Celebration of Mind: XColony – The Puzzle of Space

Oct 21st, 2014, Hosted by Sorin Alexe, Ph.D.

Everything started with Martin Gardner.

Martin Gardner (October 21, 1914 – May 22, 2010) was an American popular mathematics and science writer specializing in recreational mathematics, but with interests encompassing micromagic, literature. He wrote the *Mathematical Games* column in *Scientific American* from 1956 to 1981 and the *Notes of a Fringe-Watcher* column in *Skeptical Inquirer* from 1983 to 2002 and published more than 100 books.

Gatherings for Gardner

Gardner was famously shy and declined many honors when he learned that a public appearance would be required if he accepted. However, in 1993 Atlanta puzzle collector Tom Rodgers persuaded Gardner to attend an evening devoted to Gardner's puzzle-solving efforts, called "Gathering for Gardner". The event was repeated in 1996, again with Gardner in attendance, which convinced Rodgers and his friends to make the gathering a regular event. It has been held since then in even-numbered years near Atlanta, and the program consists of any topic which could have been touched by Gardner during his writing career. The event's name is abbreviated to "G4G*n*", with *n* being replaced by the number of the event (the 2010 event thus was *G4G9*). Gardner attended the 1993 and 1996 events.

Source: http://en.wikipedia.org/wiki/Martin_Gardner#Gatherings_for_Gardner

Celebration of Mind

October 21st this year is **Martin Gardner's 100th birthday**! **G4G's Celebration of Mind Committee**, which formed after Martin's passing in 2010, encourages everyone to hold an event or party to celebrate Martin's legacy and continue his pursuit of a playful and fun approach to math, science, art, magic, puzzles, and all of his other interests.

XColony at G4G11

The XColony project was presented at G4G11, Atlanta, March 20-23, 2014: *Polyhedral Computing Applied to Spatial Puzzle Design*, Sorin Alexe. Ph.D.

The talk introduces a novel polyhedral computing system, called XColony, that operates with various polyhedral modules to generate complex 3D constructions. The activities that are developed within this environment are fun, enjoyable and educational. They develop spatial intuition and strategic thinking of the participants. A series of images, movies and samples will illustrate these concepts and will provide significant insights into the design process specific to XColony games and puzzles

Activities

1. Read this introduction. Feel free to find out more about Martin Gardner.

http://sinews.siam.org/DetailsPage/tabid/607/ArticleID/200/The-Mathematical-Legacy-of-Martin-Gardner.aspx
http://www.scientificamerican.com/article/make-your-own-hexaflexagons-and-snap-pictures-of-them/
http://martin-gardner.org/Centennial.html

2. Solve at least one puzzle from the ones presented in the next section. Think of 2 new puzzles of this type. Challenge your friends with these puzzles, including your own, and ask them to invent 2 more.

3. Watch the YouTube movie **XColony Embeddings**
   https://www.youtube.com/watch?v=HqWzgiSwaM8

4. Build at least one XColony module or construction. If you have XColony materials feel free to advance as much as you can. If you do not have special materials just print page 4 and cut 4, 8 or 20 hexagons and build one of the modules T, O or I, depicted on page 5. Colored business card paper would work best. How many modules would you need to build the "The Fractal"? Can you identify some fractal properties?

5. Imagine how to represent a cube with hexagons. Solution will be posted after the last group acknowledge they celebrated.

   Solution
   The image below gives you a hint on how such a cube can be represented. Look at one corner. It also gives you the idea that a cube of higher complexity exists, where the image is just one of its 6 faces. But there is even a greater idea hidden in this image: the way to evolve following the Menger Sponge fractal structure.

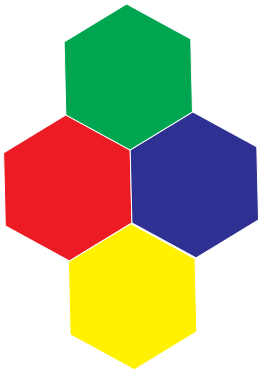
6. If you have pictures taken during the celebration send them to sorin@x-colony.com. A selection of these pictures will be posted on the website, after the event.

Solution
YOU ARE ON YOUR OWN HERE.

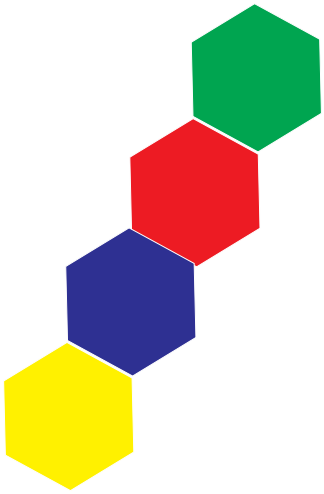
Hint: visit www.xcolony.eu

Hexa Puzzles

Hexa 1. Change configuration 1 to configuration 2. You are allowed to move on hexagon at a time in such a way that it lands adjacent to exactly 2 hexagons. The colors are not important. If you do not have hexagons you may use 4 coins. Alternatively, You may print this page and cut the pieces.

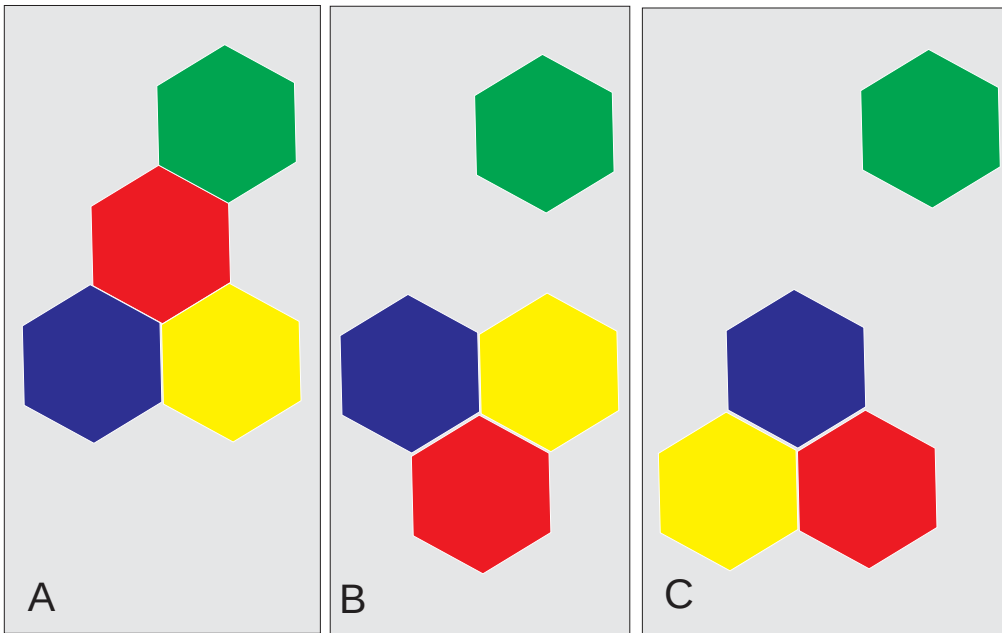


Configuration 1



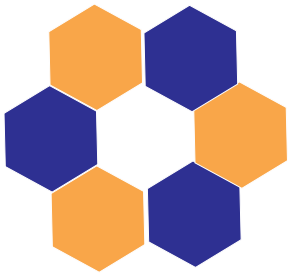
Configuration 2

Solution



Hexa 2. Change configuration 3 to configuration 4. You are allowed to move on hexagon at a time in such a way that it lands adjacent to exactly 2 hexagons. The colors are important: the final solution should display alternating colors. If you are using coins, place them in a face-up/face-down configuration.

Configuration 3



Configuration 4

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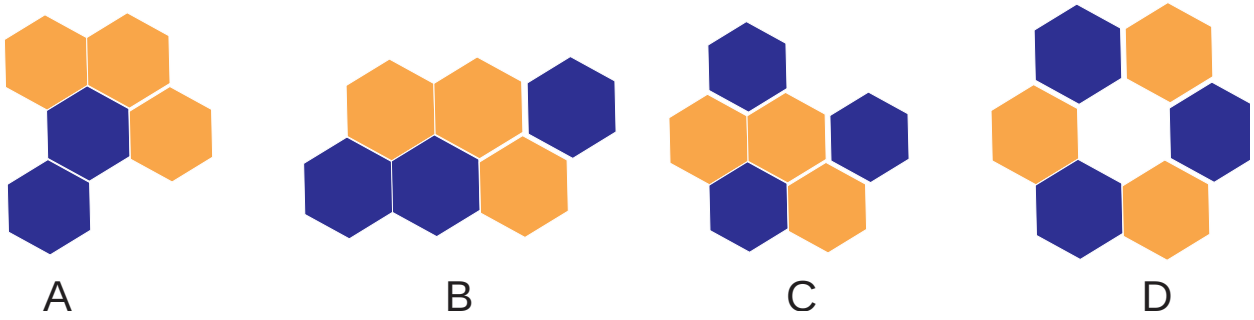
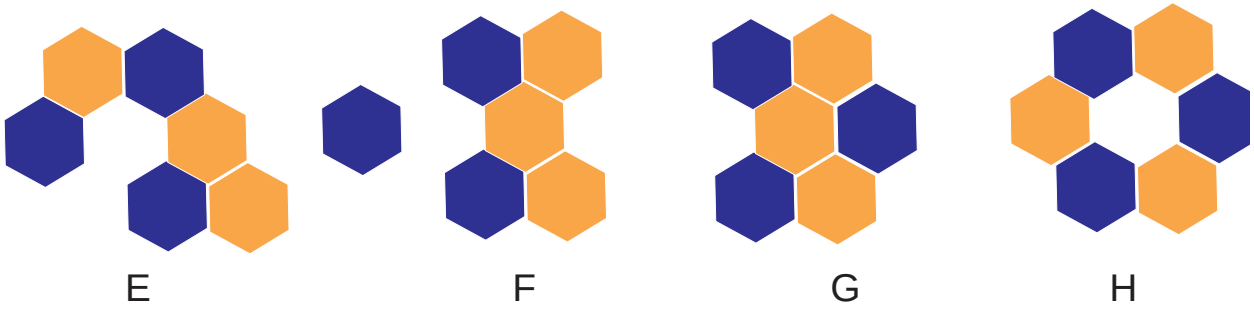
Solution 1



Notice that Solution 1 is good if Configuration 4 is allowed to be rotated. This can be done in 4 moves.

If the rotation is not allowed Solution 1 is not solving the problem. To get to configuration 4, additional moves are needed.



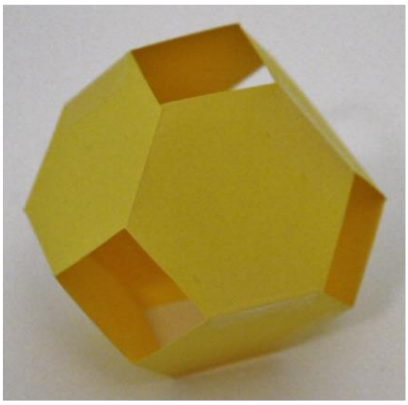
Hexa 3. Place 4 hexagons such that any 2 of them have an edge in common.

Solution

This can only be done in 3 dimension. Just construct a tetrahedron with cut corners.

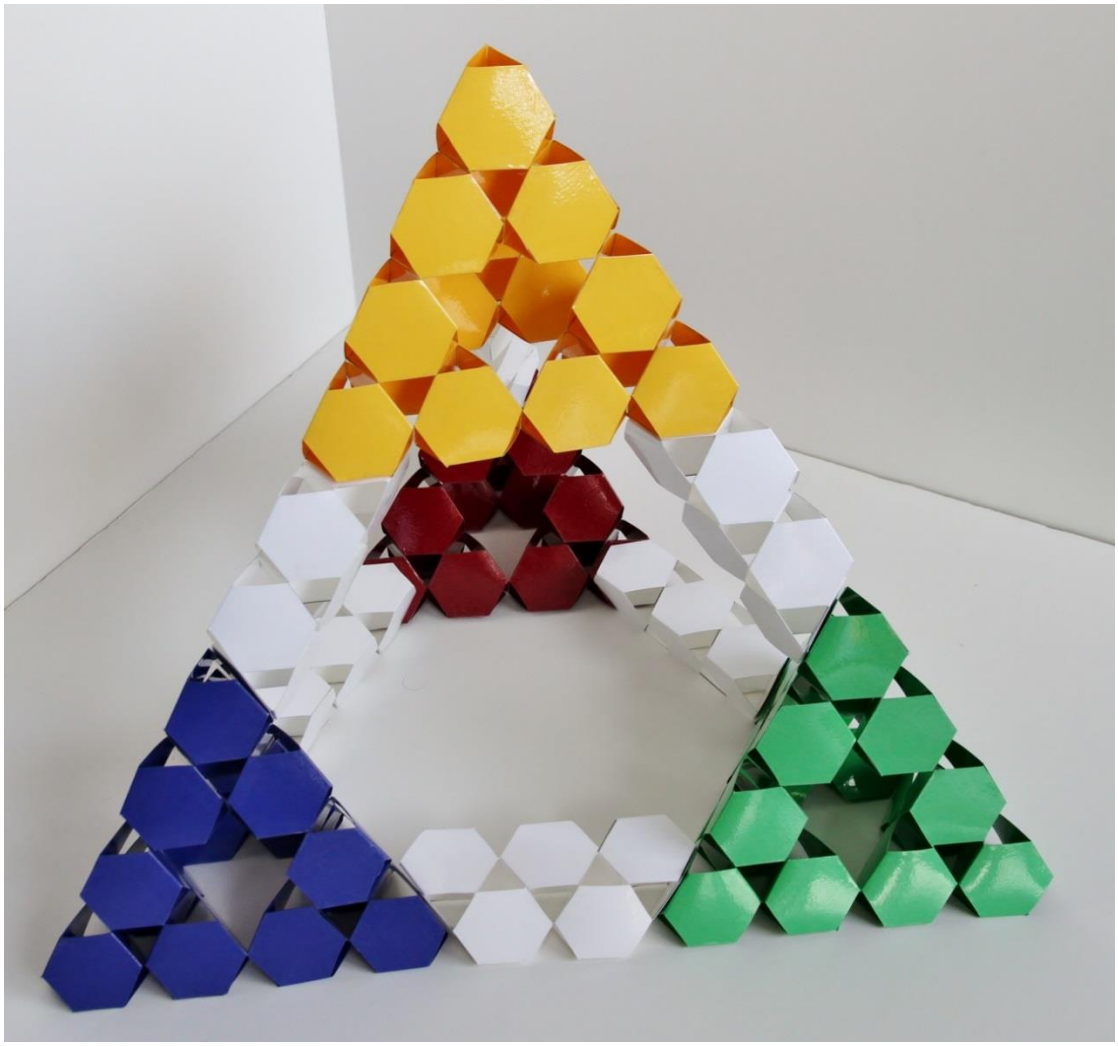
Materials – Activity 4

T(etrahedron)



O(ctahedron)

I(cosahedron)



The Fractal