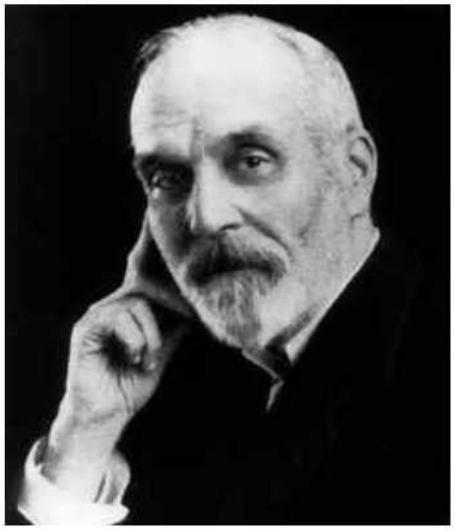
Henry Ernest Dudeney



This entry is a tribute to those individuals who fascinated and perplexed generations with the puzzles they invented. **Henry Ernest Dudeney** (April 10, 1857 – April 24, 1930) is undoubtedly England's greatest inventor of puzzles, perhaps the greatest puzzle inventor who ever lived. Many who have put together puzzle books during and since his lifetime must have agreed, because most lifted dozens of Dudeney's puzzles for their own books, often without giving credit where credit was due. Puzzles are problems designed as mental challenges, intentionally constructed to stimulate and require ingenious and frequently new ways of thinking. Oral puzzles probably have existed almost from the beginning of the use of language. The earliest known written puzzle is a riddle inscribed on a tablet, dating to the time of the early Babylonians (around 2000 BCE). Other riddles are found in the Bible, in the Qur'an (Koran) and ancient documents concerning Greek mythology, as well as in Sanskrit manuscripts. In his 5th century BCE writings, Greek historian Herodotus described the huge 19th century BCE labyrinth built by Egyptian Pharaoh Amenemhet III. In the 9th century CE, English scholar and Abbott Alcuin of York wrote *Propositiones ad Acuendos Juvenes* ("Problems to Sharpen the Young"), consisting of 56 mathematical puzzles. Throughout the centuries many others amused and challenged the curious with puzzles.

Dudeney was born in the village of Mayfield, in Sussex, the son of a local schoolteacher. His paternal grandfather was a shepherd who taught himself mathematics and astronomy while tending his sheep, and later became a schoolteacher. Dudeney early learned the game of chess and from the age of nine he was composing chess problems and other puzzles, which he published in the local newspaper. He worked as a clerk in the Civil Service from age thirteen and spent a great deal of his spare time studying mathematics and its history. Although his formal education ended early, he considered puzzle solving as an intellectual activity of the highest order. He masterfully thought clearly and logically in constructing his puzzles. When he married in 1884, his wife Alice, an author of more than 30 popular romantic novels, was the better known of the two. They had one child, Margery.

Dudeney was six years younger than America's foremost puzzler Sam Loyd, who is best known for creating chess problems and inventing games such as Parchesi, which became an international fad. Loyd later moved from chess problems to puzzles and games, inventing the Fifteen Puzzle, the Trick Donkeys, and Pigs in Clover. Loyd, who produced over 10,000 puzzles in his lifetime, was a great prankster, almost to the point of deserving to be called a con man. He brought humor into problem making and was a master at creating puzzles that appeared so simple to solve that people felt compelled to attempt them, only to discover after hours at the task they were unable to unlock their secrets. Loyd was not above claiming to have been the first to invent puzzles when the honor should have gone to others.

Sam Loyd

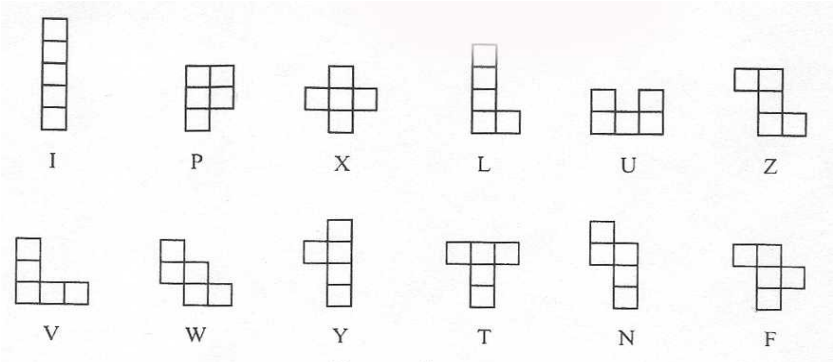
Dudeney and Loyd collaborated on a series of puzzle articles written for the magazine *Tit-Bits*, and later published some of their puzzles in each other's magazine and newspaper puzzle columns. When Loyd began publishing Dudeney's puzzles under his own name, the latter, who always gave complete credit to other puzzle-makers, was naturally outraged and, according to his daughter, ever after equated Loyd with the devil. Dudeney prospered publishing mathematical puzzles using the pseudonym "Sphinx." Like Loyd, he enjoyed fleshing out his puzzles with amusing anecdotes. The following is an example of this device.

> "I say, Rackbone, what is the time?" an acquaintance asked our friend the professor the other day. The answer was certainly curious. "If you add one quarter of the time from noon till now to half the time from now to noon tomorrow, you will get the time exactly." [The time of day when the professor spoke is given below at the end of today's entry.]

Dudeney contributed columns entitled "Perplexities" to *Strand Magazine* for over thirty years. He also contributed several longer articles and special puzzles at Christmas time. His first book, *The Canterbury Puzzles*, was published in 1907. His very popular collection of mathematical puzzles, *Modern Puzzles*, appeared in 1926. After his death, Dudeney's wife helped edit a collection of his puzzles, *Puzzles and Curious Problems*, in 1931, and later on a second collection called *A Puzzle Mine*. In addition to his puzzle books, Dudeney wrote a short story "Dr. Bernard's Patient," "The Antiquity of Modern Inventions", "Jose Casablanca: The Latest Chess Genius" and "Napoleon as a Chess Player."

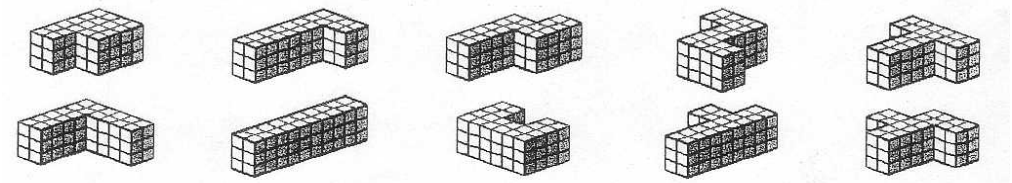
A *pentomino* is an arrangement of five unit squares that are joined along their edges. Not counting rotating and flipping,

there are 12 possible shapes (Figure 4.2). Each piece is known and often referred to by the letter from the set {F, I, L, P, T, U, V, W, X, Y, Z} that most accurately reflects its shape. Pentominoes were "invented" by Solomon W. Golumb in a talk to the Harvard Mathematics Club in 1953 and they appeared a year later in an article in the *American Mathematical Monthly.* Although Golumb coined the name and along with Martin Gardner popularized their use in puzzles, the first pentomino puzzle appeared in 1906 in Dudeney's *The Canterbury Puzzles.*



Pentomines
Fig. 4.2

Ten of the twelve pentominoes can be extended to three-dimensional figures using all twelve pieces. Figure 4.3 shows the pentominoes, as they would appear if made from cubes, three deep. Two of the pentominoes, the W and the X, cannot be constructed in this manner.



Solid Pentomines
Fig. 4.3

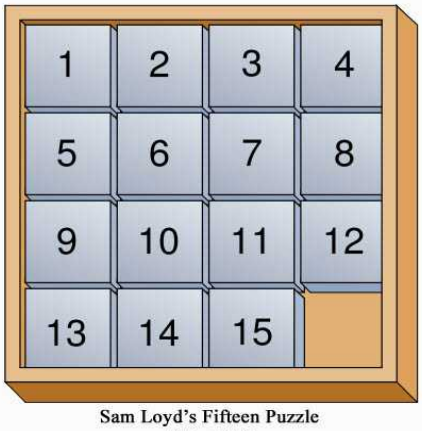
The problem is to fit the 12 pentominoes pieces into various shapes. The rectangular shapes into which all 12 pentominoes can fit are of sizes 3 x 20, 4 x 15, 5 x 12, and 6 x 10.

Many people have the mistaken assumption that mathematicians should be very good at solving puzzles, particularly mathematical or logical puzzles. This is not true. What is true is that mathematicians who enjoy playing with mathematical puzzles are usually quite good at it. The key here is not mathematics but interest. Other mathematicians looking at a

mathematical puzzle may become distracted by the generalization possibilities of the puzzle and become more interested in that than the puzzle itself. For instance, it is well known that in the simple game of tic-tac-toe, the first player should never lose. While he or she might not actually win, the first player can at least tie. A mathematician might enjoy explaining why this must be so, but would be more likely to be curious if the first player has such an advantage if the game is modified. What if it is not a 3x3 game but an *n* x *n* game? Or what if the figure is not square and the winning diagram is altered in some way?

On the other hand a puzzle can become an international obsession, as was the case with the Rubik's Cube. It consists of 27 smaller cubes, or cublets. When in its initial state, each of the six faces of the cube is made up of nine cublet faces all of the same color. An internal system of pivots allows any layer of nine cublets to be rotated through 45 degrees with respect to the rest. There are 43,252,003,274,489,856,000 different arrangements of the 27 cublets, only one of which is the original arrangement. The challenge is to twist the cublets until one moves from one of the other arrangements and arrives back at the initial one where all the faces of the cublets, which make up a face of the whole cube, are of the same color. It is estimated that 100 million cubes have been sold, 10 million alone in Hungary, the home of its inventor Erno Rubik. Not too many people know that the cube is a group theory problem.

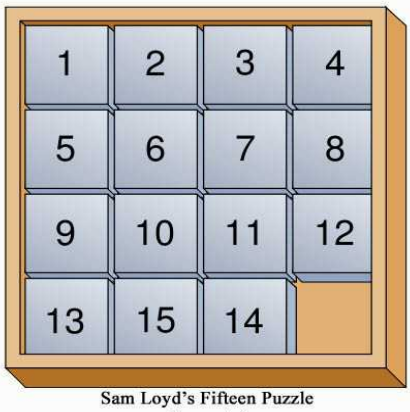
Long before the Rubik's Cube, the world became consumed with Sam Loyd's Fifteen Puzzle. The "15 puzzle" (Figure 4.4) consists of a square shallow box of wood or metal which in its original position holds 15 little square blocks numbered from 1 to 15. There is room for 16 blocks in the box so that the 15 blocks can be moved about and their places interchanged.



Sam Loyd's Fifteen Puzzle
Figure 4.4

The purpose of the puzzle is to return to the original ordering of the counters after they have been randomly shuffled. The only allowed moves are sliding counters into the empty square. The configuration in Figure 4.4 is not the only starting point. Another is shown in Figure 4.5.

The craze of the 15 puzzles swept across America and Europe to such a point that employers were forced to post notices prohibiting playing the puzzle during office hours. In Germany, Deputies in the Reichstag played it, while in France it was described as a greater scourge than alcohol or tobacco. Shortly after Loyd invented the puzzle two American mathematicians, W.W. Johnson and W.E. Story, proved that from any given initial order only half of all the conceivable positions could actually be obtained. Loyd offered large cash prizes for anyone who could solve the puzzle, but only, it appears, when the puzzle was in an impossible configuration. The difference between the two is that configurations in the solvable group, such as Figure 4.4, can be obtained by acting backwards – starting with the target ordering and just randomly sliding the counters. Configurations of the unsolvable group are obtained when, in addition, two neighboring counters are physically lifted and their positions swapped, as the 14 and 15 are in Figure 4.5.



Sam Loyd's Fifteen Puzzle
Figure 4.5

Quotation of the Day: "A good puzzle should demand the exercise of our best wits and ingenuity, and although a knowledge of mathematics … and … of logic are often of great service in the solution of these things, yet it sometimes happens that a kind of natural cunning and sagacity is of considerable value." – Henry E. Dudeney