ORION™

CONTENTS

Introduction

ORION takes its name from the most prominent and spectacular of the heavenly constellations. Like a constellation, ORION is actually a large number of different games and puzzles confederated in a single system. Extending the metaphor of astronomy, the game device is made up of rotors each forming an orbit around which the playing pieces swirl in precise paths as do satellites about planets, planets about stars, and stars about the center of galaxies. Faithful to this celestial theme, the games and activities of ORION achieve identity and memorability through parallels with the names, myths, and phenomena of astronomy.

Thus, ORION represents a dramatic innovation in the world of games; an entire game system whose unique playing device makes possible a galaxy of activities of wide variety and interest. The unique easel rules booklet describes 24 activities including 2, 3 and 4 handed strategy games, solitaire games, and mathematical puzzles.

The Playing Equipment

The nucleus of ORION lies in the unusual design of the playing board. As you can see, it contains sixty spaces which are designed to hold the special pieces supplied with the set. These spaces form a pattern of circular interlocking orbits, each enclosing a single rotor. The rotors are designed so that they click into four different "locked" positions. With quarter turns of the rotors the pieces revolve in their exact orbits and move from orbit to orbit around the board as appropriate rotors are turned from one locked position to another. (It is important that all the rotors are in these locked positions both before a game and at the end of each player's move in order to assure that the pieces move smoothly on the board.)

The twenty pieces of each color which are supplied with the game equipment are numbered on top from one to twenty. These numbers are necessary for some of the games and puzzles and are helpful in many other games for keeping track of the actual piece being moved. The pieces are beveled at each end and on their undersides, and by pressing down on top at either end, the opposite end is raised, and the piece can then be easily picked up.

Basic Rules and Considerations

The simple basic rules are important and apply to all the ORION games unless mention is made to the contrary in the description of a specific game. These five rules are easily remembered and are omitted from each particular game description to avoid unnecessary repetition.

1. The "rotor" rule. The pieces may only be moved on the board by turning appropriate rotors.

2. The "color" rule. Players may turn only those rotors whose orbits contain at least one piece of their own color. Pieces of other colors may only be moved "indirectly" when a player maneuvering his own piece affects them as well.

3. The "same piece" rule. Players must continue to move the same piece throughout the length of any move. The numbers on the pieces enable the players to keep track of a piece as it is being moved. In fact, it is part of ORION etiquette that a player in a complicated situation identify the piece he intends to move.

4. The "number of clicks" rule. Whenever a player is entitled to a move of several clicks, he may choose to take a lesser move or no move at all if he desires.

5. The "no reversal" rule. Any move is forbidden which simply reverses the entire move of the previous player and at the same time sets up the possibility of an interminable repeating sequence. (Such a situation is rare but is easily recognized when it becomes obvious that the sequence could go on forever. The first player simply points out this rule, and the second player has to make a different move).

The following key points are equally important in learning the play of ORION:

Standard Starting Sequence. A basic method for starting occurs in some of the games. It is referred to as the "standard starting sequence" and is designed to prevent the lead player from having too much of an advantage. Generally, the first round of moves starts with one-click moves, the second round with two-click moves, etc. . . . up to the number of clicks used in the game.

The Gambling Die. Several games use the special die. Usually one has the choice of throwing the die to determine the number of clicks of one's move or of taking a three-click move. The die is designed to average slightly less than 3 (2.83), but throwing a 4 or 5 is often well worth the gamble.

ORION Etiquette. As in most games, players take turns in a clockwise direction. A player's turn is considered over as soon as he takes his hand off the board. It is considered unethical, however, for a player to let his hand linger on a rotor knob after making his move. It should be stressed that ORION is meant to be played with a certain flair and daring. Overlong brooding over one's move represents very poor style and lacks the sharp, brisk decisiveness of the mature player.

The games and puzzles that follow are arranged roughly in order of difficulty. Some of the games are based on old ideas; others are entirely new. All have a freshness about them due to the unique appeal and versatility of the board. ORION owners who have a creative urge may enjoy devising additional games and puzzles of their own invention. We would be pleased to hear about such new developments and may incorporate them in future rule books. Send them to Parker Brothers, Inc., 190 Bridge Street, Salem, Mass. 01970. Attn.: Research Dept.

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This is one of the least complex of the ORION games and should be especially appealing to children.

Number of Players: Two, three or four.

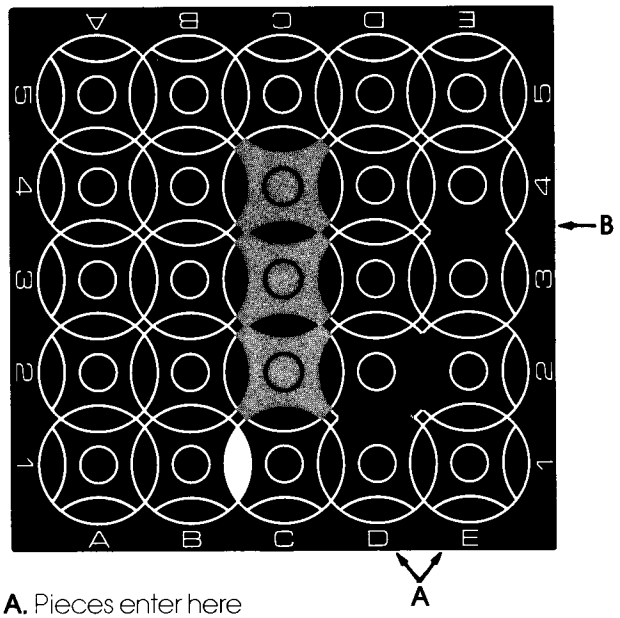
Starting Position: See diagram. Each player enters his chariot (a single piece of his color) into either of the indicated spaces when it is his first turn.

Objective: To win a race in a counter-clockwise direction around the rotors C2, C3, and C4 which may not be moved. These rotors are shaded in the diagram. The first entry to reach the indicated finish line for the second time around wins the race.

Rules of Play: At their turn players may choose between taking a three-click move or throwing the special single die to determine the number of clicks of their move. The exception is the player in the lead who must throw the single die to decide the length of his move.

Hints for Strategy: Try to "hug the rail" and plan your moves so as to set back the other entries as you pass them.

Remarks: The decision whether or not to gamble by throwing the die and the way pieces are set back when they are passed has strategic interest. Due to the action of the rotors a piece in the lead may end up last after the other pieces have come up to its position.



A. Pieces enter here at the first turn

Consider rotors C2, C3 AND C4 immobilized

B. Finish (Green wins)

Number of Players: Two, three or four.

Starting Position: Players take six pieces of a chosen color and place them in opposing corners of the board on the diagonal.

Objective: To be the first to move all one's pieces to the corresponding position in the opposite corner.

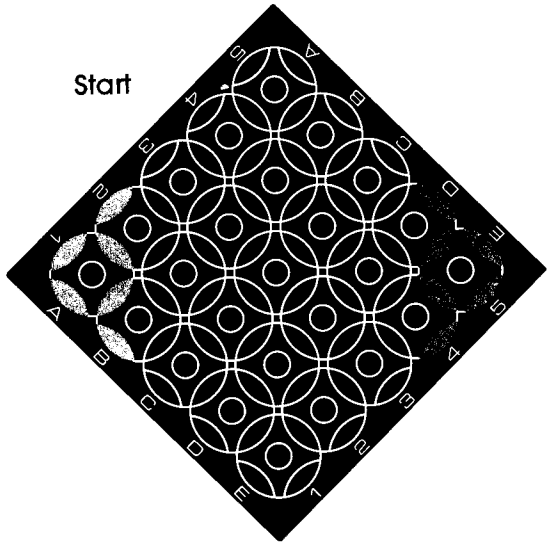
Rules of Play: Two-click moves and "multiple moves" are used. Multiple moves allow a piece to move from orbit to orbit in a series of "hops" if conditions are right. The rule is: If after two clicks (or one click, if desired) the piece being moved arrives in a new orbit where there is another piece of his color, then the original piece being moved is entitled to an additional two-click move. Thus a player may move a single piece across the board in a series of "hops" if other pieces of his color are stretched out along its path to help it along. However, the number of multiple moves is limited to five, allowing a maximum of ten clicks in any one player's turn.

Purely destructive moves are considered in poor taste. For example, if one player has almost won, the other players are not allowed to prevent him from finishing by disrupting his nearly finished position. In mid-game, however, a certain amount of disruptive maneuvering is unavoidable and may be part of good strategy.

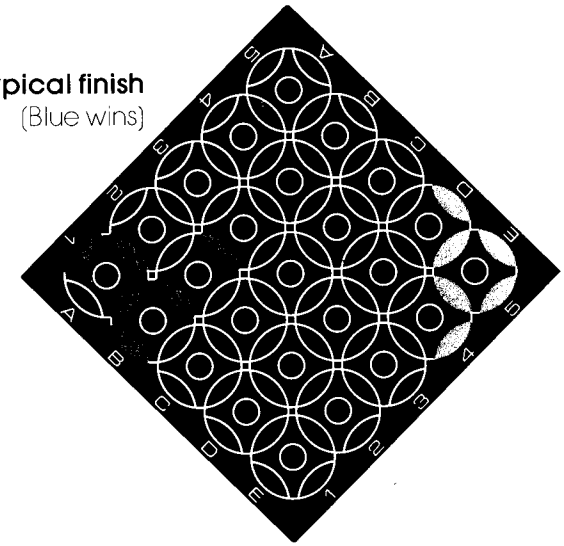
Hints for Strategy: One should try to build a series of pieces stretching across the board to take advantage of "multiple moves". Don't leave stragglers too far behind.

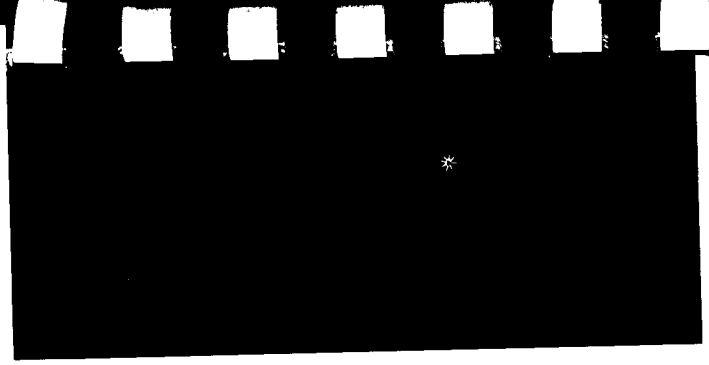
Remarks: The game may be scored by giving the winner one point for each of his opponent's men out of position at the end of the game. If three players have a series of games, they should take turns starting in the middle position.

Start



Typical finish
(Blue wins)





Algol is a famous bright star in the constellation Perseus. It is actually a double system, and periodically its light decreases dramatically when an enormous dark partner moves in front. This puzzling variability led many ancient peoples to interpret Algol as a heavenly example of strange changes and treachery; in short, players vie with one another in their attempts at deception and strategic variability.

Number of Players: Two, three or four.

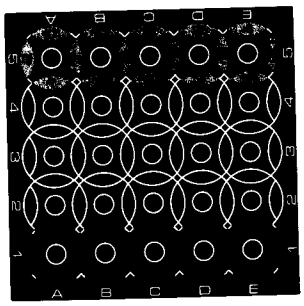
Starting Position: When two play, each player fills the row of orbits nearest him with sixteen men of a chosen color. When three or four play, each player uses only twelve men, and the corner orbits are divided on the diagonal.

Objective: To smuggle a single man whose identity is a secret across the board to a position where one end "touches" the opposite side of the board without being challenged, or to challenge and thus capture the opponent's secret man. The game ends when the first secret man gets across or when there is only one such man left. The winner is determined by a scoring system.

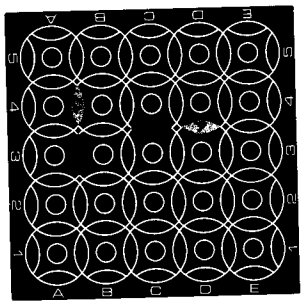
Rules of Play: After the pieces have been placed in their starting positions, each player mentally selects one of his men and secretly writes down the number on a piece of paper. Two-click moves are used. A suspicious piece may be challenged by moving a man in line and end to end with it and saying, "I challenge number ten". Its identity must then be revealed. If it is not the secret man, its owner may then remove the challenging piece and keep it to be scored as one point at the end of the game. If the piece turns out to be the secret man, the challenging player scores 5 points, and if two are playing, the game ends. If three or four are playing, the challenger picks up the found out piece and keeps it to remind him that he has won 5 points. The eliminated player then removes his men from the board, and the game continues among the others. 10 points are given to a player who gets his man across, and the game then ends.

A piece must be challenged from directly in front or behind as shown in the diagram. If a piece is already in position to challenge, it may do so, but its player's turn is then over. At the end of the game the score is tallied up to see who has won the most points. Generally a series of games is played to allow the players a chance to fool each other by radically changing their strategies.

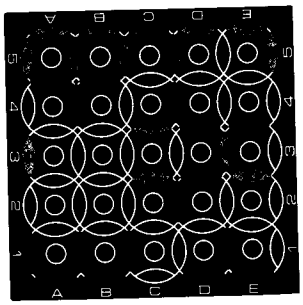
Hints for Strategy: Many strategies are possible. One is to move the secret man well behind a group of other men who act as decoys. After an opponent catches on to this, the man might be moved in a more daring way. Real bravado is shown by the player who casually moves his man in the very front of his advance, and this sometimes works.



Typical start

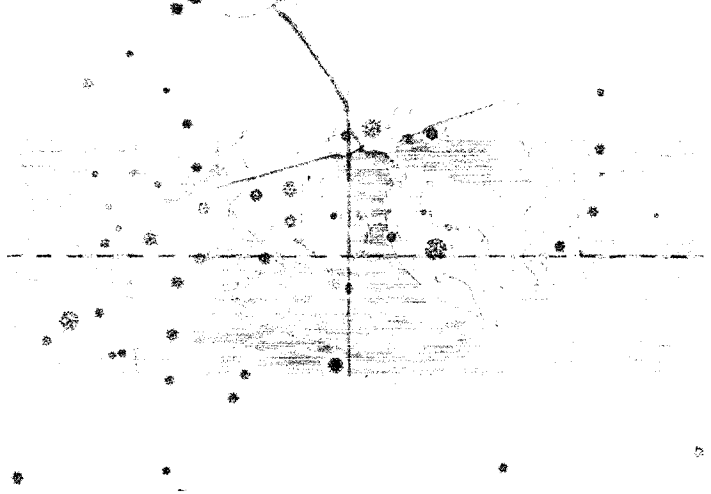


Pieces in position to challenge each other



Typical finish
Blue 13 challenges red 7 which was Red's secret man – The game ends Blue 5, Red 1.

One captured Blue piece equals 1 point for Red



Number of Players: Two.

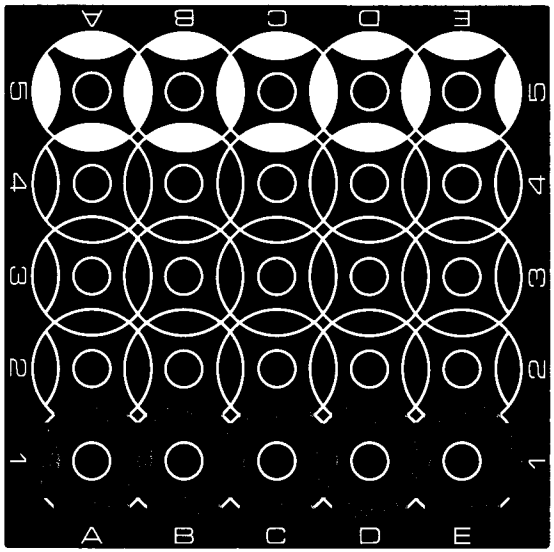
Starting Position: Each player fills the row of orbits nearest him with sixteen men of a chosen color.

Objective: Each player tries to occupy his opponent's back line of spaces with five of his own men.

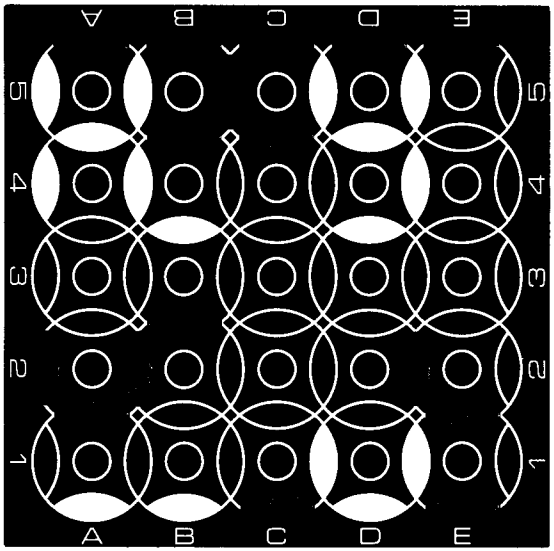
Rules of Play: Three-click moves are used after a standard starting sequence (a one-click move for the first round; a two-click for the second round; etc. up to the number of moves to be used in the game which are, in this case, three).

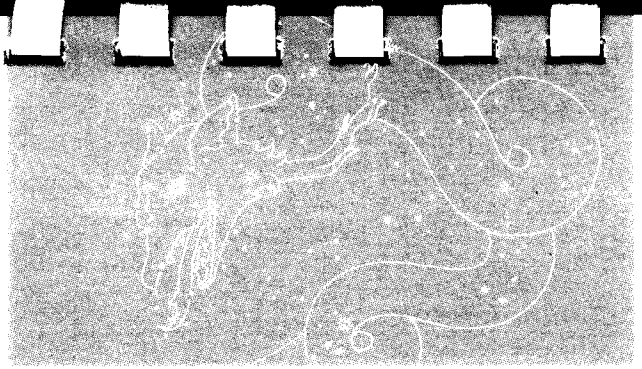
Hints for Strategy: Select moves which advance your own position while at the same time disrupting your opponent's play. The beginner may make the mistake of trying to cross the board with too few men. Many men may be needed to overwhelm the other player's defensive maneuvers. On the other hand, enough men must be left behind to break up an opponent's threat of filling your own back row Proper strategy demands a correct balance between the number of forward and rear men in response to the tactics of the opposing player.

Start



Typical finish





Number of Players: Two.

Starting Position: One red piece (the dragon) and seven green pieces (the knights) are placed on the board as shown in the diagram.

Objective: The dragon tries to break through the line of knights, and the knights try to catch the dragon.

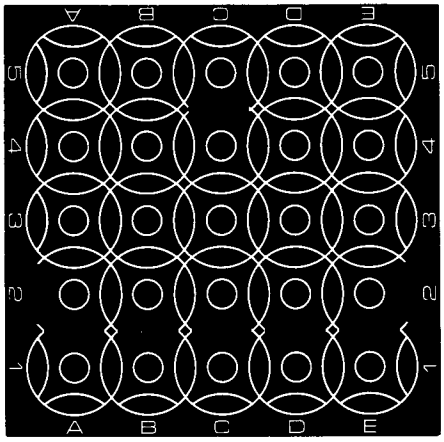
Rules of Play: Two-click moves are used by both. The dragon moves first and attempts to pass through the knights and reach the opposite side of the board. The dragon may move in any direction, but may not move in any orbit in which there are two or more knights.

The knights try to catch the dragon by forcing him into a position where he cannot move—either between two rotors whose orbits both contain at least two knights, or between one such rotor and the side of the board. The knight being moved may move forward or sideways, but may not move backward (that is, the final position of any knight being moved must never be less advanced than its position at the start of the move). Although the first click of a two-click move may move a knight backward, the second click must bring the knight back up to the level of its starting position.

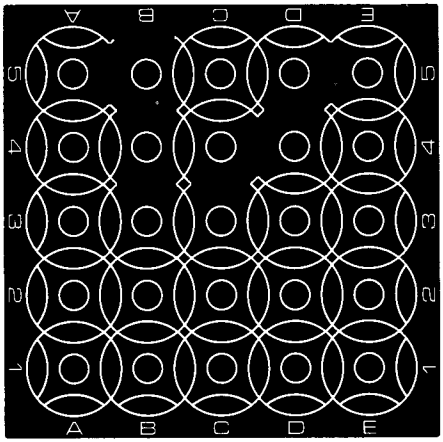
In this game the players may not pass at their turn; they must always move one or two clicks. A basic rule to remember is the "no reversal" rule which forbids a player to undo an opponent's previous move.

Hints for Strategy: The dragon should try to tempt the knights into making a mistake and allowing him a chance to break through without being caught. The knights should attempt to move relentlessly up the board and finally immobilize the dragon.

Remarks: Players should take turns being the dragon. The idea of this game is, of course, an old one, but the mechanism of the ORION game board gives it a fresh and interesting character.



Start



Typical finish
Knights win—two of them immobilizing the dragon at the top of the board

In the constellation Taurus (the Bull) there are two famous star clusters, the Hyades and the Pleiades. Through the ages legends have abounded concerning these small groups of stars which can be seen best on a clear winter night. One charming legend of the Onondaga Indians of America had it that the Pleiades were formed by a small group of children who danced and sang so exuberantly that they rose into the sky and became stars.

In the Taurus Star Clusters game both players strive (but hopefully not too exuberantly) to make a cluster pattern of pieces of their color on their side of the board.

Number of Players: Two.

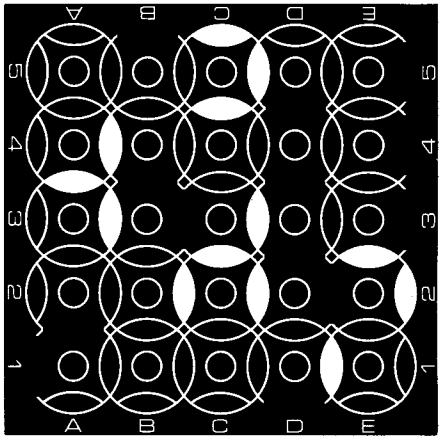
Starting Position: Thirteen pieces of one color and thirteen pieces of another are placed on the board at random.

Objective: Each player tries to be the first to complete the star cluster pattern with pieces of his color on the side of the board. The diagram shows both star cluster patterns completed.

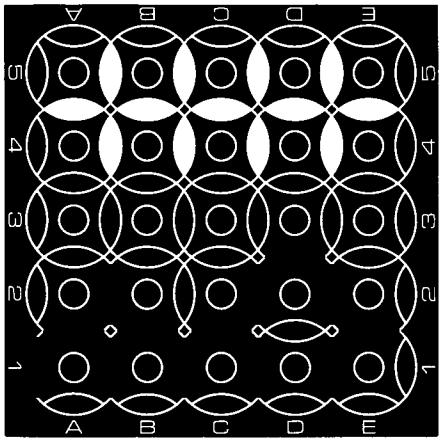
Rules of Play: After the pieces are placed at random on the board, the players decide by tossing a coin or similar means who has the first choice of color. The second player may then begin with a four-click move, and play continues with four-click moves. Each player must move the same piece of his color for his entire move.

Purely destructive moves are discouraged. For example, if one player has almost completed his pattern, the other player is not allowed to turn his pieces around and maneuver them into the other pattern in order to disrupt it and prevent it from being finished.

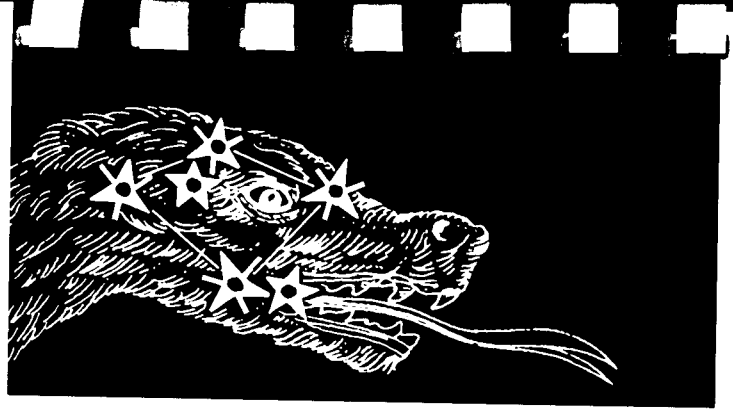
Hints for Strategy: A good move is one where some other pieces of your color are indirectly maneuvered in the right direction along with the actual piece being moved.



Typical start
with random positioning



Typical finish
(Yellow wins)



The constellation Hydra is formed by a long, serpentine chain of stars and is one of the largest imaginary figures in the night sky. To the ancient Egyptians this wandering series of stars suggested a celestial image of their beloved River Nile.

In the three Hydra games the players try to be the first to maneuver their pieces into a chain stretching from their side of the board to the opposite side. Often the winning chain is perfectly straight, but sometimes it has an elegant, serpentine form.

Hydra for Two

Number of Players: Two.

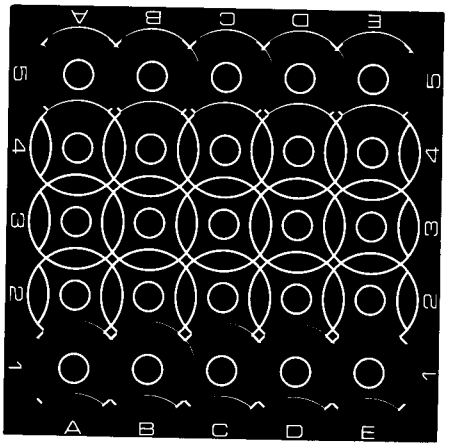
Starting Position: Each player fills the row of orbits nearest him with sixteen men of a chosen color.

Objective: Each player tries to be the first to arrange his men end to end in a chain from any point on his edge of the board to any point on the opposite edge. The chain may be straight or serpentine in form. See diagram for a typical finish.

Rules of Play: General rules apply. Players use three-click moves after a standard starting sequence.

Hints for Strategy: A player must bring up more men than are needed to form just one chain, because an opponent can easily disrupt chain-building attempts made with too small a number of pieces. Each player should concentrate not only on his offensive strategy, but also on defensive maneuvers designed to parry his opponent's forward thrusts. A good move strengthens one's own position and sets back the position of the antagonist at the same time.

Remarks: Hydra for Two demonstrates well the feel of ORION and its richness of strategy. It can be handicapped easily by removing some of the stronger player's men at the start. Four-click moves may be used for a faster-moving version of the game, or players may elect to use only two-click moves which result in a slower game where shrewd tactics are required to bring the game to a conclusion.



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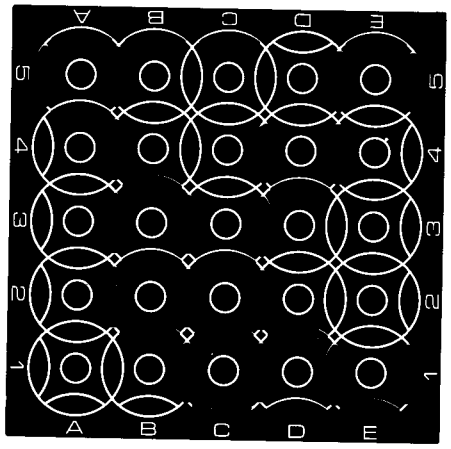
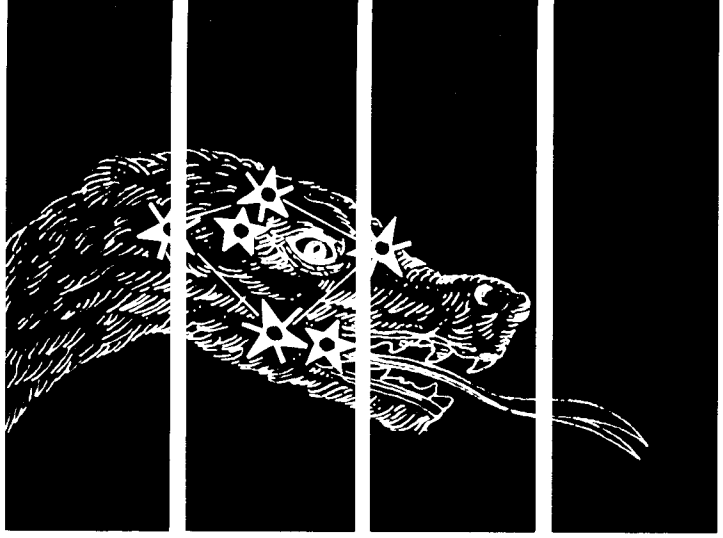
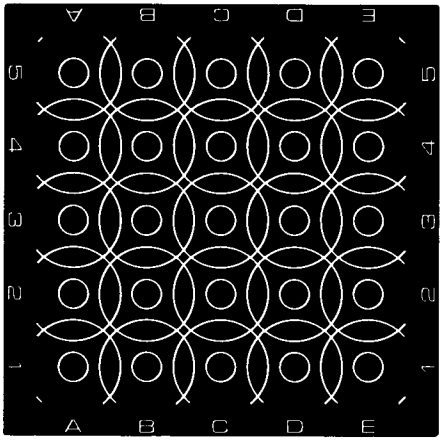


Typical finish
(Blue wins)





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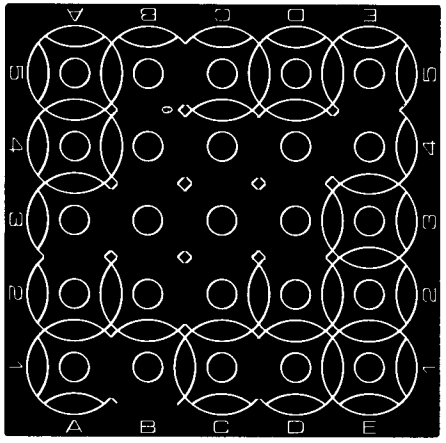


Typical finish
(Green team wins)

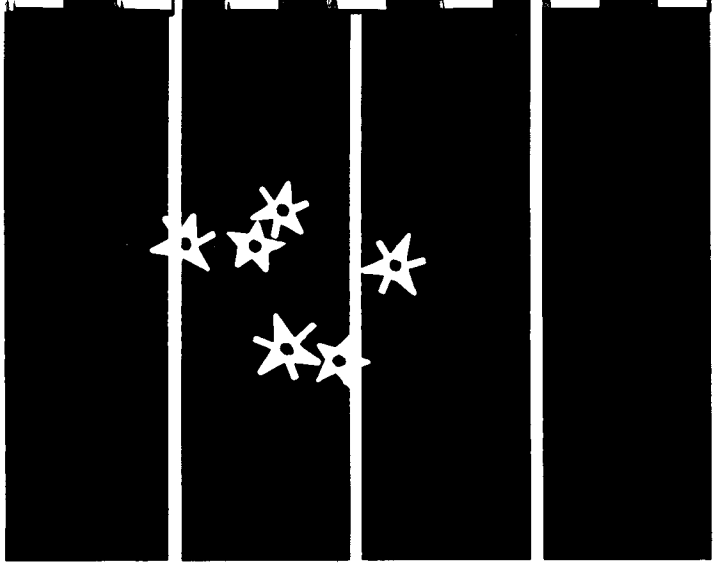
Number of Players: Four – playing as two teams of partners.

Starting Position: Partners sit opposite each other, each partner placing pieces of his team's color in the five spaces nearest his edge of the board.

Objective: Partners try to build a chain between them. The chain of pieces end to end may be straight or serpentine in form. It must stretch from one partner's edge of the board to the other partner's edge.

Rules of Play: Each player at his turn has the choice of taking a three-click move or of throwing the special single die to determine the number of clicks of his move. Each partner may move men of his team's color anywhere on the board. Partners work toward a common goal but may not discuss strategy as the game proceeds. If a chain is made for the other team in the course of a move, and they quickly point this out, then it counts as the winning chain. If two chains are made on the same move, it is not a tie; the team which made the move is the winner.

Hints for Strategy: The usual strategy of advancing one's own position and disrupting that of the opponent applies. The men should be brought into position as quickly as possible.



Number of Players: Intended for four, but three can play.

Starting Position: Each player places twelve men of a chosen color in the row of orbits nearest him. The corner orbits are divided on the diagonal.

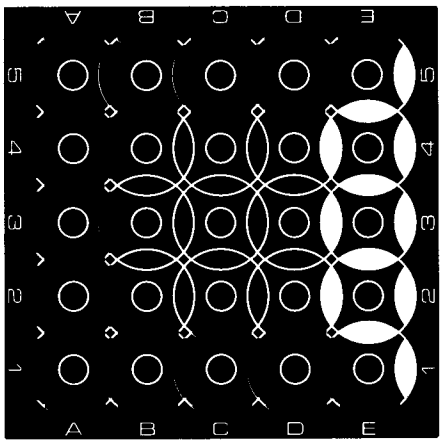
Objective: Each player tries to be the first to arrange his men end to end in a chain from any point on his edge of the board to any point on the opposite edge. The chain may be straight or serpentine in form. See diagram for a typical finish.

Rules of Play: Each player at his turn has the choice of taking a three-click move or of throwing the special single die to determine the number of clicks of his move. The first player to have a chain formed wins, even if it is not his move at the time and even if the player who is actually moving a piece is only part way through his move. However, a player must quickly point out that his chain has been made in order to win in that way. If two chains form on the same move, the player whose move it is wins the game.

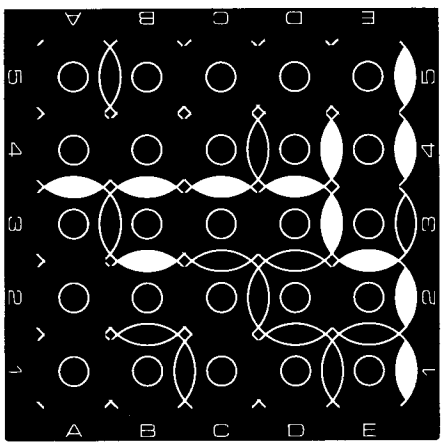
Hints for Strategy: One tries to advance one's position and at the same time to disrupt the player or players who are farthest ahead. Players should bring up their men quickly and arrange them cleverly so that a lucky throw of the single die will enable a chain to be made.

Remarks: This game illustrates well one of the unique elements in many ORION games—namely that each player becomes so engrossed in his own strategy that he fails to see the implications of his moves for the other players. It is not as rare as one might think to have a player make the winning chain for someone else or to set up an easy position for the next player's winning move, because he is concentrating solely on his own move.

If three play in a series of games, they should take turns starting in the middle position.



Start



Typical finish
(Yellow wins)

Number of Players: Two.

Starting Position: One player has four sheep (blue) and two sheep dogs (red); the other has four sheep (green) and two sheep dogs (yellow)—all placed as shown in the diagram. The game is played with the board on the diagonal.

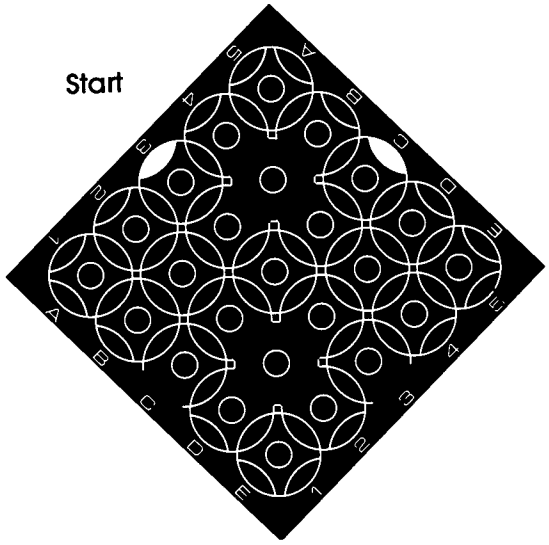
Objective: Each player tries to be the first to herd his sheep to the position occupied by his opponent's sheep at the start. The dogs must also finish in the corresponding positions.

Rules of Play: Each player may move only his sheep dogs (either the red or yellow pieces). He must "herd" his sheep by maneuvering his dogs through or near the sheep in an appropriate manner and thus move them indirectly. A player has six clicks at his turn, and they may be distributed in any way between the two sheep dogs. This game is therefore an exception to the "same piece" rule, because a player may use part of his move to move one piece, and part to move another.

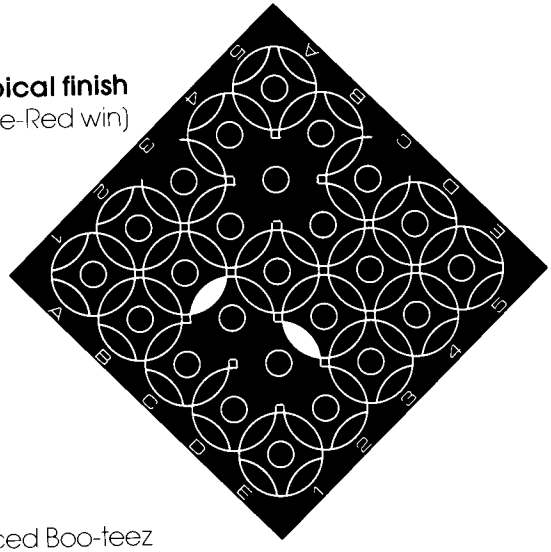
A modified starting sequence to six clicks is used: In the first round of moves the players take two clicks; in the second round—four clicks; in every round thereafter—six clicks.

An important rule in this game implies fair play between the competing sheep dogs. For instance, as the game draws to a conclusion, the player who appears to be behind may not turn around his dogs and make them wreak havoc among the other person's sheep. Such purely destructive maneuvers are forbidden. However, in the confusion of the middle game when both flocks are moving through each other in opposite directions, a certain amount of disruptive activity can hardly be avoided and indeed may be good strategy.

Start



Typical finish
(Blue-Red win)



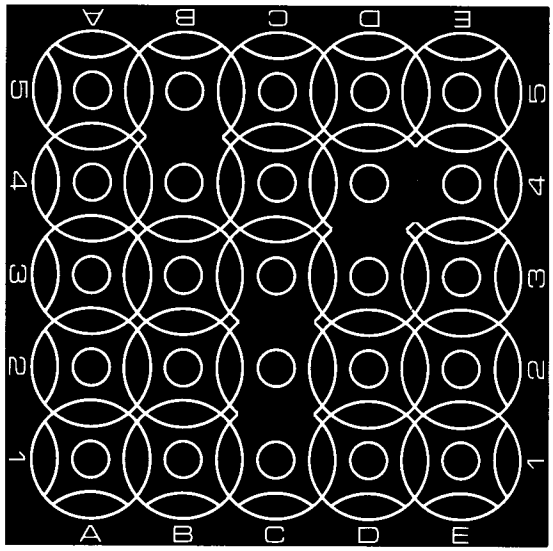
pronounced Boo-teez

In the next two games pieces are built up on the board in the following way: After each click of a player's move, if any piece of his color on the rotor which was turned has moved and left an empty space behind it, then the player may place a new piece of his color on that space. This is true whether the space appeared behind the actual piece being moved or behind another piece of the same color which also moved. It is important to remember that it is the space behind any piece which moved which is eligible for a new piece. It is as though a moving piece has left a "footprint" behind it which may then be filled. In a move of several clicks the player should fill the eligible spaces after each click rather than waiting for the end of the move. Pieces may be built up in this way only by the player whose turn it is.

In a game, if all twenty men are already on the board, and a player has no more new men to enter, the player has the option of removing a man of his color anywhere on the board (where its position may not be tactically important) to fill an eligible space described above.

In the accompanying diagram there are three examples of how pieces may be built up on the board. Imagine that each of the three rotors holding pieces has just been turned one click clockwise. The "x's" indicate spaces where new pieces may be placed. Notice that in both examples with two pieces on the same rotor it doesn't make any difference which piece was actually the one moved. An eligible space appears in the same place or places in either case. From the diagram one can sense how easy it is to enter new pieces when the board is relatively empty. When the board begins to fill up, the opportunities for building pieces decrease sharply.

Examples of building pieces



According to the ancient myth Cassiopeia was an Egyptian queen, wife of king Cepheus (a neighboring constellation). The constellation is famous because of its distinctive and memorable W shape (often seen as an M, of course, as it revolves about the Pole Star). The W represents Cassiopeia's chair and also the object of this particular game.

Number of Players: Two.

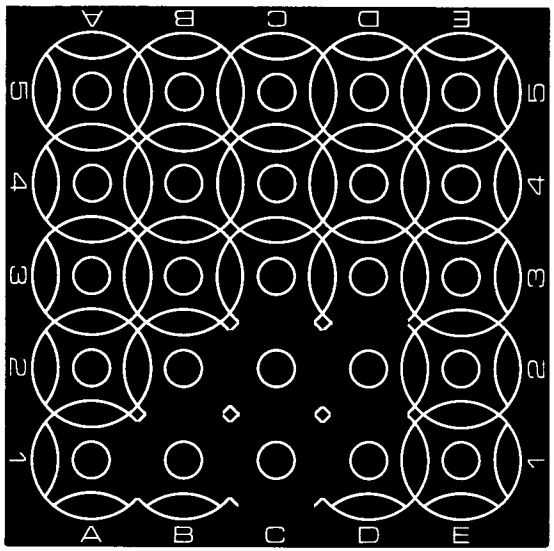
Starting Position: The game begins with the board empty.

Objective: To be the first to arrange four of one's pieces on the diagonal in a "W" (or "M", if upside down) pattern. See diagram for a typical finish.

Rules of Play: The player who starts first places a single piece of his color in any space where either its point or side is adjacent to the edge of the board. The other player may then place a single piece in any empty space he chooses. Thereafter one-click moves are used, and pieces are built up on the board as described in the rules for building pieces on page 21. It is important in this game to keep in mind the "no reversal" rule which forbids a player from precisely undoing an opponent's previous move. Here the rule applies only to two successive moves in which no new pieces enter the board. If a move makes the desired "W" pattern for both players at once, the game ends in a draw.

Remarks: After mastering the tactics of Cassiopeia, the players might decide to try a similar but more difficult game which starts anywhere on the board, allows two-click moves, and has the objective of five pieces end to end in a straight line.

Typical finish
(Green wins)



The game Orion has the classic flavor of age-old types of games which use the timeless hunting strategy of encirclement and capture. The men on the board become both the hunters and the hunted, but happily, there is no bloodshed in this game, for captured men are returned to their players to be entered again into the fray.

Number of Players: Two.

Starting Position: The game begins with the board empty.

Objective: To win points by capturing the pieces of other players. Each player maneuvers his men to make fences formed by chains of pieces end to end to surround and thereby capture other men. Surrounded men who are not of one's own color are removed from the board, scored as one point each for the capturing player, and returned to their owner to be used again. The game ends when one player captures the complete board.

Rules of Play: In the first round of moves each player at his turn places a single piece of his color in an empty space. Thereafter new pieces may be placed on the board only according to the rules for building pieces described on page 21. In the second round each player takes a one-click move, and in the third, a two-click move. From then on each player at his turn has the choice of taking a three-click move or of throwing the special die to determine the number of clicks of his move.

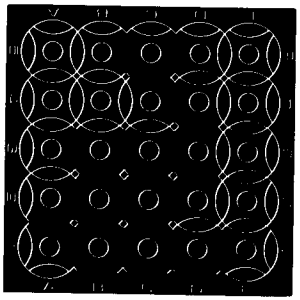
As each player builds up his men, he attempts to fence in other pieces. Fences consist of chains of pieces end to end, and the edges of the board may be used as part of a surrounding fence. A fence counts only at its owner's turn. After the turn is over, and the player has picked up whatever men he has captured, his fence may be attacked and parts captured by the other players. When a player picks up men he has captured, his turn is considered over, and the remaining clicks (if any) of his move are then forfeited.

A fenced-in area is not considered captured if it includes thirteen or more orbits (more than half the orbits on the board). Three or more fenced-in areas are needed to capture the complete board, but sooner or later a single move divides the board into several such areas, capturing it entirely and ending the game. (See diagram).

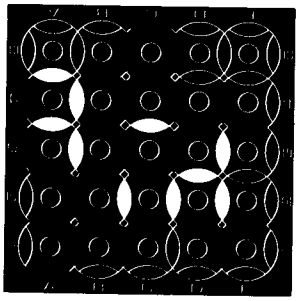
Each captured man counts as one point. These points are kept track of by one player who keeps score by marking them down on a piece of paper under a column for each player. When the whole board is finally captured, the game ends, and the player with the most points is the winner.

Hints for Strategy: It is wise to concentrate some strength in the middle of the board. Pieces which stray into the corners are vulnerable to capture. When in doubt, build more pieces.

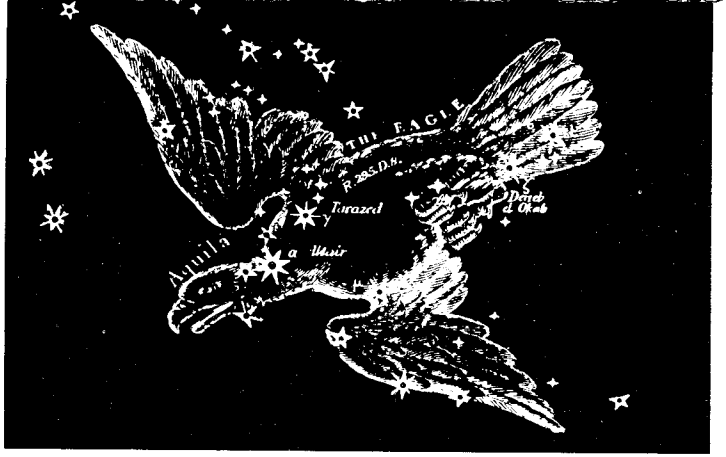
Remarks: This is one of the finest of the ORION games. It combines luck and skill and is especially good with three or four players. Sudden reversals can occur which add to its interest, and in the course of play many beautiful patterns may appear.



Two player finish
(Red wins)



Four player finish
Red will win in one two-click move (C4 clockwise, C3 clockwis captures entire board)

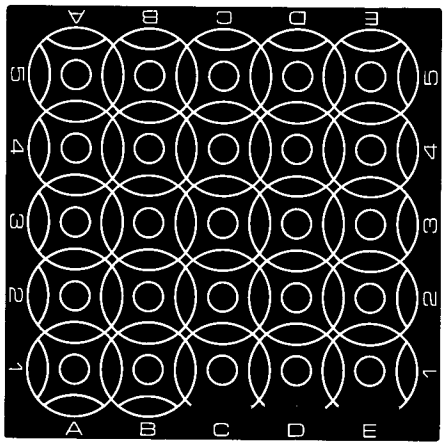


For this puzzle one imagines that a pair of eagles (red pieces) have just caught a large fish (blue piece) which both eagles are holding at the start (see diagram). The eagles must carry the fish together back to their nest where several hungry young eagles wait. The fish is too heavy for either eagle to carry by itself, and if either eagle lets go, the fish drops and is lost, and the little eagles go hungry.

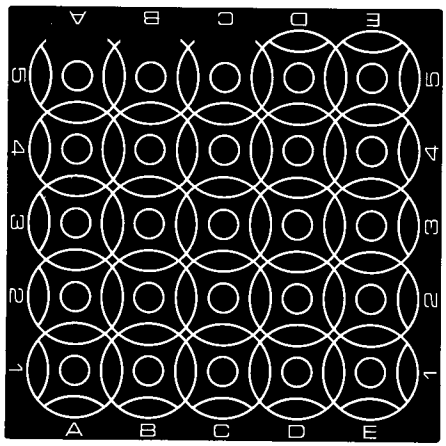
Thus the puzzlist must make sure that after each click both red pieces remain "touching" the blue piece. In addition, only the red pieces can be moved directly. The blue piece must be carried along by appropriate maneuvers of the red pieces.

The eagles will become exhausted if their flight is too long. Can you get them back to their nest (to the position shown in the diagram) in 24 clicks?

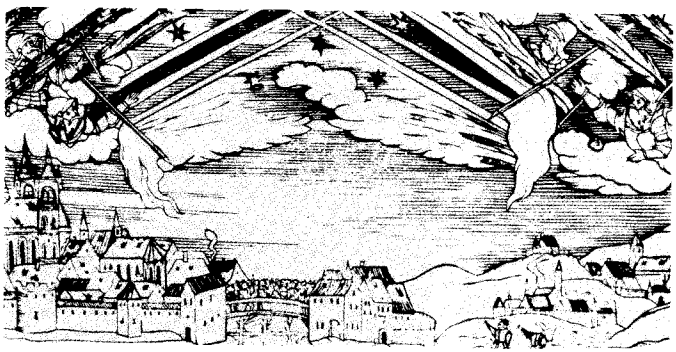
Start



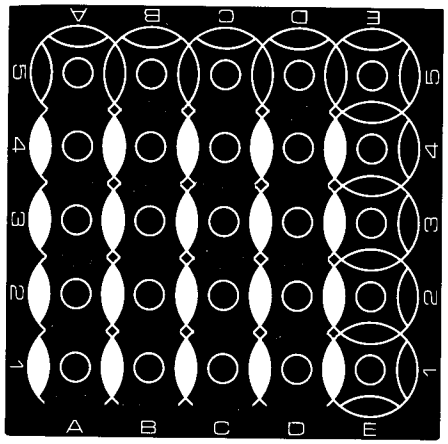
Finish



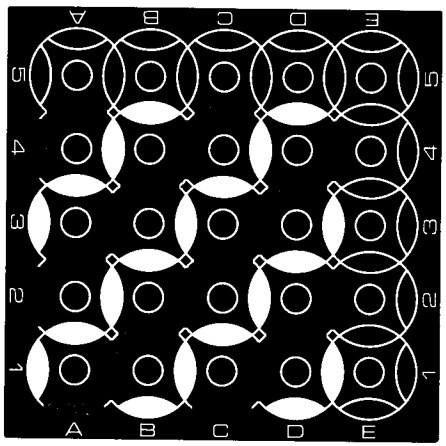
Aurora Borealis, a familiar and beautiful sight in northern latitudes, is characterized by curtains of shifting, moving light often in brilliant colors. The two puzzles which follow take their name from this spectacular celestial phenomenon and involve the switching of color patterns.



A. Vertical-Horizontal. In as few clicks as you can, change the pattern of the diagram so that the color originally in vertical lines is in horizontal lines, and the color originally horizontal is vertical. A fourteen-click solution appears on page 31.

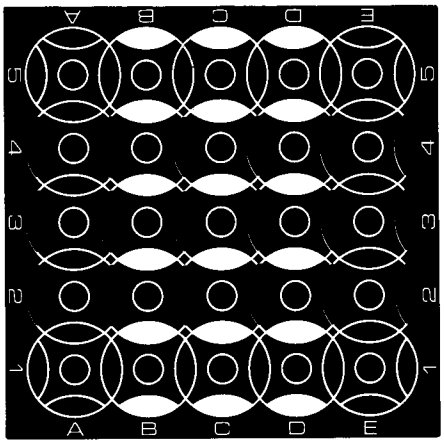


B. Herringbone. In the diagram the colored stripes run from upper right to lower left. In as few clicks as you can, change the pattern so that the stripes run from upper left to lower right. A twelve-click solution appears on page 31.

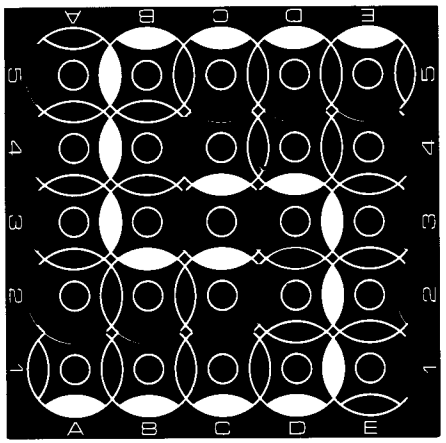


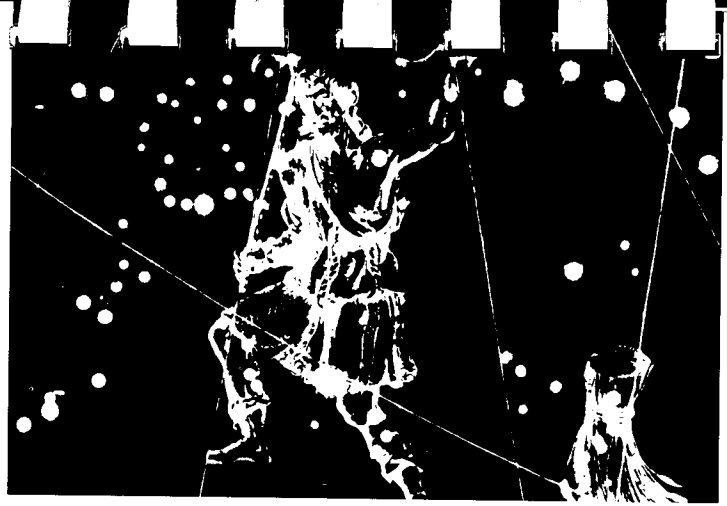
Telescopic photographs of Galaxy M51 (The Whirlpool Galaxy) are often used as dramatic illustrations of the spiral arm structure of one classic type of galaxy. The pattern which forms the objective of this puzzle resembles this typical structure. The puzzlist should try to go from start to finish (see diagram) in as few clicks as possible.

Start



Finish



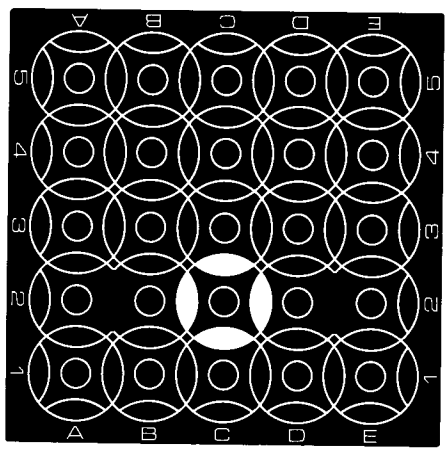


The objective is to move the two sheep dogs (red) and the four sheep (yellow) in the fewest number of clicks from start to finish. See the two diagrams. The numbers of the pieces do not matter. The sheep may be moved only indirectly by "herding"; that is, a yellow piece may not be moved directly, but only as the result of moving a red piece in the same orbit. Moves may be distributed in any way between the two sheep dogs.

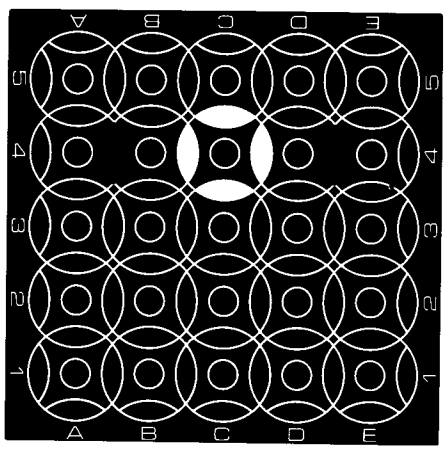
Puzzle ratings:

Number of clicks	Rating
40 or more	need practice
39-35	good
34-30	excellent
29 or less	a sheep-herding marvel

Start



Finish



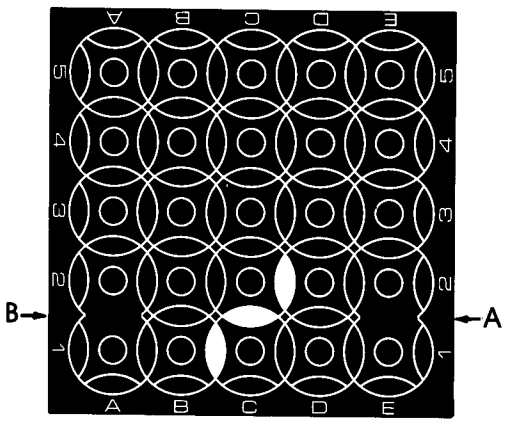
Most stars are single like the sun, but a surprising one-fifth of all stars are doubles and are systems of two or even three or more stars revolving around a common center of gravity. In the puzzles below, both the look of the bright pieces revolving in their orbits and certain maneuvers involved in some of the solutions are highly suggestive of such stars.

The object of each puzzle is to move the red piece in as few clicks as possible from right to left on the board through the pattern of yellow pieces. In the process, the yellow pieces must be maneuvered back into the same color pattern that they had at the start. (See diagrams.) The rule is that only the bottom two rows of rotors may be used, and in those rows only a rotor holding the red piece may be turned.

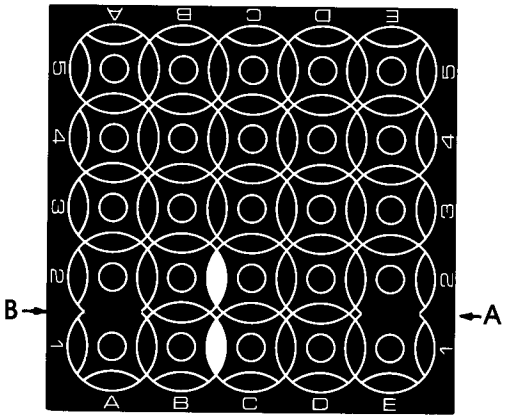
These puzzles are challenging, but hopefully not too many puzzlists, while turning rotor after rotor and watching the yellow pieces revolving endlessly in their orbits and seemingly getting nowhere, will get a strong feeling of the double and multiple stars revolving for millions of years in the depths of space.

A—Start B—Finish

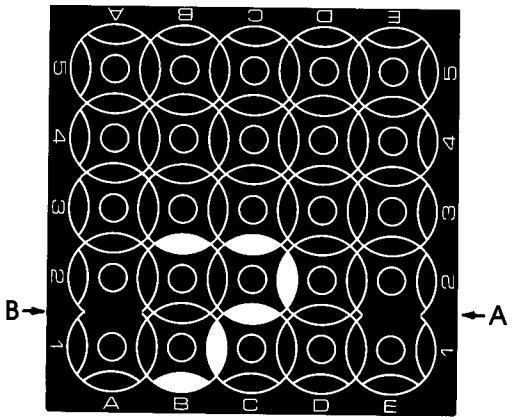
Puzzle #1



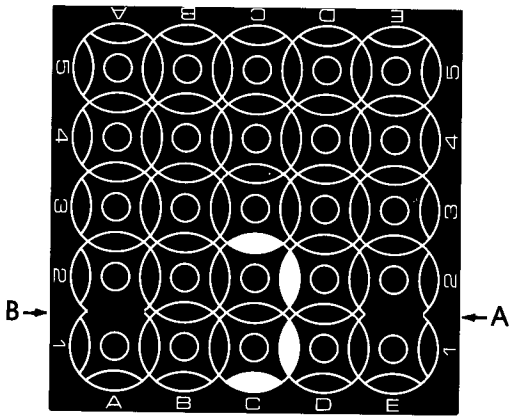
Puzzle #2



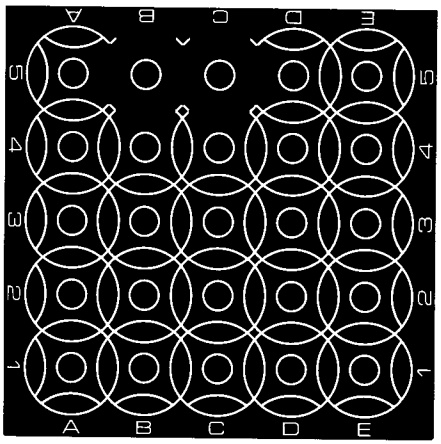
Puzzle #3



Puzzle #4



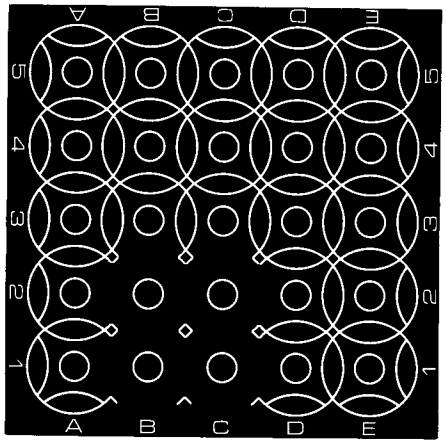
A. Two Orbit Solitaire. Place the pieces "1" through "7" of one color into any two adjacent orbits in the order shown in the upper part of the diagram. Pick up the "5", "6" and "7" pieces and put them back in one of their five possible wrong arrangements. For each of the five try to discover the shortest series of moves needed to get back to the original order. For example, if the "6" and "7" pieces are switched, a special nine-click move is required. Only the rotors of the two orbits in question may be turned.



B. Four Orbit Solitaire. Select the first twelve numbered pieces of one color. Shuffle them around and place them on the board at random in the squares of four adjacent orbits. Turning only the rotors for those orbits, try to reach in twenty-five clicks or less the arrangement shown in the lower part of the diagram. Record your successes in a number of attempts.

Ratings:

1 or 2 successes out of 6 attempts – good
3 or 4 successes out of 6 attempts – superb
5 or 6 successes out of 6 attempts – genius



Technical note: There are no impossible arrangements in Orbit Solitaire, because the mechanism of the four-bladed rotor board allows cyclical permutations which change the parity of any number arrangement with each quarter turn of any rotor. One is not trapped by the mechanism in only one parity as one is in some sliding movement puzzles (such as the "15 Puzzle," for example) where only half the possible arrangements can be done. An elegant solution to the minimum move problem remains elusive, but due to the above considerations, the necessary oddness or evenness of the number of clicks between two number arrangements is easily discovered.

This is a test in which several may participate, although only one person is being tested at a time. The person being tested for psychic ability is blindfolded and should sit near the board. On the board is built a chain of pieces which stretch from one side of the board to the opposite side. The subject has five tries to turn a rotor which moves a piece of the chain and thus breaks it. The subject is allowed to touch the sides of the board to locate it properly.

The observers concentrate their combined psychic powers to influence the subject by mental telepathy to turn a rotor which breaks the chain. Before choosing a rotor the subject should let his hand drift slowly back and forth just above the board while trying to sense the psychic pressure of the others present directing his hand toward the correct orbits.

In order that the test be rigorous the board may be rotated or a new chain built after each choice. The chain must be built so that it passes through exactly ten orbits. This means that the chain will be broken only if one of ten rotors is turned. Ten orbits equal 2 out of 5 orbits on the board; thus, guessing at random will produce 2 successes out of 5 attempts on the average. Higher or lower scores may mean that extrasensory perception is at work.

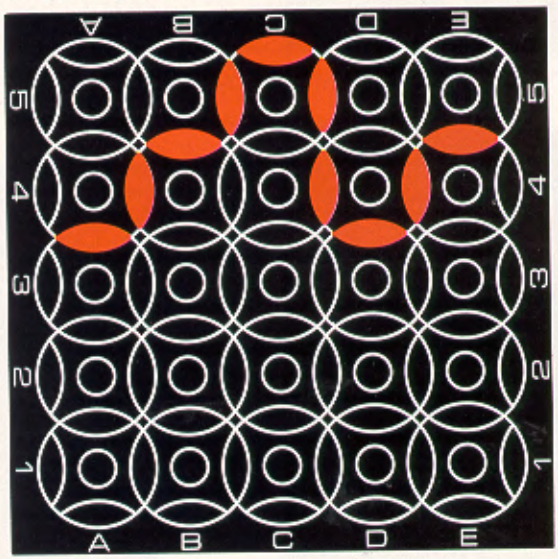
The diagram illustrates a typical test chain which is constructed so that exactly ten rotors are next to it. Notice that when part of a chain is next to the edge of the board, the chain must come out two spaces to ensure that exactly ten orbits are used in total.

Test ratings:

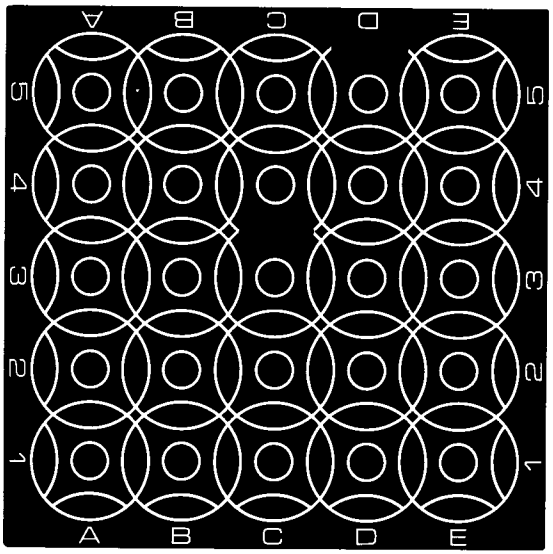
0-1 out of 5 = negative telepathy may be at work.
2 out of 5 = expected on the average—no telepathy.
3-5 out of 5 = mental telepathy is probably at work.

Is this puzzle a fair test? Or is there a small fallacy which would enable those who saw it to consistently score slightly better than average?

A typical test chain



In order to understand the notation of the puzzle solutions, one should understand the board reference system shown below.



Board reference system
Move C4L, D4R, D5L (2)

To follow a puzzle solution, one should position the board as shown in the diagram with the letters on the bottom reading from left to right, and the numbers on the sides increasing from the bottom to the top. Every rotor is identified by the letter of its column and the number of its row. The piece in the diagram is thus in the orbit of rotors C3 and C4.

The convention is that watching the motion of the top of a rotor gives the correct direction of a move. Thus, a clockwise turn is considered a turn right (R); a counterclockwise turn is considered a turn left (L). A "(2)" after an instruction means that the move is repeated twice. The four-click move in the diagram is designated as C4L, D4R, D5L (2).

The solutions to most of the puzzles are given below. In some cases in order to encourage the puzzlist to further discoveries, the solution given is not quite the best one. In other cases the best solution is a matter of some uncertainty, and the answer given, although believed to be best, may quite possibly be improved upon.

The Aquila (Eagle) Puzzle (Page 24)
Eagle: C1L, E1R, D1R, D2R, D1R, D2R, C1L, C2L, D3R, C3L, C2L, C3L, C3L, C4R, C3R, B3L, C4R, C5R, B4L, B5L, B4L, B5L, A5L, C5L. (24 clicks)

Aurora Borealis (Page 25)
Vertical—Horizontal
C4R, D4L, B4R, A4R, D3R, B3R, A3R, D2L, C2R, A2R, D1L, C1L, A1R, B1R. (14 clicks)

Herringbone
D4R, D3R, D2R, D1R, B4R, A4R, A3R, B3R, B2R, A2R, A1R, B1R. (12 clicks)

The Herdsman Puzzle (Page 27)
Here is a 30-click solution. See if you can find the solutions that exist in less than 29 clicks.
D2L (2), C2L (2), B2L, B3L, B2L, C3R, C2L, C3R, C2L, D2L, D3R, D2R (2), D4R (2), D3R, D4L, C4L, C3R, C4L, C3R, B4L, B3L, B4L, C4L (2), D4L (2).

Binary Star Puzzles (Page 28)
1. E1L, D1L (2), C1L (2), B1L, B2L, C2L, C1L, B1L, B2L, C2L, C1L, B1L, B2R, A2R, A1R, B1R, B2R, A2R. (20 clicks)

2. E1L, D1L (2), C1L (2), B1L (2), A1L, A2L, B2L (2), C2L, C1R, D1R, D2R, C2R, C1R, D1R, D2R, C2R (2), B2R (2), A2R. (24 clicks)

3. E1L, D1L, D2R, C2R, C1R, D1R, D2R, C2R (2), B2R (2), A2R, A1R, B1R (2), C1R, C2L, D2L, D1L, C1L, C2L, D2L, D1L, C1L, C2R, B2L (2), A2R. (28 clicks)

4. E1L, D1L (2), C1L, C2L, D2L, D1L, C1L (2), B1L, B2L, C2L, C1R, D1R, D2R, C2R, C1R, D1R, D2R, C2R (2), B2R, B1R, C1R (2), D1R, D2R, C2R (2), B2R (2), A2R, (32 clicks)