

## **Sherlock Holmes and the Simultaneous Monochromatic Chess Exhibition**

“Hurry up Watson!”, shouted Sherlock from the passenger seat of Watson’s Toyota Yaris. “We’re going to be late for the simultaneous monochromatic chess exhibition.”

Watson could not understand why the famous retrograde chess detective was in such a rush, for if they got there before the games started there would be no possibility of analyzing the games in a retrograde manner.

Tonight was to be quite the exhibition. The famous monochromatic chess player Larry Kasparov (no relation to the famous non-monochromatic player) was playing three games of monochromatic chess at once against other world-class players. As they entered the chess hall, to their amazement, Larry had captured the opposing queens in each of the three games and still had all of his original pieces!

Sherlock walked up to the first chess player and exclaimed, “How on Earth did Larry capture your queen without losing a single piece in the process!?”

The player shot back, “Look, everybody knows that Larry is the best.” Then he looked at his feet and continued, rather embarrassed, “It is quite a mess though, considering that no piece in this game has even moved more than twice.”

“That’s it!” Sherlock blurted out.

The player looked at him quizzically. “What’s it...”

“I know where the black queen was captured!”

The board is as shown below. Given that no piece moved more than twice, and the game was monochromatic, how did Sherlock figure where the black queen was taken? (Monochromatic chess is a variation of chess in which pieces can never move from a square of one colour to a square of a different colour.)



The player at the second board looked over in amazement as Sherlock explained his retrograde proof. “What a coincidence!” said player #2, “My board is almost exactly the same as yours and no piece was moved more than twice in this game either! The only difference in the position is that I have a pawn on a5, which was the last piece I moved (see diagram below). However, my queen was captured on a different square. Can you figure this one out, Sherlock?”

“Of course, in most games the information is not sufficient to perform retrograde analysis. But I can assure you that if it is possible then I can absolutely figure it out.” replied Sherlock in his usual manner.

Sherlock had a way of astonishing you with his arrogance, then astonishing you further by backing up his arrogance with sheer brilliance. This is exactly what happened in this case as he solved the puzzle within seconds and explained the solution to the dumbfounded players. How did Sherlock figure this one out?



Just as he finished, the third player chimed in. "If you think that is a coincidence, get a load of this. Not only has no piece in my game made more than two moves either, but the position of my board is exactly the same as in the second game! The only difference is that moving the pawn from a7 to a5 was not my most recent move. And believe it or not, my queen was captured on a different square than either of the other two games! If you can figure this one out too, that would be truly incredible."

After about 10 seconds, Sherlock replied, "I am embarrassed that it took me so long."

He then proceeded to explain how he knew with absolute certainty where the queen was captured in this third game as well.

### **Solution to First Problem:**

1. The black rook was captured on h6 by the white bishop. The black rook never could have made it past the sixth rank, and the white bishop is the only white piece that travels on dark squares which could have made it to the sixth rank.
2. The King's pawn could have only gotten to e5 by coming from d2 and taking black's missing pawn. Black's missing pawn never could have left the e5 square, and the queen and bishop could not have gotten before the missing pawn occupied the e5 square.
3. The white pawns on a4 and c4 came from a2 and c2 respectively. We know they did not cross-capture, for this would involve too many captures of black pieces.
4. The white king and white rook made no captures. Black made one move with the pawn on h5, one move with the pawn captured on e5 and one move with the rook captured on h6. The only other black pieces that could move were the missing bishop and queen, which made a maximum of two moves each. Therefore black made at most 7 moves and white made at most 8 moves. We know that white made at least 5 pawn moves and 2 bishop moves. Therefore, white did not have enough moves for either the king or rook to move and return to their home square.
5. **The queen was captured on g3!** The only remaining possibility for the capture of the queen and bishop is that it was

done by the pawn now on h4. The black bishop could not get out until the black pawn moved to e5. This square was later occupied by the white pawn, but was never vacant. Thus, the black bishop could not get to g3 in 2 moves, so it was captured on h4 and the black queen was captured on g3.

### **Solution to Second Problem:**

Points (1), (2), and (3) above still hold for the same reasons.

For point (4), now that black has made an extra move, white could have made a maximum of 9 moves. Therefore, either the king or rook could have made one capture then returned to its home square.

Since the queen was not captured on g3 (and nor was the bishop for the same reasons as in problem 1), the pawn on h4 made no captures.

Since the white king and rook could not capture more than one piece, and the fourth black piece must have been captured by the white bishop when it returned to c1. The black bishop could not make it to c1 in 2 moves, and so **the queen must have been captured on c1!**

### **Solution to Third Problem:**

Again, points (1), (2), and (3) above still hold for the same reasons.

Now that the pawn on a5 was not moved last, this allows black to make two extra moves (moving the rook from a8 to a6 and back to a8). Hence white could have made a maximum of 11 moves in this game. Since white made 5 pawn moves and 2 bishop moves, this leaves 4 moves which could have been a capture by the king and a capture by the rook and 2 moves for the king and rook to return home.

For the black bishop to get to d2 in two moves, it would have had to get there via b4. If it went to b4 before the pawn had left d2, then the pawn on d2 would have been pinned and could not leave. If the black bishop went to b4 after the pawn had vacated the d2 square, then the king would have been in check. Since white has no more available moves, this is not possible.

Therefore the bishop was taken by the white rook on a3, and **the queen was taken by the king on d2!**