

# Variant Chess

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C. F. Jaenisch, *The Chess Monthly*, 1859

## Diagonally quasi-magic tours

Bidding Chess

Knight Relay Chess

## BIDDING CHESS

Noam Elkies has told me of a recent mathematical games conference he attended in Banff, Canada, where the game of "Bidding Chess" was played deep into the night (he didn't actually say this, but I know what these meetings can be like). He thought I might find it of interest, which I did, and I think our readers will also.

The essence of a "bidding game" is that the normal alternation of play is abandoned, and instead the players each have a pile of chips and bid for the right to move next. As originally conceived by the late David Richman, players could bid any amount whether integral, fractional, or even irrational, the infinitesimally rare ties being decided by tossing a coin. An account of these games is in the book *Games of No Chance* which I mentioned briefly in VC 49. More recently, there have been "discrete bidding" games, in which each player has a pile of chips, the bid is of an integral number of chips (or zero), and there is a non-random rule to decide who wins in the event of a tie. These are discussed in general terms in a paper "Discrete Bidding Games" by Mike Develin and Sam Payne, which can be downloaded from the web site

<<http://arxiv.org/abs/0801.0579>>.

However, the general thrust of this paper is theoretical and mathematical, and Bidding Chess features only as an illustrative example occupying two pages out of thirty. The present article will look at it a little more deeply.

The rules of Bidding Chess are as follows.

- There is no check or stalemate, and the game is won by physically capturing the opponent's king.
- The normal "alternation of play" rule is abandoned, and instead each player has a stack of chips. At each turn, each player makes a sealed bid for the right to decide who makes the next move. The player bidding higher pays the amount of his bid to his opponent, and then either makes the next move himself or requires his opponent to do so.
- There is a special "tie-break chip", which is initially held by one of the players. In the event of a tie, that player can decide either to claim the tie or to concede it. If he claims, he plays the amount of his bid to his opponent, hands over the tie-break chip, and makes or requires his opponent to make the next move; if he concedes, he claims the value of his opponent's bid and retains the tie-break chip, and his opponent decides who makes the move.

Before looking at Bidding Chess in detail, let us state two theorems which apply to all games of this kind.

(1) Having the tie-break chip is never a disadvantage [formally, if a player with  $N$  chips can force a win from a given position against an opponent with  $M^*$  chips, where " $*$ " denotes possession of the tie-break chip, he can force a win from the same position with  $N^*$  chips against  $M$ ].

(2) However, its value is less than that of a single ordinary chip [if a player can force a win with  $N^*$  chips against  $(M + 1)$ , he can also force a win with  $(N + 1)$  chips against  $M^*$ ].

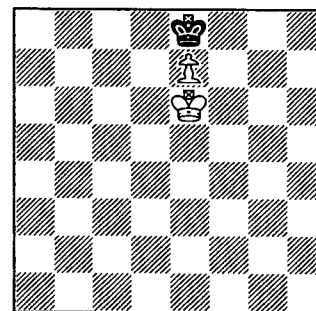
These theorems are proved rigorously in the paper, but the broad thrust of the argument is that the player follows the known win as far as possible, and exploits the extra advantage when it is needed.

If a player has half the total chips and also has the tie-break chip, he can make the next move. If he has *more than three-quarters* of the chips, and the total number of chips is divisible by 4, he can make the next two moves (because if he has more than three-quarters of the total, his opponent must have less than a quarter, so he can bid a quarter of the total, claim the first move, and then bid half the total and claim the next). Similarly, if he has more than seven-eighths of the chips and the total number of chips is divisible by 8, he can make the next three moves. The divisibility criterion can be relaxed by a factor of 2 if the player also has the tie-break chip (because he doesn't need to bid an exact quarter or eighth to get the first move, but can simply match his opponent's holding), but "more than"

is essential. Equality is not enough, even with the tie-break chip. Suppose a player has  $3N^*$  chips against his opponent's  $N$ . He can bid  $N$  chips and use the tie-break chip to claim the first move, but he then has to hand over the tie-break chip, and his opponent has  $2N^*$  against  $2N$  and can claim the second move.

And if a player has all the chips, including the tie-break chip, and the total number of chips is at least 63, he can claim the next seven moves (he bids 0 and claims the tie, then 1, 2, 4, 8, 16, and 32), march his king straight across the board (unless it is blocked by his other men), and take his adversary.

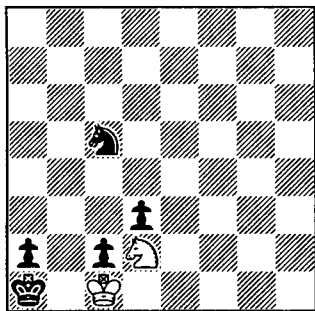
To show that a player should sometimes choose to concede a tie even though he holds the tie-break chip, consider the following position :



Suppose that White and Black each have  $N$  chips, and that White has the tie-break chip. To win, White bids 0 and concedes the tie, letting Black decide who moves next but keeping  $N^*$  chips against  $N$ . If Black decides to make the move himself, he will have to move his king into danger, and White will claim the next move and capture it. If Black decides to give the move to White, White will advance his king (the player bidding higher can require his opponent to move, but cannot dictate the move that he plays), and again he will capture Black's king next move. But if White claims the tie, Black will have  $N^*$  chips against  $N$ , so White will not dare to bring the kings together and will have to mark time; and on subsequent turns, Black will bid 0 and concede the tie, retaining  $N^*$  chips against  $N$  and making White continue to mark time. Drawn game.

Examples can also be found where a player should concede the tie-break after having bid a non-zero number of chips, but there is an important difference: such a situation can arise only as a result of faulty bidding. If the player with the tie-break chip is going to bid  $N$  chips and then concede a tie, he might just as well have bid only  $(N - 1)$  chips and claimed a tie; he still loses the right to move if his opponent bids  $N$  chips or more, but if his opponent bids  $(N - 1)$  or less he gains it at a cost of one chip fewer. So, when working out a best-play line for both sides, the only options that need be considered for the player with the tie-break chip are (a) to bid 0 and concede a tie, (b) to bid 0 but claim a tie, and (c) to bid a positive number and claim.

In the paper, the possibility of "reciprocal zugzwang" is given as a reason why a player might wish to make his opponent move instead of moving himself. It therefore occurred to me to look at the position below, which in ordinary chess is an extreme reciprocal zugzwang (whoever is to move must allow mate in one), and to see what happens in Bidding Chess.



In the example game in the paper, the players start with 100 chips each and White has the tie-break chip, so let us assume the same here.

White's optimal bid is 24. Suppose first that Black also bids 24. White claims the tie and hands over 24 chips and the tie-break chip, making the chips 76 : 124 \*, and plays Nb3. White now threatens NxK, so Black *must* claim the right to the next move, and he therefore bids 76, claims the tie, and plays ...Nxb3. But this makes the chips 152 \* : 48 (we shall always display these chip counts with White's

total first), so White now has more than three-quarters of them, and he will claim the next two moves and play Kb1 and KxK.

Alternatively, suppose Black bids 25. Having won the bid, he pays this across, making the chips 125 \* : 75, and plays ...Nb3 threatening White's king (we shall see in a moment that nothing else is better). White duly bids 75 and claims the next move, making the chips 50 : 150 \*, and plays Nxb3 threatening Black's king in turn. Black has to bid 50 and claim the next move, but this makes the chips 100 \* : 100, so White will claim the move after and Black can do nothing to bring his king to safety. Nor would it have helped to move his knight elsewhere at the first move. Suppose ...Na4 instead of ...Nb3; White's Nb3 is no longer a capture, but it still threatens Black's king, and Black's knight cannot do anything useful.

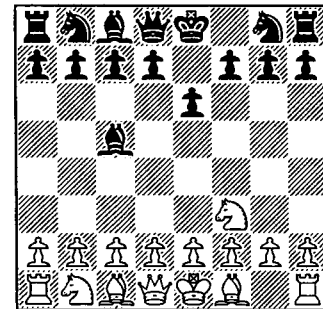
We leave the reader to satisfy himself that White loses if he bids 25 and claims the tie if Black also bids 25, if he bids 26 or more and Black bids 25 or less, and if he bids 23 or less and Black bids 24. He does win if he bids 25 and concedes a tie, but this merely illustrates the point we made earlier: it wins, but bidding one fewer and claiming a tie does just as well and at potentially less cost.

Noam didn't note down any game scores at Banff, and in any case the Banff games were played using only 28 chips (because sets of dominoes were conveniently available) and this was perhaps a little on the small side. One of the topics explored at Banff was the extent to which the precise number of chips available affected a game's strategy, and my feeling, at least in respect of this particular game, is that the strategy is richer and the game more interesting when the number of chips is relatively large. If suitably many real chips are not available, a score can be kept using the pencil and paper which are needed anyway for writing down the bids.

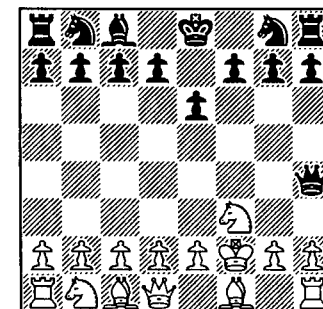
The example game in the paper was a real one, but the loser played rather cluelessly, and I think it can be made more instructive by altering it a little. The version which follows is therefore

partly composed. White is reasonably good at ordinary chess but a novice at the present game, Black has played at least once before.

We start with chips 100 \* : 100. White bids 3 and wins the first move, making the chip situation 97 \* : 103, and plays Nf3. He bids 3 again, but Black bids 4 (chips 101 \* : 99) and plays ...e6. White therefore ups his third bid to 5, but Black bids 8 (chips 109 \* : 91) and plays ...Bc5 :



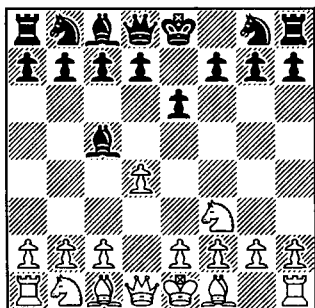
In ordinary chess, White would now chase Black's bishop away by d4, and he would think he was doing quite well. White bids 9 with this in mind, and he is very surprised when he finds that Black has bid 19 (chips 128 \* : 72) in order to play ...Bxf2. But White has to make the next move or his king will be taken, so he bids 72, claims the tie (chips 56 : 144 \*), and plays Kxf2. Black now bids 56, claims the tie (chips 112 \* : 88), and plays ...Qh4 to attack the king again :



The chips being 112 \* : 88, White must bid 88 to claim the next move and play NxQ, but this leaves Black with over seven-eighths of the chips (the precise figures are 24 : 176 \*). So Black will be able to claim the next three moves, and his knight from g8 will walk down and take the king.

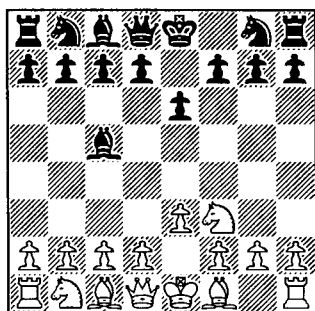
We thus see that allowing Black to capture on f2 at a cost of only 19

chips was a losing play, but White's intended d4 might not have fared a great deal better. Suppose that White bids 19 at turn 4, claims the tie, making the chips 90 : 110 \*, and plays d4 :



Black bids 38 in the hope of being able to play ...Bb4 (chips 128 \* : 72), and if he is allowed to he again has a forced win; White must interpose, making the chips 56 : 144 \*, Black bids 56 to capture and renew the threat (chips 112 \* : 88), White must bid 88 to capture the bishop (chips 24 : 176 \*), and this time it is the queen which will exploit Black's three moves to come down and take the king. So White must bid 39 to play dxc5, and this leaves the chips 51 : 149 \*. There is no longer an immediate forced win for Black, at least not one that I can see, but he has nearly three-quarters of the chips, and this will surely outweigh White's extra piece and slightly better development.

Somewhat more tentatively, we can extrapolate further. We have seen that White has to stop ...Bxf2 at turn 4, and that playing d4 appears to be insufficient. This leaves e3 :



But the chips are now 90 : 110 \*, and White has no apparent compensation. This cannot be good.

So it looks as if White should have played e3 while he had a chance to do

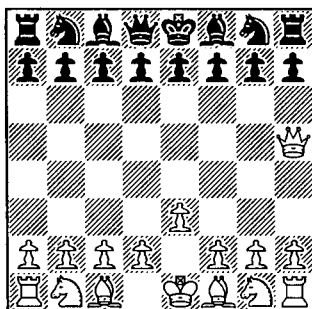
so cheaply, and since his only other opportunity was at turn 1, it may be that even his opening Nf3, however natural a move it may be at ordinary chess, was a poor choice here.

In so far as one can judge from these simple examples, the game appears to have the following properties.

- "Checks" (threats to take the king) are much more important than at ordinary chess. In ordinary chess, a check which is not part of a forcing combination or a double attack is likely to be a waste of time. Here, *any* check forces the opponent to bid as many chips as are necessary to claim the next move, and this may be cripplingly expensive.
- If both kings are vulnerable, even the smallest chip advantage may be decisive. In our second example, both kings are within two moves of capture, and whoever has more chips (or the tie-break chip if the ordinary chips are equal) can force a win.

It seems probable that the benefit of being ahead on chips will filter back even into less sharp positions, and indeed we can state immediately that in a symmetrical position, whoever has more chips can at the very least hold the draw. In ordinary chess, "if White plays perfectly, Black cannot win" is generally believed to be true but remains unproven. In the present game, it follows immediately from the first of our general theorems.

I shall be interested to hear of further experiments. In the meantime, in the position below, with chips already 88 \* : 112, can White bid a further 20 chips in order to play Qxf7?

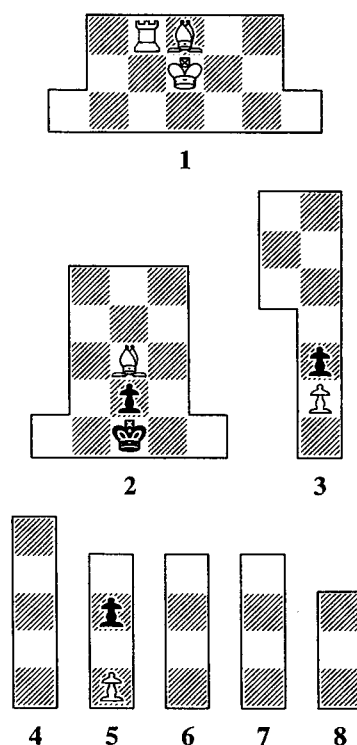


Answer on page 55.

## A CHESS JIGSAW

George Bell, who has been doing good work on the game of peg solitaire, was invited to a recent gathering due to be held in honour of Martin Gardner, and as a contribution to the festivities he told me he intended to take a chess puzzle consisting of a cut-up diagram which had to be reassembled so as to show positions with various properties. It reminded me of a jigsaw puzzle created some years ago by the South African problemist D. G. McIntyre.

McIntyre's puzzle comprised eight pieces as follows :



The task is to reassemble the pieces into a properly checkered chessboard (there are three essentially different ways of doing this), and then to solve the three-move chess problems which result (each way of reassembling the board produces a valid three-mover). Pieces 1-3 and 5 must be oriented as shown, but the unoccupied pieces may be oriented in any direction.

It isn't as hard as it may sound, and I think the problems, which are elegant rather than difficult, will appeal even to readers who normally take no interest in such things. Answers on page 55.

## THE GAMES PEOPLE PLAY

A year or two ago, Fabrice Liardet drew my attention to the wide range of chess variants offered to players on the BrainKing web site <www.brainking.com>. A look at the site early in March showed that the 123 different games available for play included Chess itself, XiangQi, Shogi, and no fewer than 32 others of chess type. 21 of these are in *ECV 2* under the same or different names, possibly with minor rule variations (it is in the nature of variants that they vary, and I do not claim to have checked the dotting of every "i" and the crossing of every "t") :

- Amazon Chess
- Ambiguous Chess
- Anti Chess (as Losing Chess)
- Atomic Chess (as on *ECV 2* page 42)
- Berolina Chess
- Cheshire Cat Chess
- Cylinder Chess
- Dark Chess
- Extinction Chess
- Fischer Random Chess (as Fischerandom Chess)
- Grand Chess (as on *ECV 2* page 124)
- Horde Chess
- Janus Chess
- Jungle (as The Jungle Game)
- Knight Relay Chess
- Legan Chess (as Legan's Game)
- Loop Chess (as Chessgi)
- Los Alamos Chess
- Maharajah Chess (as The Maharajah and the Sepoys)
- Minishogi
- Three Checks Chess (as Three-Check Chess)

Dark Chess is described in *ECV 2* as "a similar variant" to Darkness Chess, but in fact it appears to be identical. The use of the names "Anti Chess" for Losing Chess and "Loop Chess" for Chessgi will be noticed.

The remaining eleven games are outlined below.

**Behemoth Chess** is a variant of Piece-Eater Chess. It adds a chance element in the shape of a Behemoth, which initially occupies d4. After each move, the Behemoth picks one of the eight orthogonal and diagonal directions at random and moves a random number of squares from 1 to 4 in this direction, swallowing everything in its path. If this takes it off the edge of the board, it reappears on the far side (so if the randomizer turns up "SW 4" at the first move, it moves from d4 to c3, b2, a1, and h8). It cannot be captured. There is no check, and a player loses if his king is captured either by an opposing man or by the Behemoth. If the Behemoth captures both kings at the same time, the game is drawn.

**Capablanca Random Chess** (Reinhard Scharnagl) applies the ideas of Fisherandom Chess to Capablanca's 10 x 8 game, where the normal pieces are supplemented by an Archbishop (B+N) and a Chancellor (R+N). The pieces are randomized subject to the Fischerandom and certain

other constraints (bishops on opposite colours, Q and A likewise, king between the rooks, every pawn guarded by a friendly piece, Black's pieces mirror White's on the file). Castling allowed subject to the usual constraints.

**Corner Chess [BrainKing]** is a randomized variant in which Black's pieces mirror White's diametrically. Kings on h1 and a8, bishops on squares of opposite colour. There is no castling. **Fortress Chess [BrainKing]** is the same game with extra White pawns on fgh3 and extra Black pawns on abc6.

**Dice Chess [BrainKing]** uses a notional die with 1 = P, 2 = N, 3 = B, 4 = R, 5 = Q, 6 = K, and "BrainKing does not roll the die to indicate an immobile piece" (if the game is played with an ordinary die, "roll again if an immobile piece is shown" will achieve the same result rather more slowly). If a pawn is about to promote, it may be moved even if the die does not show 1, but may promote only to the piece shown by the die; if the die shows 1, it may promote to any piece.

**Embassy Chess** is yet another added-knight-power variant. Board 10 x 8; extra pieces are Marshall (N+R) and Cardinal (N+B); baseline RNBQKMCBNR.

**Ice Age Chess** (Köksal Karakus) is wholly new. Normal board and men, but at the start all 32 empty squares are filled with ice cubes. These act as obstacles, but can be captured (so White's first move can be d2xe3 but cannot be d2-d3 or d2-d4, and his next may be Qd1xd3 but not Qd1-d4 or beyond). Furthermore, after Black's 20th move, 40th, 60th, and so on, there is an Ice Age, when any empty square which does not have a man immediately adjacent to it on every available side (four sides in the case of a square away from the edge, three sides for an edge square, two sides for a corner square) is filled with a new ice cube. Yet further, if an Ice Age leaves a man surrounded by ice cubes in all directions, both orthogonally and diagonally, that man is "frozen" and is removed from the board. If a king becomes frozen in this way, its owner loses; if both kings become frozen, the game is a draw.

The rules of **Knightmate Chess [BrainKing]** were missing when I visited the site, but it is quite possibly the same game as "Knightmate" in *ECV 2*.

**Recycle Chess [BrainKing]** appears to differ from the "Recycle Chess" described in *ECV 2* only in that there is no promotion. A pawn which reaches the last rank is removed from the board.

**Screen Chess [BrainKing]** is a version of the generic Screen Chess (*ECV 2* pages 79-80) in which each pawn must be placed on a different file and the bishops must be on squares of opposite colour. **Crazy Screen Chess [BrainKing]** is the same game without the restrictions. A pawn placed on the first rank has a one-step move only, but on advancing to the second rank it gains its normal two-step power.

The site is maintained by Filip Rachunek and appears to be based in the Czech Republic, but the English text is excellent. I have not tried playing on it, but the Atomic Chess game which we featured in *VC 51* suggests that the standard is high.

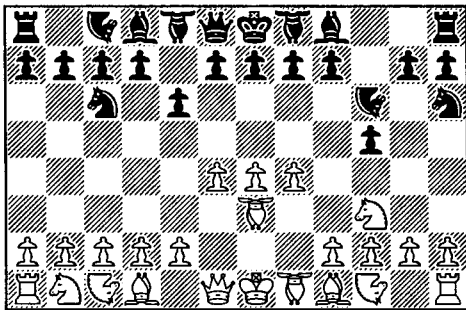
# MODERN COURIER CHESS

by Paul Byway

*Fers* (inverted B in diagrams) moves one square diagonally, *Courier* (inverted N) leaps two squares orthogonally or diagonally. Unmoved K or F can make a double move, but not to capture nor through check. - JDB

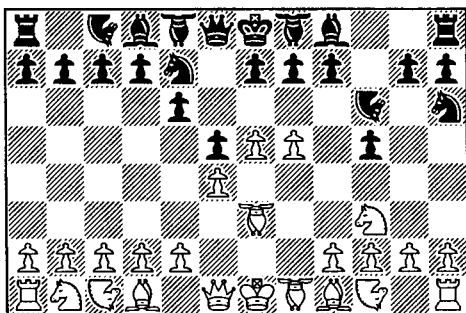
White John Beasley, Black Roy Talbot; by post.

- |   |        |        |
|---|--------|--------|
| 1 | g2-g4  | j7-j5  |
| 2 | f2-f4  | Nb8-c6 |
| 3 | h2-h4  | e7-e6  |
| 4 | Fe1-g3 | Cj8-j6 |
| 5 | Nk1-j3 | Nk8-l6 |



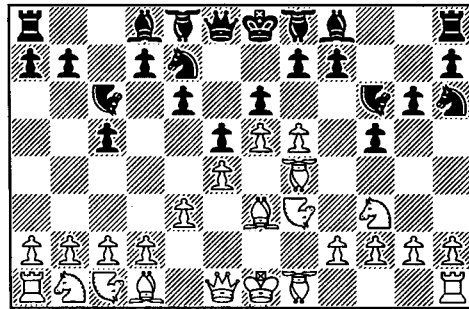
White opens in a sound, conventional (?) style. Black's first is a typical Talbot provocation; he loves piece activity and is careless of material - hoping to gain time by chasing the queen. His second and third moves are a favourite combination that develops without committing a pawn to the fourth rank. White introduces a familiar theme with h4, smothering the Black bishop, but must defend this strongpoint to safeguard his king. At move 5 the offer of j5 has been withdrawn and we begin to see possibilities for all Black's pieces on the left. White would perhaps like to solidify h4 with i2-i3, but Black can think of ...j4, Bk6, Rj8, Nk4 and so on. His refusal to move central pawns is (to me) a puzzle. Conventional wisdom is to leave pawns before the king alone, but I fret over the loss of central control. Such is the charm of MCC; does the wisdom of Chess carry over, or mislead us? Your guess is as good as mine!

- |   |       |        |
|---|-------|--------|
| 6 | g4-g5 | f7-f5  |
| 7 | h4-h5 | Nc6-e7 |



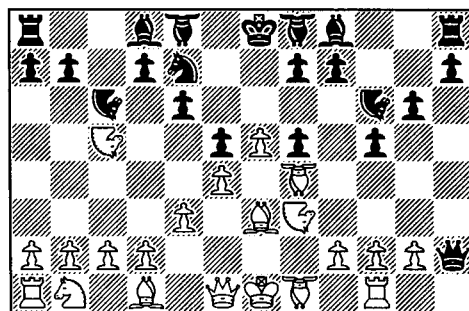
Quite a change in two moves! 6 g5 is a difficult decision and ...f5 in reply I believe to be wrong. The sequence ...f5; g5 is normal, but in reverse Black is giving up the option to attack Pg5 with f6 - and Ne7 I find incomprehensible. Even if there was an obvious end in view (there is not) I would weigh up the loss of time. For the future it seems that Black will be crushed by the pawns - or White's position will be reduced to so much wreckage.

- |    |        |        |
|----|--------|--------|
| 8  | e2-e3  | c7-c5  |
| 9  | Fg3-h4 | Cc8-c6 |
| 10 | Cj1-h3 | k7-k6  |
| 11 | Bi1-g3 | g7-g6  |

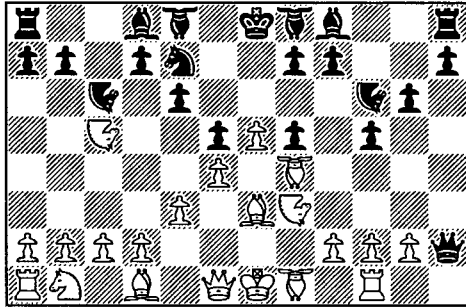


Black continues to find unconventional resources for development. His last solidifies the king's defence - but I suspect he saw a chance of 'mixing it' on the kingside. White's position appears to be rock solid and 11 Bg3 threatens a fers march up the diagonal with good prospects. His next is an error; the logical continuation 12 Fi5 cuts the line of the queen and keeps a grip e.g. 12 Fi5 Nk4 13 Rj1 Cj4 14 Fxj4 Qxj4+ 15 i3 and Black must retire in confusion.

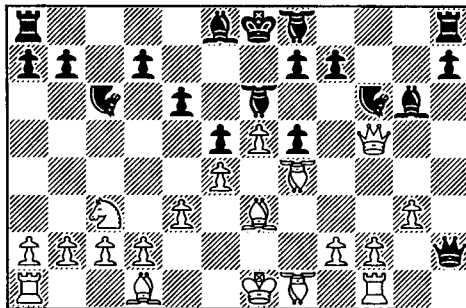
- |    |         |        |
|----|---------|--------|
| 12 | Cc1-c3? | Nl6-k4 |
| 13 | Rl1-j1  | Nk4x12 |
| 14 | Nj3x12  | Qf8x12 |
| 15 | Cc3xc5  | g6xh5  |



Black's position has greatly improved - he might even be better here. Materially he's a pawn up with another under attack; files and diagonals are opening up for his heavy pieces, the king is much safer once the pawn pair on the fifth rank is destroyed, the g-pawn can be blockaded and there is no h-pawn to act as a tin-opener. After 16 Bxh5 Fg6 17 Bj3 Qg7 (White threatened k3 and Rl1) ...Qxb2 is a real threat, and he can follow with ...Ce4, Bj7, Rc8 with excellent play.

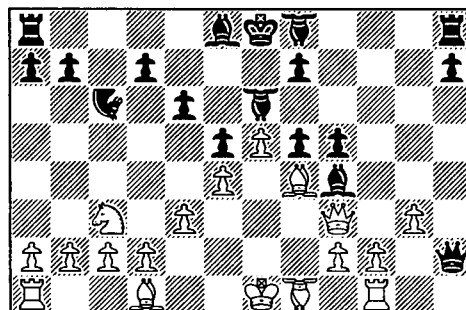


- |    |         |          |
|----|---------|----------|
| 16 | Cc5xe7  | Fe8-g6?! |
| 17 | k2-k3?  | Bd8xe7   |
| 18 | Nb1-c3  | Be7-f8   |
| 19 | Ch3xj5? | k6xj5    |
| 20 | Qf1xj5  | Bi8-k6   |



A surprising passage of play. Neither player thinks much of a courier. Black's 16th solidifies the defence and I suppose he thinks the courier, having few targets left, is so much dead wood. White thinks so too and saves a pawn, or is this a gesture towards trapping the queen? Black can save himself with ...Ql6+. At move 18 Black is definitely pointing his pieces at the king, and White's inexplicable 19 Cxj5 allows the other bishop and a rook to spring into action. 19 Cxh5 Fxh5 20 Bxh5 would be better.

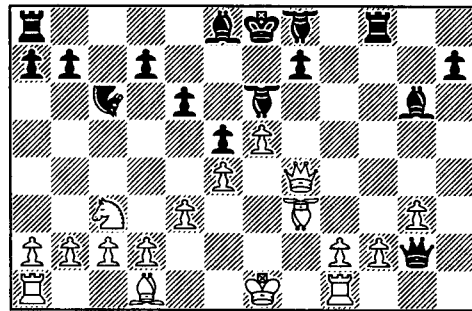
- |    |        |        |
|----|--------|--------|
| 21 | Qj5-j3 | Bk6-i4 |
| 22 | Qj3-i3 | Cj6xh4 |
| 23 | Bg3xh4 | i7-i5  |



21 Qk5 may run into trouble from ...Cj4. If so, White is in real trouble for Roy is deadly in such positions. A courier and rook tied together can hold a whole wing from collapse, and here White really needs a king's courier for his rook is undefended.

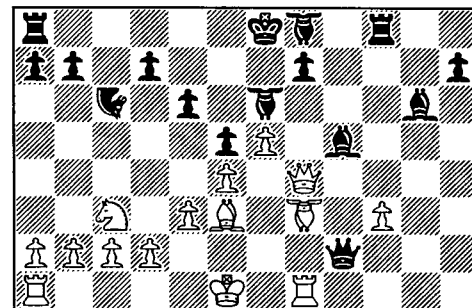
- |    |        |        |
|----|--------|--------|
| 24 | Bh4-f2 | Ql2-k2 |
| 25 | Rj1-i1 | h5-h4  |

- |    |        |        |
|----|--------|--------|
| 26 | Bf2xh4 | i5xh4  |
| 27 | Qi3xh4 | Rl8-j8 |
| 28 | Fh1-h3 | Bi4-k6 |



Working with tempo-gaining threats, Black is steadily closing in. White's next two moves hasten the end. He must sacrifice the j- and k-pawns and use the time to escape. Something like 29 Bf3 and 30 Ke2 is required (Cc4+; Kd3). Then he hopes to counterattack with his two rooks. No! That doesn't work: 29 Bf3 Rxj2 30 Ke2 Qxk3 (threatens to win the pinned fers) 31 Kd3 (or Bg2) Bi5 traps the queen. OK, White plays 29 j3 Bxk3 30 Qk1 (and not Rk1). This saves his queen and shuts out Black's; he can struggle on a while longer.

- |    |         |         |
|----|---------|---------|
| 29 | j2-j3   | Bf8xk3  |
| 30 | Ri1-k1  | Qk2-l2  |
| 31 | Rk1-h1  | Bk3-j4+ |
| 32 | Kg1-f1  | Ql2xi2  |
| 33 | Bd1-f3  | Bj4-i5  |
| 34 | Resigns |         |



As a long-time player of the Blackmar-Diemer Gambit Black revels in such slashing attacks - and I still don't know how his mind works.

*A little background. Having seen Paul's comment on one of Roy's games in an earlier issue of VC, I was aware of his liking for the "hollow centre", and since I believed that such a method of play must be fundamentally unsound I decided to ignore the offered j-pawn and to tackle it head on. I continue to believe it unsound, as I think does Paul, but on this occasion Roy very definitely had the last laugh.*

*19 Cxj5 was a major howler, of course, and my resignation was discourteously delayed; but I could not bring myself to admit that I had made quite such a mess of things. - JDB*

# KNIGHT RELAY CHESS

The basic rule of Knight Relay Chess is that any man except a king which is observed by a friendly knight has added knight power as long as the observation lasts. A pawn cannot move as a knight to the first or eighth rank, and if it moves to the second rank it recovers its two-step move. Knights can neither capture nor be captured, and there is no e.p.

The game is somewhat curious, to put it no higher, but it has had its enthusiasts and its periods of fashion. Here is what David Pritchard called "an epic three-year correspondence game" between John McCallion and Tony Gardner. I don't have a note of the source, but I imagine that it came from *Nost-algia*. Question marks and exclamation marks are David's; "R" indicates a relay move, "+R" indicates a relay move, "+R" a check given by relay power.

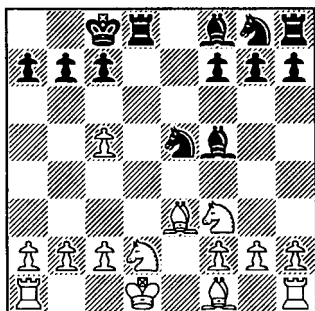
- 1 e2-e4 Nb8-c6
- 2 d2-d4 Nc6-e5

Knights are invulnerable.

- 3 Ng1-f3 d7-c5R
- 4 d4xc5 Qd8xd1+
- 5 Ke1xd1 e7-f5R
- 6 e4xf5 Bc8xf5?

This leaves Black a pawn down, which is probably more serious than at ordinary chess because the extra pawn may acquire added knight power at any time. 6...Bxc5 would have recovered both pawns.

- 7 Bc1-e3 0-0-0+
- 8 Nb1-d2



- 8 ... Rd8-d7

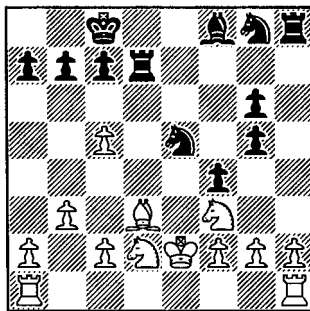
Attacking c5 (the rook now has added knight power)...

- 9 b2-b3

...and defending it similarly.

- 9 ... h7-h6
- 10 Be3-d4 f7-g5R

- 11 Bd4xf5R h6xf5R
- 12 Bf1-d3 g7-g6
- 13 Kd1-e2 f5-f4

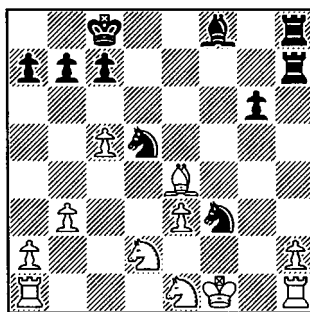


In this position, given that knights cannot capture, why not 14 Bxg6? (David's answers to this and later questions are on page 55.)

- 14 Nf3-e1 Ng8-f6
- 15 g2xf4R g5xf4
- 16 Bd3-e4 Nf6-d5+R

Check from the now knighted pawn on f4.

- 17 Ke2-f1 Ne5-f3
- 18 c2-e3R f4xe3
- 19 f2xe3 Rd7-h7

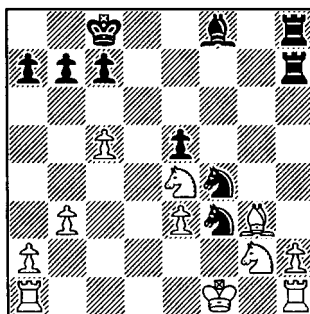


Again, why not 20 Bxg6?

- 20 Be4-g3R Nd5-f4

David's comment: "Neither black N moves again for nearly two years!!"

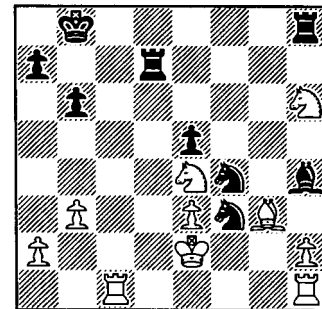
- 21 Ne1-g2 g6-e5R
- 22 Nd2-e4!



Why not 22...Bxc5?

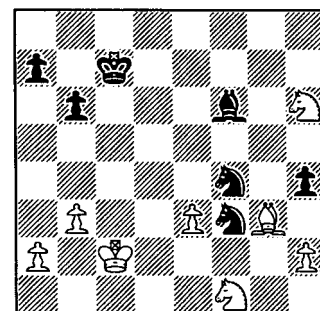
- 22 ... Kc8-b8

- 23 Ra1-c1 Bf8-e7
- 24 Ng2-h4 Rh8-d8
- 25 Kf1-e2 b7-b6
- 26 Ne4-d6 Be7-g5
- 27 Nh4-f5 Rd8-h8
- 28 c5xb6 c7xb6
- 29 Nd6-e4 Bg5-h4
- 30 Nf5-h6 Rh7-d7



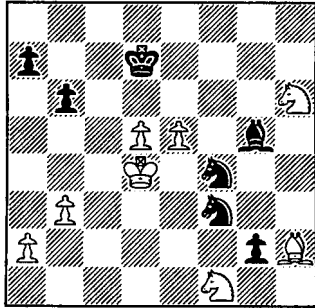
At this point, David comments that 31 Bxh4 is met by 31...e5-d3R+ "and White will lose his rook on c1 however he plays". An immediate capture is not allowed because a pawn cannot move to its eighth rank as a knight and by the same token the pawn does not command e1, but it does command f2, and we have 31 Kd2/Kd1 d3-b2R+ and 31 Ke1 d2+. This leaves 31 Kf1 d3-b2R (not 31...d2"+R" because this isn't check) with 32 Rb1 Rd2+R 33 K~1 Rxb1R+ and 32 Re1 Rd2+R 33 Kg1 b1Q.

- 31 Rh1-d1 Rh8-d8
- 32 Rd1xd7 Rd8xd7
- 33 Rc1-d1 Rd7xd1
- 34 Ke2xd1 Bh4-f6
- 35 Kd1-c2 Kb8-c7
- 36 Ne4-d2 e5-g6R
- 37 Nd1-f1 g4-h4R



- 38 h2-g4R! Bf6-g5
- 39 Bg3-h2 h4-g6R
- 40 Kc2-d3 g6-h4R
- 41 Kd3-d4 Kc7-c6
- 42 e3-d5R+ Kc6-d7
- 43 g4-e5R h4-g2R





44 Nh6-g4+R Kd7-e8

45 Nf1-e3

White's position seems immensely strong, but no direct mating attack was found in the game.

45 ... Ke8-d8

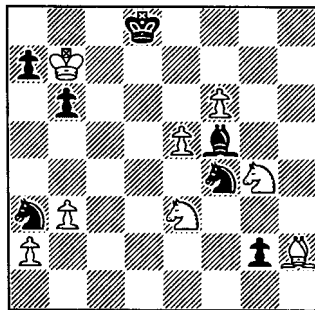
46 Kd4-c4 Bg5-e4R!

47 d5-f6R Be4-f5

48 Kc4-d5 Nf3-d4

49 Kd5-c6 Nd4-b5+R

50 Kc6-b7 Nb5-a3



51 e5-c4R

David describes this as "the winning move". Black's Q-side will be wiped out.

51 ... Nf4-d5

52 Kb7xa7 b6-b5+R

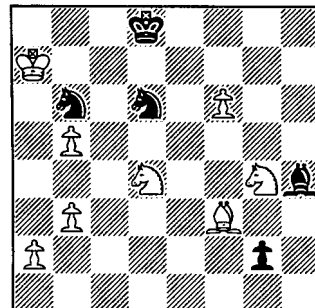
The pawn was dead anyway.

53 c4xb5 Nd5-b6

54 Nd3-c2 Na3-c4

55 Nc2-d4 Nc4-d6

56 Bh2-f3R Bf5-h4R



White now ignored the attack on f6 and mated in two; answer on page 55.

## VARIANTS IN FRITZ 11

Since version 9, Fritz has been able to play Chess 960 (Fischerandom Chess) and Giveaway (Losing) Chess. Having recently obtained Fritz 11, it occurred to me to see how well it does so. I looked only at Losing Chess, since Chess 960 is merely ordinary chess with a different starting array.

I gave it two tests: against Stan Goldovski's Giveaway Wizard, which I have been using for Losing Chess analysis hitherto, and against myself.

My first test pitted Fritz with its default setting (four-minute blitz, two-second increment per move) against Wizard with a ten-second-per-move time limit on the same machine, and Fritz won. I then set Fritz to play at the same rate as Wizard, and a two-game match was won by Wizard by 1½ : ½ (Wizard won with White and drew with Black). Since Wizard was written some ten years ago, this was not the result I was expecting, and I suspect that Wizard, having been written by a Losing Chess specialist, uses a better algorithm to assess the value of a position when there is no forced win. Fritz continues to calculate while waiting for its opponent to move (I am not sure that Wizard does), so the test may have been affected by operator clumsiness, but this is what I did and what I found.

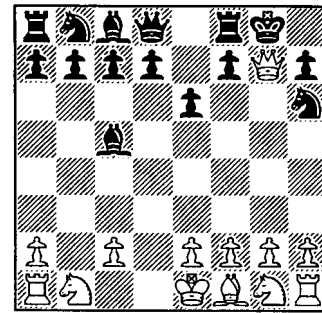
As a personal test, I opened five games with 1 e3, and it consistently replied with the line 1...b5 2 Bxb5 Bb7 which has been known since 2001 to be losing (see VC 41). I can only conclude that it has no opening book, and that its evaluation algorithm is so convinced by the positions that follow as to override any variator that may have been inserted to prevent it from playing the same moves every time. In fairness, it can point to the result, since I managed to lose 4 : 0 despite being handed a theoretical win at move 2 (the fifth game was not played out). I also played one game as Black, and lost that as well.

Verdict: tactically overwhelming, as might be expected, but positionally suspect though quite good enough for opponents like me. Wizard comes out of the comparison with great credit.

## PROOF GAMES

Peter Fayers has been unable to send his usual page, but he says that he couldn't resist trying his hand at Loch Ness Chess. I'll take the liberty of continuing his numbering :

57 - Peter Fayers, Original

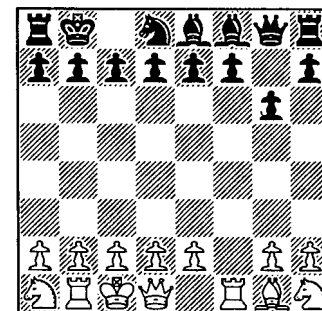


After White's 5th. Game score?  
Loch Ness Chess

It will be recalled that Loch Ness runs from b2 to g7, and that if a man on the loch is left unobserved the monster sneaks up and swallows it (so the queen is safe because she is observed by the Black king, but if Black plays ...KxQ his king will no longer be observed and Nessie will swallow).

There was another problem by Peter in the March *Problemist* :

58 - Peter Fayers  
The Problemist, 2008



After White's 10th. Game score?  
Fischerandom Chess

Here, the task is to deduce the array as well as the game score (kings between rooks, bishops on opposite colours, Black mirrors White on the file).

Answer to 57 on page 55, to 58 next time.

## ANOTHER LOOK AT 8x8 MAGIC KNIGHT'S TOURS

In the last two issues, we have been looking at magic knight's tours within a 4x4x4 cube, and we have noted some tours found by Guenter Stertenbrink and Awani Kumar which are not merely magic along the principal space diagonals but "pandiagonally magic" (magic along the broken space diagonals as well). In contrast, there is no tour on the 8x8 board which is even diagonally magic. However, it occurs to me that in looking for such a tour we may have been attempting something a little unnatural. The numbers from 1 to 64 add up to  $8 \times 260$ , so it is entirely reasonable to look for arrangements in which each of the eight rows and each of the eight columns adds to 260. But a knight's tour puts eight odd numbers on one long diagonal and eight even numbers on the other, and the odd numbers between 1 and 64 don't add to  $4 \times 260$ ; they add to  $4 \times 256$ , and the even numbers add to  $4 \times 264$ . Might it therefore be more realistic to look for tours which are "diagonally quasi-magic" (rows and columns add to 260, odd diagonal adds to 256, even diagonal to 264)?

As was reported in VC 43, a computer search in 2003 showed there to be 140 basic knight's tours which were row-and-column magic. Each of these basic tours can be placed on a chessboard in 16 different ways (it can be placed in any one of eight orientations, and can be numbered from either end), giving a grand total of 2240 arithmetically different tours, but a tabulation of the 140 basic tours is sufficient to give complete information. Furthermore, some closed loop tours share a common path, differing only in their starting points, and this reduces the number of tours that need be separately tabulated to 108. 96 of these were given by George Jelliss in *Chessics* 26 (plus one interloper which was exposed a few issues later), five more were published in an article by Tom Marlow in the May 1988 issue of *The Problemist* (two of them having appeared the previous year in issue 1 of *The Games and Puzzles Journal*), and the remaining seven are in VC 43. George posted a complete catalogue on his Knight's Tour Notes web site <[www.ktn.freeuk.com](http://www.ktn.freeuk.com)>, but not everybody has access to the Internet, and I at least much prefer reading a book or magazine to looking at a computer screen. It therefore seems to me that VC might usefully devote a couple of pages to reprinting this catalogue, now that it is definitive, and it appears on pages 52-53.

With all 140 tours in front of us, we can look for those which are "diagonally quasi-magic" as defined above. There turn out to be seven: tours 1, 4 (tour 1 starting from e6), 40, 41, 59, 60, and 62. Furthermore, tours 1, 4, and 62 have the additional property that each odd broken diagonal which is parallel to the main odd diagonal (c8-h3/a2-b1, e8-h5/a4-d1, g8-h7/a6-f1) adds to the same value 256, and each even broken diagonal which is parallel to the main even diagonal adds to 264. This elegant property seems a sufficient reason to extract these tours from the catalogue and to present them in full-size type :

15 30 1 50 27 36 63 38	27 30 51 40 53 2 15 42
2 51 14 29 64 39 26 35	50 39 28 31 14 41 54 3
31 16 49 4 33 28 37 62	29 26 37 52 1 56 43 16
52 3 32 13 40 61 34 25	38 49 32 25 44 13 4 55
17 42 53 48 5 24 11 60	23 36 45 12 57 64 17 6
54 45 20 41 12 57 8 23	48 11 24 33 20 5 58 61
43 18 47 56 21 6 59 10	35 22 9 46 63 60 7 18
46 55 44 19 58 9 22 7	10 47 34 21 8 19 62 59

Tours 1 and 4 (from e6)

Tour 62

Tour 62 is "rotationally symmetric" (diametrically opposite values always differ by 32), so starting this tour from d3 doesn't produce a different tour; it merely gives the same tour rotated through 180 degrees. And of course the summation properties are shared by the tours numbered in reverse from e7 (tour 1), c5 (tour 4), or f4 (tour 62), though the relevant odd diagonals now run NE-SW and the relevant even diagonals NW-SE.

These tours were discovered by C. F. Jaenisch. Tour 62 appeared in *The Chess Monthly* in 1859, and tours 1 and 4 in volume 2 of his *Traité des Applications de l'Analyse Mathématique au Jeu des Échecs*, St Petersburg 1862. However, while he stresses the fact that the long diagonals together add to 520, the more elegant property highlighted here seems to have escaped his notice. Nor does it seem to have been noticed by H. J. R. Murray, nor (by implication) by those whose work Murray used. I cannot believe it has genuinely remained unspotted until now, but at the moment I am not aware of any evidence to the contrary.

On a flat board, the tours above (rows and columns adding to 260, long odd diagonal and parallel odd broken diagonals adding to 256, long even diagonal and parallel even broken diagonals adding to 264) are the best we can do. The question however occurs to me: on a cylinder or torus, can we find a tour such that all the odd diagonals in both directions add to 256 and all the even diagonals in both directions to 264? Alternatively, can some mathematician prove the task to be impossible?

The catalogue that follows relies heavily on manuscript 106 of the H. J. R. Murray papers in the Bodleian Library and on a further unpublished Murray manuscript *The Magic Knight's Tours, a Mathematical Recreation* (Bodleian shelfmark MS Eng d.2370). I am grateful to the Bodleian for access to these and to other Murray papers, to Cambridge University Library for access to the Jaenisch book, and to George Jelliss for a photocopy made by Ken Whyld of the relevant pages from *The Chess Monthly*. Additionally, and to everybody's benefit, George has posted a chronological knight's tour bibliography on the Knight's Tour Notes web site, and he presented the historical material from Murray's *Magic Knight's Tours* manuscript mentioned above, with commentary, in issues 14 and 15 of *The Games and Puzzles Journal*.

Murray listed the tours in approximately chronological order, but in *Chessics* 26 George classified them by the separation of their end points, and I have followed him. The closed loop tours come first, then the tours with end points (0,1) apart, then (0,3) apart, and so on. The closed

loop tours are further divided into those admitting intermediate starting points (tours 1-47), those which are rotationally symmetric (tours 46-62, tours 46-47 being in both groups), and one other (tour 63). A rotationally symmetric tour can of course be renumbered starting from the square numbered 33, but this merely rotates it through 180 degrees. Similarly, the pattern of tours 46-47 only gives two distinct tours, those starting at e8 and d3; the tours starting at d1 and e6 are rotations of these.

As regards orientation and selection of a starting point, wherever possible I have chosen a representative in which the tour starts from the top edge of the board, and it always starts from a light square (so the diagonal a8-h1 is always odd). The tours within each group therefore tend to appear in an order slightly different from George's, and the table alongside links my numbers to his. Dates are normally those of publication (Beverley's tour was actually discovered in 1847, all those of Wenzelides in 1849, and at least the first two of Jaenisch's in 1858), but there may be minor errors during the period 1876-1885.

By classifying Murray's manuscript catalogue and publishing it in *Chessics* 26, George did much to encourage others to explore the subject and to fill in the gaps. The present catalogue, being the result of an exploration now complete, is unlikely to stimulate further work in the same way, but it may serve to commemorate

the closure of an exercise which took over a hundred and fifty years and occupied some fine brains. It seems appropriate that it should appear in a magazine which George himself founded.

1-5	00a	60	12k	87	07a	114	27a
6-9	00b	61	12o	88	14c	115	27b
10-13	00c	62	12n	89	14f	116	27d
14-17	00d	63	12p	90	14b	117	27c
18-21	00e	64	01g	91	14a	118	27e
22-25	00f	65	01b	92	14e	119	27f
26-29	00g	66	01c	93	14d	120	27g
30-33	00h	67	01d	94	16a	121	27h
34-35	00i	68	01e	95	23c	122	27t
36-37	00j	69	01f	96	23d	123	27q
38-39	00l	70	01a	97	23q	124	27s
40-41	00k	71	01h	98	23f	125	27p
42-43	00n	72	01i	99	23g	126	27r
44-45	00o	73	03c	100	23h	127	27i
46-47	00m	74	03d	101	23e	128	27j
48	12e	75	03b	102	23i	129	27k
49	12f	76	03a	103	23l	130	27l
50	12h	77	03f	104	23k	131	27m
51	12g	78	03e	105	23j	132	27n
52	12a	79	03g	106	23a	133	27o
53	12b	80	05g	107	23b	134	34e
54	12c	81	05a	108	23n	135	34a
55	12d	82	05b	109	23m	136	34d
56	12m	83	05f	110	23o	137	34c
57	12j	84	05d	111	23p	138	34b
58	12i	85	05c	112	25a	139	34g
59	12l	86	05e	113	25b	140	34f

Table linking my numbers to George's web catalogue numbers

**Sources in chronological order.** 114: W. Beverley, *The London and Edinburgh Philosophical Magazine and Journal of Science*, August 1848 (Murray). 52: C. Wenzelides, *Schachzeitung*, February-March 1849 (Murray). 115: Ditto, July 1849 (Murray). 6-9: Shri Krishna Udayar, King of Karnataka, on a silk carrying the date 31 July 1852 (Murray, also Akenhead, *The Fairy Chess Review*, April 1947). As with all transliterations of names from non-Latin scripts, the spelling in English accounts varies, and I am following S. R. Iyer, *Indian Chess*, Delhi 1982. Shri Krishna Udayar appears to be more usually described as the Rajah of Mysore, but again I am following Iyer. 46-47, 48, 53, 56: Wenzelides, *Schachzeitung*, May 1858 (Murray). 61, 62: C. F. Jaenisch, *The Chess Monthly*, April-June 1859. 1-5, 18-21, 116, 117: Jaenisch, *Traité des Applications de l'Analyse Mathématique au Jeu des Échecs*, volume 2, St Petersburg 1862. Tour 2 (tour 1 starting from f1) appears to have been overlooked by Jaenisch, and according to Murray was given by Exner in 1876.

81: C. Bouvier, dated 1876 by Murray. 127, 134, 135: Dr Exner, *Progr. des Gymn. zu Hirschberg*, 1876 (Murray). 82: E. C. Caldwell, *English Mechanic and World of Science*, 1879 (Murray, confirmed by Jelliss). 34-35: Published anonymously, dated 1880 by Murray. 54: -. Bèlignè, dated 1880 by Murray. 128: Ditto, dated 1881. 10-13, 83, 129, 130: E. Francony, dated 1881 by Murray. 57, 58, 84: Bouvier, dated 1882 by Murray. 59, 60, 85, 86, 106, 131: Francony, dated 1882 by Murray. 49...51, 55: Paul de Hijo (pen name of Abbé Jolivald), dated 1882 by Murray. 90, 91: Count Ligondès, dated 1882 by Murray. 38-39: Bouvier, dated 1883 by Murray. 40-41: Francony, dated 1883 by Murray. 22-25, 26-29, 65, 66, 70, 73, 74, 76...78, 80, 88, 95, 96, 98...105, 108, 109, 112, 136...140: Ligondès, dated 1883 by Murray. 14-17, 36-37, 118, 123...126: C. E. Reuss, dated 1883 by Murray. 93: M. A. Feisthamel, dated 1884 by Murray. 107: Ligondès, dated 1884 by Murray. 119: M. Wihnyk, *Schachzeitung* 1885 (Murray).

Everything in the preceding paragraph is based on manuscript 106 of the Murray papers in the Bodleian Library, but there are minor inconsistencies between the dates given there and those implied by the summary in his *Magic Knight's Tours* manuscript, and it may be that one or two of them are in error by a year or so. The summary in the *Magic Knight's Tours* manuscript, although slightly imprecise (Murray was well over 80 when he wrote it), further implies that most if not all of the tours given without source first appeared in Feisthamel's column in *Le Siècle*, so an examination of this would clarify the matter, but I have not tried to make one. Murray notes that Jolivald's tours also appeared in his 1882 book *Le Problème du Cavalier des échecs d'après les méthodes qui donnent la symétrie par rapport au centre*, and those of Ligondès in a privately printed work he produced in 1884.

Every tour down to here was reported by General Parmentier in papers presented to the 1891 and 1892 meetings of the French Association pour l'Avancement des Sciences and subsequently published by him, tours 6-9 being attributed to Francony (Murray).

68: -. Grossetaite, *Figaro*, 1896 (Murray). 30-33: Ligondès, *La Mode du Petit Journal*, 1906 (Murray). 110: Ditto, 1910 (Murray). 111: Ditto, 1911 (Murray). Every tour down to here appeared in M. B. Lehmann's book *Neue Mathematische Spiele*, fourth edition 1932, tours 6-9 still being attributed to Francony (Murray).

94: M. B. Lehmann, *Le Sphinx*, August 1933 (Murray). 120: H. J. R. Murray, *The Problemist Fairy Chess Supplement*, February 1936. 121: Ditto, April 1936. 132, 133: Murray, *The Fairy Chess Review*, August 1936. 63, 67, 69: Ditto, November 1939. 79: Ditto, June 1940. Every tour down to here appeared in *Chessics* 26.

64, 97: T. W. Marlow, *The Games and Puzzles Journal* 1, September-October 1987. 71, 75, 113: Marlow, *The Problemist*, January 1988. 72, 92: T. S. Roberts, *Variant Chess* 43, November 2003 (previously published on the Internet). 42-43, 44-45, 87, 89, 122: H. Mackay, J.-C. Meyrignac, G. Stertenbrink, *Variant Chess* 43 (previously published on the Internet).

1-5 Jaenisch 1862 15 30 1 50 27 36 63 38 2 51 14 29 64 39 26 35 31 16 49 4 33 28 37 62 52 3 32 13 40 61 34 25 17 42 53 48 5 24 11 60 54 45 20 41 12 57 8 23 43 18 47 56 21 6 59 10 46 55 44 19 58 9 22 7	6-9 Udayar 1852 63 6 27 36 1 38 59 30 26 35 64 5 60 29 2 39 7 62 33 28 37 4 31 58 34 25 8 61 32 57 40 3 47 10 49 24 41 16 55 18 50 23 46 9 56 19 42 15 11 48 21 52 13 44 17 54 22 51 12 45 20 53 14 43	10-13 Francony 1881 63 6 27 36 1 38 59 30 26 35 64 5 60 29 2 39 7 62 33 28 37 4 31 58 34 25 8 61 32 57 40 3 9 48 21 52 13 44 17 56 24 51 12 45 20 53 14 41 47 10 49 22 43 16 55 18 50 23 46 11 54 19 42 15	14-17 Reuss 1883 63 6 27 36 1 38 59 30 26 35 64 5 60 29 2 39 7 62 33 28 37 4 31 58 34 25 8 61 32 57 40 3 9 48 23 52 13 42 17 56 24 51 10 45 20 55 14 41 47 22 49 12 53 16 43 18 50 11 46 21 44 19 54 15	18-21 Jaenisch 1862 63 22 15 40 1 42 59 18 14 39 64 21 60 17 2 43 37 62 23 16 41 4 19 58 24 13 38 61 20 57 44 3 11 36 25 52 29 46 5 56 26 51 12 33 8 55 30 45 35 10 49 28 53 32 47 6 50 27 34 9 48 7 54 31	22-25 Ligondès 1883 63 22 15 40 1 42 59 18 14 39 64 21 60 17 2 43 23 62 37 16 41 4 19 58 38 13 24 61 20 57 44 3 25 36 11 52 29 46 5 56 12 51 26 33 8 55 30 45 35 10 49 28 53 32 47 6 50 27 34 9 48 7 54 31
26-29 Ligondès 1883 63 22 15 40 1 42 59 18 14 39 64 21 60 17 2 43 37 62 23 16 41 58 19 4 24 13 38 61 20 3 44 57 51 36 25 12 45 56 5 30 26 11 52 33 8 29 46 55 35 50 9 28 53 48 31 6 10 27 34 49 32 7 54 47	30-33 Ligondès 1906 43 50 1 24 5 48 63 26 2 23 44 49 64 25 6 47 51 42 21 4 45 8 27 62 22 3 52 41 28 61 46 7 39 54 29 20 9 14 35 60 30 19 40 53 36 59 10 13 55 38 17 32 57 12 15 34 18 31 56 37 16 33 58 11	34-35 Anonymous 1880 63 6 55 16 1 42 59 18 54 15 64 5 60 17 2 43 7 62 13 56 41 4 19 58 14 53 8 61 20 57 44 3 51 12 25 36 45 40 21 30 26 35 52 9 24 29 46 39 11 50 33 28 37 48 31 22 34 27 10 49 32 23 38 47	36-37 Reuss 1883 63 6 27 36 1 38 59 30 26 35 64 5 60 29 2 39 7 62 33 28 37 4 31 58 34 25 8 61 32 57 40 3 9 48 11 52 13 54 17 56 24 51 22 45 20 43 14 41 47 10 49 12 53 16 55 18 50 23 46 21 44 19 42 15	38-39 Bouvier 1883 23 46 61 18 7 44 59 2 62 19 24 45 60 1 6 43 47 22 63 8 17 42 3 58 20 25 36 41 64 5 16 53 37 48 21 32 9 52 57 4 26 35 10 49 40 31 54 15 11 38 33 28 13 56 51 30 34 27 12 39 50 29 14 55	40-41 Francony 1883 23 46 61 18 7 44 59 2 62 19 24 45 60 1 6 43 47 22 63 8 17 42 3 58 20 25 36 41 64 5 16 53 37 48 21 32 9 52 57 4 26 35 28 49 40 13 54 15 29 38 33 10 31 56 51 12 34 27 12 39 50 11 14 55
42-43 MMS 2003 63 2 59 24 57 14 19 22 60 25 62 1 20 23 56 13 3 64 27 58 15 54 21 18 26 61 4 53 32 17 12 55 39 28 33 16 37 52 45 10 34 5 38 31 42 11 48 51 29 40 7 36 49 46 9 44 6 35 30 41 8 43 50 47	44-45 MMS 2003 31 2 27 56 25 14 51 54 28 57 30 1 52 55 24 13 3 32 59 26 15 22 53 50 58 29 4 21 64 49 12 23 39 60 33 16 37 20 45 10 34 5 38 63 42 11 48 19 61 40 7 36 17 46 9 44 6 35 62 41 8 43 18 47	46-47 Wenzelides 1858 47 6 63 24 1 50 43 26 62 23 48 5 44 25 2 51 21 46 7 64 49 4 27 42 8 61 22 45 28 41 52 3 35 20 9 60 13 54 29 40 10 59 36 17 32 39 14 53 19 34 57 12 37 16 55 30 58 11 18 33 56 31 38 15	48 Wenzelides 1858 43 26 1 48 5 24 63 50 2 47 44 25 64 49 6 23 45 42 27 4 21 8 51 62 28 3 46 41 52 61 22 7 39 54 29 20 9 14 35 60 30 19 40 53 36 59 10 13 55 38 17 32 57 12 15 34 18 31 56 37 16 33 58 11	49 Jolivald 1882 43 46 1 24 41 20 63 22 2 25 42 45 64 23 40 19 47 44 27 4 17 38 21 62 26 3 48 37 28 61 18 39 7 50 29 60 5 16 35 58 30 53 6 49 36 59 12 15 51 8 55 32 13 10 57 34 54 31 52 9 56 33 14 11	50 Jolivald 1882 43 46 1 26 41 18 63 22 2 27 42 45 64 23 40 17 47 44 25 4 19 38 21 62 28 3 52 37 24 61 16 39 7 48 29 56 5 20 35 60 30 53 6 51 36 57 12 15 49 8 55 32 13 10 59 34 54 31 50 9 58 33 14 11
51 Jolivald 1882 43 18 1 56 5 16 63 58 2 55 44 17 64 57 6 15 45 42 19 4 21 8 59 62 28 3 54 41 52 61 14 7 39 46 29 20 9 22 35 60 30 27 40 53 36 51 10 13 47 38 25 32 49 12 23 34 26 31 48 37 24 33 50 11	52 Wenzelides 1849 63 6 55 16 1 42 59 18 54 15 64 5 60 17 2 43 7 62 13 56 41 4 19 58 14 53 8 61 20 57 44 3 35 12 25 52 29 40 21 46 26 51 36 9 24 45 30 39 11 34 49 28 37 32 47 22 50 27 10 33 48 23 38 31	53 Wenzelides 1858 63 6 23 48 1 10 59 50 22 47 64 5 60 49 2 11 7 62 45 24 9 4 51 58 46 21 8 61 52 57 12 3 35 44 25 20 29 40 53 14 26 19 36 41 56 13 30 39 43 34 17 28 37 32 15 54 18 27 42 33 16 55 38 31	54 Belgique 1880 63 24 39 20 1 26 41 46 38 19 64 25 40 45 2 27 23 62 17 44 21 4 47 42 18 37 22 61 48 43 28 3 35 60 11 16 29 54 5 50 10 15 36 53 12 49 30 55 59 34 13 8 57 32 51 6 14 9 58 33 52 7 56 31	55 Jolivald 1882 63 24 39 18 1 26 43 46 38 17 64 25 42 45 2 27 23 62 19 40 21 4 47 44 16 37 22 61 52 41 28 3 35 60 9 20 29 54 5 48 12 15 36 53 8 51 30 55 59 34 13 10 57 32 49 6 14 11 58 33 50 7 56 31	56 Wenzelides 1858 59 6 63 16 1 42 55 18 62 15 60 5 56 17 2 43 7 58 13 64 41 4 19 54 14 61 8 57 20 53 44 3 35 12 21 52 25 40 29 46 22 51 36 9 32 45 26 39 11 34 49 24 37 28 47 30 50 23 10 33 48 31 38 27
57 Bouvier 1882 23 46 61 18 7 44 59 2 62 19 24 45 60 1 6 43 47 22 63 8 17 42 3 58 20 25 36 41 64 53 16 5 37 48 21 32 9 4 57 52 26 35 10 49 40 31 54 15 11 38 33 28 13 56 51 30 34 27 12 39 50 29 14 55	58 Bouvier 1882 23 46 61 18 7 44 59 2 62 19 24 45 60 1 6 43 47 22 63 8 17 42 3 58 36 25 20 41 64 5 16 53 21 48 37 32 9 52 57 4 26 35 10 49 40 31 54 15 11 38 33 28 13 56 51 30 34 27 12 39 50 29 14 55	59 Francony 1882 23 46 63 18 7 62 59 2 44 19 24 63 42 1 6 61 47 22 45 8 17 60 3 58 20 25 36 41 64 53 16 5 37 48 21 32 9 4 57 52 26 35 28 49 40 13 54 15 12 39 33 10 31 56 51 12 34 27 30 39 50 11 14 55	60 Francony 1882 23 46 63 18 7 62 59 2 44 19 24 63 42 1 6 61 47 22 45 8 17 60 3 58 36 25 20 41 64 5 16 53 21 48 37 32 9 52 57 4 26 35 28 49 40 13 54 15 12 39 33 10 31 56 51 12 34 27 30 39 50 11 14 55	61 Jaenisch 1859 15 54 41 2 51 28 39 30 42 3 14 53 40 31 50 27 55 16 1 44 25 52 29 38 4 43 56 13 32 37 26 49 17 58 5 64 45 24 11 36 6 61 20 57 12 33 48 23 59 18 63 8 21 46 35 10 62 7 60 19 34 9 22 47	62 Jaenisch 1859 27 30 51 40 53 2 15 42 50 39 28 31 14 41 54 3 29 26 37 52 1 56 43 16 38 49 32 25 44 13 4 55 23 36 45 12 57 64 17 6 48 11 24 33 20 5 58 61 35 22 9 46 63 60 7 18 10 47 34 21 8 19 62 59
63 Murray 1939 63 42 23 32 1 34 27 38 22 31 64 41 28 37 2 35 43 62 29 24 33 4 39 26 30 21 44 61 40 25 36 3 11 60 13 20 45 52 5 54 14 17 10 57 8 55 48 51 59 12 19 16 49 46 53 6 18 15 58 9 56 7 50 47	64 Marlow 1987 59 14 1 64 11 26 55 30 2 63 60 13 56 29 10 27 61 58 15 4 25 12 31 54 16 3 62 57 32 53 28 9 39 42 17 24 5 48 33 52 18 21 38 41 36 51 8 47 43 40 23 20 45 6 49 34 22 19 44 37 50 35 46 7	65 Ligondès 1883 39 22 15 64 1 42 59 18 14 63 40 21 60 17 2 43 23 38 61 16 41 4 19 58 62 13 24 37 20 57 44 3 25 36 11 52 29 46 5 56 12 51 26 33 8 55 30 45 35 10 49 28 53 32 47 6 50 27 34 9 48 7 54 31	66 Ligondès 1883 39 22 15 64 1 42 59 18 14 63 40 21 60 17 2 43 23 38 61 16 41 58 19 4 62 13 24 37 20 3 44 57 25 36 11 52 29 56 5 46 12 51 26 33 8 45 30 55 35 10 49 28 53 32 47 6 50 27 34 9 48 7 54 31	67 Murray 1939 31 42 23 64 1 34 27 38 22 63 32 41 28 37 2 35 43 30 61 24 33 4 39 26 62 21 44 29 40 25 36 3 11 60 13 20 45 52 5 54 14 17 10 57 8 55 48 51 59 12 19 16 49 46 53 6 18 15 58 9 56 7 50 47	68 Grossetaite 1896 63 34 55 14 43 2 23 26 54 13 64 1 56 25 44 3 33 62 35 42 15 22 27 24 12 53 32 21 36 57 4 45 61 20 41 52 5 16 37 28 8 11 6 31 58 51 46 49 19 60 9 40 17 48 29 38 10 7 18 59 30 39 50 47
69 Murray 1939 63 2 51 22 53 16 35 18 50 23 64 1 34 19 14 55 3 62 21 52 15 54 17 36 24 49 4 61 20 33 56 13 5 44 25 48 9 60 37 32 26 47 8 41 30 39 12 57 43 6 45 28 59 10 31 38 46 27 42 7 40 29 58 11	70 Ligondès 1883 59 6 27 36 61 38 31 2 26 35 60 5 32 1 62 39 7 58 33 28 37 64 3 30 34 25 8 57 4 29 40 63 9 56 23 48 13 52 17 42 24 47 10 53 20 41 14 51 55 22 45 12 49 16 43 18 46 11 54 21 44 19 50 15	71 Marlow 1988 59 62 31 4 33 46 19 6 30 3 60 63 18 5 34 47 61 58 1 32 45 36 7 20 2 29 64 57 8 17 48 35 27 56 9 16 37 44 21 50 12 15 28 53 24 49 38 41 55 26 13 10 43 40 51 22 14 11 54 25 52 23 42 39	72 Roberts 2003 39 58 25 6 55 50 23 4 26 7 38 57 24 5 54 49 59 40 1 28 51 56 3 22 8 27 64 37 2 21 48 53 41 60 9 14 29 52 35 20 10 15 44 63 36 13 32 47 61 42 17 12 45 30 19 34 16 11 62 43 18 33 46 31	73 Ligondès 1883 35 6 27 60 1 38 31 62 26 59 36 5 32 61 2 39 7 34 57 28 37 4 63 30 58 25 8 33 64 29 40 3 9 56 23 48 13 52 17 42 24 47 10 53 20 41 14 51 55 22 45 12 49 16 43 18 46 11 54 21 44 19 50 15	74 Ligondès 1883 35 6 27 60 1 38 31 62 26 59 36 5 32 61 2 39 57 34 7 28 37 4 63 30 8 25 58 33 64 29 40 3 23 56 9 48 13 52 17 42 10 47 24 53 20 41 14 51 55 22 45 12 49 16 43 18 46 11 54 21 44 19 50 15
75 Marlow 1988 31 6 35 60 1 10 55 62 34 59 32 5 56 61 2 11 7 30 57 36 9 4 63 54 58 33 8 29 64 53 12 3 19 22 37 52 13 28 43 46 38 51 18 21 44 47 14 27 23 20 49 40 25 16 45 42 50 39 24 17 48 41 26 15	76 Ligondès 1883 43 2 47 24 49 26 39 30 46 23 44 1 40 29 50 27 3 42 21 48 25 52 31 38 22 45 4 41 32 37 28 51 5 20 57 64 9 16 53 36 60 63 8 17 56 33 10 13 19 6 61 58 15 12 35 54 62 59 18 7 34 55 14 11	77 Ligondès 1883 63 22 15 40 17 42 59 2 14 39 64 21 60 1 18 43 23 62 37 16 41 20 3 58 38 13 24 61 4 57 44 19 25 36 11 52 29 46 5 56 12 51 26 33 8 55 30 45 35 10 49 28 53 32 47 6 50 27 34 9 48 7 54 31	78 Ligondès 1883 63 22 15 40 17 42 59 2 14 39 64 21 60 1 18 43 37 62 23 16 41 20 3 58 24 13 38 61 4 57 44 19 11 36 25 52 29 46 5 56 26 51 12 33 8 55 30 45 35 10 49 28 53 32 47 6 50 27 34 9 48 7 54 31	79 Murray 1940 63 14 39 20 41 22 59 2 38 17 64 15 60 1 42 23 13 62 19 40 21 58 3 44 18 37 16 61 4 43 24 57 31 12 33 52 25 56 45 6 36 51 30 9 48 5 26 55 11 32 49 34 53 28 7 46 50 35 10 29 8 47 54 27	80 Ligondès 1883 43 30 53 4 45 28 51 6 54 1 44 29 52 5 48 27 31 42 3 56 25 46 7 50 2 55 32 41 8 49 26 47 63 34 9 24 57 40 15 18 10 23 62 33 16 19 58 39 35 64 21 12 37 60 17 54 22 11 36 61 20 13 38 59
81 Bouvier 1876 31 2 39 58 41 16 55 18 38 59 30 1 56 19 42 15 3 32 57 40 43 14 17 54 60 37 4 29 20 53 44 13 33 28 61 8 45 12 21 52 62 5 36 25 22 51 48 11 27 34 7 64 9 46 23 50 6 63 26 35 24 49 10 47	82 Caldwell 1879 31 2 39 58 41 16 55 18 38 59 30 1 56 19 42 15 3 32 57 40 13 44 17 54 60 37 4 29 20 53 14 43 33 28 61 8 45 12 21 52 62 5 36 25 22 51 48 11 27 34 7 64 9 46 23 50 6 63 26 35 24 49 10 47	83 Francony 1881 27 2 43 52 29 6 47 54 42 51 28 1 48 53 30 7 3 26 49 4 5 32 55 46 50 41 4 25 56 45 8 31 39 24 61 16 33 20 57 10 62 15 40 21 60 9 34 19 23 38 13 64 17 36 11 58 14 63 22 37 12 59 18 35	84 Bouvier 1882 31 2 57 40 15 18 55 42 38 59 30 1 56 41 16 19 3 32 39 58 17 14 43 54 60 37 4 29 44 53 20 13 33 28 61 8 21 12 45 52 62 5 36 25 48 51 22 11 27 34 7 64 9 24 49 46 6 63 26 35 50 47 10 23	85 Francony 1882 31 2 39 58 15 18 55 42 38 59 30 1 56 41 16 19 3 32 57 40 17 14 43 54 60 37 4 29 44 53 20 13 33 28 61 8 21 12 45 52 62 5 36 25 48 51 22 11 27 34 7 64 9 24 49 46 6 63 26 35 50 47 10 23	86 Francony 1882 31 2 39 58 41 16 55 18 38 59 30 1 56 19 14 43 3 32 57 40 15 42 17 54 60 37 4 29 20 53 44 13 33 28 61 8 45 12 21 52 62 5 36 25 22 51 48 11 27 34 7 64 9 46 23 50 6 63 26 35 24 49 10 47

87 MMS 2003  
51 54 1 6 49 22 43 34  
2 5 50 53 44 35 48 23  
55 52 7 4 21 46 33 42  
8 3 56 45 36 41 24 47  
57 62 9 20 25 32 37 18  
10 13 58 61 40 19 28 31  
63 60 15 12 29 26 17 38  
14 11 64 59 16 39 30 27

93 Feisthamel 1884  
47 22 39 28 1 50 43 30  
38 25 48 23 44 29 2 51  
21 46 27 40 49 4 31 42  
26 37 24 45 32 41 52 3  
15 20 33 60 5 64 9 54  
36 59 14 17 12 53 6 63  
19 16 57 34 61 8 55 10  
58 35 18 13 56 11 62 7

99 Ligondès 1883  
19 42 1 60 21 40 15 62  
2 59 20 41 16 61 22 39  
43 18 57 4 37 24 63 14  
58 3 44 17 64 13 38 23  
31 56 5 48 9 36 25 50  
6 45 32 53 28 49 12 35  
55 30 47 8 33 10 51 26  
46 7 54 29 52 27 34 11

105 Ligondès 1883  
23 62 15 40 1 42 19 58  
14 39 22 61 20 59 2 43  
63 24 37 16 41 4 57 18  
38 13 64 21 60 17 44 3  
25 50 11 36 5 56 31 46  
12 35 26 49 32 45 6 55  
51 10 33 28 53 8 47 30  
34 27 52 9 48 29 54 7

111 Ligondès 1911  
43 28 47 4 53 30 49 6  
46 3 44 29 48 5 54 31  
27 42 1 52 25 56 7 50  
2 45 26 41 8 51 32 55  
39 20 63 24 33 14 57 10  
62 23 40 13 64 9 34 15  
19 38 21 60 17 36 11 58  
22 61 18 37 12 59 16 35

117 Jaenisch 1862  
1 30 47 52 27 54 43 6  
48 51 2 29 44 5 26 55  
31 46 49 4 53 28 7 42  
50 3 32 45 8 41 56 25  
33 62 15 20 57 24 9 40  
16 19 34 61 12 37 58 23  
63 14 17 36 21 60 39 10  
18 35 64 13 38 11 22 59

123 Reuss 1883  
47 54 1 28 5 52 43 30  
2 27 48 53 44 29 6 51  
25 46 55 4 49 8 31 42  
56 3 26 45 32 41 50 7  
15 24 33 60 37 20 9 62  
34 57 16 21 12 61 40 19  
23 14 59 36 17 38 63 10  
58 35 22 13 64 11 18 39

129 Francony 1881  
7 54 43 28 1 30 47 50  
42 27 6 53 48 51 2 31  
25 8 55 44 29 4 49 46  
56 41 26 5 52 45 32 3  
9 24 39 60 33 62 15 18  
40 57 10 21 16 19 34 63  
23 38 59 12 61 36 17 14  
58 11 22 37 20 13 64 35

135 Exner 1876  
31 34 15 52 1 54 27 46  
14 51 30 33 28 47 2 55  
35 32 49 16 53 4 45 26  
50 13 36 29 48 25 56 3  
11 64 17 40 21 58 5 44  
18 37 12 61 8 43 24 57  
63 10 39 20 41 22 59 6  
38 19 62 9 60 7 42 23

88 Ligondès 1883  
31 58 1 40 55 42 15 18  
38 3 30 57 16 19 54 43  
59 32 39 2 41 56 17 14  
4 37 60 29 20 13 44 53  
33 28 5 64 45 52 21 12  
6 61 36 25 10 23 48 51  
27 34 63 8 49 46 11 22  
62 7 26 35 24 9 50 47

94 Lehmann 1933  
31 54 1 6 43 48 27 50  
4 7 30 53 28 51 42 45  
55 32 5 2 47 44 49 26  
8 3 60 29 52 21 46 41  
61 56 33 12 37 16 25 20  
34 9 62 59 22 19 40 15  
57 64 11 36 13 38 17 24  
10 35 58 63 18 23 14 39

100 Ligondès 1883  
19 42 1 60 21 40 15 62  
2 59 20 41 16 61 22 39  
57 18 43 4 37 14 63 24  
44 3 58 17 64 13 38 23  
31 56 5 48 9 36 25 50  
6 45 32 53 28 49 12 35  
55 30 47 8 33 10 51 26  
46 7 54 29 52 27 34 11

106 Francony 1882  
31 6 35 60 1 62 27 38  
34 59 32 5 28 37 2 63  
7 30 57 36 61 4 39 26  
58 33 8 29 40 25 64 3  
15 42 17 56 9 48 23 50  
18 55 14 41 24 51 10 47  
43 16 53 20 45 12 49 22  
54 19 44 13 52 21 46 11

112 Ligondès 1883  
59 42 1 20 61 40 15 62  
2 19 60 41 16 21 62 39  
43 58 17 4 37 14 23 64  
18 3 44 57 24 63 38 13  
31 56 5 48 9 36 25 50  
6 45 32 53 28 49 12 35  
55 30 47 8 33 10 51 26  
46 7 54 29 52 27 34 11

118 Reuss 1883  
1 30 47 52 5 28 43 54  
48 51 2 29 44 5 26 55  
31 46 49 4 53 28 7 42  
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33 62 15 20 57 24 9 40  
16 19 34 61 58 39 10 23  
63 14 17 36 21 12 59 38  
18 35 64 13 60 37 22 11

124 Reuss 1883  
47 54 1 28 5 52 43 30  
2 27 48 53 44 29 6 51  
25 46 55 4 49 8 31 42  
56 3 26 45 32 41 50 7  
15 24 33 60 37 20 9 62  
34 57 16 21 12 61 40 19  
23 14 59 36 17 38 63 10  
58 35 22 13 64 11 18 39

130 Francony 1881  
7 54 43 28 1 30 47 50  
42 27 6 53 48 51 2 31  
55 8 25 44 29 4 49 46  
26 41 56 5 52 45 32 3  
9 24 39 60 33 62 15 18  
10 57 40 21 16 19 34 63  
23 38 59 12 61 36 17 14  
58 11 22 37 20 13 64 35

136 Ligondès 1883  
31 34 15 52 1 54 27 46  
14 51 30 33 28 47 2 55  
35 32 49 16 53 4 45 26  
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11 64 17 40 21 58 5 44  
18 37 12 61 8 43 24 57  
63 10 39 20 41 22 59 6  
38 19 62 9 60 7 42 23

89 MMS 2003  
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46 3 56 17 44 31 50 13  
7 42 25 64 5 36 19 62  
24 57 6 43 18 63 12 37  
41 8 59 22 39 10 61 20  
58 23 40 9 60 21 38 11

95 Ligondès 1883  
43 50 1 26 63 48 23 6  
2 27 44 49 24 5 62 47  
51 42 25 4 45 64 7 22  
28 3 52 41 8 21 46 61  
53 40 13 32 57 36 9 20  
14 29 56 37 12 17 60 35  
39 54 31 16 33 58 19 10  
30 15 38 55 18 11 34 59

101 Ligondès 1883  
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57 18 43 4 37 24 63 14  
44 3 58 17 64 13 38 23  
31 56 5 48 9 36 25 50  
6 45 32 53 28 49 12 35  
55 30 47 8 33 10 51 26  
46 7 54 29 52 27 34 11

107 Ligondès 1884  
59 6 27 36 1 62 31 38  
26 35 60 5 32 37 2 63  
7 58 33 28 61 4 39 30  
34 25 8 57 40 29 64 3  
9 56 23 48 13 52 17 42  
24 47 10 53 20 41 14 51  
55 22 45 12 49 16 43 18  
46 11 54 21 44 19 50 15

113 Marlow 1988  
11 54 15 44 1 46 39 50  
14 43 12 53 40 49 2 47  
55 10 41 16 45 38 51 4  
42 13 56 9 52 3 48 37  
63 28 17 32 57 36 5 22  
18 31 64 25 8 21 58 35  
27 62 29 20 33 60 23 6  
30 19 26 61 24 7 34 59

119 Wihnyk 1885  
1 30 47 52 5 28 43 54  
48 51 2 29 44 5 26 55  
31 46 49 4 53 28 7 42  
50 3 32 45 8 41 56 25  
33 62 15 20 9 24 57 40  
16 19 34 61 58 39 10 23  
63 14 17 36 21 12 59 38  
18 35 64 13 60 37 22 11

125 Reuss 1883  
47 54 1 28 5 52 43 30  
2 27 48 53 44 29 6 51  
55 46 25 4 49 8 31 42  
26 3 56 45 32 41 50 7  
15 24 33 60 37 20 9 62  
34 57 16 21 12 61 40 19  
23 14 59 36 17 38 63 10  
58 35 22 13 64 11 18 39

131 Francony 1882  
7 54 43 28 1 30 47 50  
42 27 6 53 48 51 2 31  
55 8 25 44 29 4 49 46  
26 41 56 5 52 45 32 3  
9 24 39 60 33 62 15 18  
40 57 10 21 16 19 34 63  
23 38 59 12 61 36 17 14  
58 11 22 37 20 13 64 35

137 Ligondès 1883  
31 34 15 52 1 54 27 46  
14 51 30 33 28 47 2 55  
35 32 49 16 53 4 45 26  
50 13 36 29 48 25 56 3  
11 64 17 40 21 58 5 44  
18 37 12 61 8 43 24 57  
63 10 39 20 41 22 59 6  
38 19 62 9 60 7 42 23

90 Ligondès 1882  
31 34 15 52 1 54 27 46  
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35 32 49 16 53 4 45 26  
50 13 36 29 48 25 56 3  
11 38 17 64 5 44 23 58  
18 63 12 37 24 57 6 43  
39 10 61 20 41 8 59 22  
62 19 40 9 60 21 42 7

96 Ligondès 1883  
59 42 1 20 61 40 15 62  
2 19 60 41 16 21 62 39  
43 58 17 4 37 64 23 14  
18 3 44 57 24 13 38 63  
31 56 5 48 9 36 25 50  
6 45 32 53 28 49 12 35  
55 30 47 8 33 10 51 26  
46 7 54 29 52 27 34 11

102 Ligondès 1883  
23 62 15 40 1 42 19 58  
14 39 22 61 20 59 2 43  
63 24 37 16 41 4 57 18  
38 13 64 21 60 17 44 3  
11 50 25 36 5 46 31 56  
26 35 12 49 32 55 6 45  
51 10 33 28 53 8 47 30  
34 27 52 9 48 29 54 7

108 Ligondès 1883  
47 62 23 6 43 50 27 2  
22 7 48 63 26 1 42 51  
61 46 5 24 49 44 3 28  
8 21 64 45 4 25 52 41  
19 60 9 36 13 40 29 54  
10 35 20 57 32 53 14 39  
59 18 33 12 37 16 55 30  
34 11 58 17 56 31 38 15

114 Beverley 1848  
1 30 47 52 5 28 43 54  
48 51 2 29 44 53 6 27  
31 46 49 4 25 8 55 42  
50 3 32 45 56 41 26 7  
33 62 15 20 9 24 39 58  
16 19 34 61 12 57 10 23  
63 14 17 36 21 40 59 14  
18 35 64 13 60 37 22 11

120 Murray 1936  
1 30 47 52 3 28 45 54  
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31 8 49 42 25 6 55 44  
50 41 32 7 56 43 26 5  
9 62 39 20 33 24 15 58  
40 19 10 61 16 57 34 23  
63 38 17 12 21 36 59 14  
18 11 64 37 60 13 22 35

126 Reuss 1883  
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2 27 48 53 44 29 6 51  
55 46 25 4 49 8 31 42  
26 3 56 45 32 41 50 7  
15 24 33 60 37 20 9 62  
34 57 16 21 12 61 40 19  
23 14 59 36 17 38 63 10  
58 35 22 13 64 11 18 39

132 Murray 1936  
7 30 43 52 1 54 47 26  
42 51 6 29 48 27 2 55  
31 8 49 44 53 4 25 46  
50 41 32 5 28 45 56 3  
9 60 39 22 33 58 15 24  
40 21 10 59 16 23 34 57  
61 38 19 12 63 36 17 14  
20 11 62 37 18 13 64 35

138 Ligondès 1883  
31 34 15 52 1 54 27 46  
14 51 30 33 28 47 2 55  
35 32 49 16 53 4 45 26  
50 13 36 29 48 25 56 3  
11 64 17 40 21 58 5 44  
18 37 12 61 8 43 24 57  
63 10 39 20 41 22 59 6  
38 19 62 9 60 7 42 23

91 Ligondès 1882  
31 34 15 52 1 54 27 46  
14 51 30 33 28 47 2 55  
35 32 49 16 53 4 45 26  
50 13 36 29 48 25 56 3  
11 38 17 64 5 58 23 44  
18 63 12 37 24 43 6 57  
39 10 61 20 41 8 59 22  
62 19 40 9 60 21 42 7

97 Marlow 1987  
43 48 1 50 63 18 31 6  
2 51 44 47 30 5 62 19  
45 42 49 4 17 64 7 32  
52 3 46 41 8 29 20 61  
39 10 53 16 57 24 33 28  
54 13 40 9 36 27 60 21  
11 38 15 56 23 58 25 34  
14 55 12 37 26 35 22 59

103 Ligondès 1883  
23 62 15 40 1 42 19 58  
14 39 22 61 20 59 2 43  
63 24 37 16 41 4 57 18  
38 13 64 21 60 17 44 3  
11 50 25 36 5 56 31 46  
26 35 12 49 32 45 6 55  
51 10 33 28 53 8 47 30  
34 27 52 9 48 29 54 7

109 Ligondès 1883  
47 62 23 6 43 50 27 2  
22 7 48 63 26 1 42 51  
61 46 5 24 49 44 3 28  
8 21 64 45 4 25 52 41  
35 60 9 20 53 40 29 14  
10 19 36 57 32 13 54 39  
59 34 17 12 37 56 15 30  
18 11 58 33 16 31 38 55

115 Wenzelides 1849  
1 30 47 52 43 54 7 26  
48 51 2 29 6 27 42 55  
31 46 49 4 53 44 25 8  
50 3 32 45 28 5 56 41  
33 62 15 20 37 60 9 24  
16 19 34 61 12 21 40 57  
63 14 17 36 59 38 23 10  
18 35 64 13 22 11 58 39

121 Murray 1936  
1 30 47 52 3 28 45 54  
48 51 2 29 46 53 4 27  
31 8 49 42 25 6 55 44  
50 41 32 7 56 43 26 5  
39 62 9 20 33 24 15 58  
10 19 40 61 16 57 34 23  
63 38 17 12 21 36 59 14  
18 11 64 37 60 13 22 35

127 Exner 1876  
43 48 27 52 1 54 5 30  
26 51 44 47 6 29 2 55  
45 42 49 28 53 4 31 8  
50 25 46 41 32 7 56 3  
15 40 19 24 57 62 9 34  
20 23 16 37 12 33 58 61  
39 14 21 18 63 60 35 10  
22 17 38 13 36 11 64 59

133 Murray 1936  
7 30 43 52 1 54 47 26  
42 51 6 29 48 27 2 55  
31 8 49 44 53 4 25 46  
50 41 32 5 28 45 56 3  
39 60 9 22 33 58 15 24  
10 21 40 59 16 23 34 57  
61 38 19 12 63 36 17 14  
20 11 62 37 18 13 64 35

139 Ligondès 1883  
47 22 39 28 1 50 43 30  
38 25 48 23 44 29 2 51  
21 46 27 40 49 4 31 42  
26 37 24 45 32 41 52 3  
15 20 33 60 5 54 9 64  
36 59 14 17 12 63 6 53  
19 16 57 34 61 8 55 10  
58 35 18 13 56 11 62 7

92 Roberts 2003  
27 24 31 52 1 54 37 34  
30 51 28 25 36 33 2 55  
23 29 22 32 53 4 35 38  
50 26 49 12 48 39 56 3  
11 14 41 64 5 20 47 58  
42 63 12 21 40 57 6 19  
15 10 61 44 17 8 59 46  
62 43 16 9 60 45 18 7

98 Ligondès 1883  
19 42 1 60 21 40 15 62  
2 59 20 41 16 61 22 39  
43 18 57 4 37 14 63 24  
58 3 44 17 64 23 38 13  
31 56 5 48 9 36 25 50  
6 45 32 53 28 49 12 35  
55 30 47 8 33 10 51 26  
46 7 54 29 52 27 34 11

104 Ligondès 1883  
23 62 15 40 1 42 19 58  
14 39 22 61 20 59 2 43  
63 24 37 16 41 4 57 18  
38 13 64 21 60 17 44 3  
25 50 11 36 5 56 31 46  
12 35 26 49 32 45 6 55  
51 10 33 28 53 8 47 30  
34 27 52 9 48 29 54 7

110 Ligondès 1910  
39 62 23 18 47 42 27 2  
22 17 40 63 26 1 48 43  
61 38 19 24 41 46 3 28  
16 21 64 33 8 25 44 49  
37 60 9 20 45 56 29 4  
12 15 34 57 32 7 50 53  
59 36 13 10 55 52 5 30  
14 11 58 35 6 31 54 51

116 Jaenisch 1862  
1 30 47 52 5 28 43 54  
48 51 2 29 44 53 26 7  
31 46 49 4 27 6 55 42  
50 3 32 45 56 41 8 25  
33 62 15 20 9 24 57 40  
16 19 34 61 38 59 10 23  
63 14 17 36 21 12 39 58  
18 35 64 13 60 37 22 11

# THE END IS NIGH !

by Paul Byway

## Solutions to competition 32

#199 9 Kc3 e4 e5 Bc4 Bxe6 Bg8 e6 exf7 d8Q mate. (In the original the pawn started on e4; it was put back to e3 to remove the useless filler, Pa3-a4.)

#200 9 Ke1 Kf2 h4 Nh3 Nxf4 Ng6 Rh3 Rf3 Rf8. The game was played under "Italian" rules (check cannot be given before the end of a series), so this was mate, but there would have been a normal mate on White's next turn had play continued.

#201 8 Nf5 Ba4 g5 g4 g3 gxf2 fxg1Q Qe3 mate.

#202 8 Nf5 Nd4 Re8 Re4 Rxf4 Ra5 Rxd5 Nc2 mate.

#203 10 Ke6 Re1 h5 hxg4 g3 gxf2 f1Q b5 b4 Qe2 mate.

#204 8 Kxc8 f5 f4 f3 fxg2 gxh1Q Qc6 Qc1 mate.

#205 1 Cd1+ Pe4 2 Pd7+ Pd4 3 Pd8 G10e9 4 Pd9+ Ke10 5 Pd10+ Kf10 6 Cf1 checkmate.

#206 1 Ch9 G~ 2 Pd7+ Kd9 3 Ch6 Ge9 4 Cd6+ Gd8 5 CxG Pc4 6 Ke2 Kd10 7 Ch8 Pd4 8 Ch1 Pe4 9 Cd1+ Ke10 10 Ce1 wins the pawn and then the game.

The current scores:-

FG 147, IR 124, JB 55, RC 51, PW 35, CL 24, RT 19, AD 6.

Competition 33 is alongside.

A Study in XiangQi

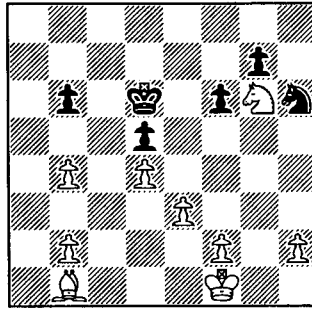
```

10 . . . . k : P . . . .
 9 . . . . : P : . . . .
 8 . . . . P : : . . . .
 7 . . . . . . . . . .
 6 . . . . . . . . . .
 5 . . . . . . . . . .
 4 . . . . . . . . . .
 3 . . . . : : : . . . .
 2 . . . . r G r . . . .
 1 . . . . G K : . . . .
    
```

Black is to play, but Red threatens several mates. What is the best play?

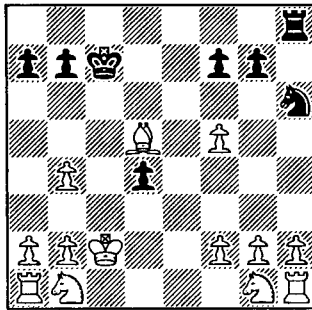
Solution on page 56.

#207 Pensimus - Lantillo (1992)



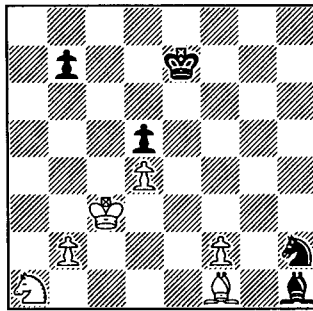
Black wins (series 8)

#208 Devetta - Sarale (1991)



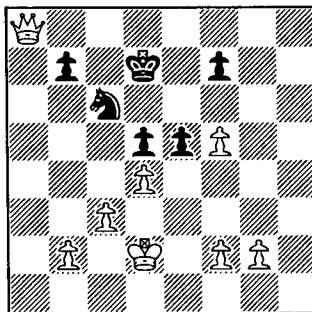
Black wins (series 8)

#209 Castellano - Forzoni (1992)



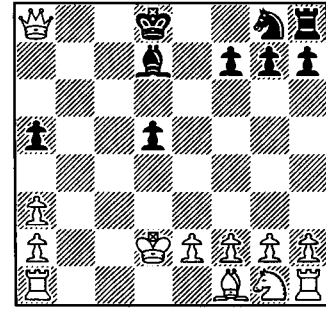
Black wins (series 8)

#210 Leoncini - Sarale (1992)



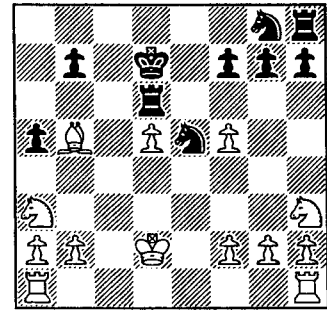
Black wins (series 10)

#211 Bertello - Manzini (1989)



Black wins (series 8)

#212 Sala - Picasso (1991)



Black wins (series 8)

#213 Cannon + Pawn #20

```

10 . . . C : : : . . .
 9 . . . . : g : . . .
 8 . . . . g : k . . .
 7 . . . . . . P . . .
 6 . . . . . . . . . .
 5 . . . . . . . . . .
 4 . . . . . . . . . .
 3 . . . . : : : . . .
 2 . . . p p : : : . . .
 1 . . . E : K : . . .
    
```

Red to play and win

#214 Cannon + Pawn #21

```

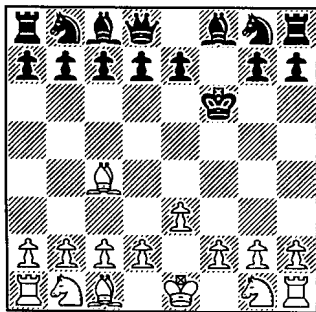
10 . . . e : : k . . .
 9 . . . . : : : . . .
 8 . . . . : e : . . .
 7 p . . . . . . . . .
 6 . . . . . . . . . .
 5 . . . . . . . . . .
 4 . . . . . . P . . .
 3 . . . . : E : . C .
 2 . . . . : : : . . .
 1 . . . . : K : . . .
    
```

Red to play and win

# SOLUTIONS

**Bidding Chess** (page 44). Yes, he can. After the move, the chips are 68 : 132 \* at worst, and Black must bid 68 to claim the move and play ...Kxf7 (chips 136 \* : 64). White now bids 64 to play Bc4 (chips 72 : 128 \*), and if Black interposes or moves his king to a light square White gets another check with his bishop and we are on familiar ground (Black's move makes the chips 144 \* : 56, White's second bishop check makes them 88 : 112 \*, Black's parry makes them 176 \* : 24, and White gets the next three moves).

The only way Black can avoid this is to meet Bc4 with ...Kf6, putting his king on a dark square and leaving White with no immediate check :



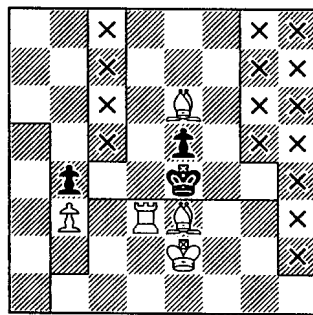
However, this brings Black's king into the open and the chips are a massive 144 \* : 56 in White's favour, so surely White can force a quick win?

Indeed he can. Black cannot afford to bid more than 31 for the next move (if he bids 32, he will reduce his holding to less than an eighth of the total, and White will be able to claim three moves). So White bids 31, making the chips 113 : 87 \*, and plays Nc3. This puts his knight within two squares of Black's king, so Black must retain at least a quarter of the chips and cannot afford to bid more than 37. White therefore bids 38 (chips 75 : 125 \*) and plays Ne4, and Black has to bid 75 and move his king (chips 150 \* : 50). White cannot quite claim the next two moves, but his next move will threaten the king (chips 100 : 100 \*), Black will have to bid everything to avoid its capture, and White will have eight moves with which to do as he likes.

**McIntyre jigsaw** (page 44). Pieces 1 and 2 cannot be placed side by side, and if 1 is placed above 2 then there is nowhere for 3 to go. So 1 must go at the bottom, with 2 above it. If the board is to be properly checkered, h1 must be white, so the baseline of 1 must go from b1 to h1.

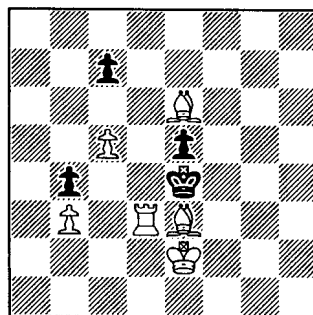
By the same argument, the baseline of 2 must go from a4 to e4 or from c4 to g4, but if it goes from a4 to e4 there is a five-square hole in the a1 corner which we cannot fill. So the baseline of 2 must go from c4 to g4. If we now try to put 3 above h1, we find that square g5 is left unfilled. So 3 must be placed above b1, and 4 must be used to fill the squares from a1 to a5.

All this gives the following, where xxx indicate the squares to be filled by pieces 5-8 :



We now see that piece 5, with the last two pawns, can go from c5 to c8, from g5 to g8, or from h2 to h5, and this gives us our three problems.

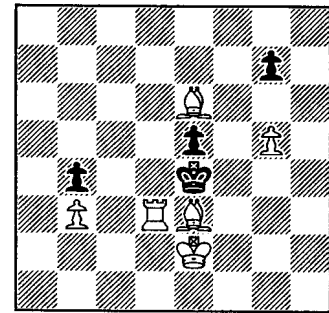
Case 1, pawns on c5/c7 :



White plays 1 Rd3-d8, and Black of necessity replies 1...c7-c6. White continues 2 Be6-d7 to release the stalemate, Black must walk into the square just given him, 2...Ke4-d5, and White's 3 Bd7-f5 discovers check and stops him returning to e4.

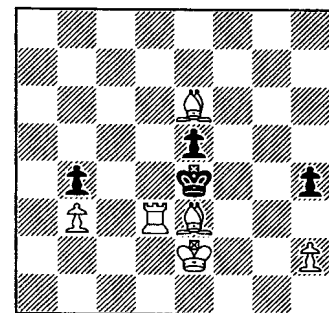
The remaining problems have similar solutions, but with the men

playing different roles. Case 2, pawns on g5/g7 :



This time it is the bishop which retreats, 1 Be6-c8, and after 1...g7-g6 2 Rd3-d7 Ke4-f5 3 Rd7-d4 it is the rook which has discovered check and stopped the king returning to e4.

Case 3, pawns on h2/h4 :



Time for White's third piece to make the first move: 1 Be3-c1 h4-h3 2 Rd3-d2 Ke4-f4 3 Rd2-d4.

McIntyre was one of the masters.

**Knight Relay Chess** (pages 48-49). Why not play 14 Bxg6? Because 14...Nd3+R adds knight power to the pawn on f4, forking king and bishop.

Why not 20 Bxg6? Because of a blistering attack by the rooks, aided by the knight on f3: 20...Rxb2+R 21 Rxb2 Rxb2+R 22 Kg1 Rg4R+ forking king and bishop.

Why not 22...Bxc5? 23 Bf5R+ wins the exchange.

The final mate in two: the game finished 57 Bf3-c6+R Kd8-c8 (the pawn on b5 guards c7) 58 f6-d7R mate.

**Proof Games** (page 49). 1 d4 e6 2 Bd2 (b2 off, d4 off) Bc5 (g7 off) 3 Bh6 Nxb6 4 Qd4 0-0 5 Qg7 mate. Peter thinks this is the shortest game to this Nessie-assisted mate, and believes it sound as a proof game.



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No "ECV 2 footnotes" this time!

We should not let the recent death of **Bobby Fischer** pass without notice, even though his only contribution to our particular corner of the field seems to have been the rather limited "Fischerandom" idea. I am reminded of a remark I recently saw - sadly, I cannot remember where - by someone who was watching Fischer play, and in the absence of his opponent Fischer put his hand on a piece, saw too late that its move would be a bad one, shrugged his shoulders, and played the move anyway. "As far as I am concerned," he wrote, "Bobby Fischer is a gentleman."

A view wholly consistent with this appears in the *Oxford Companion*, whose entry on Fischer is well worth rereading. It gives a rounded picture significantly at variance with the usual caricature.

VC 58 will not appear until the autumn - frankly, I need the break - but we are a society publication, and if any member would like to edit an interim issue, or to produce a monograph of some kind to fill the gap, we shall be delighted to hear from him. The funds will stand it.

## BCVS NOTICES

This year's **annual meeting** will be at **7 St James Road, Harpenden**, on **Saturday 7 June**. The formal AGM will be at 1130, after which there will be a light buffet lunch, and in the afternoon I thought we might try out Bidding Chess (see pages 42-44). UK members will find a formal notice of the AGM with this issue of VC, and members abroad who happen to be in the UK on the day will be very welcome also. The kitchen will be helped by advance notice from those intending to come, but we'd rather see you without prior warning than not see you at all.

**Computer programs.** It isn't only Fritz which has started to offer variants. Roberto Cassano tells me that ChessMaster XI plays Extinction Chess, Progressive Chess, Losing Chess, and Dark Chess, and I hope he will be able to provide us with a review in a future issue of VC. The ability to play Extinction and Progressive strikes me as particularly interesting.

From a commercial point of view, it seems to me that the addition of simple variant capabilities to standard chess-playing programs must make excellent sense. The mechanics are straightforward, at least in respect of variants which use the normal board and men, and the only difficulty is likely to lie in developing suitable algorithms for assessing the values of the positions reached at the end of the evaluation trees.

So the expenses are not high, and in return the product becomes that little bit more attractive; it doesn't require many extra sales to recoup the costs.

## EVENTS

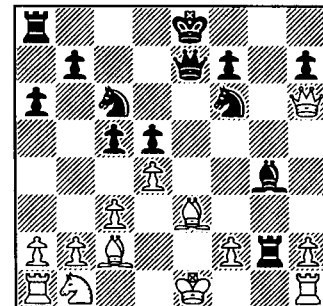
I understand that Mike Adams and Mike Gunn will again be organizing a **Variants Evening in memory of David Pritchard** at the **British Championship** meeting, and that details will be supplied to those attending the meeting.

Similarly, I understand that details of this year's **Circular Chess World Championship** will appear on

<[www.circularchess.co.uk](http://www.circularchess.co.uk)>

in due course.

Just before going to press, I received an idea from Alain Dekker called **Jump Chess** in which Q, R, and B can jump over an immediately adjacent man of either colour (from the initial array, Ra1 to a3, Bc1 to a3 or e3, Qd1 to b3/d3/f3). He would welcome an opponent by e-mail ([abdekker@gmail.com](mailto:abdekker@gmail.com)), and modestly sends a game he lost to Ian Deswarte :



Black played **15...R<sup>e</sup>2+** **16 Kd1** (Kf1 loses the bishop on c2) **Rxe3+** **17 Kc1 Re1+**, and 18 Rxe1 Qxe1 will be mate because interposing the bishop on d1 won't help.

**XiangQi study** (page 54). 1...Rxf10 2 Gd3! Rf1+! 3 Kxf1 Rxd1+ 4 Kf2 Rxd3 5 Pd9+ RXP 6 PxR+ KxP draw.

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