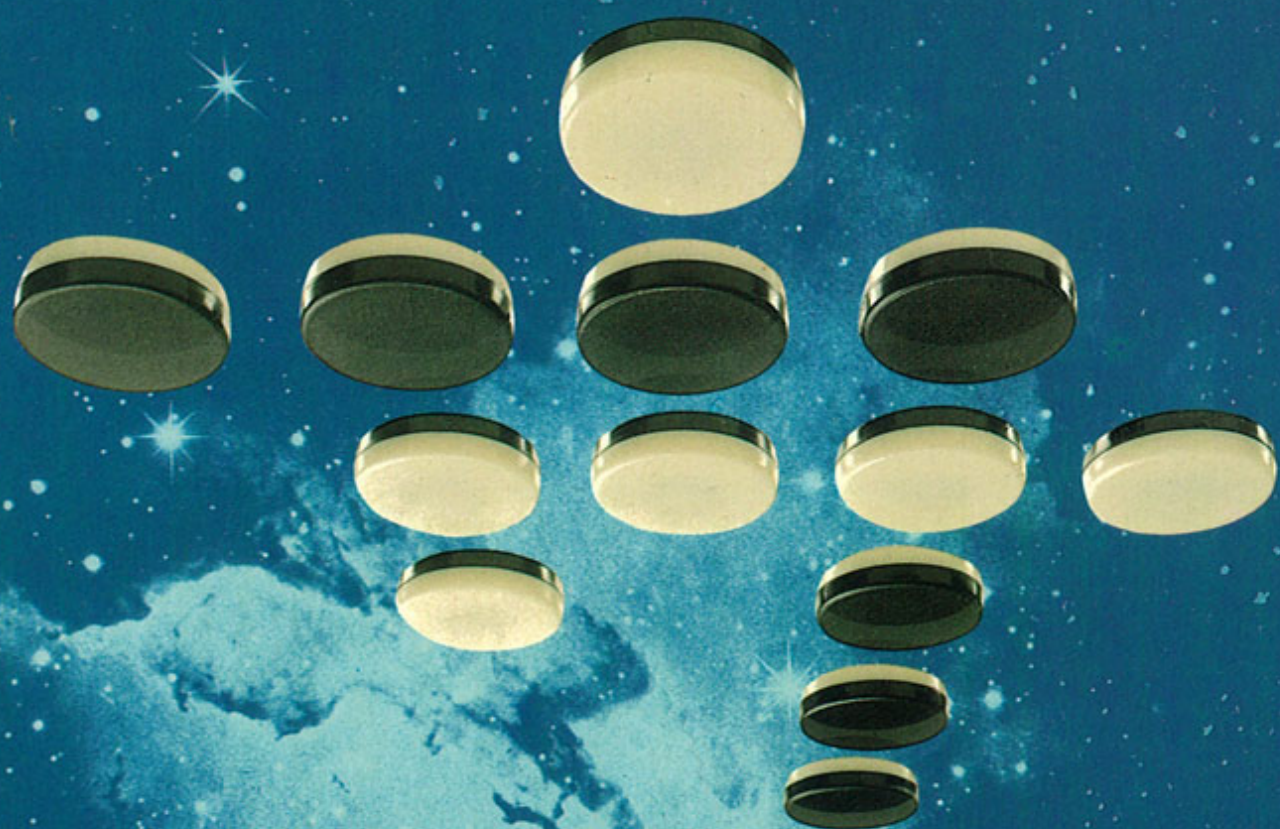Strategic Intelligence Classics in their Definitive Microcomputer Versions

ODIN

Playing by U.S. Othello Association Rules

BY LARRY ATKIN
AND PETER FREY

ODESTA

The MIND OF MAN Series
Volume 3

Odesta

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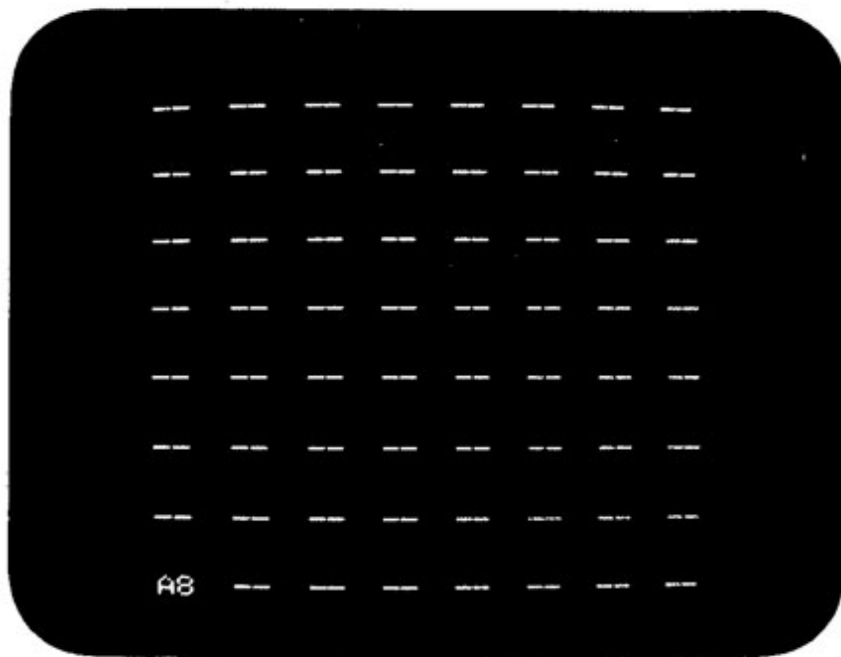
∽CONTENTS∾

APPENDIX

Playing surface showing numbered rows & lettered columns.

ODIN's playing field.

A1	B1	C1	D1	E1	F1	G1	H1
A2	B2	C2	D2	E2	F2	G2	H2
A3	B3	C3	D3	E3	F3	G3	H3
A4	B4	C4	D4	E4	F4	G4	H4
A5	B5	C5	D5	E5	F5	G5	H5
A6	B6	C6	D6	E6	F6	G6	H6
A7	B7	C7	D7	E7	F7	G7	H7
A8	B8	C8	D8	E8	F8	G8	H8

ODIN "Board" displaying full notation.

RULES OF PLAY

BLACK   2   ODIN   2

SELECT A PADDLE CONTROL AND PRESS BUTTON
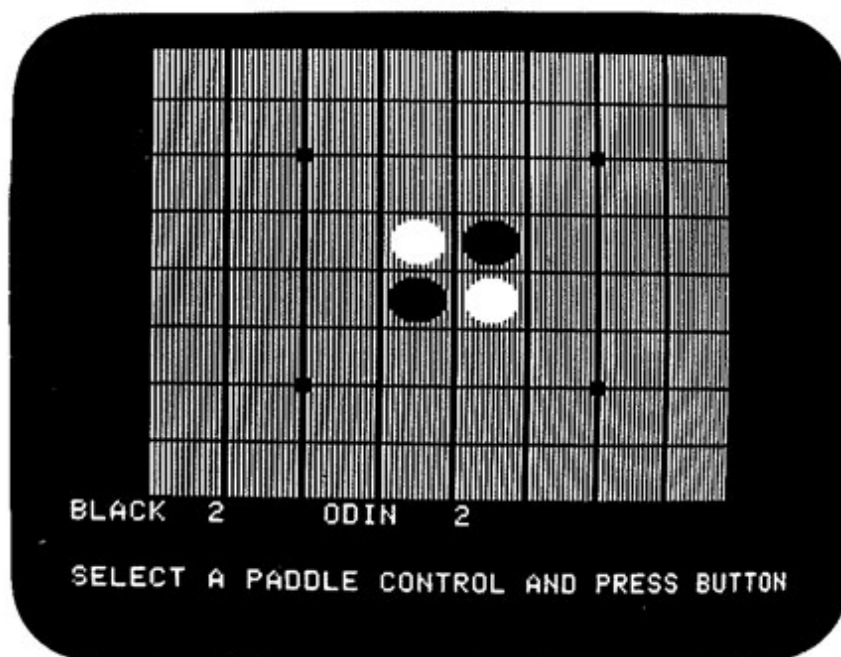
The start position (never varies)

The rules of play for Annexation (Reversi, etc.), have been modified slightly each time another variation of the game has appeared (see "BACKGROUND" - Appendix). ODIN plays according to the rules which are most frequently used in modern play. In rule considerations where

5

there may be several slightly different interpretations, ODIN follows the regulations established by the United States Othello Association.

The modern version of the game is played on an 8 x 8 grid (a chess or checker board). Each player has a large number of playing pieces which are a characteristic color or shape. Typically, small disks, painted black on one side and white on the other, are used. These are then flipped over as the pieces change sides. Play begins with four pieces occupying the centermost squares of the grid. Each player has two pieces lying on one of the main diagonals. Play consists of each contestant taking a turn by placing a piece in the playing area. The two contestants alternate turns until the playing area has no more empty spaces (or until neither has a legal move).

A move is legal IF it simultaneously fulfills three requirements.

First, each piece must be placed on an empty cell of the 8 x 8 grid. Attempts to place pieces on occupied locations are forbidden.

Second, the newly placed piece must be immediately adjacent to one or more of the opponent's pieces (vertically, horizontally, or diagonally).
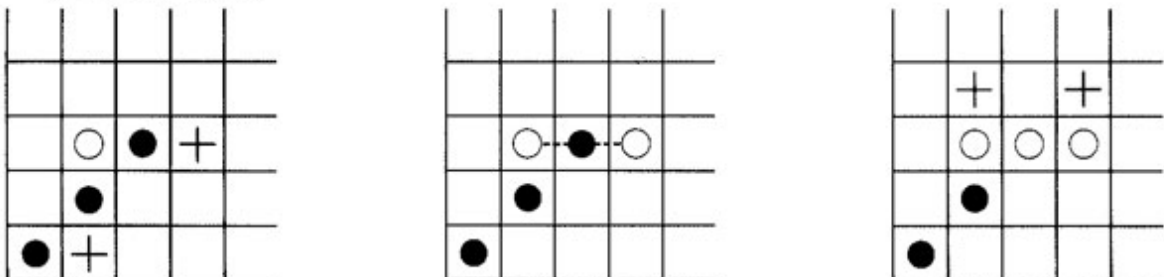
Example 1 (a)
(Black to move) "+" signifies a legal move
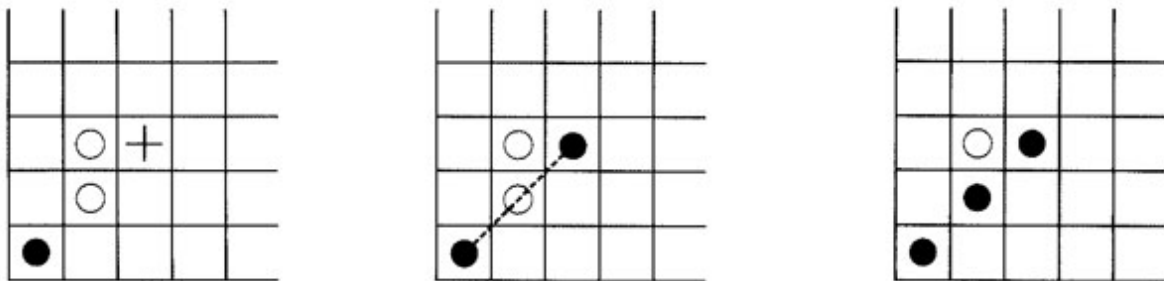
Example 1 (b)
(White to move)

Third, the placement must be made so that a straight line drawn from the newly placed piece, and going through one of the adjacent enemy pieces, must eventually intersect a friendly piece before it encounters an empty cell or the edge of the playing area (see examples). The enemy piece or pieces lying between the newly placed piece and the existing friendly piece are said to be "outflanked", and are captured by the player making the move. Each of these pieces reverses its status (changes sides). This outflanking can occur in more than one direction at the same time. When it does, all of these pieces are captured by the player. During the late stages of the game, a newly placed piece may outflank multiple rows of the opponent's pieces, causing whole sections of the playing area to change ownership. It is this characteristic of the game which presumably led to the names of Annexation and Reversi.

If a player has no moves, he or she must pass, and the opponent then plays again. If the player has one or more moves, he or she must choose one of them. A player may not pass just because all of the available moves are undesirable. When neither player has a legal move, the game is over. The winner is the player with the larger number of pieces at the end of the contest.

If you are unfamiliar with this game, the easiest way to learn is to load the program and play a game. ODIN will not accept an illegal move, and will suggest a move for you if you so desire. After playing a few games, you will have easily mastered all of the rules of play.

7

TO REITERATE

1. Moves are permissible only onto unoccupied squares (and once placed, the square remains occupied throughout the game, although it may change sides several times).

2. Only moves which capture pieces are permitted.

3. If no legal move is present, the player loses a turn (and continues to lose turns until a valid move surfaces).

4. Captures are made by line interception, in all 8 possible directions, simultaneously. Remember - only the originally placed piece may capture, and the newly reversed squares are powerless (but open to capture by your opponent), until you regain your turn.

5. You may not pass if a legal move is present (even if the move will do more harm than good).

6. When there are no valid moves for either side (such as when the board is filled), a count is taken, and the side with the largest number of pieces is declared the winner. Note: it is possible, though not common, to win by capturing **all** of the opponent's pieces, resulting in no possible moves even though the board is only partially filled.

LOADING THE PROGRAM

System Requirements: 48K, 1 disk drive

1) Insert disk in disk drive (label up and toward you).
2) Power up. The program will boot automatically for most hard-ware configurations. If it does not, boot in the usual way for your system.

GETTING STARTED

ODIN identifies himself and asks you to select a game paddle. Pick one and press its button, or press the return key (you can switch paddles by using the QUIT option explained later).

The paddle controller is one means of communication with the ODIN program. By rotating the knob throughout its range, you can select either the board position you wish to move to, or a wide range of command features designed to help you master the game. You may also use the right and left arrow keys to do the same thing. Pressing the button on the game paddle, or the 〈return〉 key on the keyboard will "enter" your selection.

In this manual, the paddle knob should also be read to mean the left and right arrow keys, and the controller button also means the 〈return〉 key. Also, keyboard commands and paddle commands may be used together during play.
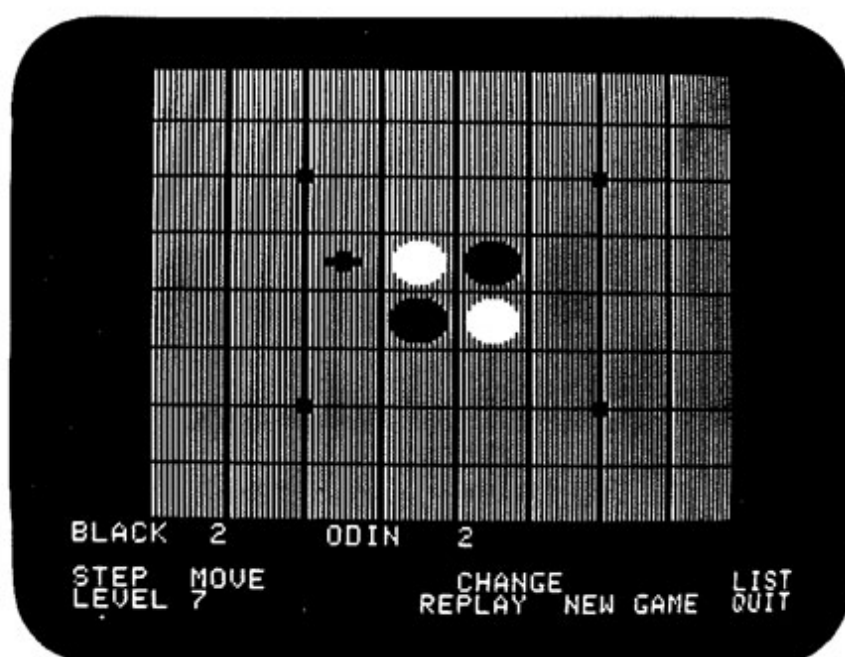
Turning the paddle control causes a "cursor" to move around the board. This "cursor" indicates what part of the monitor screen the computer is "looking" at for your command.

On the playing board, the cursor will be a cross-type symbol ("+"). Rotating the paddle knob will cause this symbol to jump around the board. Note that only squares representing legal moves will be visited.

Below the playing board are several lines of text. These contain the various command options you can select, as well as the game scores for each player. By rotating the controller knob, the cursor can be made to leave the playing surface and travel to these commands, each in turn. As the cursor visits each command, the word(s) for that command will be highlighted. At this point pressing the controller button will initiate that particular command.

IMPORTANT: Due to some automatic features of the cursor, you will note that a specific cursor position will not correspond to a particular position of the control knob from move to move. This might (and often does), cause some of the possible moves, as indicated by the cursor, to fall at the far end of the knob position from the other moves. Therefore, when scanning the board for possible moves, remember to rotate the control knob **through its full range** to insure all legal moves are covered. (All your moves may be seen at a glance using the SCORES command. See "FEATURES").

ODIN will assume you wish to move first and therefore be black. If this is not the case, select the MOVE command by rotating the control knob until the word "MOVE" is highlighted, and press the button. See "FEATURES" for more explanation of this and all other commands.

ENTERING YOUR MOVES

After your selection of a game controller, the board will be set-up, and the command features displayed below. Rotate the control knob until you see the cursor appear on the playing surface.[1] Turning the knob will cause the cursor to jump to several different squares. At the start of the game, the first player to move will have four possible moves. If the cursor doesn't indicate four different squares, remember to turn the knob through its entire range to pick them all up.

With the cursor marking the square to which you wish to move, press the button on the controller, and your piece will be placed there.

ODIN will then take over and consider his move. At the lower levels of play, this thinking time will be very short. At higher levels, after the game has progressed, the evaluation will lengthen, with a blinking asterisk near the lower right of the board indicating that the evaluation is in progress.[2] During this time, all commands are inoperative, and no entries are possible (to cut short this interval, see explanation of the "HALT" command).

When ODIN has selected his move, he will flash a playing piece of his color in the chosen square, allowing you to examine the move and consider its effect. To complete the move (i.e., "flip" the captured pieces), press the controller button. The move will then be finished, with the captured pieces changing color and the score updating accordingly.

This completes one move cycle, and it is now your turn again. For help in selecting a good move, see "SCORES" and "EX-PECT".

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[1]Note: the square that the "+" appears in after ODIN has made a move has no particular significance, and may or may not be a good move.

[2] This normally occurs while it is Odin's turn to move. It also flashes (at higher levels) while it is your turn to move. This indicates that Odin is computing his response to the move that he expects **you** to make, and is known as "thinking on your opponent's time".

FEATURES

A variety of special features has been included to help make your playing time pleasant, as well as to aid in your mastery of the game. The features are active only when it is your turn to move. Rotate the selected game paddle control knob until the desired command is highlighted. Pressing the button will initiate the selected feature. If not using paddles, press the ← or → keys to advance the cursor. Remember: paddle knob = ← . .→ keys, and paddle button = **(return)** key.

Command names and their definitions are:
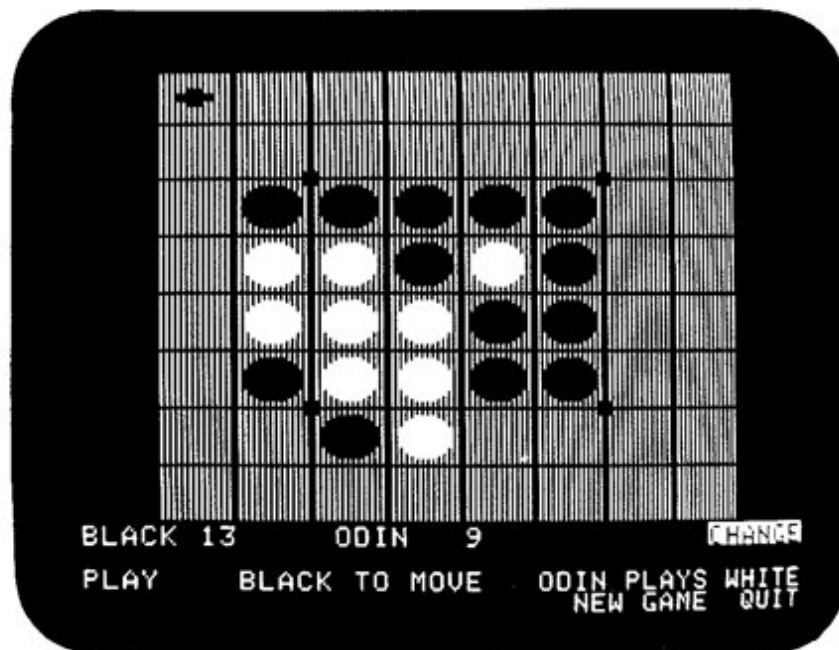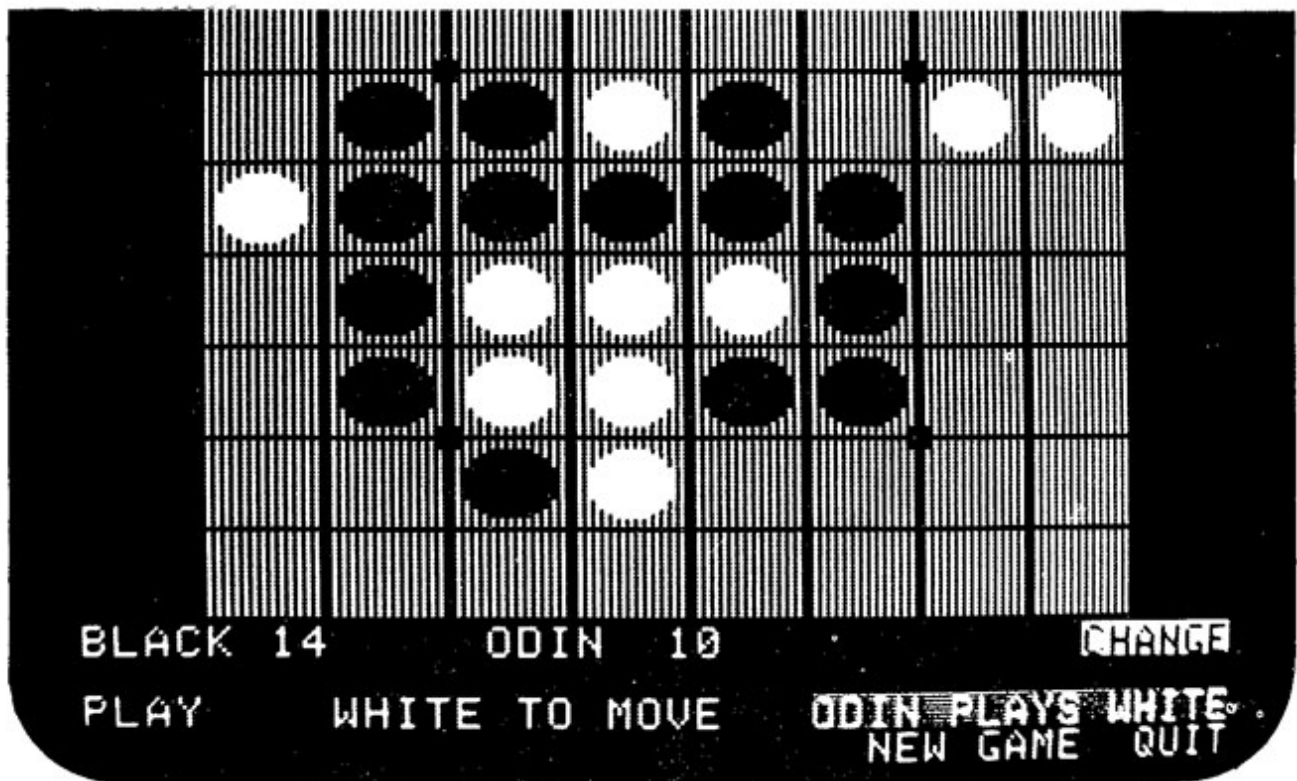

CHANGE   This command lets you set up a special position, or change an existing board. It may be used at any time — before, during, or after a game.

                      After selecting CHANGE, rotate the control knob while watching the game board. The "+" can be directed to any square. Where a piece is to be placed, press the control button.

                      Each push of the .button will sequence the square through each of the three possible configurations (empty, black, or white). Therefore, any square, whether empty or occupied, may be changed to a different status.

                      Note that the only restriction to this concerns the four center squares. Although these may be changed in color, none of these pieces may be removed, since they

12

represent the "start" position squares, which are always occupied on a legal board.


```
BLACK 14        ODIN 10       ·       CHANGE
PLAY        WHITE TO MOVE    ODIN PLAYS WHITE·  .
                              NEW GAME    QUIT
```

When the CHANGE mode is in operation some new command options will appear:

WHITE TO MOVE (or) BLACK TO MOVE — Position the cursor over this command and press the button. The first word will change, allowing the selection of the color which is to move next.

ODIN PLAYS BLACK (or) ODIN PLAYS WHITE — The last word will change when the button is pressed, allowing the computer to play either color.

PLAY — Resume game (start-up the game from this position).
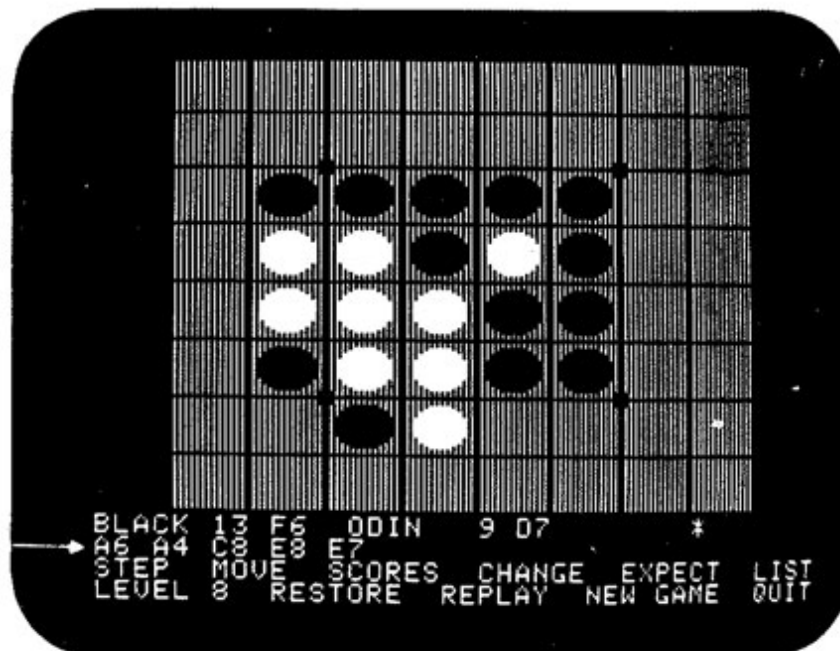
EXPECT   This feature provides detailed information about ODIN's planning process. It is not truly functional until skill level 5 or higher. At lower levels, it will provide only the move that corresponds to the square with the highest scores (see SCORES).

With the controller button depressed, the notation for the square ODIN suggests for your move will appear on the second line under the game board (normally blank), starting at the far left. Below level 5, there will only be one move displayed. At 5 or higher, ODIN will display what he thinks is your best move, the counter-reply he intends to make, your best response to his reply, and so on. This is known as the "principal variation". The extent of these predictions depends on the depth of the look-ahead search (which depends on the level).

When the button is released, (or the⟨return⟩pressed again) the cursor marker "+" will automatically appear at the suggested location on the board. Pressing the button again will enter this move.

HALT   This option is only available at higher skill levels, when ODIN begins to require more time for his calculations. After ODIN has been thinking for about 10 seconds, the HALT option will appear. By pressing the controller button, you can stop ODIN from completing his evaluation (which might require hours, depending on the skill level–

14

see skill level chart), and force the program to make the best play that has been found up to that time. If you are playing ODIN at a level high enough to display the "Halt" command, the program will let you know when it has chosen a move (finished "thinking") by ringing the "bell" on the Apple.

The use of HALT will disable EXPECT and SCORES for the next move.
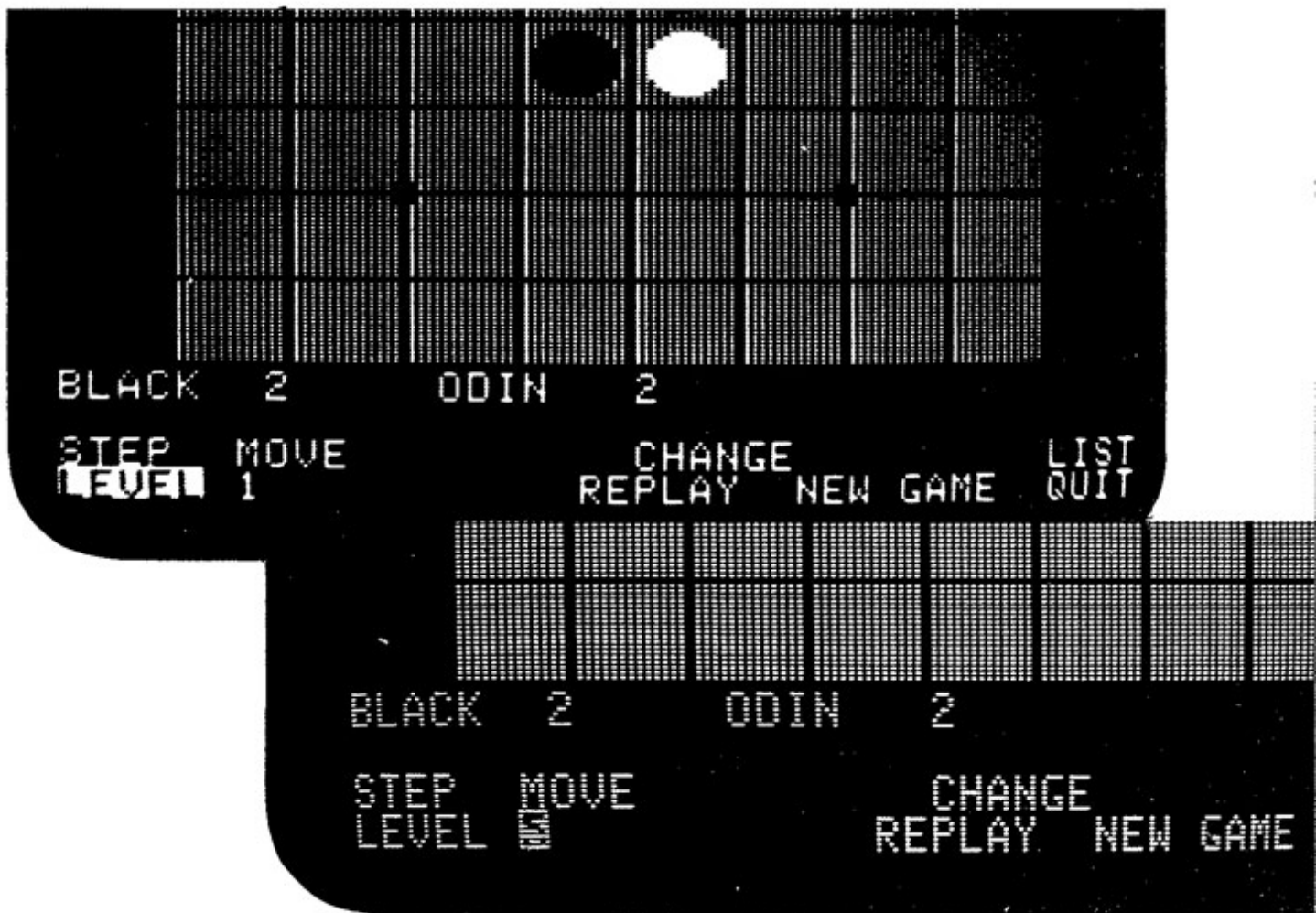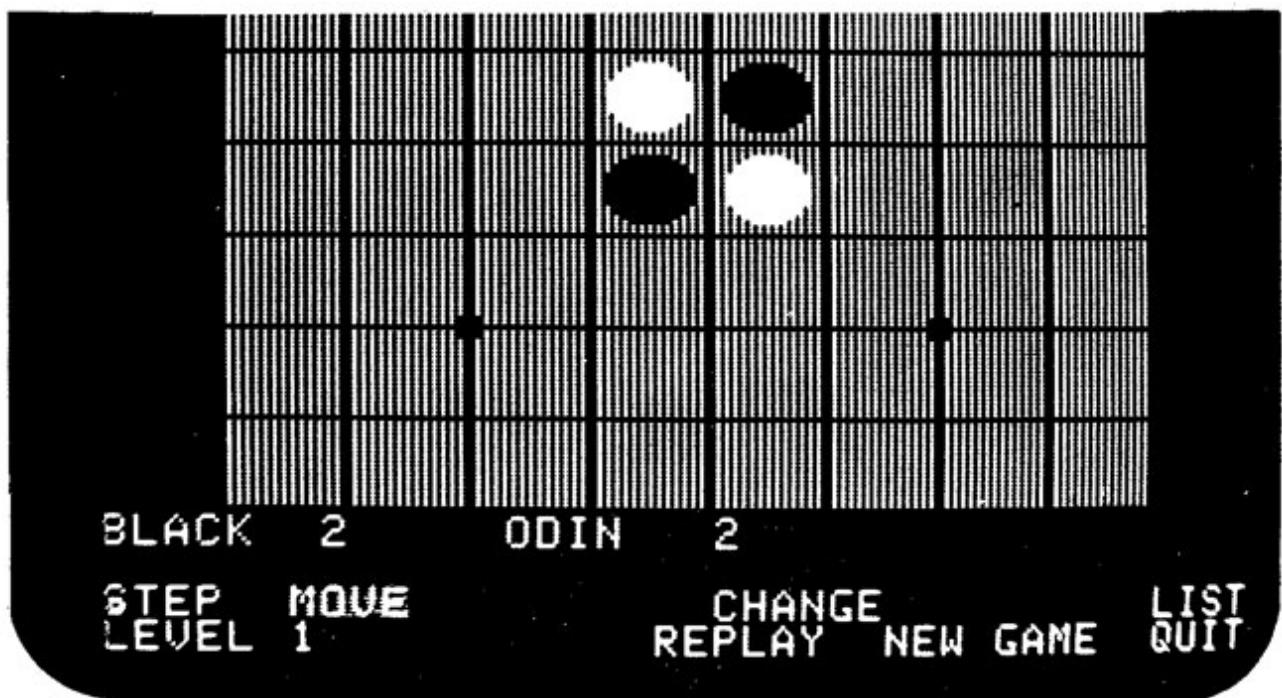

LEVEL Use this command at any time (when displayed), to adjust Odin's level of playing skill. With LEVEL highlighted, pressing the controller button will cause the cursor to jump to the right, highlighting the current playing level. Turning the controller knob will change the displayed level. Pushing the button again will return the cursor to LEVEL. For information on what the different levels mean, see the section "Odin's Skill Levels".

```
 1 D3 C3   16 G5 G6
 2 C4 E3   17 A2 F8
 3 F4 D6   18 C1 B1
 4 C6 C5   19 E8 C8
 5 E6 F6   20 D8 H3
 6 B3 F5   21 H4 A5
 7 B4 F3   22 H6 A1
 8 C2 B5   23 B2 F1
 9 D2 E2   24 H2 H5
10 F2 E1.  25 G7 H1
11 B6 F7
12 G4 D7
13 E7 C7
14 G3 A3
15 A4 D1


BLACK 26      ODIN  28

STEP  MOVE              CHANGE  EXPECT  LIST
LEVEL 5   RESTORE   REPLAY  NEW GAME  QUIT
```

LIST   With the selection of this feature (at any time during or after a game), a complete game record will be presented, using the standard notation. A pass by either player is denoted by "--". The display will disappear when the button is released (or ⟨return⟩ pressed again).


```
BLACK    2     ODIN    2

STEP  MOVE              CHANGE            LIST
LEVEL 1              REPLAY  NEW GAME  QUIT
```

MOVE   This feature allows you to change sides at any time. If you have played yourself into a bad position, change

sides, and see how ODIN attempts to make the best of it. With continual use of this command (you can simply hold the button down), the computer can be made to play **both** sides for as long as desired. Note — moves made in this mode are ignored when you RESTORE.

NEW GAME   By selecting New Game, you may set up a new game board at any time.

PLAY   This command only appears while using the STEP, REPLAY, or CHANGE features. It is used to resume normal play from the current board position.
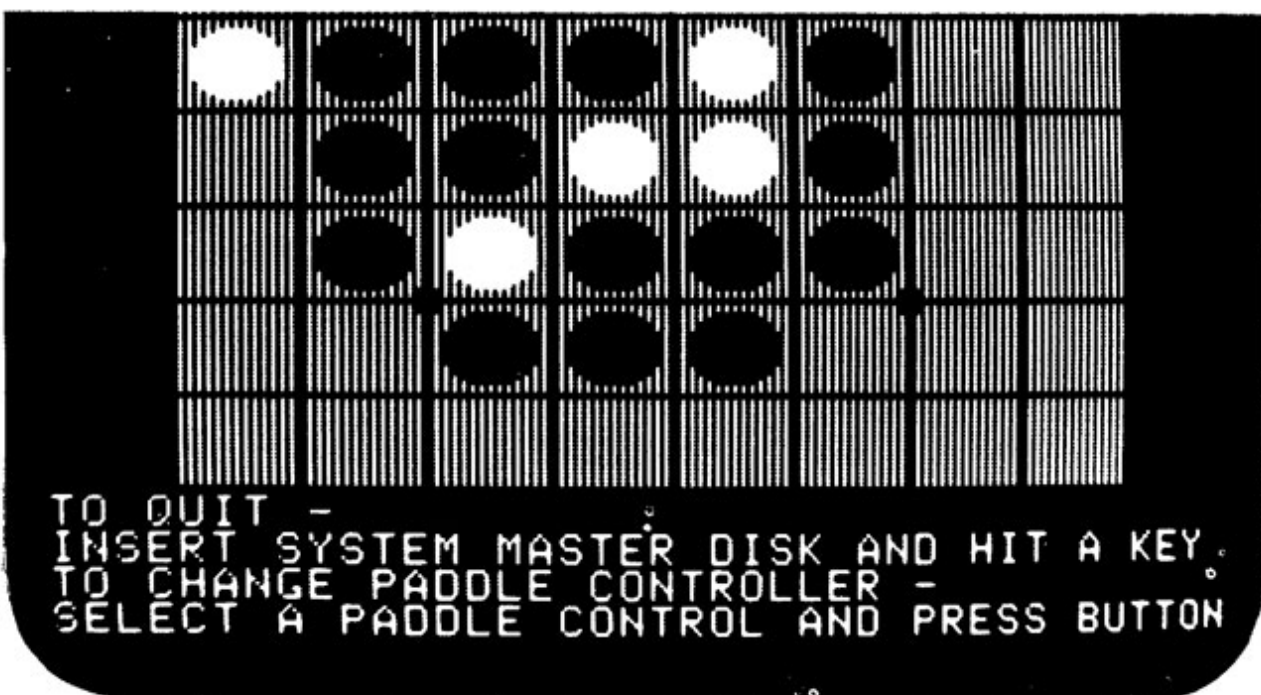
QUIT   Quit allows you to exit the program and boot another disk. It also gives you the option of changing the game paddle. After selecting the QUIT command, pick-up the other controller and press the button. The computer will automatically give control to this paddle.

REPLAY   At the end of a game you may request to see the entire game replayed move by move. For each move, make sure the cursor position is on the NEXT command, and then press the controller button. Holding the button down continuously will sequence through all the moves.
— This command may also be used at any time dur-

17

ing a game to view the moves up to that point.
— To resume normal play from any point during the replay, select PLAY.
— To replay again, select REPLAY (but only at the **end** of a replay).

Note: You cannot replay a game if you have RE-STOREd to a previous game (see RESTORE).

RESTORE   This feature allows you to take back your move, along with your opponent's reply. You may travel up to eight moves into the past (from your most advanced point in the game). [There is a point (8 moves) beyond which the program will not allow any more retractions — to reach an earlier point in the game, the REPLAY feature should be used.]

— The last move can always be taken back.
— If you RESTORE past the start of a game, or past a CHANGE (set-up) position, the board from the end of your last game will be visible, but the RE-PLAY will no longer be available.
— If you have made moves using the MOVE mode, RESTORE will return you to the point in the game one move **before** you started MOVEing.
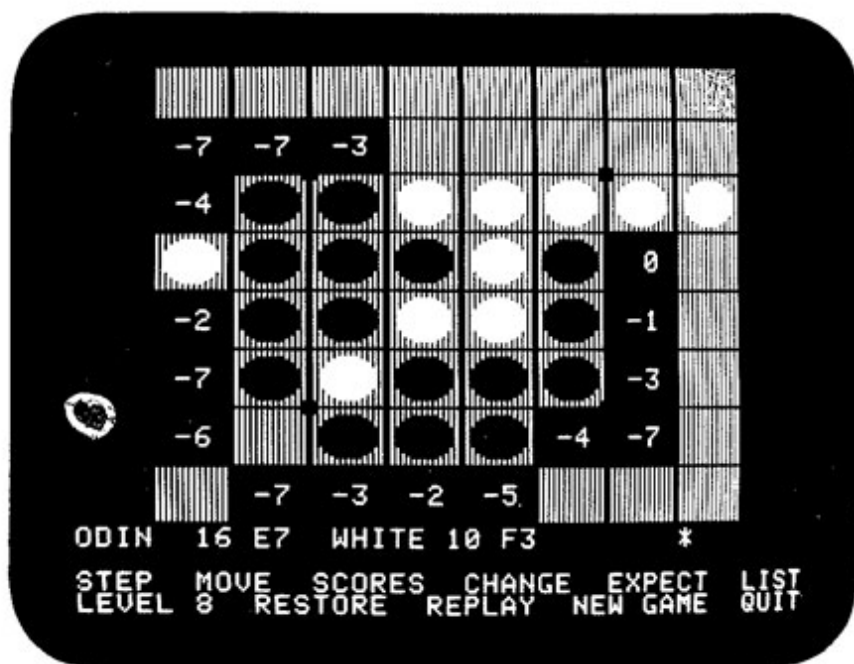

SCORES   Select "SCORES" with the controller knob and push the button. A number will appear on each of the squares to which you can legally move. Releasing the button will erase the numbers and restore the board to normal.

18

Positive numbers denote good moves, negative numbers imply poor moves. The larger the number (in absolute terms), the better (+) or worse (−) the move is for you.

However, these numbers are based on ODIN's evaluation of the immediate situation, and do not reflect the strategic considerations formed with a look-ahead search. They provide for a reasonably balanced game against the computer on the first few levels, but will fall further behind at the higher skill levels. With this consideration in mind, the SCORES feature should be very helpful to the novice in learning what constitutes a good move for an immediate board position, but will be less valuable for the advanced player. Also, during the end-game these values may not be helpful, since a look-ahead search is required for accurate assessment.
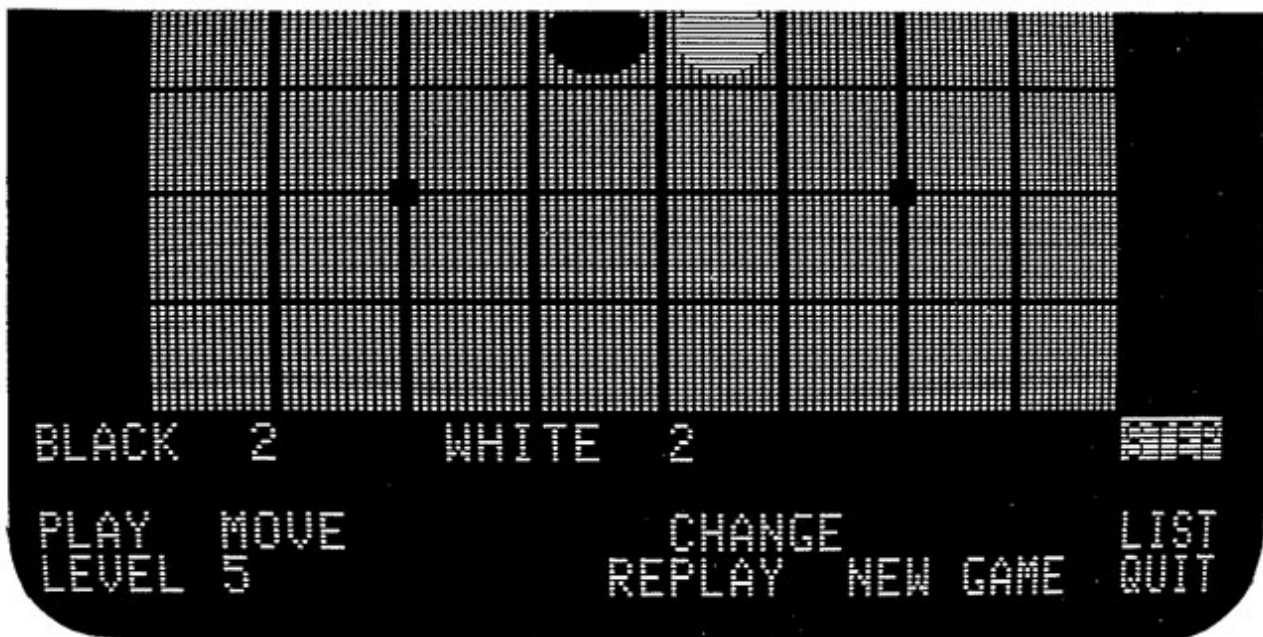
STEP   In this mode, the plays for both sides are made by the player(s), with the computer taking no active part other than to display the moves and the scores.

This feature allows two persons to play a regular game using the monitor instead of a real board and playing disks. It can also be used to set up a position from a game record of a previously played game.

The STEP mode may be entered at any time during a normal game with ODIN, and normal play may again be resumed by selecting PLAY.

During the "STEP" mode, the evaluation functions (SCORES and EXPECT), are not available, but the game record will continue to record all the moves.

19

CHANGE — Create a new board position, or change board of game in progress. (Begin normal play by selecting PLAY).

EXPECT — Display principal variation (level 5 or above).

HALT — Stop Odin's "thinking" process, and force him to move.

LEVEL — Select or change Odin's playing strength.

LIST — Display record of moves made by both sides.

MOVE — Change sides.

NEXT — Replay next move in REPLAY mode.

NEW GAME — Start a new game.

PLAY — Resume normal play after STEP, REPLAY, or CHANGE.

QUIT — Change paddles, or boot another disk.

REPLAY — Replay moves up your current position, or replay a game up to a certain point, and then begin new play by selecting PLAY.

RESTORE — Take back up to eight moves.

SCORES — For help in selecting a move.

STEP — Use to play with another person, or against yourself. Resume normal play by selecting PLAY.

REMEMBER —
*You can use paddle knob and button and/or ← → keys and **⟨return⟩**
*Use of RESTORE disables the opening library

ODIN's SKILL LEVELS

It is possible to adjust ODIN's level of play from that of a beginning amateur, to that of the finest championship players. The various skill levels are determined in a complex way by manipulating the depth of the look-ahead search, and the time for activating the endgame module. By endgame, we mean that point at which the program begins to evaluate **all** the remaining moves and possible counter-moves, and arrives at the best possible move considering every variation. In other words, it is playing a perfect game.

An "opening library" refers to a pre-programmed selection of moves and counter-moves that have been found to be advantageous in the beginning of a game. These moves will make ODIN's game stronger and at the higher skill levels will markedly speed up ODIN's first few moves. Skill level 3 is the lowest level using the opening library. At any level where it is in use, the use of RESTORE will cause the program to leave the library, and evaluate each move in the normal manner.

Level 1 and 2 use a simple square-priority strategy. The squares are ordered from best to worst, based only on their board location. A move is made by scanning this list from top to bottom and selecting the first square to which a legal move can be made. This strategy was discussed by Peter Frey in an article in BYTE (July, 1980, p. 56). It provides surprisingly strong competition for the beginner, but is easily defeated by an experienced player. It has no look-ahead capability, but, as adapted here, will switch to an endgame search when there are 2 or 3 empty squares left, respectively.

Level 3 has no look-ahead either, but instead of playing the first move,plays the best move based on the immediate board position.

The look-ahead search begins with a 2 ply search at level 4. This means that ODIN will look at every possible move and every possible counter-move for the next two moves into the "future". The SKILL LEVELS chart gives full information on depth of search and when the endgame is activated for all playing levels.

Level F is designed for tournament play, where each side must complete its moves within 25 minutes. It starts with the opening library. After the opening library, a 7 ply search is carried out until move #18. The look-ahead is then increased to a 9-ply until the endgame, which begins when there are 12 empty squares left on the board (or one move later if Odin thinks he is going to win).

APPENDIX

REVERSI AND GO BANG.

BY

"BERKELEY."

Authorized by Lewis Waterman.

WITH NUMEROUS ILLUSTRATIONS.

NEW YORK:
FREDERICK A. STOKES COMPANY.
MDCCCXC.

The earliest comprehensive treatise published on the strategy of Reversi (1890). The game was apparently first described in the "Queen" newspaper in the spring of 1888, and in a handbook authorized by the inventor (Waterman), in the same year.

A BIT OF BACKGROUND

Many board games originated as a reflection of the real world, and their popularity lies in the ability of the players to manipulate armies, empires, and strategic forces — without risking more than their pride.

ODIN plays the modern variation of a game which has engrossed and challenged players for many years. The early history of this pastime is clouded in obscurity, but points to a game called Annexation. (International law describes annexation as the act by which a state adds territory to its dominions). Known in parts of Europe at least as far back as the 1700's, the game followed the same general principles as its modern counterparts. An official set of rules was lacking, however, and it is fairly certain the board size varied. Annexation and its various descendants are classed as war games, with the playing pieces traditionally referred to as "men".

The rules for Annexation were modified around 1890, when the game was "re-invented" by Lewis Waterman, who claimed all proprietary rights to the game. He gave the game, for the first time, a clear set of rules, fixed the board size to the present standard, and, for ownership and marketing purposes, gave it a new name — "Reversi". References to the game invariably use the Reversi name, with mention of its earlier history being rare.

Reversi, as originally published by the London firm of Jaques & Son, was very popular in England at the close of the Victorian era. The game ranged up and down in popularity over the years, and by the 1970's had generally declined in familiarity. Then, from the Far East, came yet another re-birth (cloaked in a new name).

A Japanese chemical engineer, Goro Hasejawa, seems to be the father of the modern and most commonly known version. It is sold under the tradename "Othello" by the Tsukuda Company in Japan, and by CBS Toys, Inc. (Gabriel Inc.), in the United States and Canada. Othello, as currently marketed world wide, uses a variation of the

rules Hasejawa established in 1974. The game has become a great success, with more than 20 million sets sold in Japan, and over 5 million sets already sold in the newer U.S. market.

Some of the differences between Reversi and its offspring "Othello" are significant. In Reversi, the two players take turns placing each disk of the initial four disks in the center four squares, and each player is also limited to a maximum of 32 disks. Othello does away with the initial placement routine in favor of a fixed, standard placement, and allows unlimited playing pieces for each side.

The process of refinement continues through the United States Othello Association, which publishes a comprehensive set of rules and guidelines for use in officially recognized tournament play.

All things considered, the procedural innovations have tended to streamline the game, adding to its exciting, concise nature of play. At the same time, the different names tied to these alterations have, perhaps, contributed to an identity problem. The beauty of the game in its modern incarnation is that the rules are easily learned, and yet truly skillful play develops only after considerable practice. Each player's fortunes may change rapidly, and the winner is seldom known until the last few pieces are placed. It is a compelling game of logic and strategic planning, and the relative speed of play adds to its addictive properties. Unlike chess or "Go", a thoughtful game can be completed within 20 or 30 minutes. The phenomenal increase in the number of players in the last few years is testimony to the game's inherent fascination.

PLAYING SKILLFULLY

Some Strategic Considerations

by Peter Frey

Despite the fact that Annexation/Reversi/Othello has been played for several hundred years in many different countries, there remains some doubt concerning which playing strategies are most effective. There are, however, a number of ideas which appear to have nearly universal acceptance. The advice which follows tends to emphasize this common ground.

One of the most basic ideas about the game is that corner squares are very desirable. The reasoning behind this idea is not complicated. The four corner squares are the only locations on the playing area which can never be reversed. Once a corner has been captured, it will remain as the property of the initial owner for the rest of the game. The corners therefore provide permanent outposts on a playing area which otherwise has the property of quicksand in terms of ownership rights.

A related idea is that it is good to play next to a corner after the corner has been captured. Pieces "backed-up" to one's own corner piece are also permanent. When a corner has been captured, the successful party should attempt to make moves adjacent to that corner while his or her opponent should strive to direct play away from that corner.

If corners are valuable, then it follows that playing on a square next to an empty corner is very dangerous. The reasoning in this case is that your opponent can never go to a corner square if you have no pieces adjacent to that corner. If you do play next to an empty corner, it is very likely that your opponent will eventually gain control of the corner. Most good players avoid playing next to an empty corner during the early stages of the game. This is especially true of the square next to the corner on the diagonal.

Although some players believe that it is advantageous to gain access to and control of the edge

CORNER SQUARES

squares, this idea is not universally accepted. Recent tournament play demonstrates a tendency by the top players to avoid moves to edge squares during the early part of the game. If a player gets many pieces on the edge during the early part of the game, there is a tendency for these pieces to cause later moves to flip many pieces. If the playing area becomes dominated by one set of pieces, this is often a disadvantage for the side with most of the pieces. Having a large number of pieces often restricts your future move options and forces you to make a bad move. When moves are made to an empty edge, there seems to be a slight preference for the squares located two away from the corner instead of squares which are three away from the corner. One should never play next to the corner on the edge when the edge is otherwise empty.

One cannot overemphasize the importance of having many move options. If you have many pieces and your opponent has very few, he or she may be able to select moves which eventually force you to play adjacent to a corner for lack of any better moves. The number of pieces for each player is only a rough index of the number of moves for each side. A more reliable consideration has to do with the relative position of the pieces. In general, one should avoid as much as possible having one's pieces on the "outside" of the game.

During the early stages of the game, it is common for players to select moves which decrease their opponent's future move options while increasing their own options. Generally this means making moves which flip only one or two pieces. When multiple pieces are flipped, it is best if they are interior pieces surrounded on all sides by other pieces.

During every game, each player is faced with the decision of whether to capture pieces on the edge and thereby gain a row of pieces on the edge or to give the opponent the option of capturing the edge. There are two rules of thumb which are useful for these decisions.

EDGE SQUARES

MOBILITY

EDGES

A drastic example of the concept of mobility.

Black has been spotted 38 pieces (none in the corners, though). Black is destined to lose.

5 plays later

	A	B	C	D	E	F	G	H
1			●	●	●	●		
2	●		●	●	●	●		
3	●	●	●	○	●	●	●	●
4	●	●	●	●	●	●	●	●
5	●	●	●	●	●	●	●	
6			●	●	●	●		
7			●	●	●			
8			●	+				

1) Black 39 – White 1
The first move for white is to strike downward, to D8.

	A	B	C	D	E	F	G	H
1			●	●	●	●		
2	●		●	●	●	●		
3	●	●	●	○	●	●	●	●
4	●	●	●	○	○	●	●	●
5	●	●	○	○	●	○	●	
6	●	●	●	○	●	●	●	●
7		●	●	●	●	●		
8		○	○	○	○	○		

2) White has established a beachhead on the lower row, but the real power still comes from the excellent, (unblocked), center positions.

	A	B	C	D	E	F	G	H
1	○	○	○	○	○	○	○	○
2	○	○	○	○	○	○	○	○
3	○	○	○	○	●	○	○	○
4	○	○	●	○	○	○	○	○
5	○	○	○	○	○	○	○	○
6	○	○	○	○	●	○	○	○
7	○	○	○	○	○	○	○	○
8	○	○	○	○	○	○	○	○

3) Black 3 – White 61
White has completely devastated the opponent.

	Black	White
19		D8
20	E8	B6
21	A6	G6
22	H6	F8
23	F7	B8
24	B7	A8
25	A7	A1
26	pass	B2
27	pass	B1
28	pass	G7
29	G8	G2
30	G1	H5
31	pass	H8
32	pass	H7
33	pass	H2
34	pass	H1

Game Record

EDGES

The first has to do with the number of edges which you control. It is better to control one or two edges than to control no edges or three or four edges. It can be a serious problem if you control all the edges or if you have no pieces at all on the edge. A second important consideration has to do with the configuration of your pieces on the edge. It is better to have an even number of pieces in a row on the edge than an odd number of pieces. Five pieces in a row can be a major liability when the adjacent corners are still empty.

SAFE MOVES

In the late middle game when the contest becomes tense, there are several important goals for which each player should strive. Each person should try when possible to reserve one or more safe moves. A safe move is one which does not immediately endanger a corner. Moves which can be reserved are ones which are open to you but not available to your opponent. When possible, these moves should be postponed as long as possible. In simple terms, you are trying to save for a rainy day. As the game approaches its climax, one of the players will run out of safe moves and will be forced to give up a corner. If you have saved several safe moves, it is likely to be your opponent who runs out of safe moves first.

DIAGONALS

A second important idea at this stage of the game is to control one or both of the main diagonals. Sometimes a player can create a safe move for himself or herself by playing on the diagonal square next to an empty corner (normally a very bad move) **if** the player controls the diagonal (i.e. the opponent has no pieces on the diagonal). Even though the player has a piece in a very dangerous position, the opponent cannot immediately move to the corner and may be forced to make a move which gives up one of the other corners.

TEMPO

A third idea which can be helpful in the late stages of the game is the notion of tempo. This term comes from the game of chess and is related to which player has the move. Often in Othello, and especially in the early endgame, it is important to minimize the number of forced

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