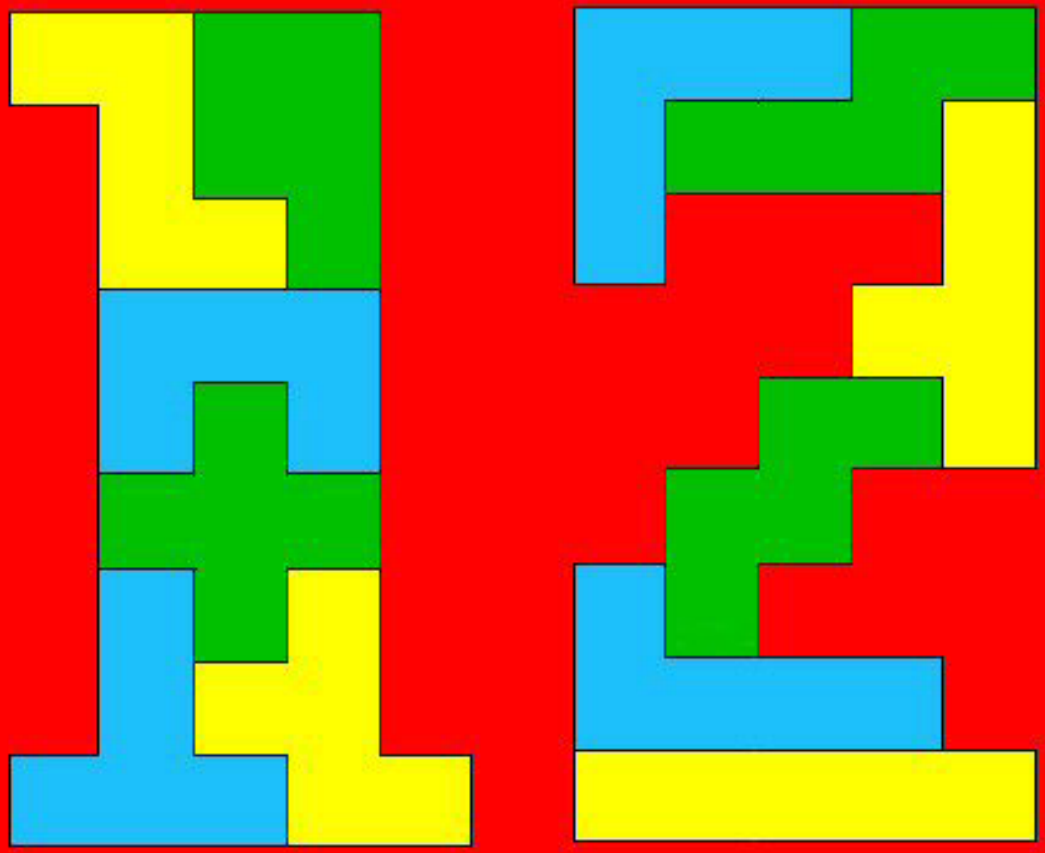
A Fibonacci verse



Bridges 2016–Jyväskylä, Finland

Twelveness

A Fibonacci verse celebrating the 12 pentominoes

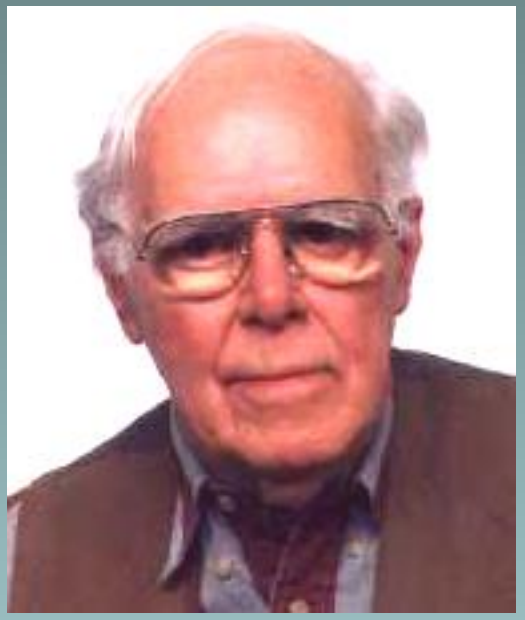
1 1 2 3 5 8 13 21 34 55 89 144

Presentation by Kate Jones
at Gathering4Gardner 12 – Atlanta, GA
and Bridges 2016 – Jyvaskyla, Finland

1 Martin

1 Gardner

2 long ago



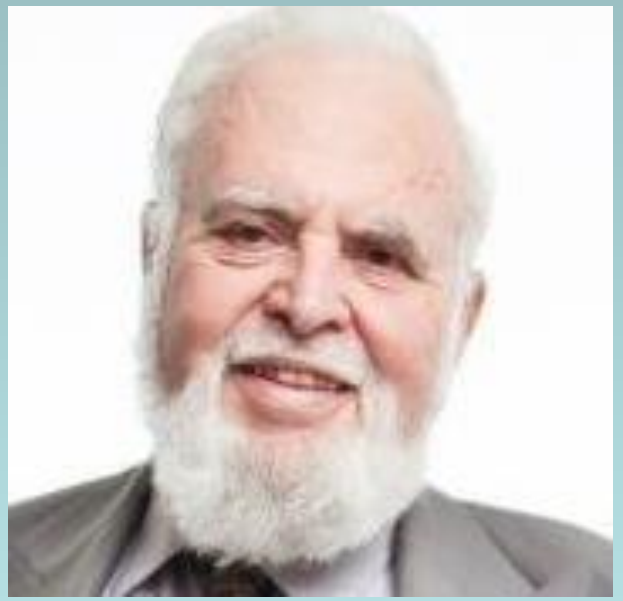
SCIENTIFIC AMERICAN

May 1957

Volume 196, Issue 5

3 Wrote about pentominoes

5 Brainchild of young Solomon Golomb



8 The coolest recmath set in all the world

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THE MATHEMATICAL ASSOCIATION OF AMERICA, INC.

VOLUME 61 NUMBER 10

CONTENTS

DECEMBER 1954

For Kate Jones,
10/17/2012
-Sol Golomb

CHECKER BOARDS AND POLYOMINOES

S. W. GOLOMB, Harvard University

Our starting point is the well-known problem: Given a checker board with a pair of opposite corners deleted (Fig. 1), and given a box of dominoes, where each domino covers exactly two squares of the checker board, is it possible to cover this checker board exactly with dominoes? The answer is "no"; for suppose that the checker board is colored in the usual manner (Fig. 1). Then each domino covers one light square and one dark square. Thus n dominoes would cover n light squares and n dark squares, that is, an equal number of each. But the checker board of Fig. 1 has more dark squares than light squares, and so it can not be covered with dominoes.

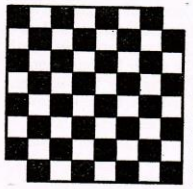


FIG. 1

We shall retain the 8×8 checker board as our "canonical domain," but we shall generalize the "domino" to the "polyomino," and our theorems will involve all the simpler polyominoes, shown in Figure 2. More precisely, we *define* an n-omino as a simply-connected set of n squares of the checker board which are "rook-wise connected"; that is, a rook placed at any square of the n-omino must be able to get to any other square, in a finite number of moves.

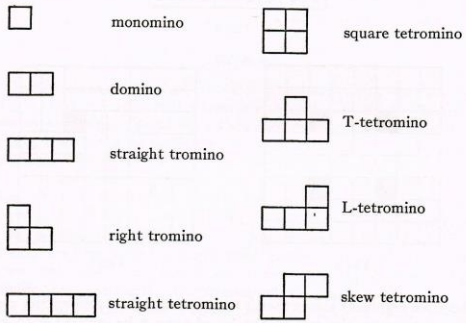


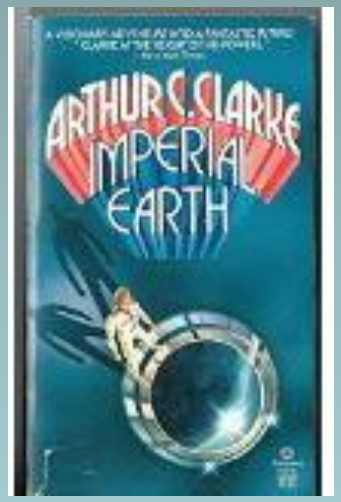
FIG. 2

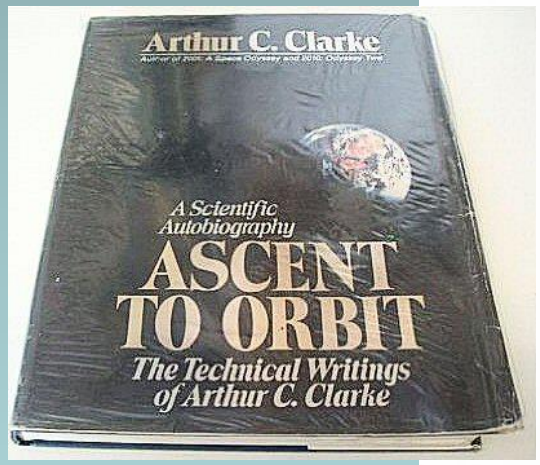
First we consider trominoes. Clearly it is impossible to cover the 8×8

13

Soon everybody played them, Gabriel made them,

Even Arthur Clarke became their addict.





And in 1980 Kadon Enterprises (1227 Lorene Drive, Pasadena, Md. 21122—did you know that there was a Pasadena in Maryland?) sent me one of their beautiful 3-D sets, trademarked "Quintillions." These are cut from extremely hard wood by a laser, so precisely that they fit together almost like machined metal blocks.

23 *HELP! I Am a Pentomino Addict!*

I cannot remember
mathematics, but I c
ment when I first be
the mind by revealir

The occasion was one of the rather rare lectures by our Headmaster at Huish's, Arnold Goodliffe. He was a large, imposing figure in the great tradition of English pedagogues; we all regarded him with awe and respect, but not with fear (unless there was good reason; in those far-off days corporal punishment was still permitted, and the Old Man knew how to apply it). His duties as Head must have left him little time for taking classes, but he must have been an inspiring teacher or he would not have made such an impact on my mind.

The lesson was one in elementary algebra. We all knew the simple formula for the sum of the first n integers:

$$n(n + 1)/2$$

and Arnold Goodliffe posed the question, which had probably never occurred to any of us: Is there a formula that gives the sum of the *squares* of the first n integers? He then proceeded to derive it by the process of induction, and I was at once struck by the power and elegance of the method. It impressed me enormously; but I had a bigger surprise in store.

When Dr. Goodliffe had written down the plausible but not very exciting solution

$$n(2n + 1)(n + 1)/6$$

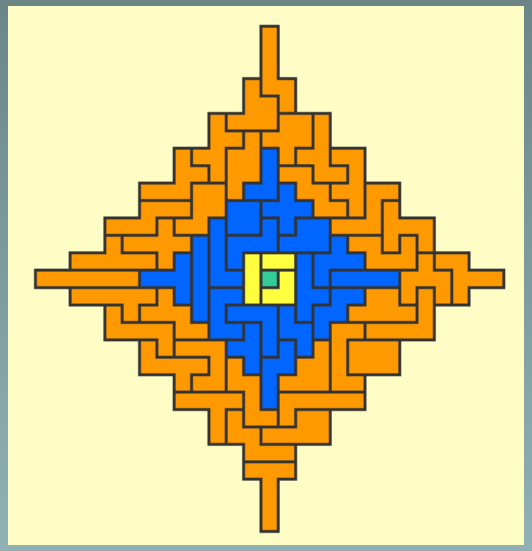
199

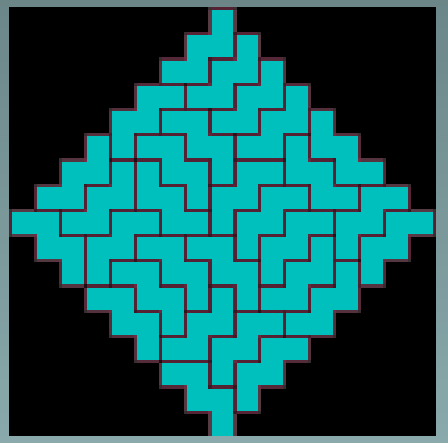
21

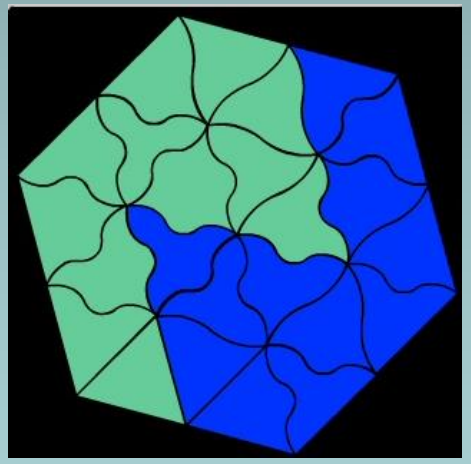
Through a feat of fate along came Kate and started a business, because she could, founded on 12 pieces of wood.

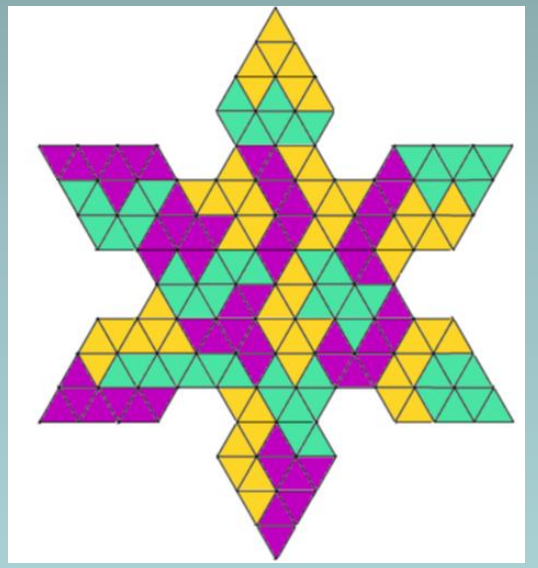
34

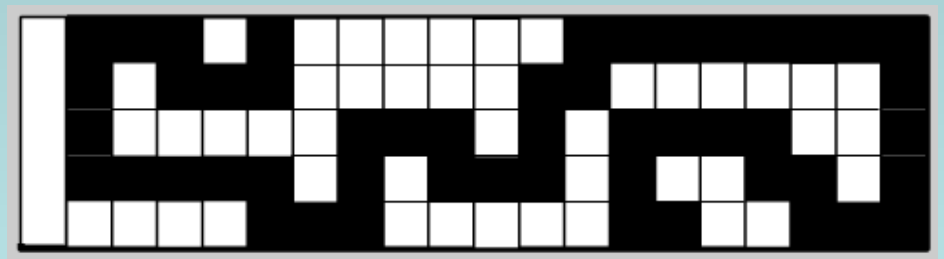
And this one set begat lots more—
combinatorial puzzles by the score—
as awards rolled in and ribbons flew
and a beautiful mathematical product line grew,
lovingly crafted… sold only in our traveling store.









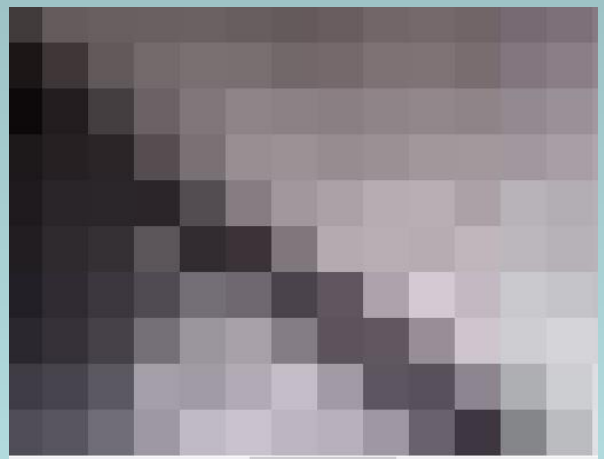


55

As decades flowed by, the pents we'd named Quintillions
Stood ever in first place, and their fans grew by the millions.
    Their shapes showed up in a whole parade
    Of other creations that we made.
And dear Martin Gardner, friend and mentor,
Let us make the two games of which ***he*** was the inventor.

89

Polyominoes are everywhere, just take a look around —
On floors and walls, on every web page as pixels they are found…
From the Singularity to infinity, particles join in ever more fanciful arrays
Like elements in galaxies, where energy with space-time plays;
Then living beings happened along, from single cell to the giant whale
And played with variations, inventiveness at every scale,
And somewhere in the middle are these humans on a planet blue —
They have minds that play with puzzles, math and the magic they can do.



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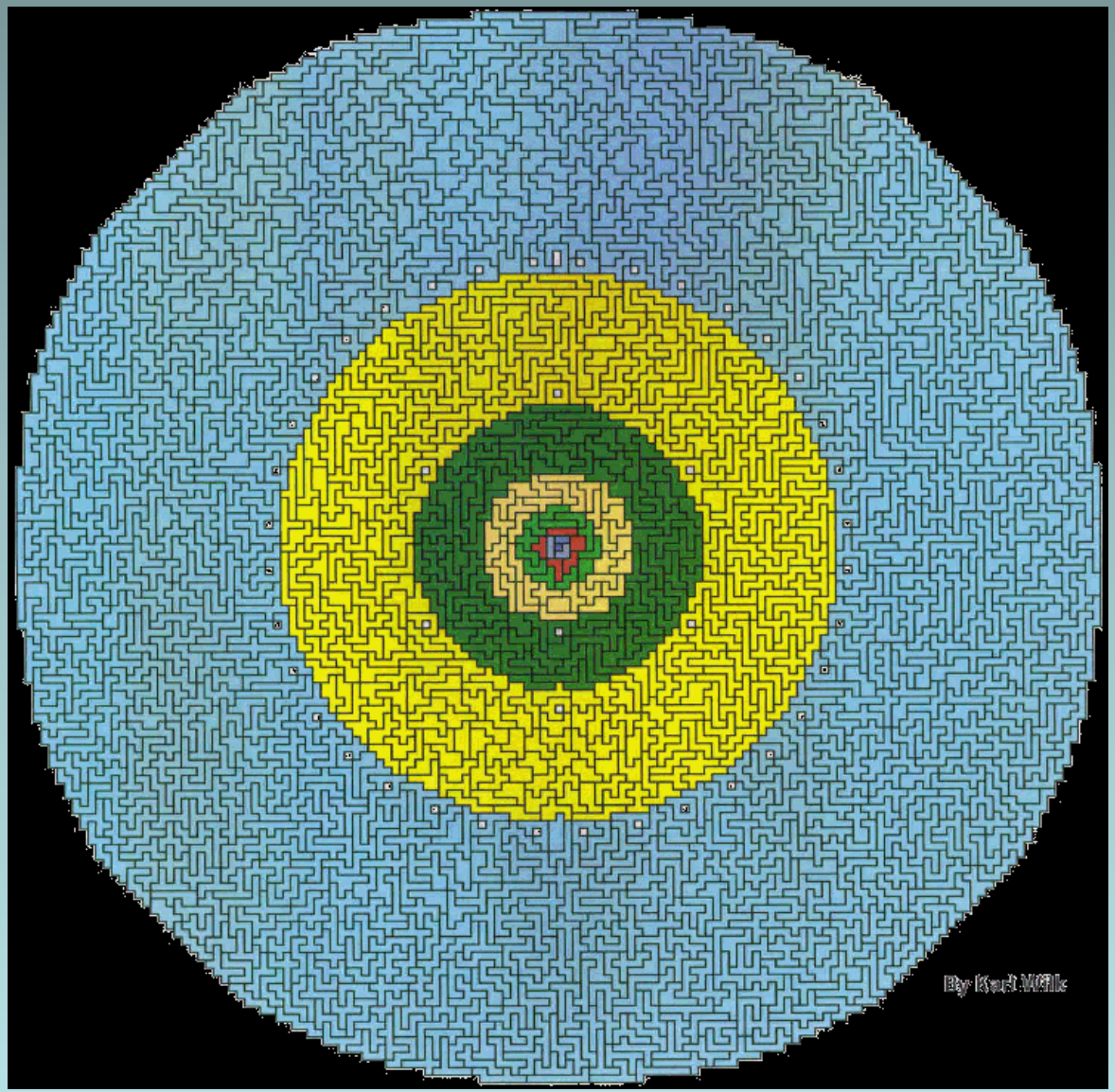
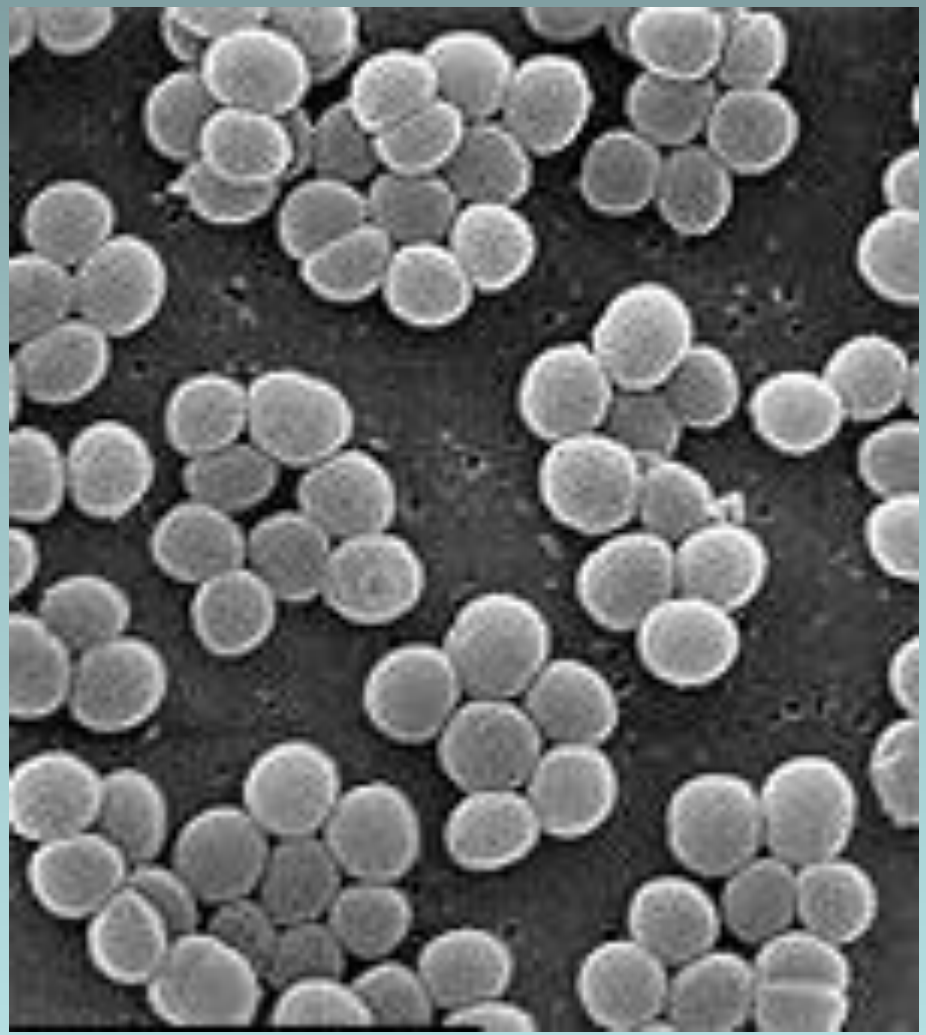
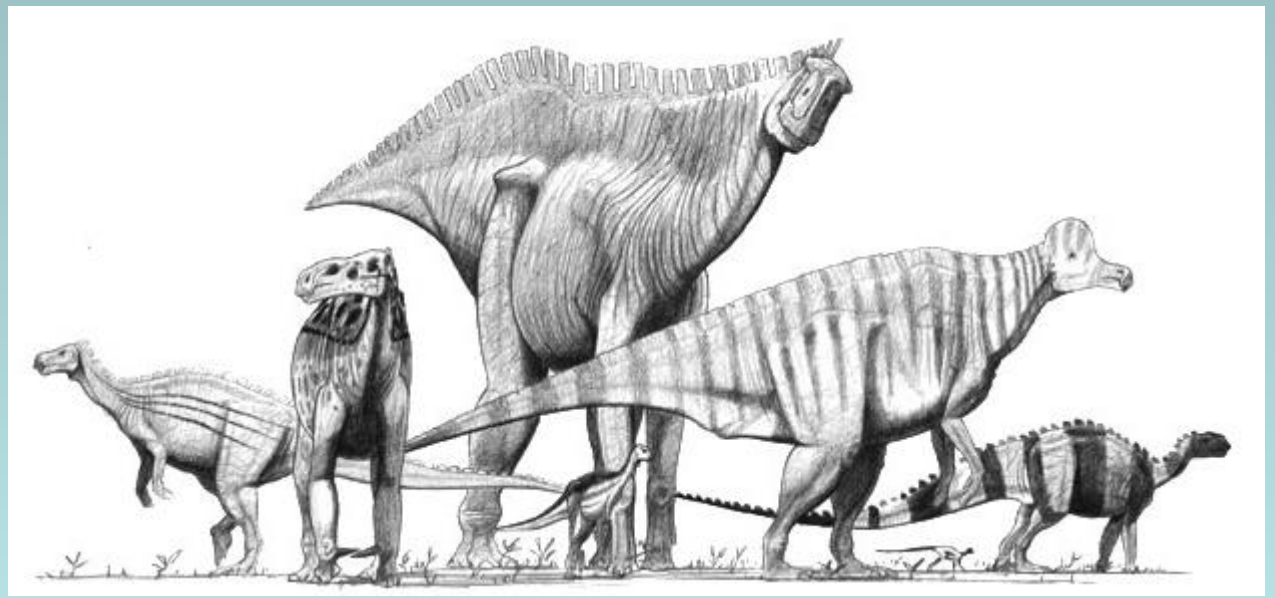
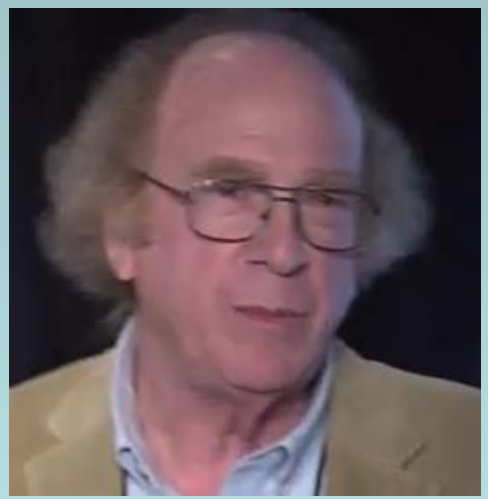


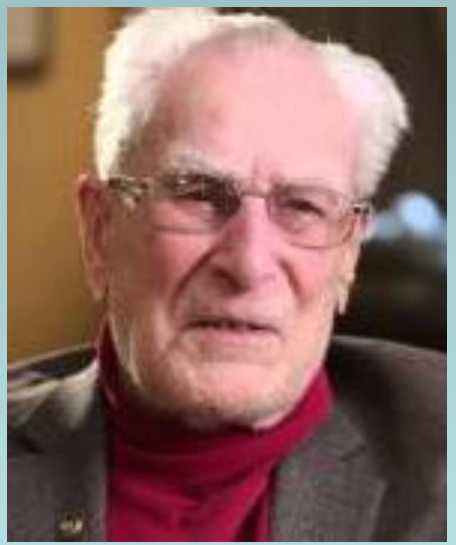
Then living beings happened along, from single cells to the giant whale
And played with variations, inventiveness at every scale,





And somewhere in the middle are these humans on a planet blue —
They have minds that play with puzzles, math and the magic they can do.

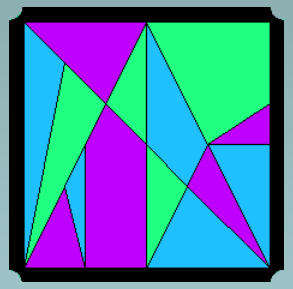




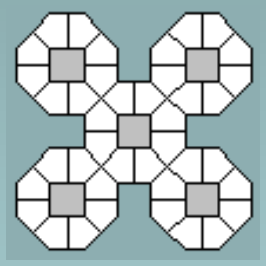
144

Wrapping up the last line, with a 12-times-12 word string — I counted them with care —
Here is the list of all our games where you'll find pentominoes demand their share:

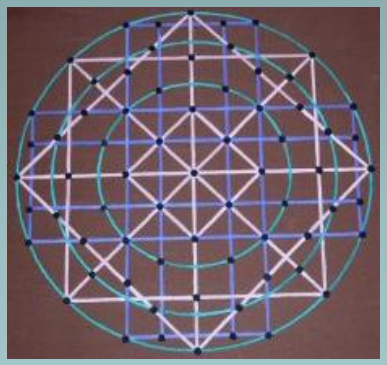
Archimedes' Square



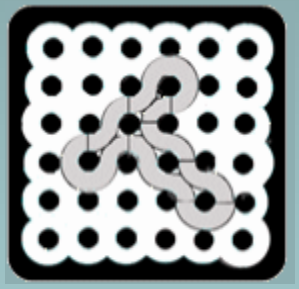
Boats



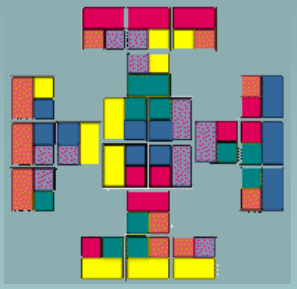
Brace



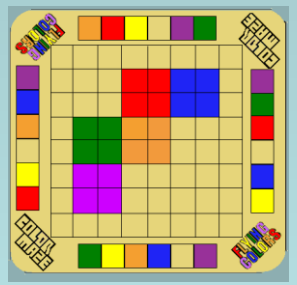
ChooChooLoops



Color Up

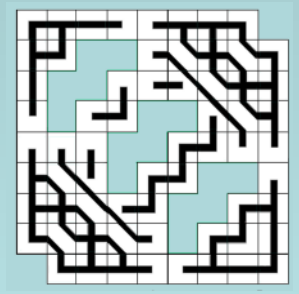


Colormaze

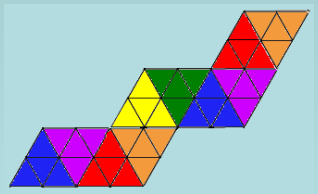


Combinatorix

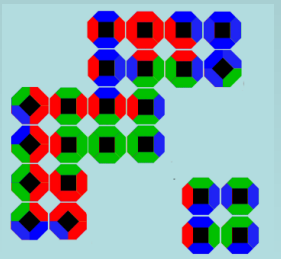
Dezign-8



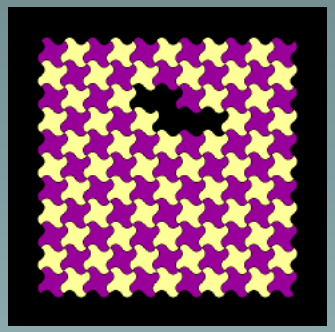
Diamond Rainbow



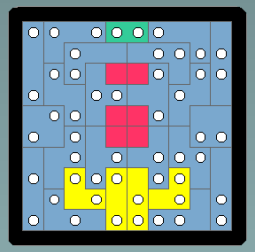
Doris



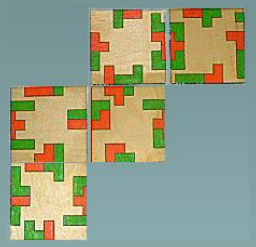
Dual Quintachex



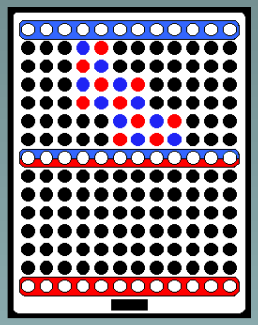
Fill-Agree



Fractured Fives

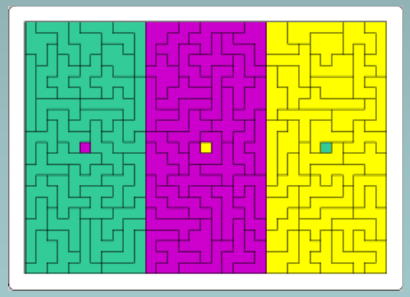


Gallop



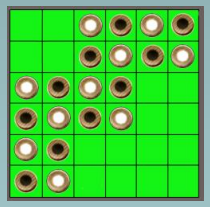
Grand Multimatch

Heptominoes

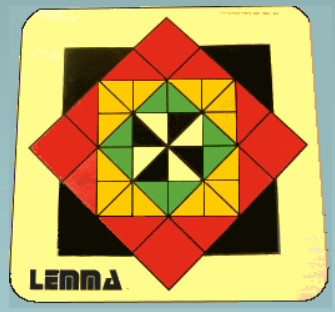


Hexacube

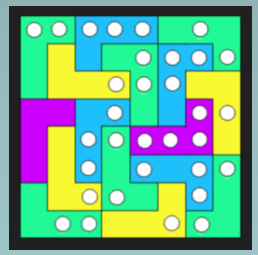
Leap



Lemma



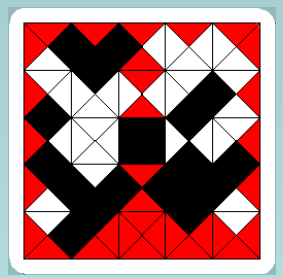
L-Sixteen



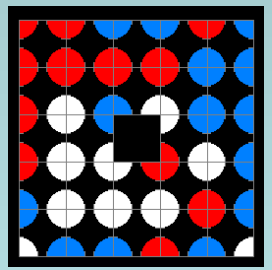
Mini-Iamond Ring

MiniMatch I

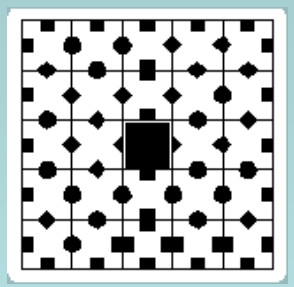
Multimatch I



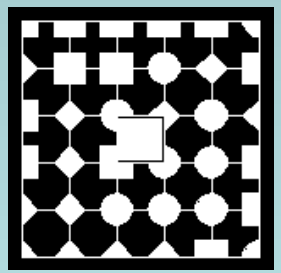
Multimatch II



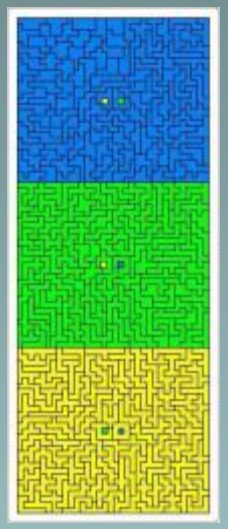
Multitouch I



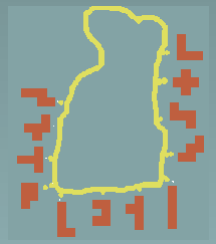
Multitouch II



Octominoes

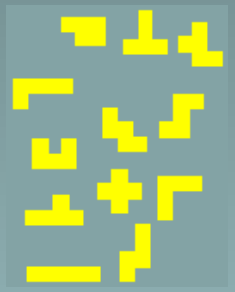


Pentomino necklace

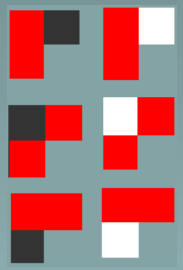


Perplexing Pyramid

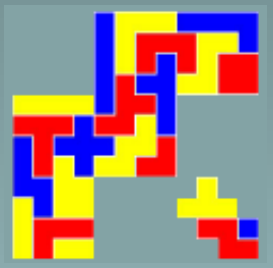
Pocket Pentominoes



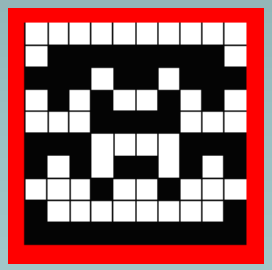
Pocket Vees



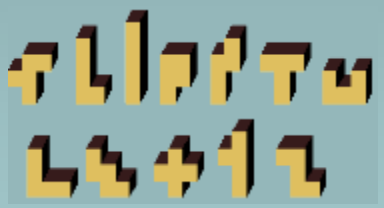
Poly-5



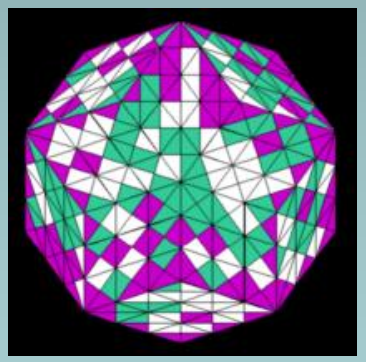
Quintapaths



Quintillions



Rhom-Antics

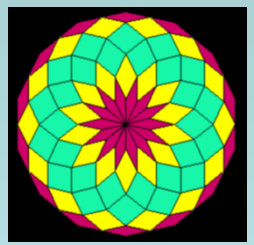


Quintachex

Quantum

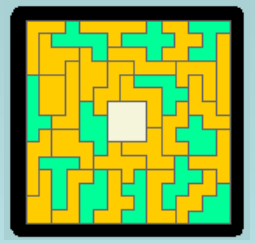
Rhombiominoes

RhombStar-7

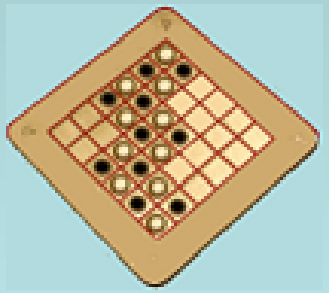


Rombix Jr.

Sextillions



Six by Six



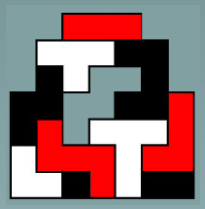
Six Disks

Snowflake Square

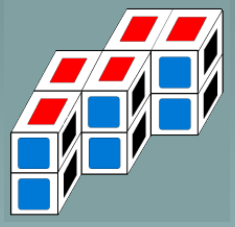
Snowflake Super Square

Super Quintillions

Ten-Yen

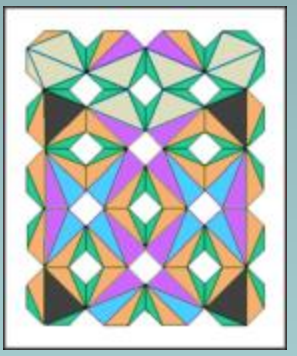


Throw a Fit

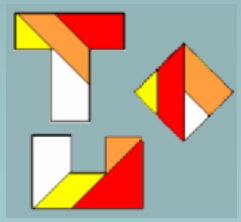


Triangoes

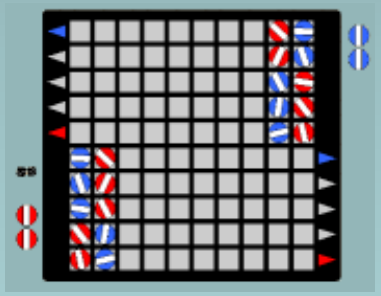
Triangule-8



Tiny Tans

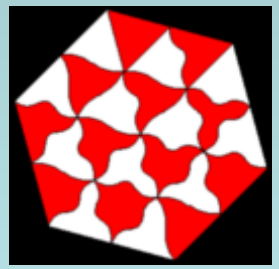


Transpose



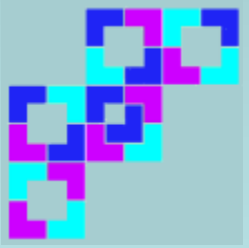
Triangoes Jr.

Trifolia

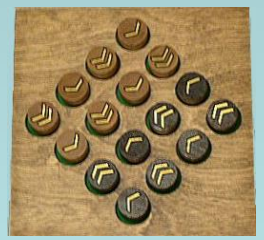


Trio in a Tray

Vee-21



Void

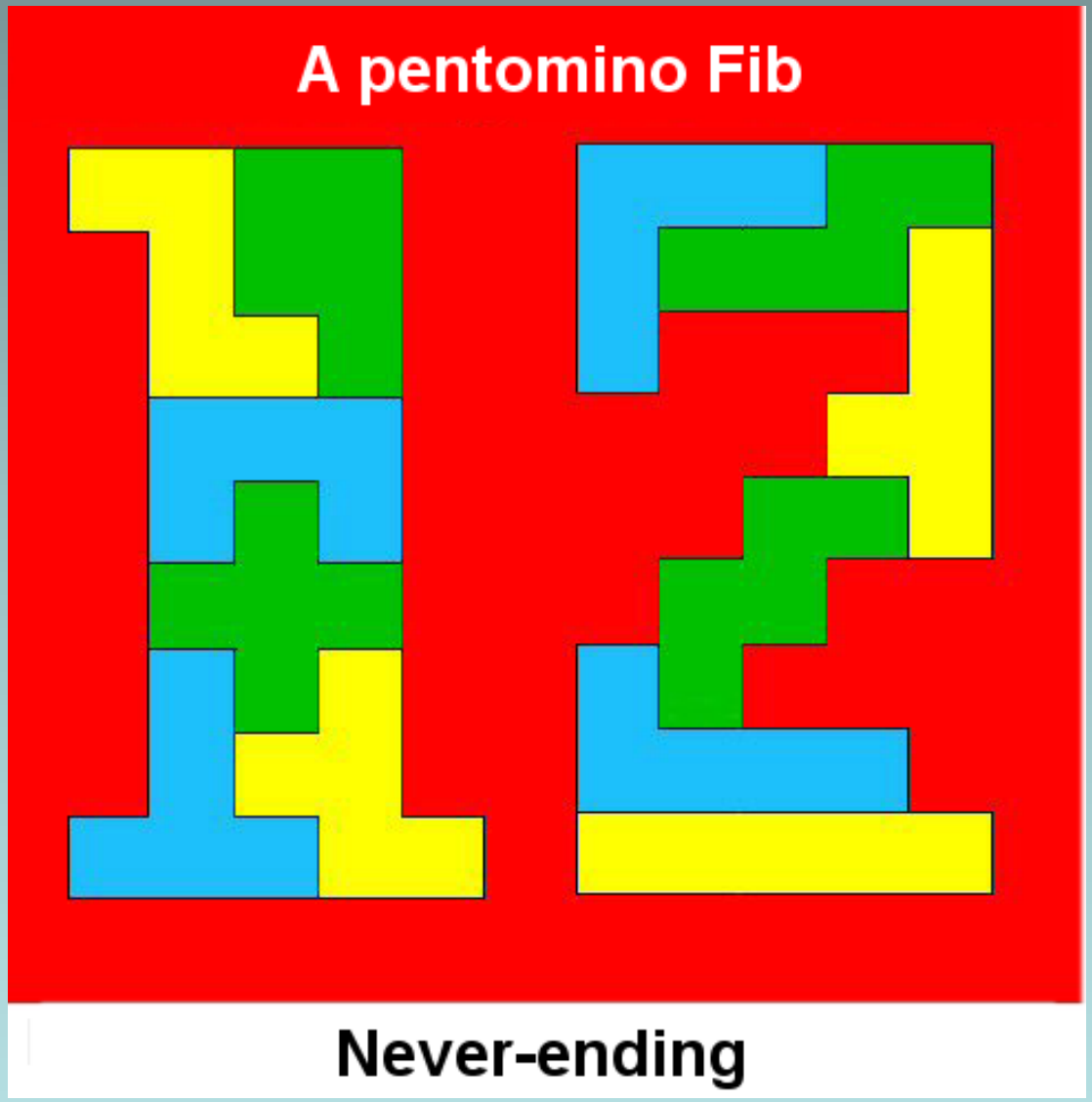


and Warp-30

So thank you, Sol, for what you started,

And thank you, Martin, for what you imparted,

And thank you, World, for what you hearted.


A pentomino Fib
Never-ending