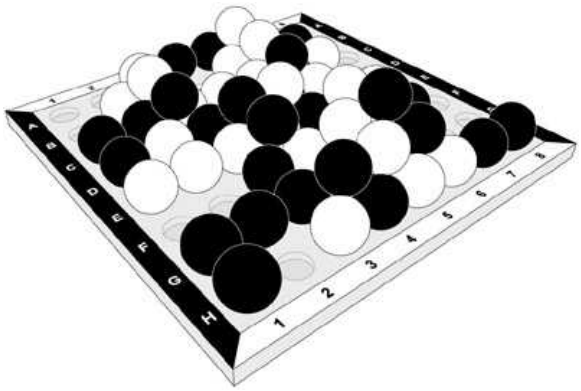
Akron

The game that takes a lot of balls

Cameron Browne



1. Introduction

Akron is a new connection game played with marbles on a square grid. Most games in this family, such as the classics Hex and Y, tend to be hexagonal in nature to avoid problems with deadlocks in the plane. Gonnect (AG 6) is a rare exception on the square grid that uses Go-like captures to elegantly get around this problem. Akron takes a different route; upwards. Players resolve deadlocks by stacking pieces to step *over* enemy blocks.

Two players, Black and White, strive to connect their edges of the board with pieces of their colour. The board is an 8x8 square grid of holes and each player starts with a pile of 32 balls of their colour (1" marbles make ideal playing pieces).

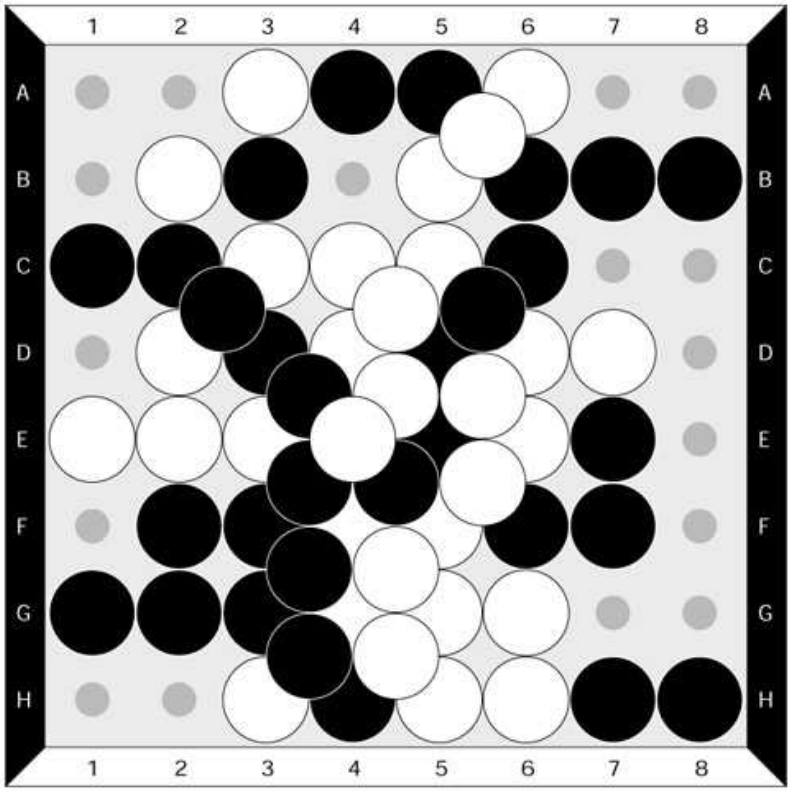


Figure 1. A game won by White.

2. Rules

Two pieces *touch* if they are orthogonally adjacent or one is stacked directly upon the other. Two pieces are *connected* if one can be reached from the other through a series of touching same-coloured pieces. If a connection crosses over an opponent's connection at any point then *the uppermost connection prevails* ; the lower connection is cut until the upper one is removed (over/under rule).

Start: The board is initially empty. The first player starts by placing a piece from their pile on any board hole. The second player then has the choice of either accepting this move and continuing with their colour, or swapping colours to steal the first move.

Play: Players then alternate taking turns. Each turn the current player must either:

(i) ***Add*** a piece from their pile; or

(ii) ***Move*** one of their pieces already on the board.

(i) The current player may ***add*** a piece from their pile (if there are any left) to any vacant board hole. Note that pieces added from the pile must be placed directly on the board and not stacked on existing pieces.

(ii) Alternatively, a piece may be ***moved*** to any valid empty point that touches a connected same-coloured piece (excluding the moving piece itself). An empty point is valid if it is either on the board surface or supported by a flat stable square formed by four touching pieces before, during and after the move.

A *support piece* (a piece with at least one other piece resting directly upon it) can be moved only if it supports a single piece on the level above. The upper piece is dislodged and drops down to fill the gap. There will be a *cascade* effect if the dropping piece supports a piece above itself, etc. The moving piece may step up or down one or more levels per move, but it may not take the place of a dropping piece or use a piece that has dropped this turn as a support piece.

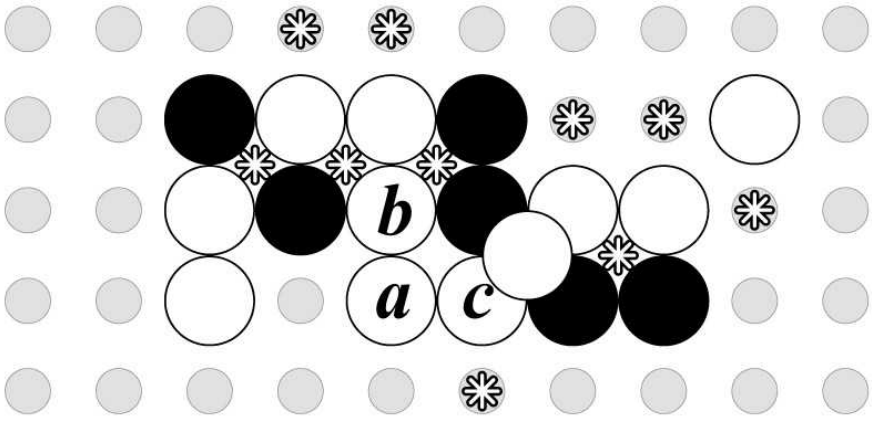


Figure 2. Valid moves for piece ***a*** are marked ***.

Figure 2 shows all possible moves for White piece ***a***. Note that all valid moves are connected to at least one of the touching White neighbours ***b*** and ***c*** both before and after the move. Four of the moves are steps up to level 1.

A drop is shown in Figure 3 where piece ***a*** initially supports a single piece ***b*** (left). When ***a*** is moved (middle) then ***b*** drops down to fill the gap (right). This mechanism is one of the attractive features of Akron; the marbles give a nice solid *clunk* as they drop.

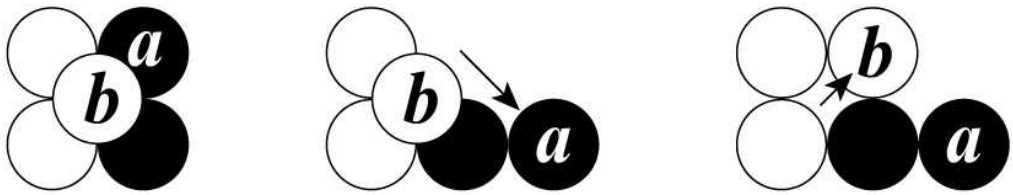


Figure 3. Moving support piece ***a*** causes piece ***b*** to drop.

As an aside, the Akron board should be constructed so that balls physically touch their adjacent neighbours if possible. This has the double benefit of visually emphasising adjacent connections and minimizing the chance of balls balancing precariously before they drop.

Aim: A player wins by completing a connected chain of their pieces between their two sides of the board. In addition, a player also wins if their opponent has no legal move on their turn. Either player may call a draw if the same position recurs two or more times on the same players' move (one repetition is allowed). Note that players only need to check positions since the last piece was added.

3. Game Mechanics

As mentioned above, deadlocks are resolved by players stacking pieces to push their connection over enemy blocks. Figure 4 shows a local deadlock on the left, where two White groups and two Black meet at a common interstitial point but do not connect. However, if White moves their free piece ***a*** up a level to the common interstitial point (right) then the White connection is completed.

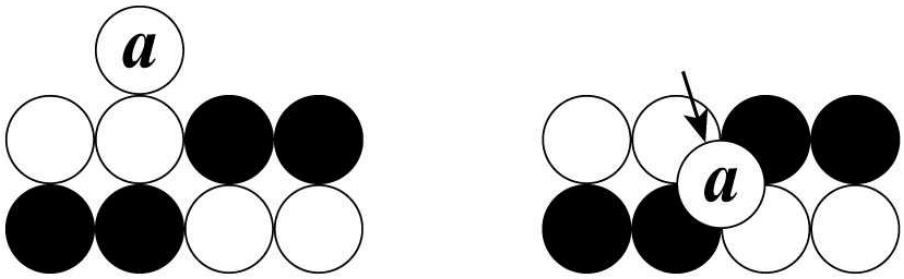


Figure 4. Deadlock resolution using up one freedom.

Such a piece connected to a group that can be moved without breaking the group's connection is called a *freedom* of that group (not to be confused with the similar Go term). Piece ***a*** in Figure 4 initially constitutes a freedom for White, but is no longer a freedom once played since moving it would break the new connection. Freedoms are pieces that can be moved without penalty and are the key to moving pieces to higher levels.

Stacking can also be used to cut dangerous enemy connections due to the over/under rule, as shown in Figure 5. Black moves piece ***a*** to connect their two groups and cut White's threatening connection. This is a necessary move for Black, but by no means a brilliant one. Their group has

no freedoms; each piece is temporarily pinned if the connection is to be maintained, and White now has the opportunity to play an even higher level cut.

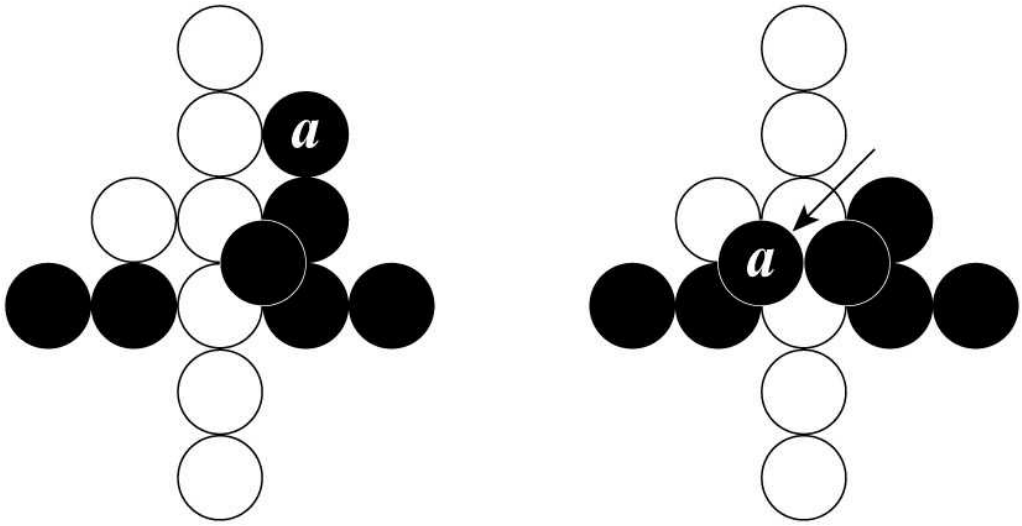


Figure 5. Black cuts White's connection.

Figure 6 shows the same group a few moves later. White moves piece ***n*** to cut Black's previous cut and restore the strong White connection. It's unlikely that Black will be able to move enough pieces into position to make a further cut at the next level up.

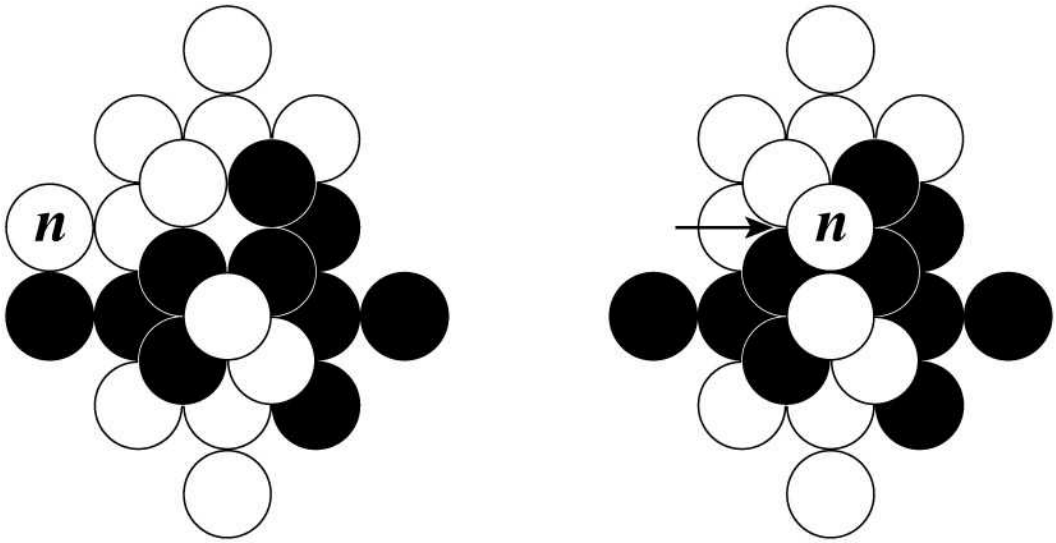


Figure 6. White cuts Black's cut.

Ties are not possible in Akron; the game ends as soon as a winning connection exists. If the moving player removes an overpass to reveal an opponent's winning connection, then the game is awarded to the opponent as soon as the piece is picked up, regardless of whether the move would also have resulted in a winning connection.

4. Strategy and Tactics

Basic connection tactics such as forks, forced moves and ladders apply in Akron, however these are largely overshadowed by piece stacking/dropping considerations particular to the game.

In addition to developing as many strong connections as possible, the deployment of freedoms is a critical aspect of the game. Forced moves (such as intrusions into virtual connections) are a good way of entering pieces onto the board and creating freedoms at negligible cost.

The following rule of thumb is good to keep in mind: *larger groups provide greater choice of movement* . Once a group is cut into two subgroups, the freedoms contained in each half are now restricted to the range of their respective subgroups rather than the group as a whole.

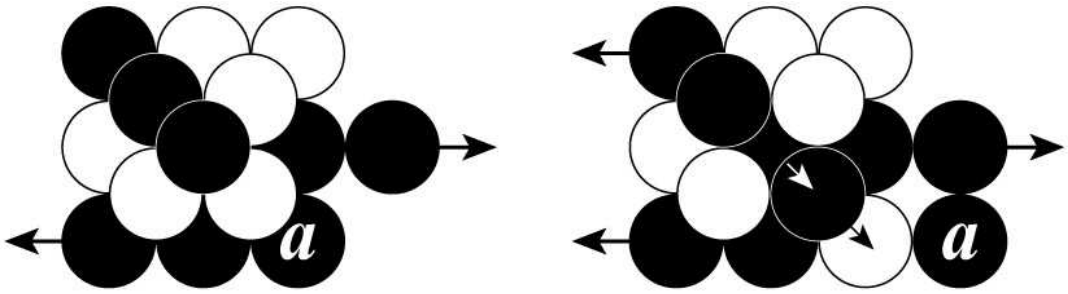


Figure 7. Piece ***a*** is a freedom despite appearances.

Note that a piece's status as a freedom may depend on the state of its neighbours and is not always obvious. For instance, piece ***a*** in Figure 7 is a freedom; its removal temporarily breaks the group's connection, but the Black piece above drops down to reestablish it.

This cascading double drop is actually quite a good move. Black not only maintains their connection but another forking connection is revealed to the left, and the White group is cut as an additional bonus. The only drawback is that the top point of the stack is now vacant and open to attack by White.

This example demonstrates how a player may indirectly move opponent's pieces under certain circumstances. This is an interesting aspect of Akron that does not happen regularly, but can occasionally be exploited to good advantage.

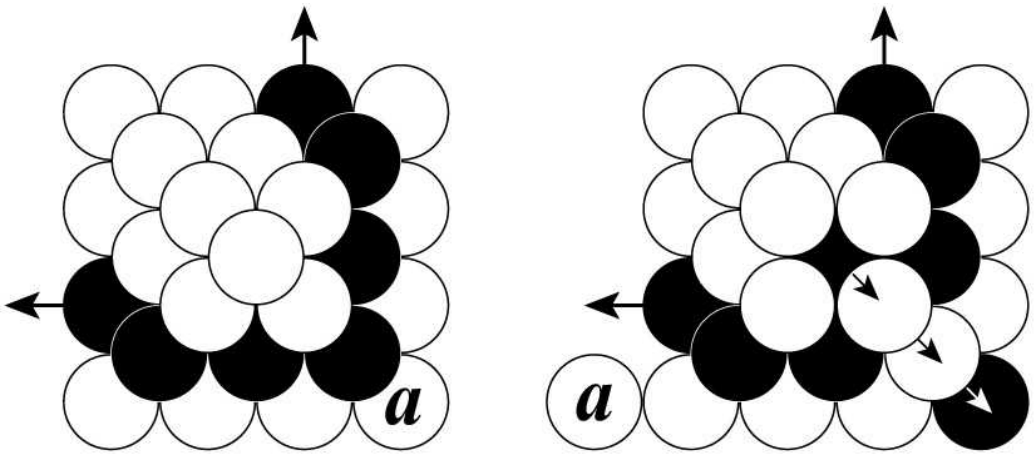


Figure 8. Dropping an opponent's piece to advantage.

Imagine that the Black group in Figure 8 threatens to connect with other groups above and to the left, and that White must cut this group to survive. Moving support piece ***a*** causes a triple cascade (right); Black's connection is broken and will require at least two moves to reestablish. Note that piece ***a*** can not be moved to the newly vacated top of the stack because this point is neither empty nor connected to a same-coloured neighbour until after the move, and not before it.

Now consider the system shown on the left if Figure 9 in which a Black group is cut by an overpassing White connection. To break this cut, Black moves piece ***a*** to its only valid destination (middle) and lets the White piece ***b*** drop, splitting the White connection in two.

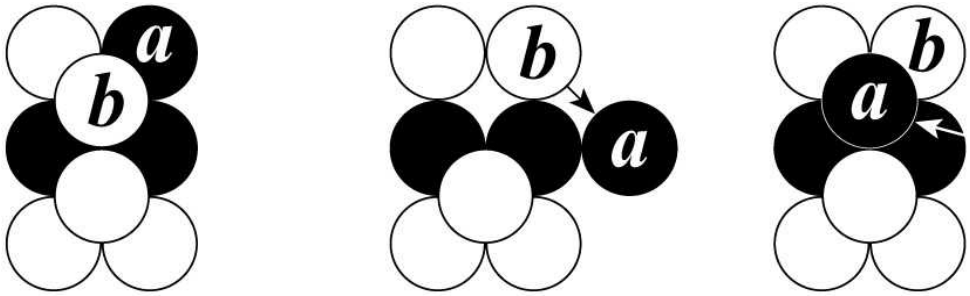


Figure 9. A break-and-block cycle by Black.

If White had a freedom associated with either subgroup they would be able to reinstate the cut next turn by playing back at the interstitial point, and this time the cut would be more or less permanent; Black would have no more supporting pieces to pull out.

However, White has no freedoms in this case and must move elsewhere. Black is free to promote piece ***a*** up to the interstitial point next turn and temporarily block White from further cuts (right). The plays shown in Figures 7, 8 and 9 demonstrate the danger of relying on enemy support pieces. *Don't tr ust enemy foundations* .

There appears to be a first move advantage in Akron, although this has not been established beyond doubt, as there is also some merit in moving second and using the opponent's extra pieces as stepping stones to higher levels.

Once a player runs out of pieces their game enters a closed stage. They have no more resources to draw from, and all future moves much be scavenged from pieces already available on the board. This phase of the game requires special care; *every* move involves either a freedom or a broken connection.

5. History

Akron was originally envisaged as a stacking game on the hexagonal grid, which would have allowed the most efficient sphere packing possible. However it soon became clear that the square grid with its the resulting pyramidal stacking was preferable for a number of reasons.

1. Phase Problems

Figure 10 shows three touching pieces ***a***, ***b*** and ***c*** stacked together upon a tightly packed hexagonal base (left). However if the piece ***d*** is packed *out of phase* with piece ***a*** (middle) then

these two pieces can never connect except via higher or lower levels, and the four adjoining interstitial points can not be used. This leads to awkward developments in play, and any attempt to dismiss this behaviour as just another feature of the game would be unsatisfactory.

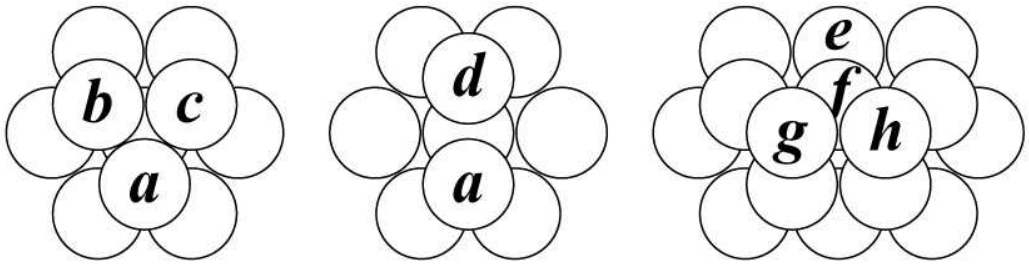


Figure 10. Bad packings within a level and bad drops between levels on the hexagonal grid.

There are also phase problems between levels on the hexagonal grid (right). Observe that the three levels, although tightly packed and consistent within themselves, are inconsistent as a whole. This breaks the drop mechanism; removing support piece ***e*** leads to trouble even though it only supports a single piece ***f*** on the level above. Piece ***f*** drops to fill the gap left by ***e***, but then pieces ***g*** and ***h*** compete for the gap left by ***f***. This introduces a random element that is anathema to games of pure strategy. This problem does not occur on the square grid, where at most one piece will drop to fill each gap even during a cascade (see Figures 7 and 8).

These hexagonal stacking problems cannot be resolved without substantially changing the basic nature of the game, or introducing superficial rules that would compromise its elegance.

2. Interstitial Space

The efficiency of the hexagonal packing implies a minimum of wasted interstitial space. However this is actually a bad thing in Akron, where players need to insert their fingers into the gaps to pick up pieces surrounded on all sides, such as pieces ***a*** and ***b*** in Figure 11. This can be done easily with 1" marbles on the square grid but is extremely difficult on the hexagonal grid.

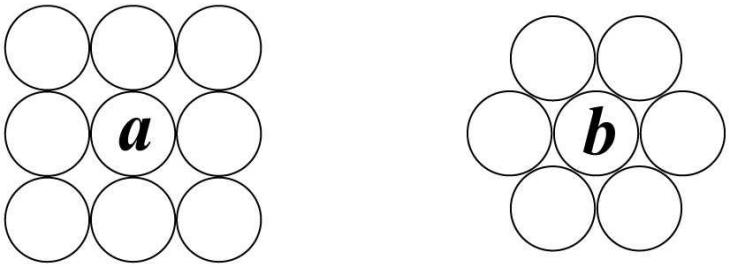


Figure 11. The square packing offers greater interstitial space.

In addition, stacked pieces settle more securely in the larger interstitial gaps of the square grid. This makes the game more robust to accidental bumps from players and means that dropping balls settle with more authority. These minor points actually have a major impact on the attractiveness and playability of the game.

Many thanks to Steven Meyers for fruitful discussions during Akron's development. Steven encouraged the use of designated player directions (as opposed to players connecting in either

direction) and suggested that the movement constraint be relaxed from points *touching* a same-coloured neighbour to points *connected to* a same-coloured neighbour. This promoted a freer, more interesting style of piece movement that captures the connective spirit of the game nicely.

Another important contribution by Steven was pointing out the benefits of the over/under rule in lieu of hidden underlying connections. This was originally intended as a solution to the problem of tied games but has since proven to add strategic depth and encourage the upwards movement of pieces, realizing the full potential of the game's three dimensional nature.

The last fine-tuning to be made to the rules was the official board size and number of pieces. n^2 / 2 balls per player (enough to cover the board surface) are recommended for an *n*x*n* board. A complete pyramidal stacking as per the non-connection stacking game Pylos was never intended. An 8x8 board with 32 x 1" marbles per player was found to be a good compromise between size/weight and strategic depth, although a 10x10 board with 50 marbles per player is recommended for advanced players with a lot of balls seeking a deeper game.

6. Conclusion

Akron adds a new dimension to traditional connection games by taking play out of the plane. Move mechanics involving the stacking and dropping of marbles complement these underlying themes to make Akron an interesting game to play with rich new strategies.

A computer Akron player is available free for download at:
http://members.optusnet.com.au/cyberite/akron/akron-1.htm.

7. Acknowledgments

Thanks again to Steven Meyers for valuable suggestions and play testing. Also thanks to Paul van Wamelen for play testing.

akron (*Greek*): highest extreme.

"I never heard Harvey say a word against Akron."
- James Stewart in *Harvey* by Mary Chase.

Note to players: Readers interested in constructing their own Akron set can purchase 1" or 25mm marbles from most large toy stores. These are cheap in bulk but will still add up to a few dollars. Alternatively, two Abalone sets will provide each player with 28 large marbles – close enough to the 32 recommended for an 8x8 game of Akron.

Akron boards may be constructed from any material with a square grid of depressions spaced 1" apart. The game set used while writing this article was made from a single $5 sheet of rubber matting that provided 3x3, 4x4, 5x5, 6x6, 7x7, 8x8, 9x9 and 10x10 boards. Such material may be found at matting or carpet stores. Alternatively, corrugated plastic sheeting (such as the reinforced bottoms of plastic cartons) may be found at plastic or container stores. The deeper, rounder and more regular the depressions the better.

Unfortunately Lego is an awkward size for constructing Akron boards. Lego’s 8mm stud-to-stud spacing is a fraction to small for 1” marbles, and other marble sizes (such as 16mm, 24mm and 32mm) are less than optimal for various reasons.