MultiMixi puzzzle Reprinted with Permission of **Journal of Recreational Mathematics, J**RM, and Baywood Periodicals V 5 No. 4, Fall 1973 pp-293-295. *(I made a version of this game and possibly still have the working model. It exhibits quite interesting behavior, ie., like a twisty puzzle, but sort of generalized to be set up in many different ways from easy to solve to not so easy.)*

Multimixi

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Suppose a given pattern of square chips can be moved from place to place on an 8 X 8 board. If this pattern is first removed from a board covered with chips, each succeeding move can be made by moving the chip pattern to the vacant areas left by the previous move. It is a kind of glorified 15 puzzle. This allows a continual mixing of the pieces.

   Figure 1 shows a device that can be used for picking up the pieces by employing permanent magnets. It is made with two planes of Plexiglas and a handle to grasp the device. The magnets are mounted on the upper plane. When the bottom plane is pushed away from the top plane it causes the chips sticking to the bottom plane to release because the magnets are pulled away from them.
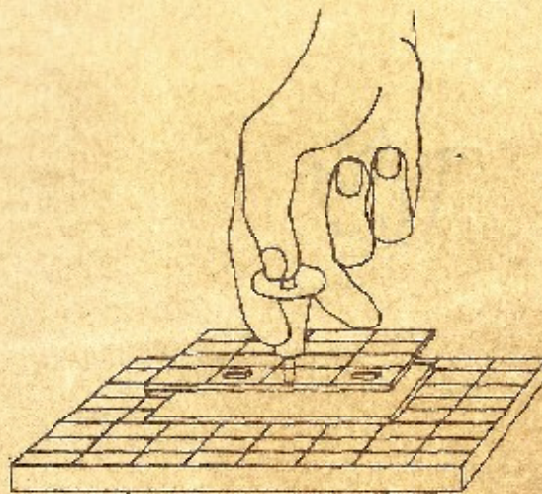

Figure 1.

   The present discussion will attempt to show some of the logical conclusions this device enables one to come to on a board of half white and half black colored chips.

We can begin by using a pickup pattern of two pieces with a space in between as shown in Figure 2.

Figure 2.

Remove a black and a white piece from a random array, as shown in Figure 3. Now, attempt to achieve a complete checkerboard pattern on the board by picking up two chips at a time and leaving them in the spaces always left by the previous move. It is impossible when the black and white piece removed to begin with are left off the board until the last move. If you remove a B W from the sequence WB B BW, placing it in on the last move gives WBBBWBW—not a checkerboard pattern. Is it possible if the two pieces removed to begin with are left out of the last move (thus leaving the board with two empty spaces)? Is it possible if two white pieces are removed to begin with and are left out until the last move?
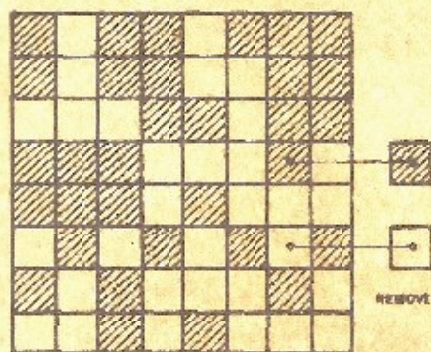
Figure 3.

Try to get a checkerboard pattern from a random array by using a 2 X 2 square pickup pattern of four magnets. This is difficult to do if one attempts it by making the entire board into a checkerboard directly. This is because the last few moves must all be interrelated. In fact, it appears impossible to do at first.

However, if you first achieve the black and white pattern shown in Figure 4 it is a simple matter to rotate the squares of pieces indicated in Figure 4 $90°$ and get the desired checkerboard pattern.

Another pattern using three adjacent magnets (hence, three adjacent squares) as a pickup pattern is interesting. Starting with a random array again remove two blacks and a white and attempt to get a complete checkerboard

pattern. It appears to be impossible when you get to the last few moves, but it is not.

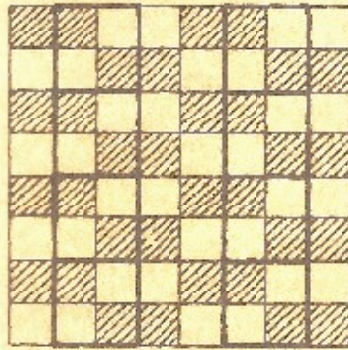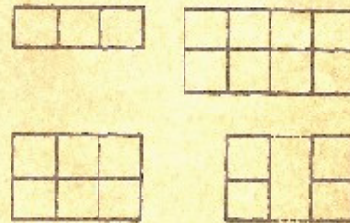Some other pickup patterns are shown in Figure 5.

Figure 4.

Figure 5.

MORE PICKUP PATTERNS

A simple game can be played by starting from a checkerboard pattern. Black attempts to get a continuous line of adjacent black chips from one side of the board to the other while white attempts the same thing but in a direction at right angles to black. A good pickup pattern to use for this game is a 2 × 2 square. The only rule to be observed is that white may not remove a black that is adjacent to two other blacks, and vice versa for black. Thus, in a square array of 2 × 2 black pieces none of the chips may be removed by white. The game can end in a draw if no other moves are possible.

An extra bit of intrigue can be added if the orientation of the various pieces can be kept track of by drawing an arrow on each one. They can also be kept track of by numbering their positions. Other games and variations are left to the readers' imaginations.