

# The exciting impact of a game changer

# When Magnus met AlphaZero



Magnus Carlsen and Peter Heine Nielsen at the St. Louis Chess Club. It's been a great year for the World Champion and the head of his analytical team, not in the last place thanks to the inspiration of AlphaZero.

AlphaZero's play has sent shockwaves through the chess world. Magnus Carlsen even confessed that he has become a different player thanks to the inspiration of the revolutionary engine (and Daniil Dubov). **PETER HEINE NIELSEN** looks back on a wonderful year for the World Champion and the role AlphaZero played in his successes.

**I**magine a spaceship landing in the centre of London, friendly aliens having a quick look at the tourist attractions and then quietly leaving again. Apart from the initial shock, I assume life would resume its normal course, except for the fact that we would seriously have to question our technological level and anyone in power would probably be paranoid about the ‘aliens’ teaming up with their enemies.

For chess players, that is how it felt in December 2017, when DeepMind released 10 of the games from the match in which its creation AlphaZero utterly crushed Stockfish, the strongest available engine, in a 100-game match. The London Chess Classic was under way at the time, and we continued preparing for and analysing the games with Stockfish. What else could we do?

At the closing dinner, Demis Hassabis, a former chess prodigy who is now CEO of DeepMind, held a Q&A session in which he explained that AlphaZero was part of the company’s scientific research (in the meantime they have shifted their attention to real-world problems and are playing Starcraft). They had no intentions of upsetting the chess world, but were (justifiably) proud of breathing new life in the attacking prospects in chess.

### Long-term initiative

The ten games that they published certainly achieved this. One was even more beautiful than the next, with AlphaZero giving up pawns and even pieces for a long-term initiative. Most chess experts would have considered this impossible to do against Stockfish until we actually saw it happen. DeepMind also published an academic paper in which they explained the premises of their research. Hungry for every bit of

information, curious chess players obviously read the smallest details, looking to extract as much knowledge as they could.

The following formula:

$$(\mathbf{p}, v) = f_0(s), \quad l = (z - v)^2 - \pi^T \log \mathbf{p} + c \|\theta\|^2$$

is explained at great length, but I think it left us just as wise as non-chess players reading chess notation.

Still, apart from the ten games, the paper did have quite some chess info. Besides playing the main match, DeepMind took the twelve most common opening complexes from human games, and held separate 100 games matches with these as well.

As we could see in a graph, AlphaZero scored 27 wins in 50 games as White in the main line of the Spanish – an amazing feat, considering that it was World Champion Magnus Carlsen’s main opening at the time and that no-one, not even Sergey Karjakin in the 2016 World Championship match, had come

Championship match between Magnus and Fabiano Caruana to finish before publishing the paper, not risking that some novelty played by AlphaZero would influence the match.

Again they were beautiful games, interesting novelties and explanations of AlphaZero’s ‘thought-processes’ in one of its most impressive wins.

But we were still basically left to do our own interpretation of how AlphaZero had renewed chess until, in January 2019, the book *Game Changer* was published, which was literally a game changer! The authors Natasha Regan and Matthew Sadler had had exclusive access to the DeepMind team behind AlphaZero, and to a far larger number of games than had been published.

They had asked for experiments to be done, as well as created hypotheses on why AlphaZero plays like it does,

## One game was even more beautiful than the next, with AlphaZero giving up pawns and even pieces for a long-term initiative.

close to setting him any theoretical problems.

The moves given in the graph are AlphaZero’s preferred choices for both colours, but brutally stop after 7.♙b3 0-0. We still don’t know if AlphaZero prefers the topical 8.a4!? or whether it has actually refuted the Marshall Gambit and plays 8.c3, but that just like Fermat and his famous theorem they thought there was not enough space in the margins to actually inform us.

### 200 new games!

A year passed, and then DeepMind published another paper, this time with 200 new games! They even politely waited for the 2018 World

getting help from the team to either confirm or refute these thoughts. All this is clearly presented in an academic style in *Game Changer*. The book was fittingly presented during the Wijk aan Zee tournament in the Netherlands, where the world elite was gathered, so everybody could start reading and deepening their understanding of chess, and then apply their own interpretation of the new knowledge in the upcoming tournaments.

As Magnus Carlsen stated during a press-conference in Stavanger during this year’s Norway Chess tournament in June: ‘In essence I have become a very different player in terms of style than I was a bit earlier, and it has

## Magnus Carlsen: ‘In essence I have become a very different player in terms of style than I was a bit earlier, and it has been a great ride.’

been a great ride’, acknowledging the inspiration from AlphaZero, and Daniil Dubov!

### Pushing the h-pawn

In Shamkir, at the Vugar Gashimov Memorial, Magnus successfully sacrificed pawns, and in Norway Chess we saw a couple of examples of him successfully following the AlphaZero concept of aggressively pushing his h-pawn towards his opponent’s king.

*Game Changer* devotes a full chapter to this concept. Here’s what Magnus did in Stavanger.

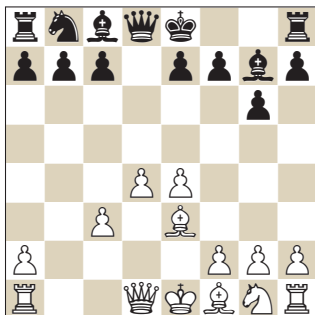
#### Magnus Carlsen

#### Shakhriyar Mamedyarov

Stavanger 2019

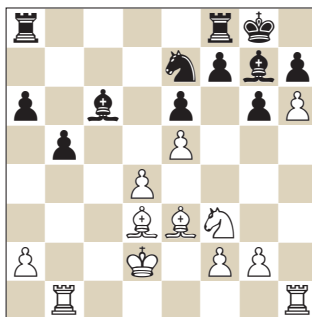
Grünfeld Defence, Exchange Variation

**1.d4** ♖f6 **2.c4** g6 **3.♗c3** d5  
**4.cxd5** ♗xd5 **5.e4** ♗xc3 **6.bxc3**  
**♗g7** **7.♕e3**

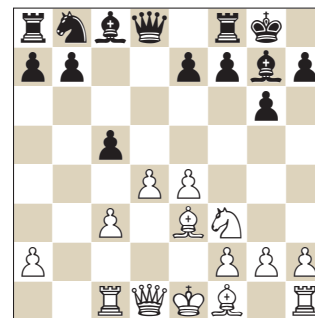


AlphaZero’s favourite against the Grünfeld, which we knew already from the 2017 paper. But with no further moves or explanations! None of the original test games vs. Stockfish featured the Grünfeld, since Stockfish does not play it as Black unless forced to. So, for the sake of the experiment in connection with the writing of *Game Changer*, test games were played, with the position after 2...

g6 3.♗c3 being mandatory, which resulted in 3...d5 4.cxd5 ♗xd5 5.♗f3 ♗g7 6.e4 ♗xc3 7.bxc3 c5 8.♕e3 ♖a5 9.♖d2 ♗c6 10.♖b1 a6 11.♖c1 cxd4 12.cxd4 ♖xd2+ 13.♗xd2 e6 14.♕d3 ♕d7 15.e5 0-0 16.♖b1 b5 17.h4 ♗e7 18.h5 ♕c6 19.h6!



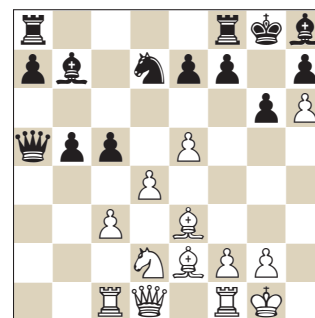
This led to a beautiful win and a model game of utilizing the h-pawn to cramp Black’s king’s position even in a queenless middlegame!  
**7...c5** **8.♖c1** **0-0** **9.♗f3**



### 9...♗d7

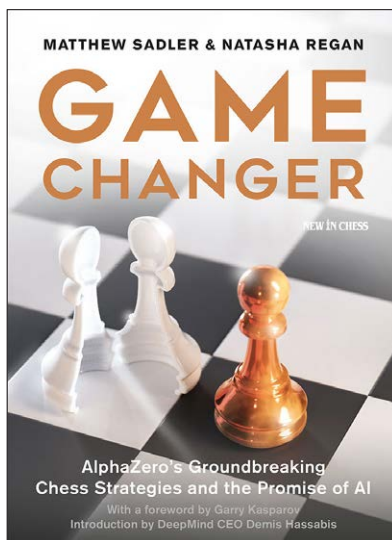
After 9...♖a5 10.♖d2 ♕g4 11.d5 b5 12.♕e2 ♗d7 13.0-0 ♕xf3 14.♕xf3 c4 15.♕e2 ♖fd8 16.f4 ♗b6 17.♕f3 ♖a3 18.h4 Magnus went on to beat Grischuk earlier on in the same tournament (for my further notes see *New In Chess* 2019/5, pp.21-24).

**10.♕e2** ♖a5 **11.0-0** ♖xa2  
**12.♗d2** ♖a5 **13.h4** b5 **14.h5** ♕b7  
**15.h6** ♕h8 **16.e5**



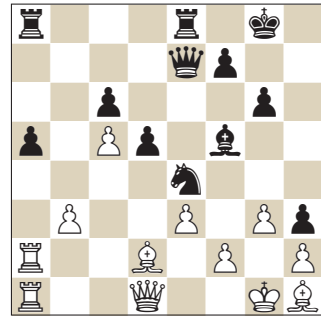
As this game was already debated in detail in *New In Chess* 2019/5 (pp. 20-21), I will not rehash the comments, but this is a text-book example of the AlphaZero attacking concept. Black’s king is crowded by the bishop on h8, and an attempt to liberate the position with ...f6 often will be met by a deadly check on the a2-g8 diagonal, at times even at the cost of material. It is true that the bishop on h8 does parry mating threats on g7, preventing White’s most basic kind of attack, but a slower, much more irresistible wave is coming, starting with f4 next.

In short: Black could be a pawn up, with no immediate white threats, yet strategically he is lost! (Although Mamedyarov managed to escape with a draw after 46 moves.)



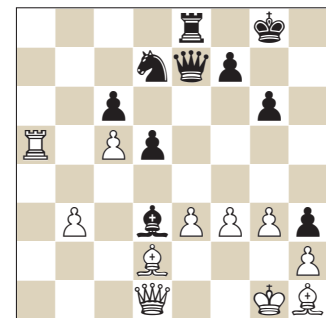
**Game Changer by Natasha Regan and Matthew Sadler is a remarkably lucid introduction to the mysteries of AlphaZero.**





ANALYSIS DIAGRAM

gives counterplay, the principal point being that 24. ♖xa5? ♜xa5 25. ♜xa5 d4! wins instantly for Black, as White's position cannot defend against the immediate threats. Even more cunning might be 23... ♙e4!?, when after 24. f3 ♙d3 25. ♖xa5 ♜xa5 26. ♖xa5 ♘d7



ANALYSIS DIAGRAM

Black has excellent compensation. The bishop will relocate to b5, combining the defence of c6 and control of the squares around White's king, while Black's knight will aim for d3, or if 27.b4 ♘e5, possibly also c4. True, White does have an extra pawn, but we are playing for much higher stakes.

21. ♙h1 may be just wrong. If the bishop ends up stuck on h1 with a pawn on f3, then it just crowds the white king, depriving it of an escape square. This makes 21. ♙f3 a logical move, but then Black can start aiming at the bishop by transferring a knight to g5. If it retreats to e2 then, after a ... ♙xc5 scenario, ... ♗e4 will threaten mate on g2. Black starts with 21... ♗e7, with a very interesting struggle ahead.

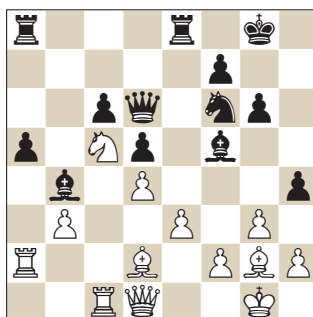


In his game against Magnus Carlsen at Norway Chess, Shakhriyar Mamedyarov was not ready yet to take the march of the h-pawn one step further.

## Not ready yet

Interestingly, these same players could have been in a similar situation two months earlier in Shamkir, but at that point the 'march of the h-pawn' had not caught on yet.

**Magnus Carlsen**  
**Shakhriyar Mamedyarov**  
Shamkir 2019



position after 20. ♘c5

When you think about this game from the Gashimov Memorial earlier in the year, this position springs to mind. Mamedyarov continued in traditional fashion, stepping up the pressure along the h-file, and it was

only very accurate defending that allowed Magnus to keep the balance. The game ended in a draw after:

20... ♙g7 21. ♙xb4 axb4 22. ♖xa8 ♜xa8 23. ♖a1 ♜h8 24. ♗e1 hxg3 25. hxg3 ♘e4 26. ♘xe4 ♙xe4 27. ♙xe4 dx4 28. ♖a5 ♜h5 29. ♖xh5 gxh5 30. ♙g2 c5 31. dxc5 ♗xc5 32. ♗d1 ♗c3 33. ♗d5 ♙f6 34. ♗d6+ ♙g7 35. ♗d5 ♙f6 36. ♗d6+ ♙g7 37. ♗d5 ♙f6 Draw.

No one seemed to contest that this was the logical turn of events; neither the live commentary nor the press conference that followed paid any attention to this position.

Maybe humanity is just not ready for it yet, but it seems likely that in the diagrammed position, AlphaZero would have played 20...h3!?. At first, Stockfish laughs at this move, but then it goes along and evaluates it as 0.00, like quite some other moves in the position. After 21. ♙h1 ♗e7 22. ♖ca1 White does break through on the queenside, but 22... ♙xc5 23. dxc5 ♘e4

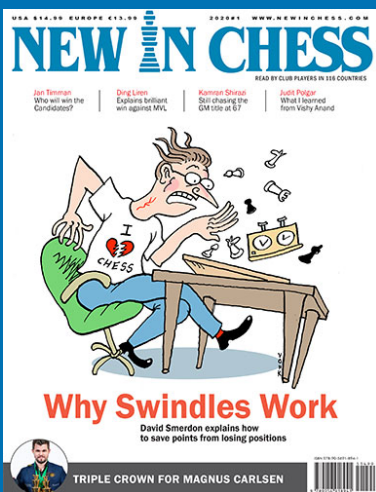


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## King mobility

In *Game Changer* the authors make the highly interesting statistical observation that AlphaZero seems to value 'king mobility' a lot more highly than traditional engines. Obviously, this will manifest itself in the later stage of the games, since AlphaZero wins more often than it loses, and a game of chess is decided by giving checkmate, the ultimate removal of all mobility from the opponent's king!

15...♖c6 16.♗f3 ♘e7 17.♗e5 ♘g6 18.f4 ♗xe5 19.fxe5 ♕c6, when Black manages to threaten mate on g2 just in time before White plays ♗f3, and after 20.g3 ♗d7 Black's resources have proved sufficient to hold the balance. Strangely enough, White's 'safe' king becomes the problem, because Black uses it to win an important tempo when reorganizing his defence. At the same time, the possibilities to attack Black's king are restricted, since White cannot

## A game of chess is decided by giving checkmate, the ultimate removal of all mobility from the opponent's king!

But in the opening stages of the game, the statistics also show that AlphaZero prefers to have more squares available around its king for it to feel comfortable.

attack freely on the kingside when his own king is located there. So Magnus played:

**15.0-0-0**

A spectacular move, at least by our traditional understanding of chess. But AlphaZero might approve! While Black's king is restricted on g8, White's on c1 has a lot more mobility – in a strict mathematical sense 4 vs 2 available squares. Of course, White's king is not 'safe' by traditional standards, but is it less safe than Black's counterpart on g8? If White castles short, positional features where White's pawn on c3 looks weak become a factor, while with opposite castling the relative king safety becomes the relevant factor. And White has the easier plan, aiming for h4 and ♖h3. Like with the h6/...h3 positions, it would be a bold statement to say that 15.0-0-0 is a better plan than the traditional ones, but it is interesting and has every right to exist, and leads to a far more complex battle!

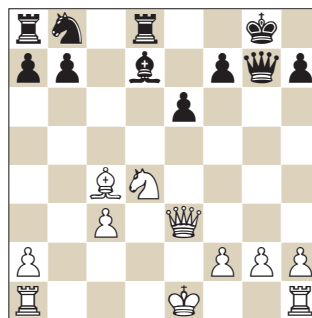
**15...♗c6 16.♕b3 ♕e8**

16...♗e5 has been seen in similar positions, with Black trying to temper White's attack by exchanging queens, but after 17.♗h6 ♗g7 White will not repeat but retreat to either h5 or h4.

### Magnus Carlsen Levon Aronian Zagreb 2019

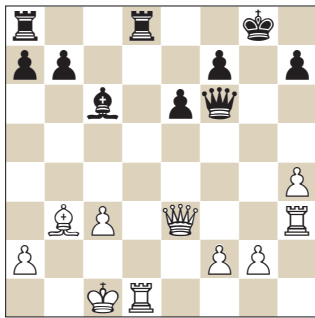
Queen's Gambit Declined, Vienna Variation

1.d4 ♗f6 2.c4 e6 3.♗f3 d5 4.♗c3  
♕b4 5.♕g5 dxc4 6.e4 c5 7.e5  
cx4 8.♗xd4 ♕xc3+ 9.bxc3  
♖a5 10.exf6 ♗xg5 11.fxg7  
♗xg7 12.♗d2 0-0 13.♕xc4 ♗d8  
14.♗e3 ♕d7



Before this game White had always castled kingside, 15.0-0, in this position. It is the obvious move, safeguarding the king before further action, with games continuing

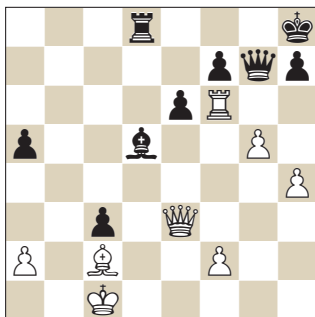
17. ♖xc6 ♗xc6 18. h4 ♕f6  
19. ♖h3



### 19...b5

Here Magnus uses another theme from *Game Changer*, the rook lift, zig-zagging his rook to the proximity of Black's king. But maybe it would have been better to 'go full AlphaZero' on Black: 20.h5!? b4 21.h6!, and things are anything but simple for Black after 21...♗xc3+ 22.♗xc3 bxc3 23.♖xd8+ ♖xd8 24.♖xc3, since the rook ending after 24...♗d5 25.♗xd5 exd5 26.♖c6, followed by a4, is close to being lost. But since 21...♗h8 22.g4!, threatening 23.g5, only makes things worse for Black, his position is hard to defend.

20. ♖g3+ ♖h8 21. ♖g4 a5 22. ♖f4  
♗g7 23. ♖xd8+ ♖xd8 24. g4 b4  
25. g5 bxc3 26. ♗c2 ♗d5 27. ♖f6



### 27... ♗f8!

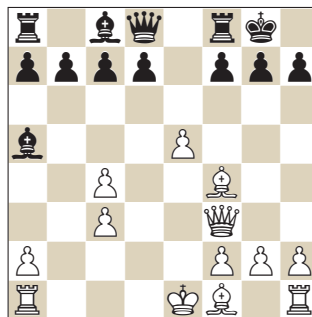
Aronian manages to create counter-threats just in time, and defended brilliantly to save the game.

28. ♗xc3 ♖c8! 29. ♗d3 ♗g7  
30. f4 ♖g8 31. ♗d2 h6 32. a3  
hxg5 33. fxg5 ♖c4 34. ♗g3 ♗e4  
35. ♗b3 ♖d4+ 36. ♖e1 ♗f5 37. h5

♖d3 38. ♗b8+ ♗f8 39. ♗xf8+  
♖xf8 40. ♗c2 ♖h3 41. ♗xf5 exf5  
42. h6 ♖g8 43. a4 ♖h4 44. ♖xf5  
♖xa4 45. ♖f2 ♖g4 46. ♖f3 ♖g1  
47. ♖f2 ♖g4 48. ♖f3 ♖g1 49. ♖f2  
Draw.

A few months later, the world's two highest-rated humans butted heads in Isle of Man, and again Magnus chose a spectacular way to castle.

**Magnus Carlsen**  
**Fabiano Caruana**  
Douglas 2019 (9)



position after 10...0-0

Here Magnus played: **11.0-0-0!**

The similarity to the Aronian game is striking. White again castles into open space, but this time Black even has a 'perfect' castle, with pawns at f7, g7 and h7. The *Game Changer* king-mobility count, however, is a 4-1 in favour of White. More importantly, Black's kingside is unprotected, especially with the bishop as far away as on a5. As in the Aronian game, the weakness of the c-pawn(s) becomes less important with opposite castling. The question now is who gets to the opposite king first?

For the rest of this game I refer to Erwin l'Ami's notes in his report on the Isle of Man Grand Swiss elsewhere in this issue.

### Turning things upside down

Apart from general concepts, *Game Changer* also debates a number of AlphaZero's specific opening ideas, and analyses them in great detail. This has not gone unnoticed either.

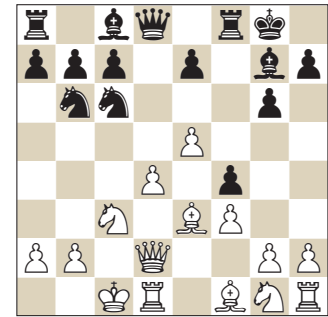
Wesley So

Magnus Carlsen

Stavanger (Armageddon) 2019

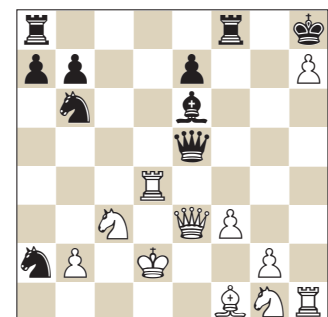
Anti-Grünfeld Indian

1. d4 ♖f6 2. c4 g6 3. f3 d5 4. cxd5  
♗xd5 5. e4 ♗b6 6. ♗c3 ♗g7 7. ♗e3  
0-0 8. ♗d2 ♗c6 9. 0-0-0 f5 10. e5 f4



An amazing concept. After 10.e5 Black usually continued 10...♗b4, when after 11.♗h3 White kept a positional bind that at times turned into a kingside attack (with Magnus' own spectacular win against Li Chao, Doha 2015, as the primary example).

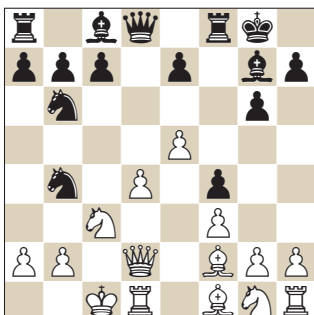
With 10...f4!? AlphaZero turned things upside down, sacrificing a pawn, saying that with opposite castling, mobility and time are more important. In *Game Changer* they analyse: 11. ♗xf4 ♗b4 12. h4 ♗e6 13. h5 c5 14. hxg6 ♗c7!! 15. gxh7+ ♖h8 16. ♗h6 cxd4 17. ♗xg7+ ♖xg7 18. ♗h6+ ♖h8 19. ♖xd4 ♗xa2+ 20. ♗d2 ♗e5 21. ♗e3



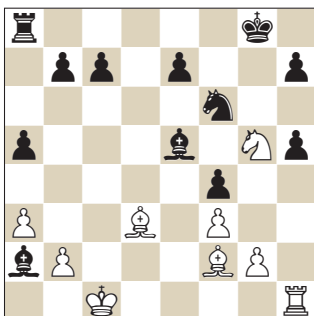
So why did AlphaZero play it? Simply because it found it was Black's relatively best option! This was a training game with the position till 9...f5 being forced and AlphaZero saying 'I strongly object to this position, but having said that, how about this pawn sacrifice?'



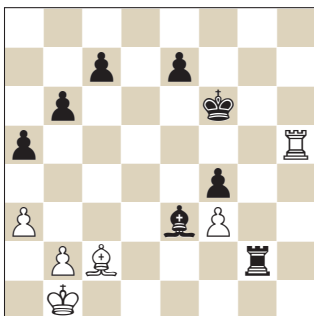
11. ♖f2 ♜b4 As this was a blitz game, the following moves indeed lack accuracy, but in the end Magnus exploits the mobility created by 10... f4!?, but then agrees to repetition, as this was an Armageddon game.



12. a3 a5 13. h4 ♖e6 14. ♘h3 ♘a2+ 15. ♘xa2 ♖xa2 16. d5 ♗xd5 17. ♗xd5+ ♘xd5 18. ♖e1 ♖f5 19. ♖d3 ♖xe5 20. ♖xe5 ♖xe5 21. h5 gxh5 22. ♘g5 ♘f6



23. ♘xh7 ♖d8 24. ♖c2 ♖f7 25. ♘g5 ♖d4 26. ♖e1 b6 27. ♖h4 ♖e3+ 28. ♖b1 ♖d2 29. ♘xf7 ♖xf7 30. ♖xf6 ♖xf6 31. ♖xh5 ♖xg2



32. ♖h6+ ♖e5 33. ♖h5+ ♖d6 34. ♖h6+ ♖e5 35. ♖h5+ ♖d6 36. ♖h6+ Draw.

NEW IN CHESS



In their Armageddon game at Norway Chess, Magnus Carlsen defeated Wesley So with an amazing concept that AlphaZero had found in a training game.

### The absolutely sharpest choice

In what is maybe the sharpest of all openings, the Anti-Moscow Gambit, AlphaZero also had its say, adding to a debate that is very much on the opening theorists' radar.

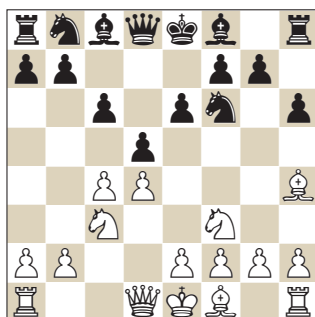
**Magnus Carlsen**

**Maxim Matlakov**

Douglas 2019 (10)

Semi-Slav, Anti-Moscow Gambit

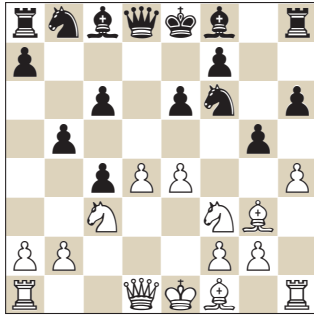
1. ♘f3 ♘f6 2. d4 d5 3. c4 e6 4. ♖c3 c6 5. ♖g5 h6 6. ♖h4



AlphaZero goes for the absolutely sharpest choice, the Anti-Moscow Gambit, in which White sacrifices a full pawn for long-term compensation. We tend to describe AlphaZero's style as aggressive, with a strong willingness to give up material for the

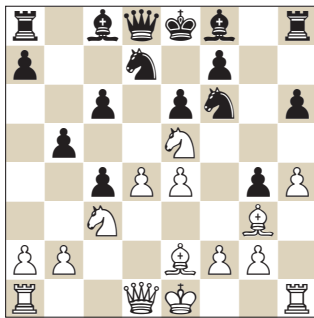
initiative. This view was very much influenced by the first 10 published games of 2017, but still holds when you see the 2018 games. Yet how does that explain its preference for the Berlin as Black? It is hard to see any other reason than that the Berlin is a good or even optimal choice! No matter whether efficiency means sacrificing material or being incredibly solid, they will do what is required! Regardless of whether they are the pinnacle of AI or the Chess World Champion. 6...dxc4 7.e4 g5 8. ♖g3 b5 9.h4

**No matter whether efficiency means sacrificing material or being incredibly solid, they will do what is required! Regardless of whether they are the pinnacle of AI or the Chess World Champion.**

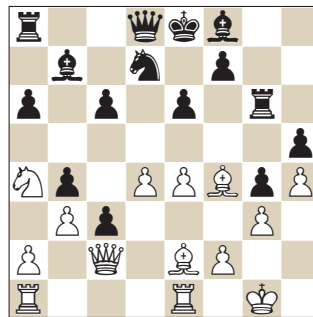


I seconded Vishy Anand in the 2007 World Championship in Mexico, where the Anti-Moscow Gambit was all the rage. In those days, however, White would either push h4 a bit later or not at all. AlphaZero adds its own flavour:

**9...g4 10.♘e5 ♘bd7 11.♙e2**

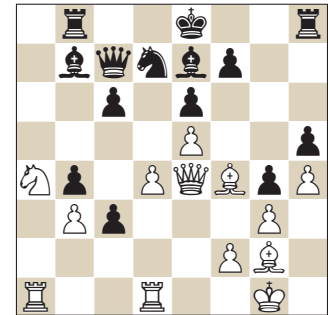


**11...♙b7** In the AlphaZero-Stockfish game a different move-order appeared: 11...♘xe5 12.♙xe5 ♖g8 13.0-0 ♙b7 14.♖e1 a6 15.g3. What was striking in this AlphaZero game was the absolute calmness in the style of play, believing that the long-term compensation is sufficient and thus calmly improving the position as if there is absolutely no hurry at all to prove that White's initiative compensates for the investment: 15...h5 16.♗c2 ♘d7 17.♙f4 ♖g6 18.b3 b4 19.♘a4 c3



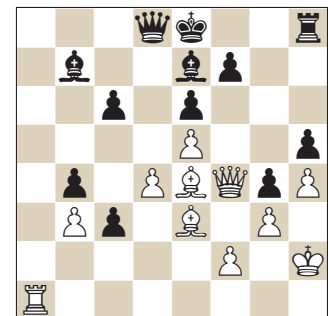
Black gets a protected passed pawn, but that doesn't seem to worry AlphaZero the slightest either, since it instead gets access to the

b1-h7 diagonal for its bishop and can continue to slowly improve its position: 20.e5 ♗c7 21.♙d3 ♖g8 22.♙h7 ♖h8 23.♙e4 a5 24.a3 ♙e7 25.♙g2 ♖d8 26.axb4 axb4 27.♗e4 ♖b8 28.♙ed1!



ANALYSIS DIAGRAM

A strategic gem has materialized. Black is basically committed to passively waiting for White to try to break through, as 28...c5 will now be met strongly by 29.d5 ♙xd5 30.♖xd5 exd5 31.♗xd5, when the exchange sac turns White's long-term prospects into an immediate tactical win. 28...♖d8 29.♙h2 ♖a8 30.♙e3 ♘b6 31.♘xb6 ♖xa1 32.♖xa1 ♗xb6 33.♗f4 ♗c7 34.♙e4 ♗d8



ANALYSIS DIAGRAM

35.f3!. Breaking Black's 'fortress'. 35...♖g8 36.♗h6 ♘d7 37.♗xh5 ♗e8 38.♗h6 ♗b8 39.♗f4 f5 40.exf6 ♗xf4 41.♙xf4 ♙xf6 42.fxg4 ♙c8 43.♖a4 ♙xh4 44.♖xb4 ♙f6 45.♖c4 ♘d8 46.♖xc3 ♖xg4 47.♖c4 ♖g7 48.♙xc6 ♙a6 49.♖b4 ♙c8 50.♙g2 ♖a7 51.♙f3 ♙e7 52.♙e5 ♙xe5 53.dxe5 ♖c7 54.♙e4 ♖c3+ 55.♙f4 ♖c1 56.♖c4 ♖f1+ 57.♙g5 1-0.

**12.♘xd7 ♗xd7 13.♙e5 ♗e7**

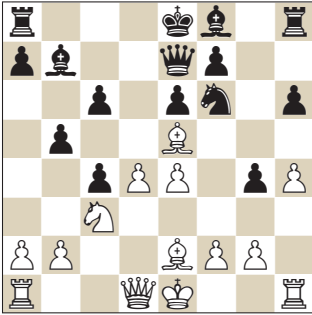


At the FIDE Grand Swiss, Magnus Carlsen created a strategic gem against Maxim Matlakov with an idea gleaned from a game between AlphaZero and Stockfish.

MARIA EMELJANOVA



Had Matlakov retreated to d8, then after 13...♖d8 14.0-0 ♜g8 it would have been a straight transposition to the AlphaZero game!

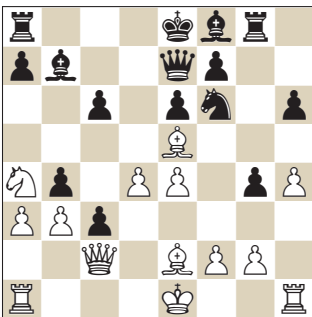


**14.b3!?** Magnus immediately pokes the queenside, inviting Black to get his protected passed pawn on c3.

**14...♞g8**

Matlakov's idea is that 15.bxc4 b4 now allows Black to play 16...♘xe4, trading his queenside pawn for a central pawn. That would also lead to interesting complications, but Magnus stays loyal to the AlphaZero concept and protects his e4-pawn.

**15.♖c2 b4 16.♘a4 c3 17.a3**



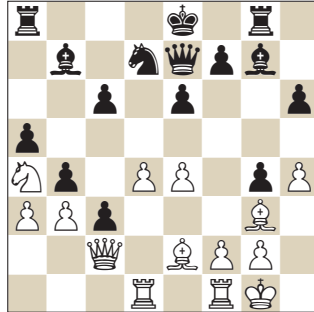
The inclusion of a3/...a5 generally favours White, not only because of the option of opening the a-file, but also because it gives access to the b6-square. Since 17...a5? 18.♘b6! is very good for White, Matlakov has to make a couple of intermediate moves before protecting the b4-pawn.

**17...♘d7 18.♙g3 ♙g7 19.♞d1**

A necessary precaution. 19.e5 c5! would be grim for White, because his centre would crumble.

## Magnus' play is like that in the original ten AlphaZero games, with the initiative being a more important factor than the number of pawns.

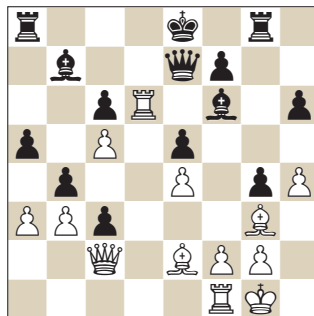
**19...a5 20.0-0**



**20...♙f6!?** 20...e5 21.♙xg4 ♞d8! would also be interesting, trying to undermine the white centre and hoping to withstand the attacking possibilities White would get in the process. But Matlakov's move is obviously critical, trying to simply pick up the h4-pawn, and thus forcing Magnus to show his hand.

**21.♘c5!?**

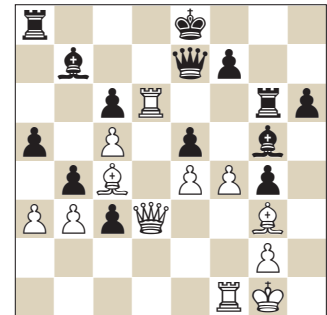
The right plan, but the wrong execution! White indeed has to give up more pawns, but the incredible 21.♙c7!! was the way, when 21...♙xh4 22.e5 gives White a huge initiative for the two sacrificed pawns. 21...♞c8 would be logical, but the a3/...a5 inclusion means that 22.♙xa5! is possible! **21...♘xc5 22.dxc5 e5 23.♞d6**



Magnus' play is like that in the original ten AlphaZero games, with the initiative being a more important factor than the number of pawns, even if objectively speaking Black is fine.

But because he was short of time, Matlakov was facing a difficult practical job.

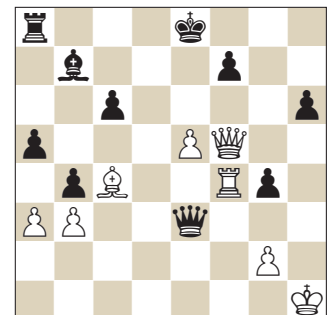
**23...♙xh4 24.♙c4 ♙g5 25.♖d3 ♞g6 26.f4**



**26...exf4?** This logical move ruins Black's position. 26...gxf3 27.♖xf3 ♞g7 will hold, but only if Black finds 28.♙xe5 ♖xe5 29.♙xf7+ ♔f8!? 30.♙c4+ ♙f4!, when Black's passed pawn on c3 will finally show its relevance in the ensuing endgame.

**27.♙xf4?** In the post-game press conference Magnus said he had actually intended the crushing 27.e5!, but then somehow forgot!

**27...♙xf4 28.♞xf4 c2 29.♖xc2 ♞xd6 30.cxd6 ♖xd6 31.e5! ♖c5+ 32.♔h1 ♖e3 33.♖f5**



Black's king is caught in the centre, and although Magnus could have won more quickly, the result never was in doubt (1-0, 80). ■