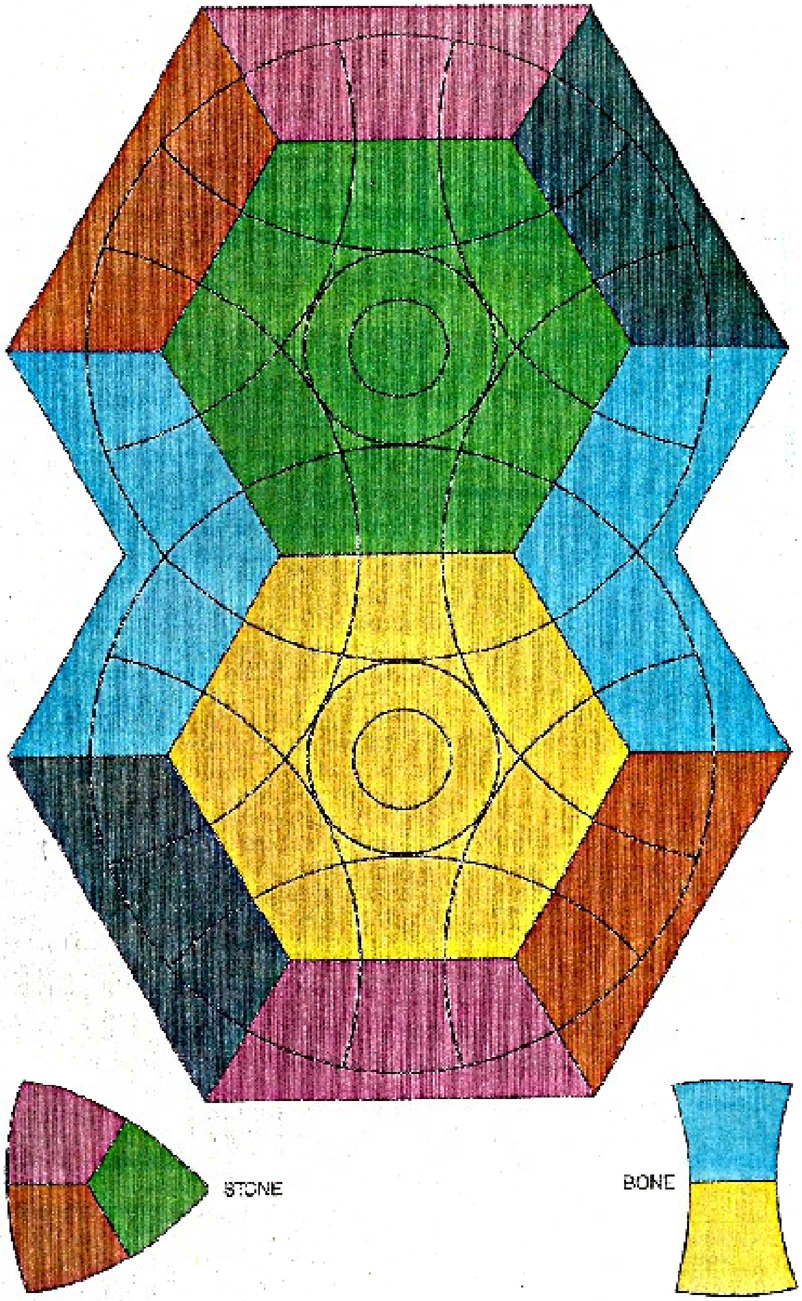
Reprinted with permisions as follows:
Invention of Deep Cut Circle Puzzles, (c) **Scientific American** (c) A.K. Dewdeney, pp 16-17, 24 also in the book **The Armchair Universe** (c) 1988 A.K. Dewdeny, 175-185. *(I sent Dewdeny a copy of the Enigma puzzle and he then gave it the name Enigma. Dewdeny called it one dimensional but it turns out to be every bit as difficult as a Rubik Cube. The third dimension is effectively hidden by rotations of pieces. In fact it has resulted in discovery of a whole new set of fractals using different amounts of integral rotation of two circles. Bob Hearn on The Twisty Puzzle Forum was able to show that when n=5(pentagonal symmetry) the puzzle at a critical radius becomes an infinite number of pieces and therefore jumbles, never able to become fully symmetrical. This means new cuts of the pieces are constantly required. It ends up making a fractal that emulates Penrose Tilings. Twisty puzzlers now give me credit for suggesting my Gizmo Gears as possibly being a jumbling puzzle. It resulted in the first discovery of full infinite jumbling turning the pieces into dust. You can observe many of these amazing fractals at this link: http://www.deluxerender.com/2015/12/gizmo-fractals-in-2d/ Also visit Jaap Scherphius web site for discussion of many different twisty puzzles and analysis of some of my many circle puzzle designs: https://www.jaapsch.net/puzzles/)*

Bill's Baffling Burr, Coffin's Cornucopia, and Engel's Enigma

To write a computer program that assists in the design of a puzzle is no less difficult or interesting than writing a program that solves one. Bill Cutler of Wausau, Wis., and Stewart T. Coffin of Lincoln, Mass., would agree. With the aid of a computer Cutler has designed a three-dimensional six-piece puzzle called Bill's baffling burr. A burr puzzle, because of its many protruding pieces and their interlocking relations, resembles the adhesive seedpod: it may cling to the would-be solver for days. Bill's burr consists of six pieces arranged in pairs in each of three orthogonal directions (*see* Figure 59). Two puzzles in one, it challenges us both to take it apart and to reassemble it. By using two computer programs to evaluate the puzzle potential of each combination of pieces, Cutler has arrived at what may be the most difficult six-piece burr in existence.

Coffin and his computer have designed a two-dimensional puzzle of hexominoes. These are flat pieces consisting of six squares glued together in various shapes. Depending on how cleverly the shapes are chosen, the task of assembling the hexominoes into a large square can be difficult and frustrating for the person who attempts it. Coffin's program searches through possible combinations of hexominoes that yield particularly difficult puzzles. It has found so many designs that Coffin is ready to send each reader who asks for one a unique personal hexomino puzzle (*see* List of Suppliers). Such bounty leads Coffin to label his facility a cornucopia. I received the puzzle shown in Figure 60.

A third puzzle I shall discuss was invented entirely by a human, Douglas A. Engel of Englewood, Colo. The challenge is hereby thrown



Engel's enigma (unscrambled)

From Figure in Scientific American, Oct., 1985,
Computer Recreations column by A. K. Dewdney

0 1 2 3 4 5 6 7 8 9

Suppose the upper circle is rotated 60 degrees clockwise. If we regard the 10 positions in the sequence above as standing for the corresponding sites in the puzzle, the rotation produces a permutation:

5 0 1 2 3 4 6 7 8 9

Note that 5 has been plucked, in effect, from the sixth position and placed in the first. Readers can easily generate the other three permutations. All four can be embedded in a program that operates on an array of size 10. Initially the array contains the numbers in ascending order. Invoking the permutations in random order will scramble the puzzle. The same representation scheme may make computerized attempts to obtain a solution go faster.

Now at last readers will see why I think of Engel's enigma as one-dimensional. The enigma and related puzzles can be ordered from Engel at the address given in the List of Suppliers.

Addendum

Hundreds of readers have tackled the puzzles just described. While some seek the magic combination of moves that disassemble the burr, others scratch their head over the placement of polyominoes in a tray. Members of this group will have to get by without help from their friends: each puzzle is unique. Still other readers keep rotating the wheels of Engel's enigma in a vain attempt to unscramble it. Some of the devotees are succeeding, at least on an abstract plane: claims of solutions to the enigma have come in.

An algorithmic solution to Engel's enigma is claimed by P. Clavier of Dallas, Tex. Clavier says that his program, written in BASIC and running on a Texas Instruments CC-40 portable computer, solves typical scrambles in from 300 to 700 moves. The solution implements six fundamental exchange operations on the stones and bones. Readers who used the sequence representation I suggested may have cast their net too widely; solutions of the numerical sequence are not always solutions of the enigma. In framing the suggestion I was aware that bones were excluded from the representation. "Well," said I at the time, "take care of the stones and the bones will take care of themselves." Not so. The stones should be interleaved with the symbols that represent the bones.

The ultimate scramble-unscramble puzzle appears to have been invented by Robert Carlson of Los Altos, Calif. It is so complicated to make that he must be content with the view of it on his monitor. The puzzle is an icosahedron, the Platonic solid that has 20 triangular faces. Each vertex is the site of a possible scrambling operation.

When a vertex is rotated, the five incident triangles are rotated as well. Each triangle has three colors. In unscrambled form the colors adjacent to each vertex are the same. Carlson has prepared a version of