable position Black had sacrificed two pawns. Many observers questioned whether such an artificial position was worth two pawns especially when White managed to exchange the queens and also one pair of rooks. However with the remaining pieces, JUNIOR was able to attack all the squares around the white king. White could prevent the worst by sacrificing a piece. But then the further continuation was professionally handled by JUNIOR and it won this marvelous game convincingly.

Standings: 1= HIARCS and JUNIOR 2½, 3 JONNY 2, 4 PANDIX 1½, 5 SHREDDER ½ and 6 MERLIN 0

Round 4: PANDIX–HIARCS 0-1, JUNIOR–MERLIN 1-0 and SHREDDER–JONNY ½-½

PANDIX–HIARCS was a contest that was dominated by surprisingly strong moves. The strategy followed by both sides was difficult to interpret: VA noted long stretches of computer moves. After a quiet opening White tried to take the initiative but Black countered continuously. White opposed a threat to win the exchange and Black let it happen. Meanwhile other complications started to emerge and soon there were a number of indirect exchanges. Nowadays we have computers to forecast the consequences of the exchange sequences. As play continued on the board, it transpired that HIARCS was the program able to analyze more deeply: MU notes 36. ... Nc7! and 37. ... Nd5! and VA notes 49. Rxb4 in what was now a bad position for White. 66. ... Nxf3+ triggered another complex sequence of exchanges sequence to a KRKRPP endgame which White resigned.

JUNIOR was facing an old variation of the Sicilian, the Dragon. The game followed well-known paths which imply that White has a clear initiative. On move 18, JUNIOR had an opportunity to break through in the

center. Black decided not to play defensively and sacrificed a piece for two pawns. This was insufficient and JUNIOR crisply secured the full point.

Some games are exciting to play but less exciting to replay. The game SHREDDER–JONNY is an example of such a game. In the Ruy Lopez opening they followed the closed variation and then in its most closed form. White had some advantage over the open a-file but it turned out that the two white rooks could not create any threat. Black compensated this initiative by an action in the center. A couple of pieces disappeared from the board but many remain to continue moving forward and backward. Obviously both programs had a plan but they were not able to realize them. The interaction was nice to see but after some time the repetition of patterns was no longer fascinating. However the two companions decided to fight to the last pawn. When the situation arose, JONNY refused to take the last pawn for some moves because it could be taken on the next move. The logic of this is interesting but the game was manifestly drawn.

Standings: 1= HIARCS and JUNIOR 3½, 3 JONNY 2½, 4 PANDIX 1½, 5 SHREDDER 1 and 6 MERLIN 0

Round 5: MERLIN–SHREDDER 0-1, HIARCS–JUNIOR 1-0 and JONNY–PANDIX ½-½

We see the pattern ‘white king on g1, black bishop on g2 protected by a pawn on f3 or h3’ infrequently. In the game MERLIN–SHREDDER it occurred for the second time this week. Obviously the white king is then confined in a very small area. One check is sufficient to win the game. In both cases there was no mating involved but it was a start of considerable material gain. MERLIN had no chance and SHREDDER gratefully accepted the full point.

If programs were humans, they would run the risk of becoming a victim of hubris when everything in the tournament is going in their favor. So far JUNIOR had to suffer only one lost game and was credited with many fantastic manoeuvres that resulted in a win. In a Queen’s Gambit Accepted both programs followed the classical path to the middle game. Both sides showed their ingenuity and tried to outclass each other. HIARCS put its knife on JUNIOR’s throat by playing **20. Bf5!** with the threat Ng5. JUNIOR accepted the challenge and sacrificed its queen for a rook and a knight. In the scrimmage that occurred JUNIOR could have taken an extra pawn but it neglected the additional material. Instead it played for the white king but in this game that king turned out to be untouchable by the black pieces. HIARCS did what every professional player would do, namely simplify the position, exchange material and aim for an endgame that is easy to win. HIARCS fully succeeded in this task and won the game without any further difficulties. World Champion Vishy Anand comments here:

*“We see a sharp Queens Gambit Accepted: this type of position suits computer strengths perfectly. Moves like **15. ... f5** are easy for computers to play because they can calculate the consequences easily. Then something strange happens on move **19. Re1** it seems to me that Ne4 is quite playable and I know that JUNIOR is quite tactical. It is not clear to me if it played **Bc5** to provoke a Queen sacrifice or if it stumbled into one. After **25. fxe3** Black could wait with g6 Nd2 Re5 and I think White wants to play e4. Computers are weak still in finding and understanding fortresses. Here I found Black’s play quite strange with Rg4 and coming back to e4 and somehow the Queen breaks free and comes to d1 and b3 and then there is a bit of chaos and the Queen has escaped. By move 31 it seems that Black’s compensation is not enough. Why did Black play **25. ... Rg4** when it should have been possible to calculate to move 31 quite easily?”*

The game JONNY–PANDIX opened with an English variation such as has been seen many times in this tournament. This time both players specifically adopted a path along which they could exchange as many pieces as possible. Finally a handful of pawns remained on the board together with a black-squared bishop on both sides. Where grandmasters would have agreed on a draw, computer programs play like beginners trying to exhaust each other. However, computers cannot be exhausted and therefore they could not escape a draw.

Standings: 1 HIARCS 4½, 2 JUNIOR 3½, 3 JONNY 3, 4= PANDIX and SHREDDER 2, and 6 MERLIN 0

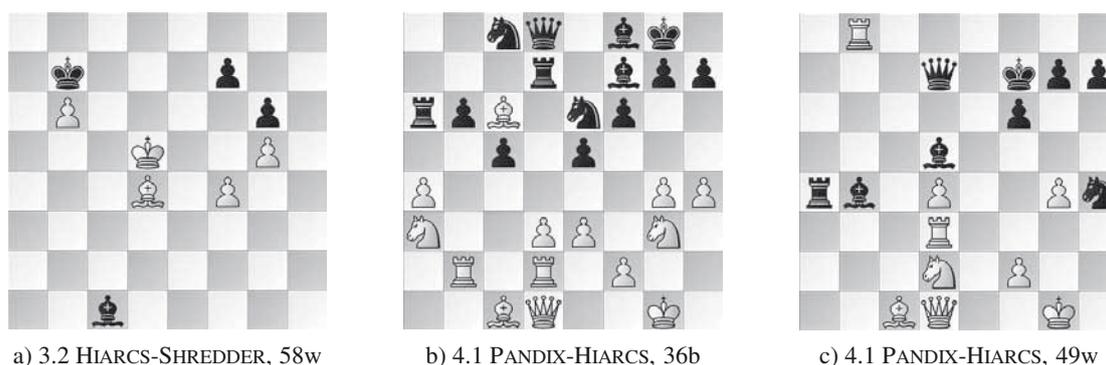


Figure 1. Three highlighted positions from the first round-robin.

Round 6: MERLIN–PANDIX 0-1, JUNIOR–SHREDDER ½-½ and JONNY–HIARCS ½-½

An intriguing question is: what is the value of the initiative? If you play quietly and exchange pieces and are prepared to lose the initiative is that sufficient for a draw? In the game MERLIN–PANDIX it seemed for a long time that the answer would be positive. Yet PANDIX succeeded in collecting small advantages and all of a sudden it was able to arrive at an endgame with two bishops against two knights with a rook on each side. The two bishops and the rook had a reach that paralyzed the white position completely. Lacking attractive moves, White tried to reach an endgame with very robust material that was not winnable for Black. This was however in vain and Black deservedly won.

JUNIOR–SHREDDER was a Sicilian game in which SHREDDER prevented JUNIOR deploying a full attack on the king. SHREDDER was active on the queenside and JUNIOR had to take notice of it. SHREDDER wisely exchanged some pieces to reach an endgame that was difficult to handle. However the technique of both programs is of high standard and therefore the game remained in balance. When the material was greatly reduced, the play became more lively and many moves were played in a drawn position. The outcome remained the same: draw.

In JONNY–HIARCS, JONNY took the lead with original ideas and well thought manoeuvres. However HIARCS was on the alert and even the penetration of the black position by a white pawn did not upset HIARCS. It defended calmly and after some time and many moves it eliminated the pawn on f7. The beginning of the endgame was characterized by a small advantage for white. However where JONNY looked for an opening HIARCS defended adequately. This pattern was the main theme of the game but HIARCS held its own quite well and should have been happy in the end with the draw.

Standings: 1 HIARCS 5; 2 JUNIOR 4; 3 JONNY 3½, 4 PANDIX 3; 5 SHREDDER 2½ and 6 MERLIN 0

Round 7: PANDIX–SHREDDER ½-½, HIARCS–MERLIN 1-0 and JONNY–JUNIOR 0-1

The game PANDIX–SHREDDER followed the Scheveningen variation of the Sicilian for a long time. It showed that PANDIX has a real opening book and does not just play to get the opponent out of book as soon as possible. PANDIX played aggressively but was countered solidly by SHREDDER which picked up two pawns on the queenside. That action would have troubled PANDIX if it had continued with its attack on the black king. Therefore PANDIX chose the better option, half a point rather than the pursuit of vague chances. It repeated the moves by perpetually attacking the black queen. It is remarkable that Black had no way of escaping from this continuous attack. Hence, the draw was agreed.

It is remarkable how a strong program when facing a weaker program can easily create a situation in which it has attacking chances. After a quiet opening HIARCS did so and soon it was looking for combinations around the black king. There were many of them and HIARCS was at liberty to look for the most elegant one. It did so and selected an attractive mating variation from all the continuations available. MERLIN stopped in time and was happy with the resistance it had offered.

Repeatedly creating attractive and aggressive play in so many games is a supreme achievement. With computers to hand nowadays, people are inclined to think that chess is in principle a strategic game. However JUNIOR seems to see it as its task to prove that there are tactics which last over twenty plies. Relying on these tactics it plays a refreshing type of play that is also difficult for its companion programs to handle. In this round JONNY was facing the typical JUNIOR style of play. Originally White's position looked fine and Black's pieces were held back. That was not what JUNIOR wanted. Therefore it sacrificed a pawn in its desire to expand its reign over the board. Since JONNY is a tough contender there was a real fight on almost every square. It must be said that JUNIOR had more tricks in its locker than JONNY and so we saw clear progress for Black. First more space then penetration and finally payoff, first capturing some pawns and then the full point.

Standings: 1 HIARCS 6, 2 JUNIOR 5, 3= JONNY and PANDIX 3½, 5 SHREDDER 3 and 6 MERLIN 0

Round 8: SHREDDER–HIARCS ½-½, JUNIOR–PANDIX 0-1 and MERLIN–JONNY 0-1

In SHREDDER–HIARCS we again saw a revival of the old SHREDDER. It played the opening well and the transition from opening to middle game very well. HIARCS was offered very difficult problems to solve. The only thing it could do was wait for the opponent to choose when and where it would enter the black position. The last question turned out to be of crucial importance. SHREDDER hesitated for one moment with **29. Bh3**. Nobody understood why a well-positioned bishop should be moved to another square. The better move here was 29. Qf4. Obviously the program must have seen this move since it played this move on move 30. However that was too late since one tempo was sufficient for HIARCS to save its life. It did so quite accurately; SHREDDER was not given any chance to rebuild its advantageous position. The game continued as an equal fight and ended in the same way. The draw was agreed in an endgame where both sides had weak and strong pawns but no one could force a decision.

Playing a game in a tournament is like doing an examination: for both, one should be well prepared. In the fourth round of the WCCC, on August 14, PANDIX played a fascinating game as Black against JUNIOR. However it lost the game and at home Gyula analyzed that PANDIX could have done better. Instead of **14. ... Nxb2** it should have played 14. ... Rc8. The difference is that after 15. Bb3 the square d3 is available for the knight after 15. ... Nxb2 16. Qc1. Therefore White has to play Qc2. Of course Gyula implemented this in his opening book and four days later, in this round, he had success with this subtle improvement. The game was not over but JUNIOR had additional difficulties to face. As usual JUNIOR was able to complicate matters considerably. Yet PANDIX managed the attack and worked towards a solid position with an advantage of two pawns. That was sufficient for a win and took JUNIOR out of the race for the title. With two rounds to go JUNIOR is 1.5 points behind HIARCS.

Once a program is spotted as the weakest program of the tournament, its task is even more difficult as each opponent program plays with aggressive intentions even if the start is quiet. Here too MERLIN managed to exchange many pieces but every exchange had a small disadvantage in it. This led to a spatial advantage for Black resulting in more combinatorial possibilities. Finally it was time for Black to bring in the harvest, move two pawns ahead and secure the easy win.

Standings: 1 HIARCS 6½, 2 JUNIOR 5, 3= JONNY and PANDIX 4½, 5 SHREDDER 3½ and 6 MERLIN 0

Round 9: JONNY–SHREDDER 1-0, MERLIN–JUNIOR 0-1 and HIARCS–PANDIX 0-1

The ninth round was full of tension resulting in three decisive games. The higher-order result was that the tournament remained open. JUNIOR won according to expectation against MERLIN, but HIARCS surprised us by losing a remarkable game against PANDIX.

In that game, the Queen's Gambit appeared in its Tartakower variant. This implies dynamic positions with fast changing goals to aim at. HIARCS was doing well by clearly focusing on a weak black pawn on c6. The square c5 was achievable for its knight: Black had two bishops which were locked. However positional advantage is not sufficient to win a game. HIARCS moved forwards and backwards but could not find another weak spot in the black position. Black meanwhile had other ideas. It moved its king from the eighth rank to the seventh emptying the back row and allowing the program to switch the queen from the a-file where it was accompanying the black rook via a8-h8-h5 to e2. That put real pressure on White's position.

Many combinations were possible and White had difficulties to keep the material balance. By opening the position, the black bishops came alive and exerted great force in the direction of the white king. White was in all sorts of pain with black's active queen in its position. It duly lost its pawn on h3 and the game moved to an endgame that was prosperous for Black. In the end a remarkable fact occurred: White played **90. e8=B** and Black could not enter that move with his mouse via WINBOARD. This led to some commotion but Gyula showed that the difficulty could be resolved by typing in the move via the keyboard. After the capture of the newborn bishop with **90. ... Bxe8**, White resigned.

This result brought added excitement to the final round which featured the last game between the two leading contenders, HIARCS and JUNIOR. Meanwhile JONNY won against SHREDDER, which also meant there would be a big fight for third place.

Standings: 1 HIARCS 6½, 2 JUNIOR 6, 3= JONNY and PANDIX 5½, 5 SHREDDER 3½ and 6 MERLIN 0

Round 10: PANDIX–JONNY 1-0, SHREDDER–MERLIN 1-0 and JUNIOR–HIARCS ½-½

In the last round JUNIOR played the role of title contender with real enthusiasm. It sacrificed a pawn and obtained an agreeable position with a variety of small advantages. However HIARCS was on the alert: it had already been shocked by losing in the penultimate round when so close to the championship. Now it would not like to be overcome by JUNIOR. The countermeasures were adequate and although JUNIOR regained its pawn and won an additional pawn it was not sufficient for a win. HIARCS managed to keep all threats under control, 'reacting in time with **35. ... g4!**' (VA), and safely reached a drawn rook ending. It is not the case that 'all rook endings are drawn'¹ but here the draw was soon agreed and Harvey Williamson, together with Mark Uniacke, were congratulated for winning the WCSC 2013 tournament in Yokohama.

SHREDDER completed the tournament by winning against MERLIN and PANDIX did the same against JONNY. JZ notes that JONNY walked into a trap with **32. ... Qe6?** instead of Qe7, and also notes **35. Nxa6!** and **37. Nxc6!** Thus, the second placed was shared by JUNIOR and PANDIX with 6½ points.

Standings: 1 HIARCS 7, 2= JUNIOR and PANDIX 6½, 4 JONNY 5½, 5 SHREDDER 4½ and 6 MERLIN 0



a) 5.2 HIARCS–JUNIOR, 25b



b) 10.1 PANDIX–JONNY, 32b



c) 10.3 JUNIOR–HIARCS, 35b

Figure 2. Three later key positions from WCSC 2013.

#	Program	Author/Operator	Hiarcs	Pandix	Junior	Jonny	Shredder	Merlin	W	D	L	RR1	RR2	Pts
1	HIARCS	M. Uniacke / H. Williamson		1, 0	1, ½	½, ½	1, ½	1, 1	5	4	1	4½	2½	7
2=	PANDIX	Gyula Horváth	0, 1		0, 1	½, 1	½, ½	1, 1	5	3	2	2	4½	6½
	JUNIOR	Amir Ban	0, ½	1, 0		½, 1	1, ½	1, 1	5	3	2	3½	3	6½
4	JONNY	Johannes Zwanzger	½, ½	½, 0	0, ½		1, ½	1, 1	3	5	2	3	2½	5½
5	SHREDDER	Stefan Meyer-Kahlen	0, ½	½, ½	0, ½	½, 0		1, 1	2	5	3	2	2½	4½
6	MERLIN	Balázs Jákó	0, 0	0, 0	0, 0	0, 0	0, 0		0	0	10	0	0	0

Table 2: The WCSC 2013 cross-table of game results (Round Robin 1, Round Robin 2).

¹ A quote commonly attributed to Tarrasch, except by Korchnoi who nominates Tartakower. The maxDTM KRPPKRP position, 8/k1P5/8/8/1R5P/7p/r7/1K6 b, has dtm = 217m (Haworth, 2013) so it may look drawn but is not!

#	Program	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10
1	HIARCS	4w½	6b1	5w1	2b1	3w1	4b½	6w1	5b½	2w0	3b½
2	PANDIX	6w1	5b½	3w0	1w0	4b½	6b1	5w½	3b1	1b1	4w1
3	JUNIOR	5b1	4w½	2b1	6w1	1b0	5w½	4b1	2w0	6b1	1w½
4	JONNY	1b½	3b½	6w1	5b½	2w½	1w½	3w0	6b1	5w1	2b0
5	SHREDDER	3w0	2w½	1b0	4w½	6b1	3b½	2b½	1w½	4b0	6w1
6	MERLIN	2b0	1w0	4b0	3b0	5w0	2w0	1b0	4w0	3w0	5b0

#	Program	r1	r2	r3	r4	r5	r6	r7	r8	r9	r10
1	HIARCS	½	1½	2½	3½	4½	5	6	6½	6½	7
2=	PANDIX	1	1½	1½	1½	2	3	3½	4½	5½	6½
	JUNIOR	1	1½	2½	3½	3½	4	5	5	6	6½
4	JONNY	½	1	2	2½	3	3½	3½	4½	5½	5½
5	SHREDDER	0	½	½	1	2	2½	3	3½	3½	4½
6	MERLIN	0	0	0	0	0	0	0	0	0	0

Tables 3 and 4: The WCSC 2013 game results and standings, round by round.

Overall scores for a ‘WCCC/WCSC biathlon’, had it existed, would have been:

1 JUNIOR 14, 2= HIARCS and JONNY 12½, 4 PANDIX 12, 5 SHREDDER 9 and 6 MERLIN 0.

Thanks to all for their participation in both WCCC 2013 and WCSC 2013, and to Vishy Anand, Mark Uniacke, Harvey Williamson and Johannes Zwanzger for post-event contributions.

References

Haworth, G. M^cC. (2013). Chess Endgame Records. <http://centaur.reading.ac.uk/34268>.

ICGA (2013). WCSC 2013 pgn file. http://icga.uvt.nl/?page_id=633.

Krabbenbos, J., Haworth, G.M^cC. and van den Herik, H.J. (2013a). The 20th World Computer Chess Championship (WCCC 2013). ICGA Journal, Vol. 36, No. 3, pp. 151-158. <http://centaur.reading.ac.uk/34051/>.

Krabbenbos, J., Haworth, G.M^cC. and van den Herik, H.J. (2013b). The 3rd World Chess Software Championship (WCSC 2013). ICGA Journal, Vol. 36, No. 3, pp. 159-165. <http://centaur.reading.ac.uk/34052/>.

Williamson, H. (2013). Success in Japan. Chess, Vol. 78, No. 7, pp. 28-29.



The WCSC 2013 Podium

1st Harvey Williamson (HIARCS), 2nd Amir Ban (JUNIOR), Gyula Horváth (PANDIX).