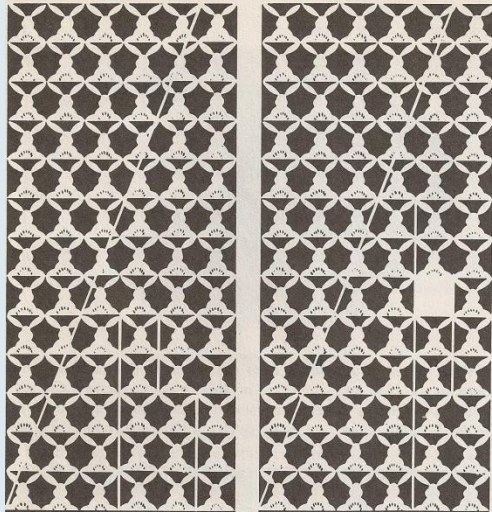


Puzzles Make Math Less Puzzling

How'd the Bunny Vanish?

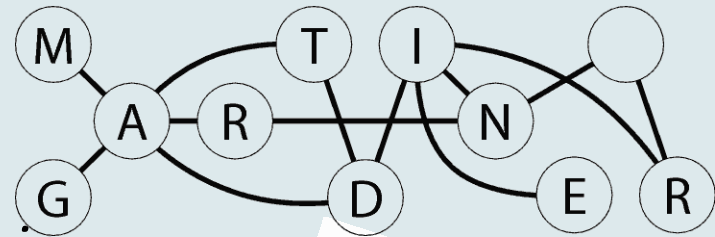


Stuart Moskowitz
Humboldt State University
Arcata, CA 95521
1-707-445-5795

stuart@humboldt.edu

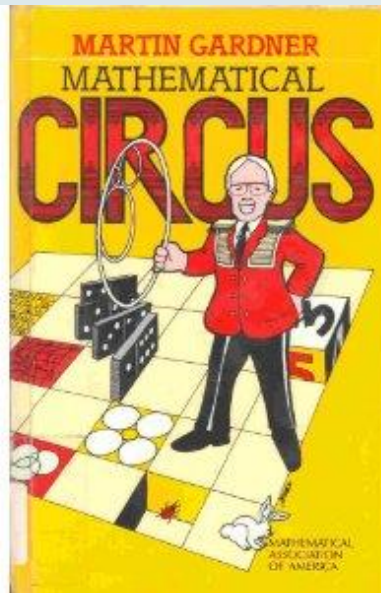
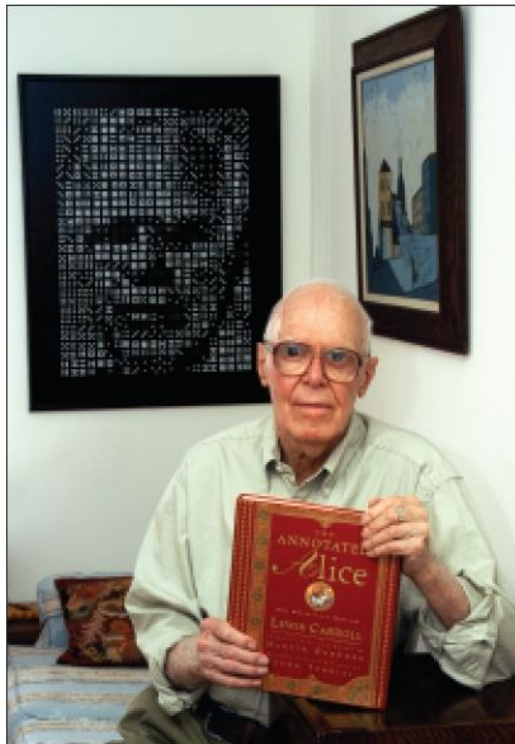


Dedicated to



“In fact, I believe one reason I am in Mathematics today is that I began reading Gardner’s books and articles in Junior High and High School. Browse and Enjoy!”

1915-2010



H.E. Dudeney* (1857-1930) and Sam Loyd (1841-1911)

- These 2 greatest puzzle inventors may have worked together, or they may have stolen from each other.
- Both wrote newspaper columns.
- Dudeney was English. Loyd was American.
- Dudeney was the stronger mathematician.
- Loyd exploited and popularized his puzzles, primarily for advertising purposes.

* Not to be confused with AK Dewdney

From Dudeney's 536 Puzzles and Curious Problems:

FINDING A SQUARE

- Here are six 7-digit numbers:
- 4,784,887 2,494,651 8,595,087
1,385,287 9,042,415 9,406,087
- Three of these numbers added together will form a perfect square. Without resorting to a “...no other course but laborious trial..., the answer may be found directly by very simple arithmetic and without any experimental extraction of a square root.”
- In other words, solve it without a calculator and without calculating any square roots. Note: there is only one solution.

Loyd was the master at creating geometric vanishing area (and disappearing rabbits) puzzles, one of many types of mechanical puzzle.



The most famous puzzle of them all is Sam Loyd's "Get Off the Earth", from 1896.

.

Millions were made.

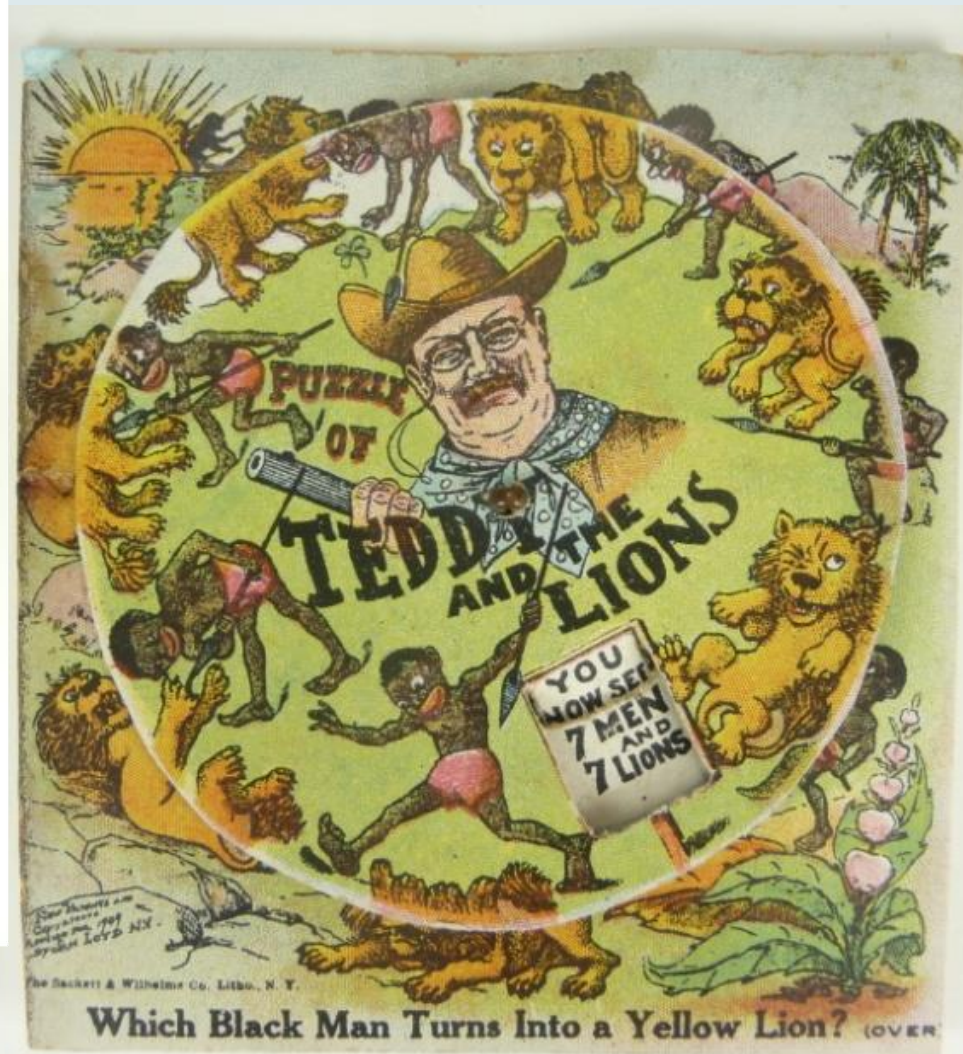
Used for all kinds of advertising and campaigning (people tend to keep flyers longer if they contain something worth keeping)

Loyd offered all kinds of prizes for the best explanation, including a new bicycle. He received literally 1000s of letters.

Here's a modern version of GOTE:

<http://www.samuelloyd.com/gote/index.html>

Sam Loyd Originals



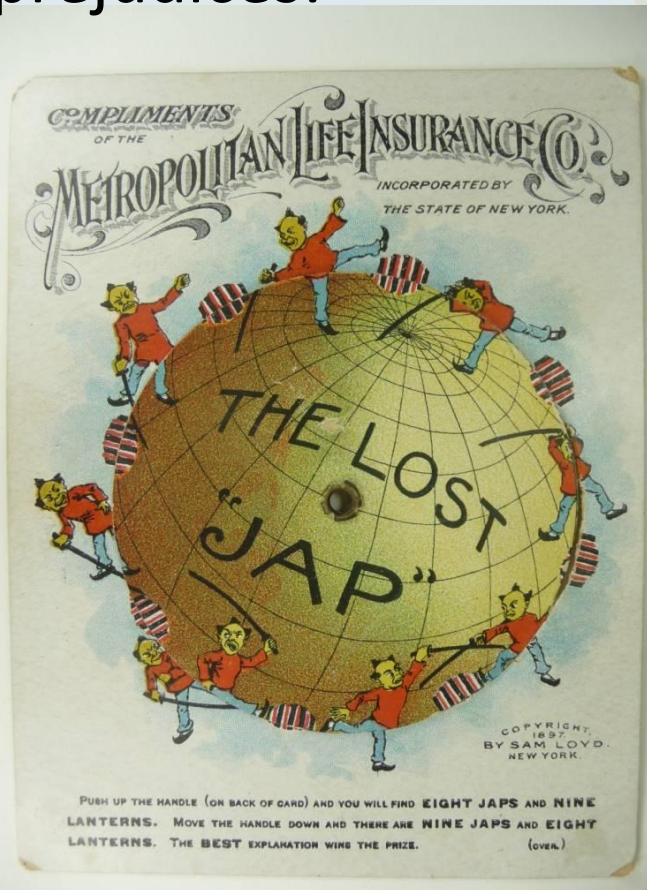
In 1896, Republican candidate William McKinley was in trouble. As a means to get people to listen to his message, his campaign contacted Sam Loyd and licensed GOTE. While the back of the puzzle stated McKinley's platform, the bigger message was the disappearing stereotyped Chinese man. American anti-Chinese prejudice was widespread; Denis Kearney's Workingman's Party platform played off fears that Asian immigrants take jobs from Whites. Its slogan bluntly stated "The Chinese Must Go".

With this not-so-subtle message, the Republican Party was subliminally using Kearney's platform. Over 10 million GOTE puzzles are said to have been distributed.

To emphasize this disgraceful bit of history, Chinese were officially banned from Humboldt County from 1885-1959

<http://users.humboldt.edu/ogayle/hist383/CentralPacific.html>

One more example of how advertisers took advantage of 1890s America and its prejudices:



For the BEST explanation of the principle of the puzzle on the opposite side received within one year from September 1st, 1897, from any policy-holder of the Company whose policy is in force September 1st, 1898, the Company will present a gratuity of \$100 in Gold. For the next Best, \$95. For the third, \$90. For the fourth, \$85; and so on to \$5, making twenty gratuities in all, the Highest \$100, the Lowest \$5.

There must appear at the top of the sheet on which the Explanation is made, the number and date of the policy held, together with the address (street, number, city and state) of the competitor, and the name of the agent who last collected on the policy. The explanation is to be sent by mail addressed to the "Metropolitan Life Insurance Company, New York City, N. Y., Puzzle Department."

The announcement of the successful competitors will be made in the Company's Paper "The Metropolitan," first issued after the competition closes.

This curious puzzle illustrates the uncertainty of life. We see a little family circle of Japs suddenly broken up, and yet cannot tell beforehand which one is to go. We can only hope that the right one was insured when the miniature earthquake occurred.

The moral is plain. The only way to make sure that the first member of a family who dies is insured, is for every member of the family to have a policy.

Every one of those policies will be realized on if they are kept in force, for, though we may go through life without sickness or accident, none can evade death. From that there is no escape and no postponement.

Life policies, payable at the death of the insured, and Endowment policies payable to the insured during his lifetime, are issued by the

Metropolitan Life Insurance Co.

on both sexes and at all ages, between two and seventy. Premiums run from five cents per week, upward, and are collected from the home of the insured by the Company's agents. Claims are paid immediately upon receipt and approval of proofs of death. The Company is now paying one every seven minutes of each business day, and is disbursing \$16 a minute in doing so! It has already distributed among its policy-holders a sum which, including that now invested for their security, exceeds Eighty-five millions of dollars. Its assets amount to Thirty-four millions, and its surplus to considerably more than five millions. It has close to four millions of policies in force, and yet there is room for you, reader, if you are not insured, or if you want to increase your present insurance.

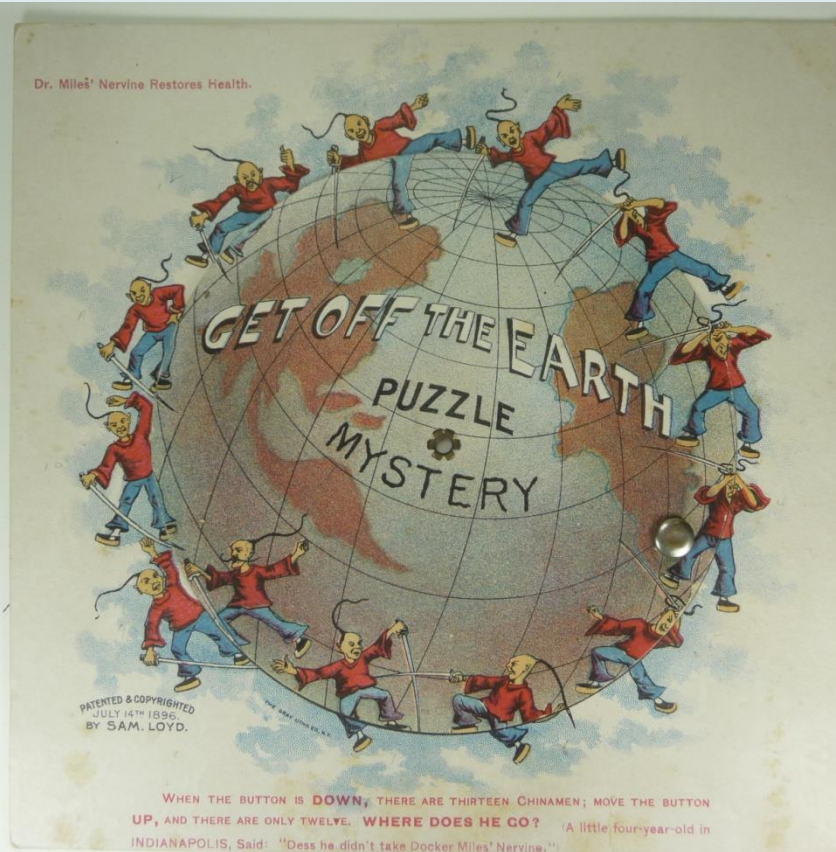
The Company has also an Intermediate Branch, in which policies for even-\$500 are issued, on males or females from 12 to 65; premiums payable quarterly, half-yearly or annually.

It has also an Ordinary Department, in which policies from one to twenty-five thousand dollars are issued on adult lives.

For full particulars send to the home office, or to any of the branch offices.

BRANCH OFFICE,

Not all advertisers exploited racism and politics.



DR. MILES'

New System of Restorative Remedies.


Restorative Nervine is a brain and nerve food, and medicine; that soothes while it nourishes and strengthens the whole system.

New Heart Cure is the only reliable remedy known for heart disease. A tonic that strengthens the heart and makes new, pure blood.

Restorative Tonic is a scientific combination of iron, phosphates and other remedial agents. Both a food and a medicine.

Restorative Blood Purifier for removing impurities from the brain, nerves, bones, skin and mucous membranes.

Nerve and Liver Pills, **Nerve Plasters** **Pain Pills**
For Constipation, Biliousness, etc. For Backache, Irritability, Etc. For Headache and other pain.



Dr. Miles' Remedies

Are sold strictly on their merits. To parties who have not tried them, the druggist will sell first bottle on guarantee that it will benefit or money will be refunded.

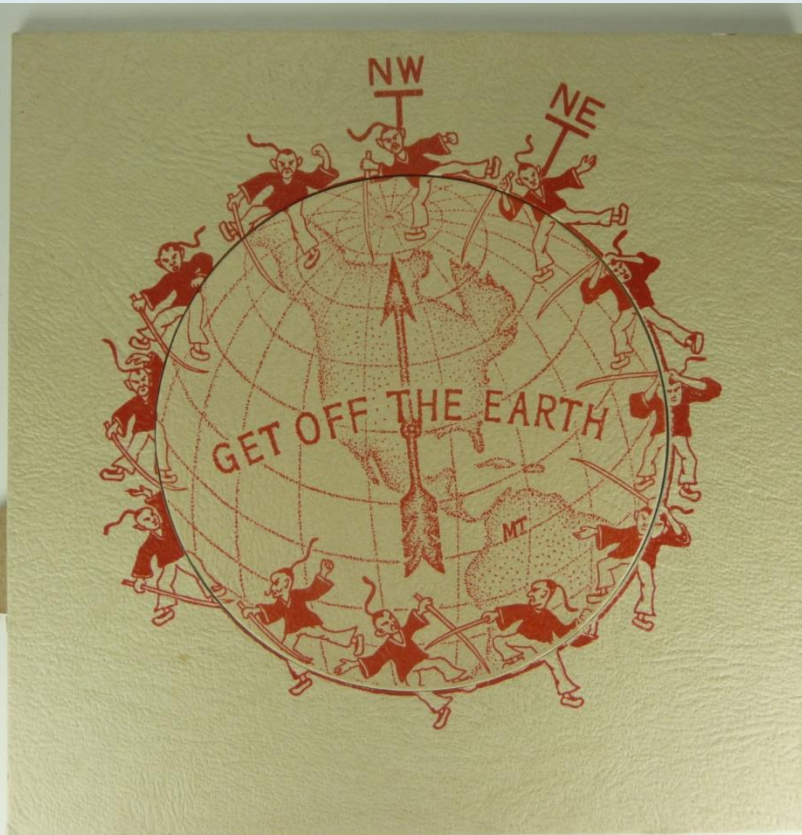
Dr. Miles' Remedies

Are as represented. They restore the invalid to health. They cure. This is why we can make this broad guarantee. For full description of Dr. Miles' Restorative Remedies ask for Dr. Miles' book, "New and Startling Facts." Sent free on request.

DR. MILES MEDICAL CO., ELKHART, IND.

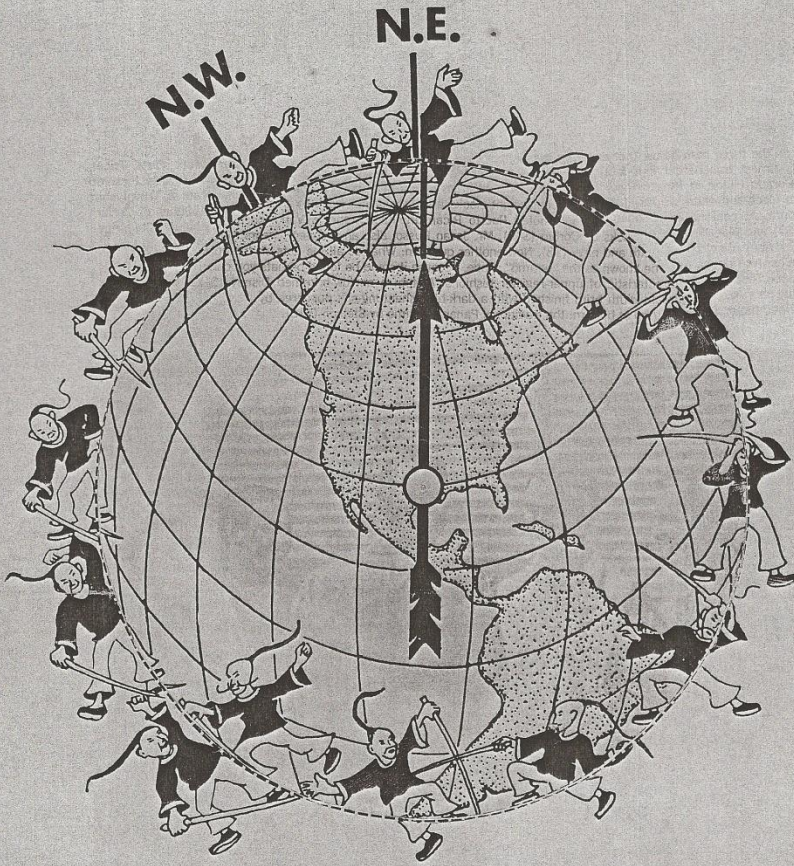
WHEN THE BUTTON IS **DOWN**, THERE ARE THIRTEEN CHINAMEN; MOVE THE BUTTON **UP**, AND THERE ARE ONLY TWELVE. **WHERE DOES HE GO?** (A little four-year-old in INDIANAPOLIS, Said: "Dess he didn't take Docker Miles' Nervine.")

Some versions didn't sell anything (I think)

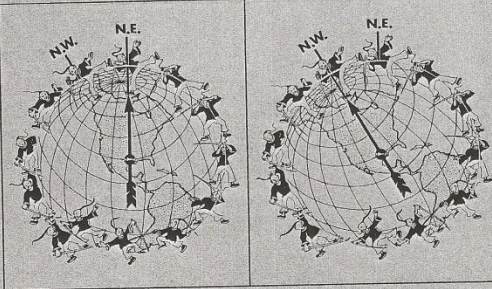


GOTE continues to
be used for political
messages.

From Esquire
Magazine, 1955?



Look at the pictures at right; cut out the large square (dotted line) above. Now cut out the inner circle along the dotted line. This will leave you a square piece of paper with a hole in it. Glue this on a piece of shirt cardboard. Take the center circle and fasten it back where it belongs with a pin, so it will swivel. Swivel the arrow to N.E. Count the Red Chinese. Now swivel to N.W. and count again. What happened to the thirteenth man? Why can't the American Government solve *its* recognition problems this neatly? The answer to the first question (thirteen entities may be redistributed to make twelve, but each of the twelve will be a trifle larger) plays a fundamental role in chemistry; it applies to conservation of mass in ordinary chemical reactions—no matter how two or more chemicals may combine to form other compounds, their total mass does not change noticeably. (In nuclear physics, the conversion of mass into energy accords with Einstein's equation, $e=mc^2$.) We suggest you try this one on your friends, though not if they're Red Chinese.



Look at the pictures at right; cut out the large square (dotted line) above. Now cut out the inner circle along the dotted line. This will leave you a square piece of paper with a hole in it. Glue this on a piece of shirt cardboard. Take the center circle and fasten it back where it belongs with a pin, so it will swivel. Swivel the arrow to N.E. Count the Red Chinese. Now swivel to N.W. and count again. What happened to the thirteenth man? Why can't the American Government solve *its* recognition problems this neatly? The answer to the first question (thirteen entities may be redistributed to make twelve, but each of the twelve will be a trifle larger) plays a fundamental role in chemistry; it applies to conservation of mass in ordinary chemical reactions—no matter how two or more chemicals may combine to form other compounds, their total mass does not change noticeably. (In nuclear physics, the conversion of mass into energy accords with Einstein's equation, $e=mc^2$.) We suggest you try this one on your friends, though not if they're Red Chinese.

To Protect his rights, Loyd Patented His Invention

UNITED STATES PATENT OFFICE.

SAMUEL LOYD, OF NEW YORK, N. Y.

TRANSFORMATION PICTURE.

SPECIFICATION forming part of Letters Patent No. 563,778, dated July 14, 1896.

Application filed March 11, 1896. Serial No. 582,802. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL LOYD, a citizen of the United States of America, and a resident of the city, county, and State of New York, have invented a new and useful Improvement in Transformation Pictures, of which the following is a specification, reference being made to the accompanying drawings.

The object of my invention is to produce a transformation puzzle picture, so constructed that figures or parts of the picture may be made to appear or vanish at will by a slight movement of a revolving portion of the picture.

In the accompanying drawings, Figure 1 shows the picture containing eight squares and figures of men. Fig. 2 shows the same picture with the central disk slightly turned, so that the dissected figures again match, but present the appearance of but seven squares and men.

The disk revolves upon the pivotal point Y and is restricted by the groove and pin I from making more than a one-eighth turn, so that at either end of the movement all of the figures will match properly.

In Fig. 1 there are eight squares and eight men. By giving the disk an eighth-turn *h* will match with G, *g* will match F, *f* will match E, *c* will match D, *d* will match C, *e* will match B, and *b* will match A; but as nothing goes from A to H, the picture will, as shown in Fig. 1, present but seven squares and seven men. Each square and man has

absorbed a small portion of the missing one, which is so evenly distributed as to be almost imperceptible and gives the appearance of one figure having vanished. A reverse movement of the disk will cause an eighth man to evolve from the seven.

The figures, it will be seen, are drawn in sections of a circle, equidistant apart, on the periphery, but at different distances from the center of the disk, increasing in regular progression, according to the line of a volute, as shown.

By the introduction of a second series of figures, drawn upon the line of a reversed volute, the two principles may be introduced in the one picture, so that when the figure of one series vanishes the other will appear.

I claim as my invention—

A transformation picture divided into two or more parts, arranged upon movable pieces, each of which contains parts of a sequence of figures or subjects placed at equidistant points, so that a slight turn of the movable part leads to a new point of contact, matching the dividing parts and producing variable results, substantially as shown.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 10th day of March, 1896.

SAMUEL LOYD.

Witnesses:

A. WILFORD HALL,
GEO. B. KERR.

(No Model.)

S. LOYD.
TRANSFORMATION PICTURE.

No. 563,778.

Patented July 14, 1896.

Fig 1

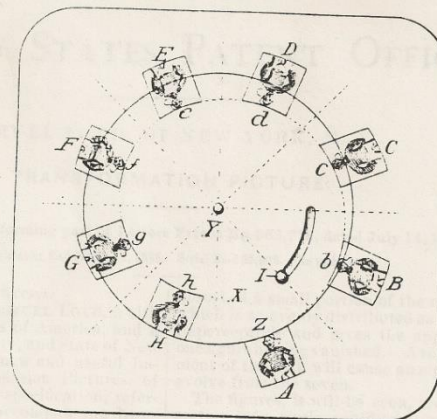
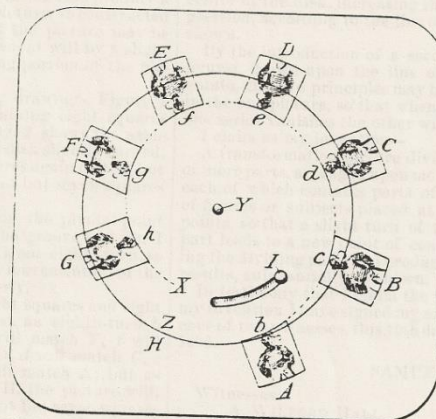


Fig 2



Witnesses.

A. Wilford Hall
Geo. B. Kerr.

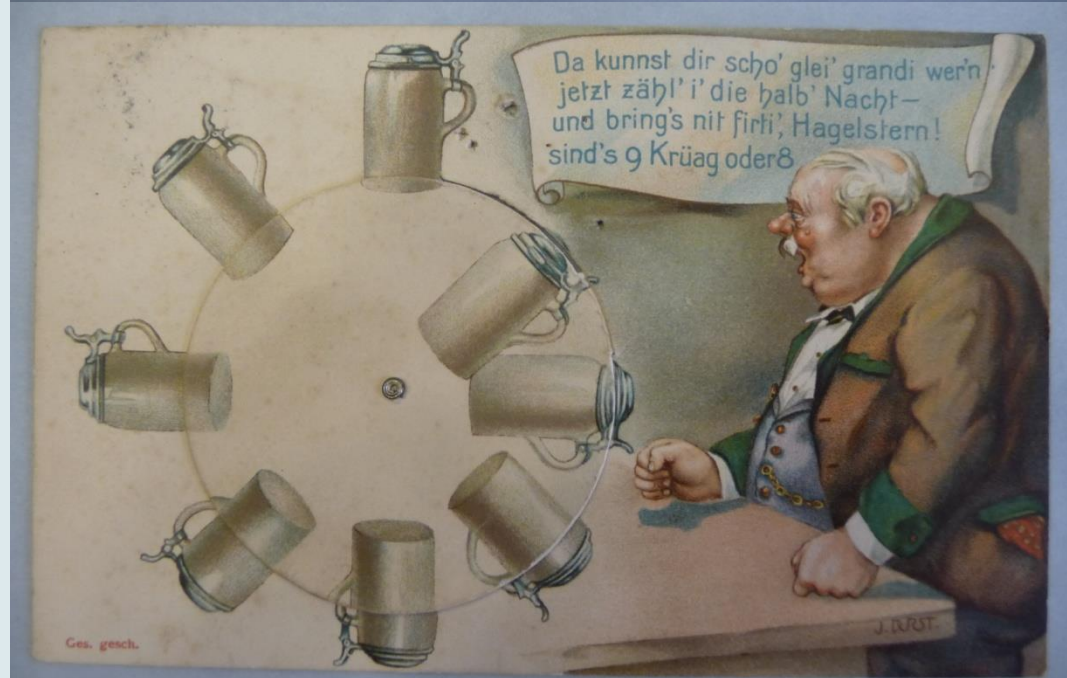
Inventor.

Samuel Loyd

Loyd


But it didn't stop
the countless
bootleggers.
Many unauthorized
versions were
produced.

Here's a German
one:



Here's one from Canada:

WHERE DOES HE GO?



"SOUVENIR" STOVES & RANGES ARE THE BEST

BUY ONE AND ALL YOUR TROUBLE IN COOKING OR HEATING WILL DISAPPEAR AS QUICKLY AS DOES THE JOLLY TAR.

REGISTERED AUG 1ST 1896 BY P.O. CASE

When the button is down there are thirteen Jack Tars. Count them study their postures, Then move the button UP, and count again You will find there are only twelve. Can you tell WHICH ONE HAS VANISHED? where does he go?

MOWELL LITH. CO. HAMILTON.

"SOUVENIR" Stoves and Ranges Are the World's Best

THE GURNEY, TILDEN CO., LIMITED.
HAMILTON, ONT.

We are the Largest Manufacturers of STOVES and RANGES in Canada.

WESTERN AGENCY:
The GURNEY STOVE & RANGE CO., LTD.,
Winnipeg, Man.

EASTERN AGENCY:
The GURNEY MASSEY CO., LTD., Montreal, Que.

The Greatest Variety of Styles & Sizes in Canada.

SOLD BY LEADING DEALERS IN EVERY TOWN IN THE DOMINION OF CANADA.



Political Themes are still popular:

"ONE INTERNATIONAL WAR CRIMINAL ALWAYS HAS TO LOOK OVER HIS SHOULDER. IF YOU THINK HE CAN'T BE FOUND...."

O Sumwon bin Lyin

TO YOU!

THAT JOKER GEORGE HAS CONVENIENTLY FORGOTTEN HIM. BUT IT DOESN'T TAKE A CRYSTAL BALL TO SEE THE FUTURE.

IF YOU WANT TO SEE HOW I WOULD SERVE HIM UP TO YOU, TURN THE INNER CIRCLE TO THE RIGHT AND LET THE JOKER ENTERTAIN THE DOG." - Hillary



© 2006 FAERIE TALE BOOKS, LTD. ALL RIGHTS RESERVED WWW.FAERIETALEBOOKS.COM FIRST PRINTING

PRINTED AND MANUFACTURED IN THE U.S.A.

"ONE INTERNATIONAL WAR CRIMINAL ALWAYS HAS TO LOOK OVER HIS SHOULDER. IF YOU THINK HE CAN'T BE FOUND...."

O Sumwon bin Lyin

TO YOU!

THAT JOKER GEORGE HAS CONVENIENTLY FORGOTTEN HIM. BUT IT DOESN'T TAKE A CRYSTAL BALL TO SEE THE FUTURE.

IF YOU WANT TO SEE HOW I WOULD SERVE HIM UP TO YOU, TURN THE INNER CIRCLE TO THE RIGHT AND LET THE JOKER ENTERTAIN THE DOG." - Hillary



© 2006 FAERIE TALE BOOKS, LTD. ALL RIGHTS RESERVED WWW.FAERIETALEBOOKS.COM FIRST PRINTING

PRINTED AND MANUFACTURED IN THE U.S.A.

THE VANISHING LEPRECHAUN

©W.A Elliot Co. 1968
Toronto, Canada



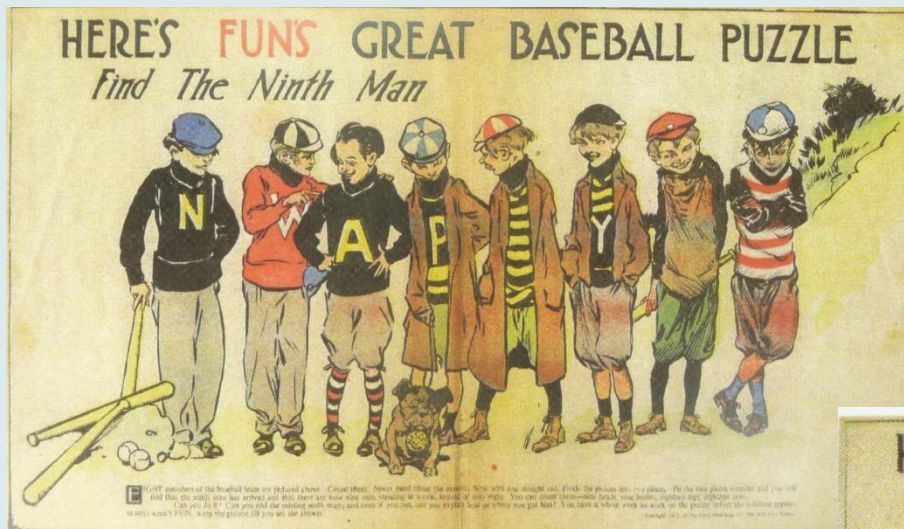
WHICH ONE VANISHES? WHERE DOES HE GO? WHEN HE COMES BACK, WHERE HAS HE BEEN? WILL ANYONE EVER SOLVE THIS MYSTERY?

THE VANISHING LEPRECHAUN

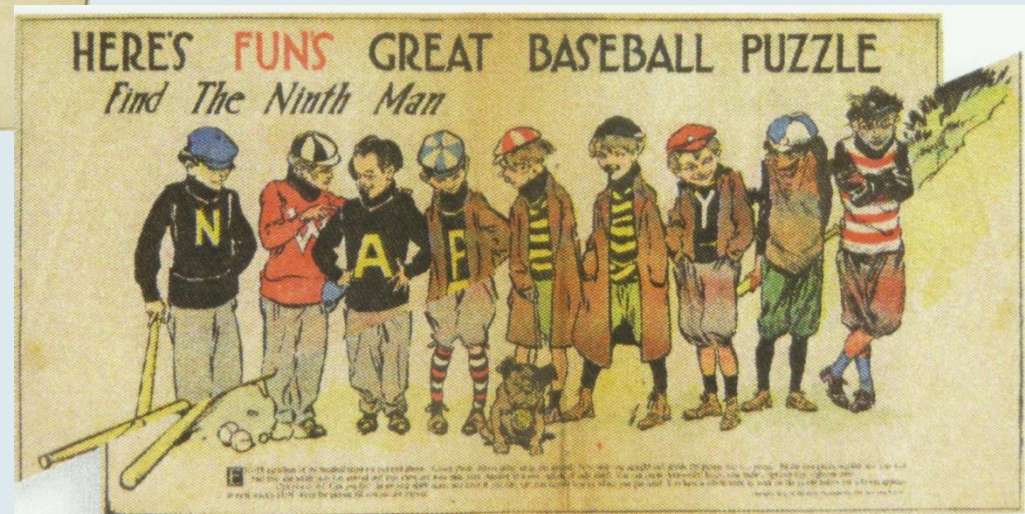


WHICH ONE VANISHES? WHERE DOES HE GO? WHEN HE COMES BACK, WHERE HAS HE BEEN? WILL ANYONE EVER SOLVE THIS MYSTERY?

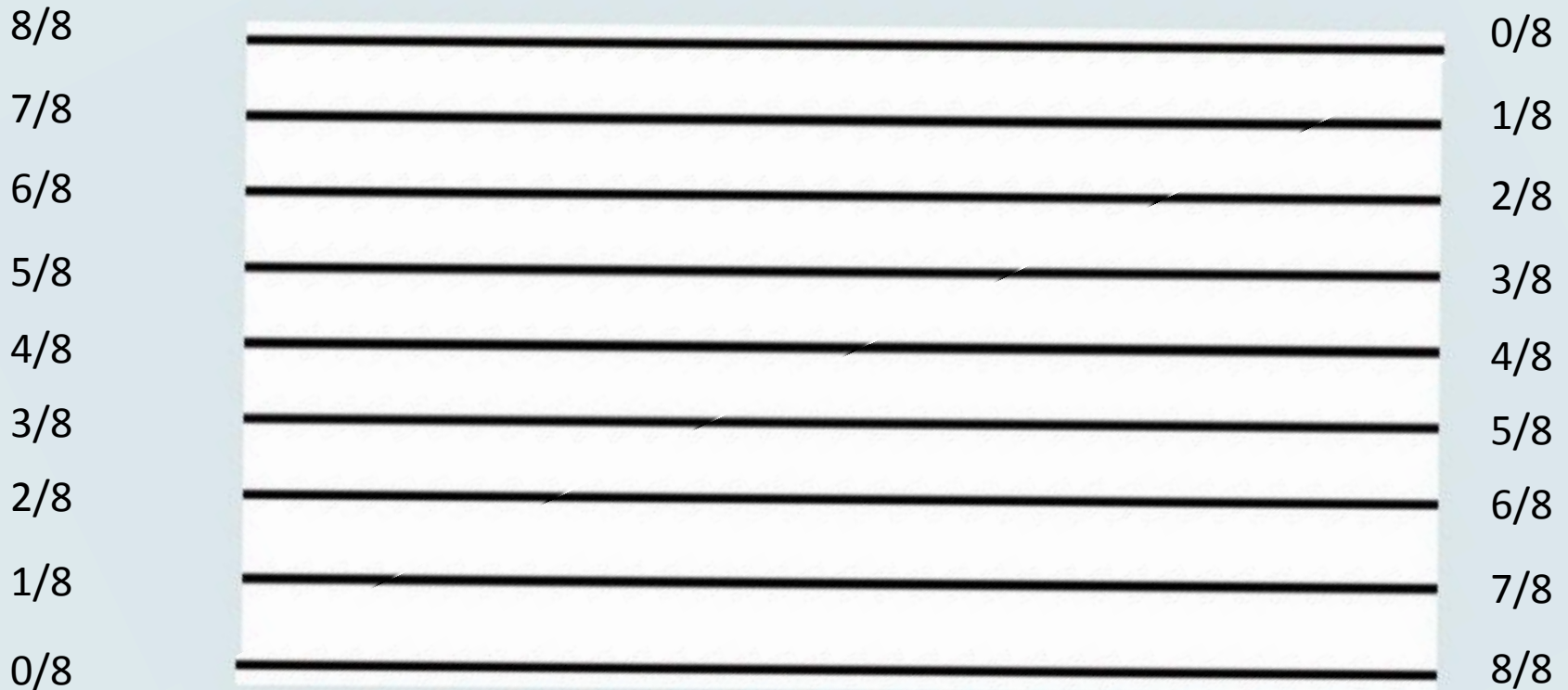
So what's going on? If you want to solve this yourself, I'll understand if you leave class now. But if you want more hints, solving this one will help you solve the others!



*You choose where
to cut the card*



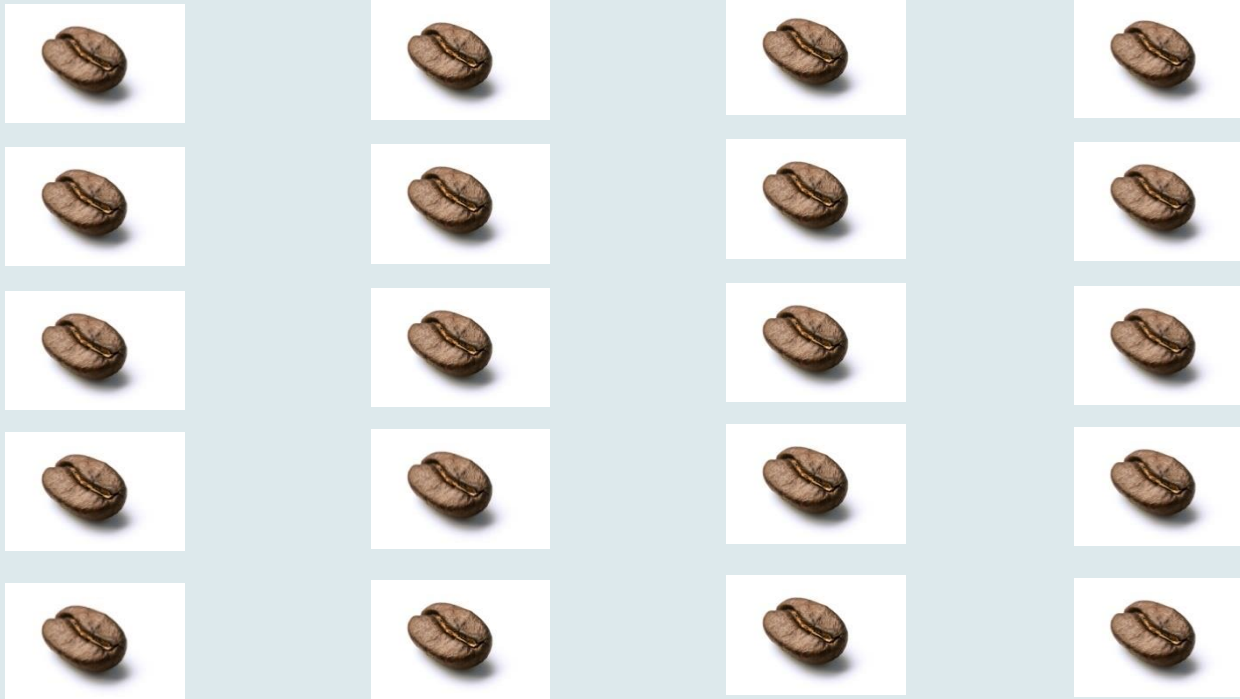
Let's take away all the fancy stuff
and take another look at it in its
most basic form.



Here's another way to look at it:

Gain a pile: move $4/5$, then $3/5$, then $2/5$, then $1/5$.

Then lose a pile: move $1/4$ move $2/4$, then $3/4$, then $4/4$.



which man disappears

SCHWENK@wmich.edu <SCHWENK@wmich.edu>

Thu, Feb 22, 2001 at 5:43 AM

To: sm14@humboldt.edu

Cc: SCHWENK@wmich.edu

Stuart,

I enjoyed your talk yesterday.

Last night I had an amusing thought about which of the six men in tophats disappears. If you print their names between the heads, then we can talk about exactly which guy goes.

J				
O	R	D	R	A
E	O	O	O	L

Y	N	N	B	L
	A	N	E	E
	L	I	R	N
	D	E	T	

See what happens?

After the shift we have Joey, Ronald, Donnie, Robert, and Allen

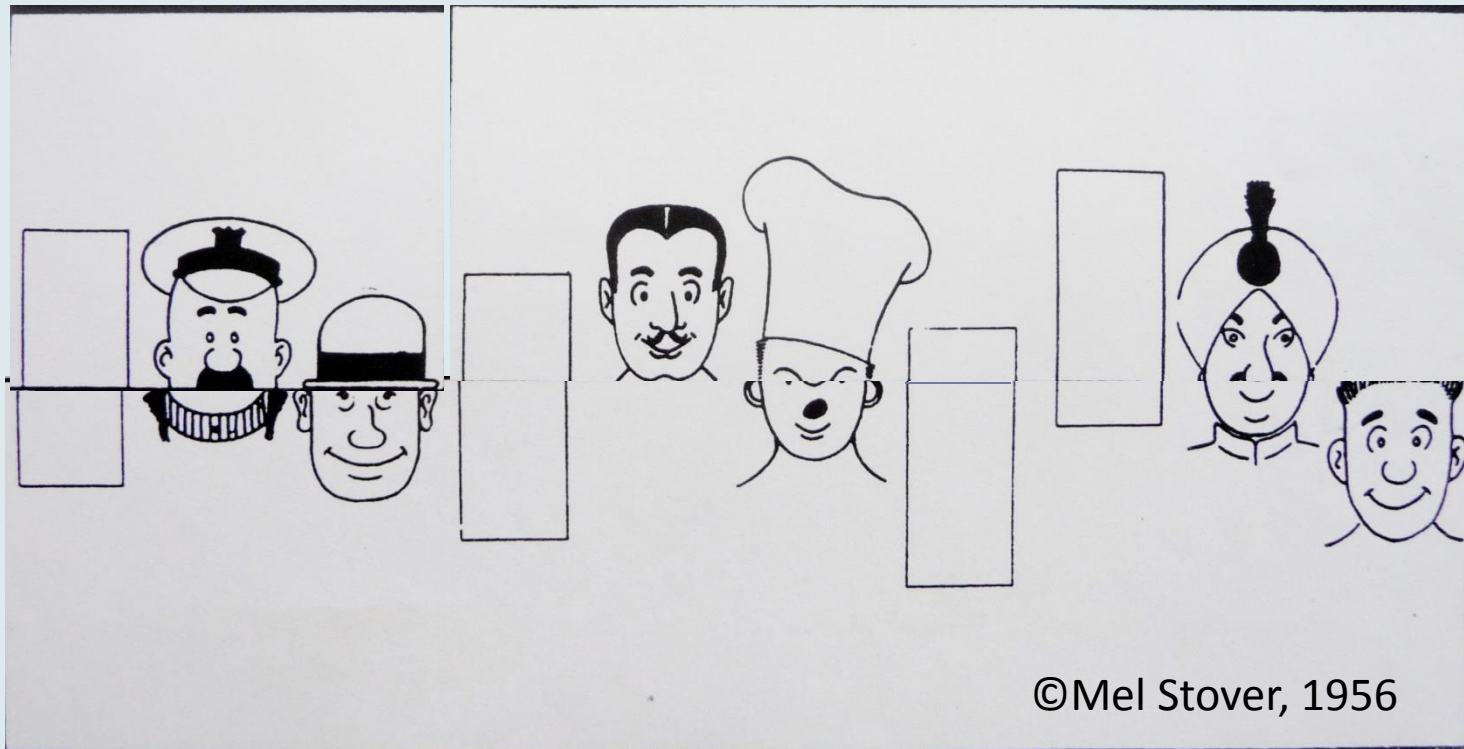
Just a thought. Best wishes, Allen Schwenk

This was one puzzle I knew Jerry didn't have. It was sent to me by a professor who attended an earlier version of this presentation (10 years ago)

LEN
ALBERT
RONNIE
DONALD
ROY
JOE

Just when you might be
thinking it's starting to
make sense.....

From Martin Gardner's MATHEMATICS, MAGIC AND MYSTERY, 1956:



If these puzzles provide insights into the important issues of the time, then what does this one by Robin DeBreuil and titled “Who Turned to Doggie Doo?” say about our current era?

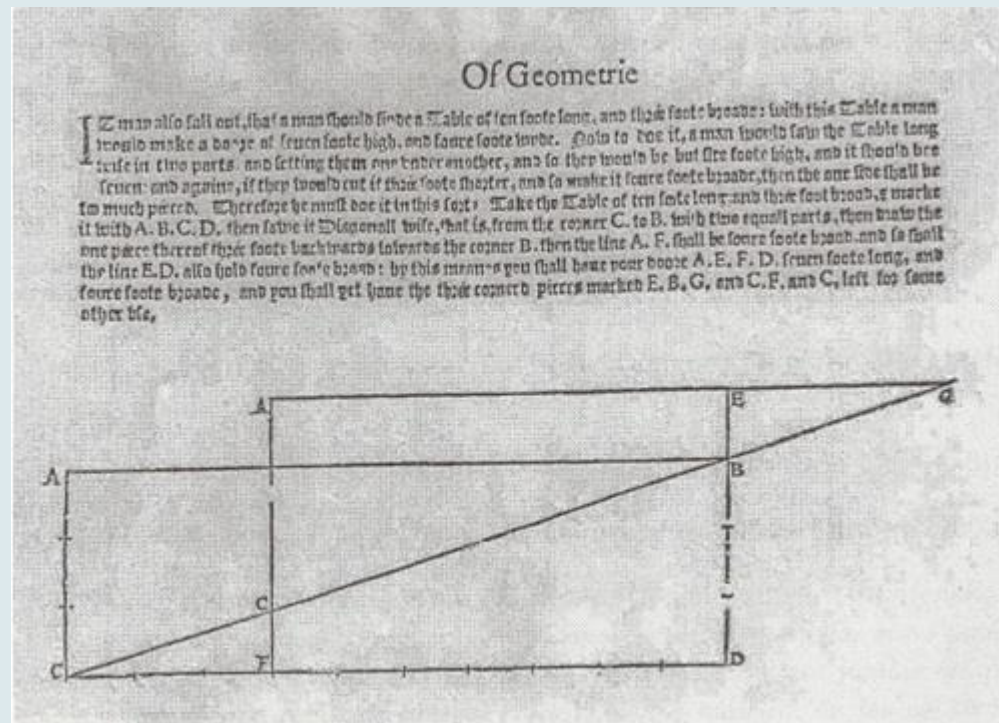


<http://debreuil.com/ddw/puzjava/picmove.htm>

The puzzles so far have all been essentially one-dimensional, that is, objects get shorter or longer. Now, let's move to two dimensions and explore puzzles where area appears either to vanish or appear from nowhere.

Sebastiano Serlio's Architettura, 1545

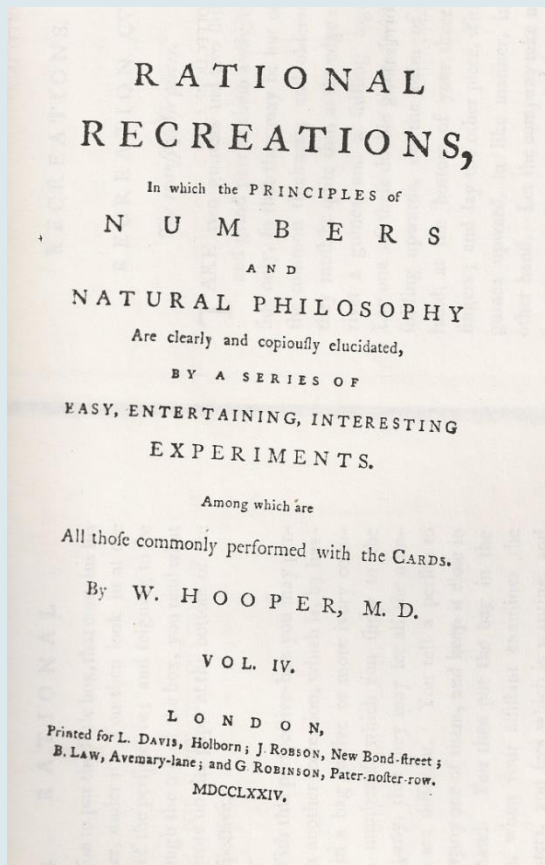
“a man should finde a Table of ten foote long, and three foote broade: with this Table a man would make a doore of seven foote high, and foure foote wide...and you shall yet have (two) three cornerd pieces” (with a combined area of 3 square feet)



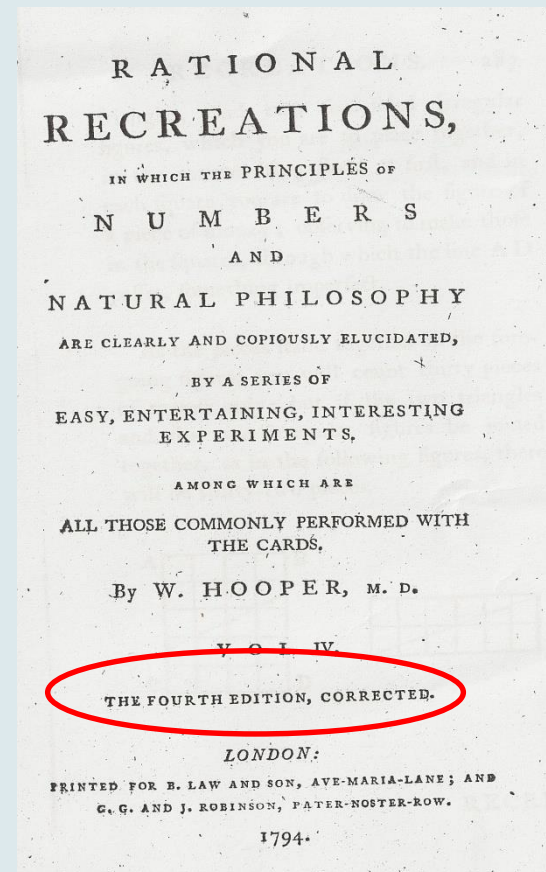
William Hooper, Rational Recreations

1st ed. 1774, 4th ed. 1794

Did Hooper understand the paradox or was he just plagiarizing Edme Guyot's Nouvelles Recreations Physiques et Mathematiques, which had a major error in the 1st edition in 1770 and was corrected in the 2nd ed. 1775



1st edition, MDCCLXXIV



4th edition, corrected, 1794

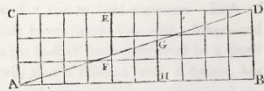
Hooper's Geometric Money

286 RATIONAL

RECREATION CVL

The geometric money.

DRAW on pasteboard the following rectangle ABCD, whose side AC is three inches, and AB ten inches.



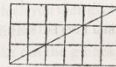
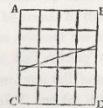
Divide the longest side into ten equal parts, and the shortest into three equal parts, and draw the perpendicular lines, as in the figure, which will divide it into thirty equal squares.

From A to D draw the diagonal AD, and cut the figure, by that line, into two equal triangles, and cut those triangles into two parts, in the direction of the lines EF and GH. You will then have two trian-

RECREATIONS. 287

angles, and two four-sided irregular figures, which you are to place together, in the manner they stood at first, and in each square you are to draw the figure of a piece of money; observing to make those in the squares at A and D something imperfect.

As the pieces stand together in the foregoing figure, you will count thirty pieces of money only, but if the two triangles and the two irregular figures be joined together, as in the following figures, there will be thirty-eight pieces.



RECRE-

$$1^{\text{st}} \text{ ed: } 3 \times 10 = 5 \times 4 + 3 \times 3$$

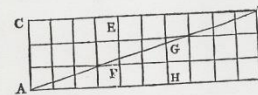
$$30 = 38$$

286 RATIONAL

RECREATION CVL

The geometric money.

DRAW on pasteboard the following rectangle ABCD, whose side AC is three inches, and AB ten inches.



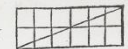
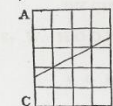
Divide the longest side into ten equal parts, and the shortest into three equal parts, and draw the perpendicular lines, as in the figure, which will divide it into thirty equal squares.

From A to D draw the diagonal AD, and cut the figure, by that line, into two equal triangles, and cut those triangles into two parts, in the direction of the lines EF and GH. You will then have two trian-

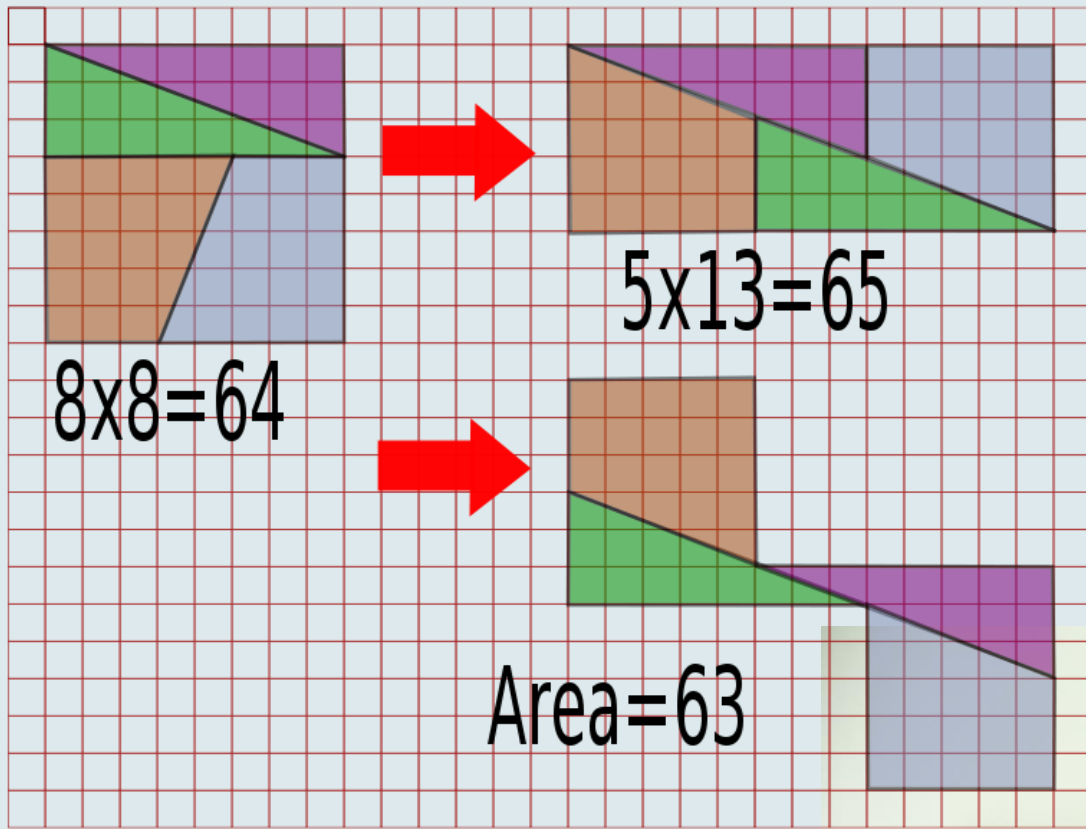
RECREATIONS. 287

angles, and two four-sided irregular figures, which you are to place together, in the manner they stood at first, and in each square you are to draw the figure of a piece of money; observing to make those in the squares, through which the line AD passes, something imperfect.

As the pieces stand together in the foregoing figure, you will count thirty pieces of money only; but if the two triangles and the two irregular figures be joined together, as in the following figures, there will be thirty-two pieces.



RECRE-

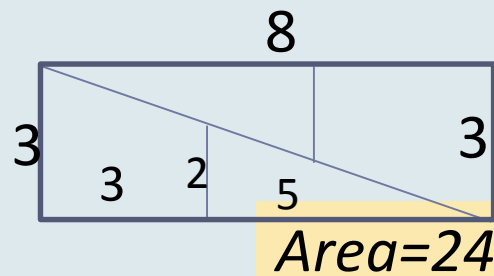
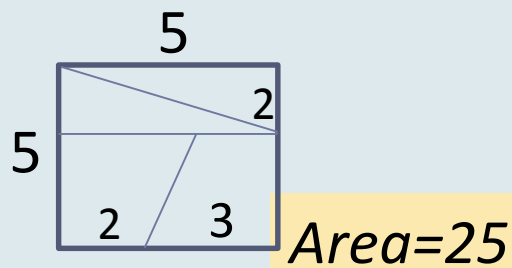
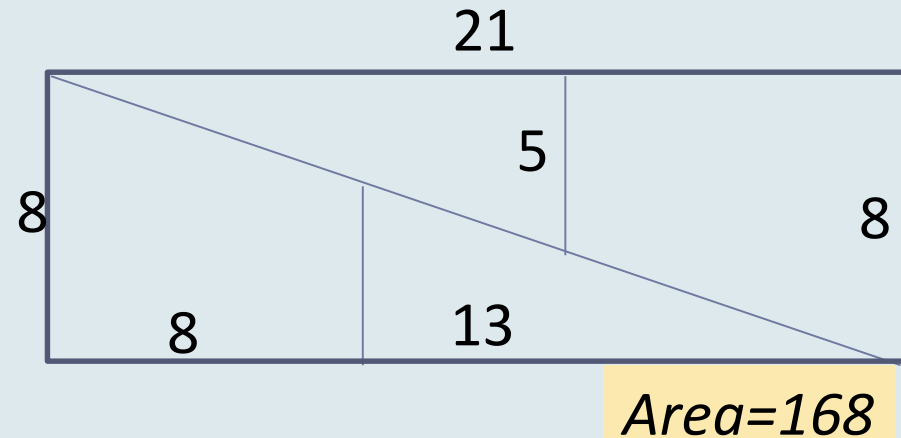
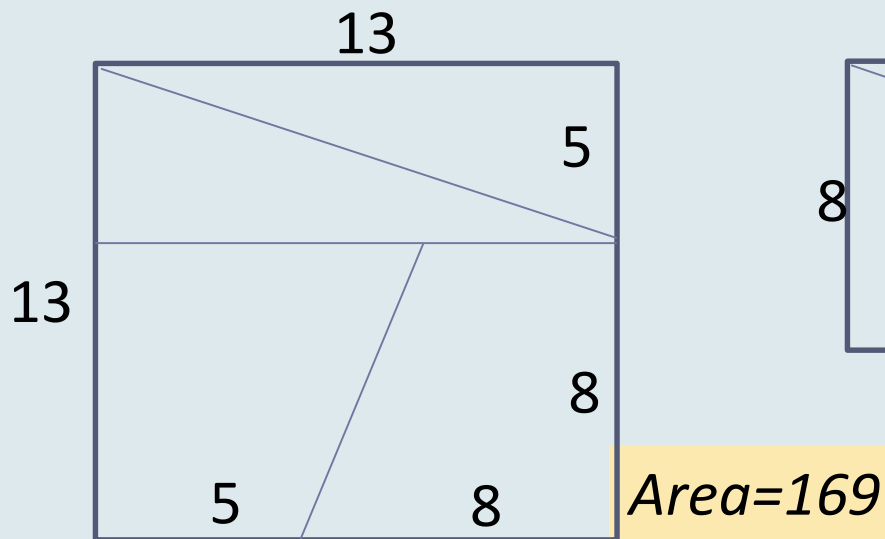
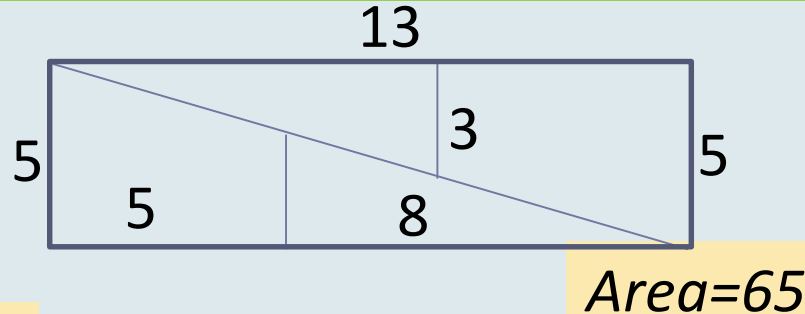
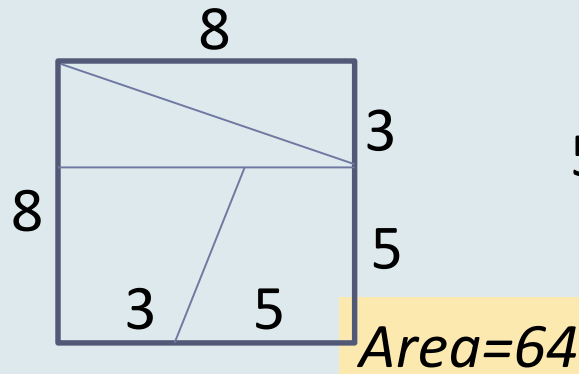


$$63 = 64 = 65$$

A French version
from the 1800s



Let's explore other cut-up squares that have been changed to rectangles:

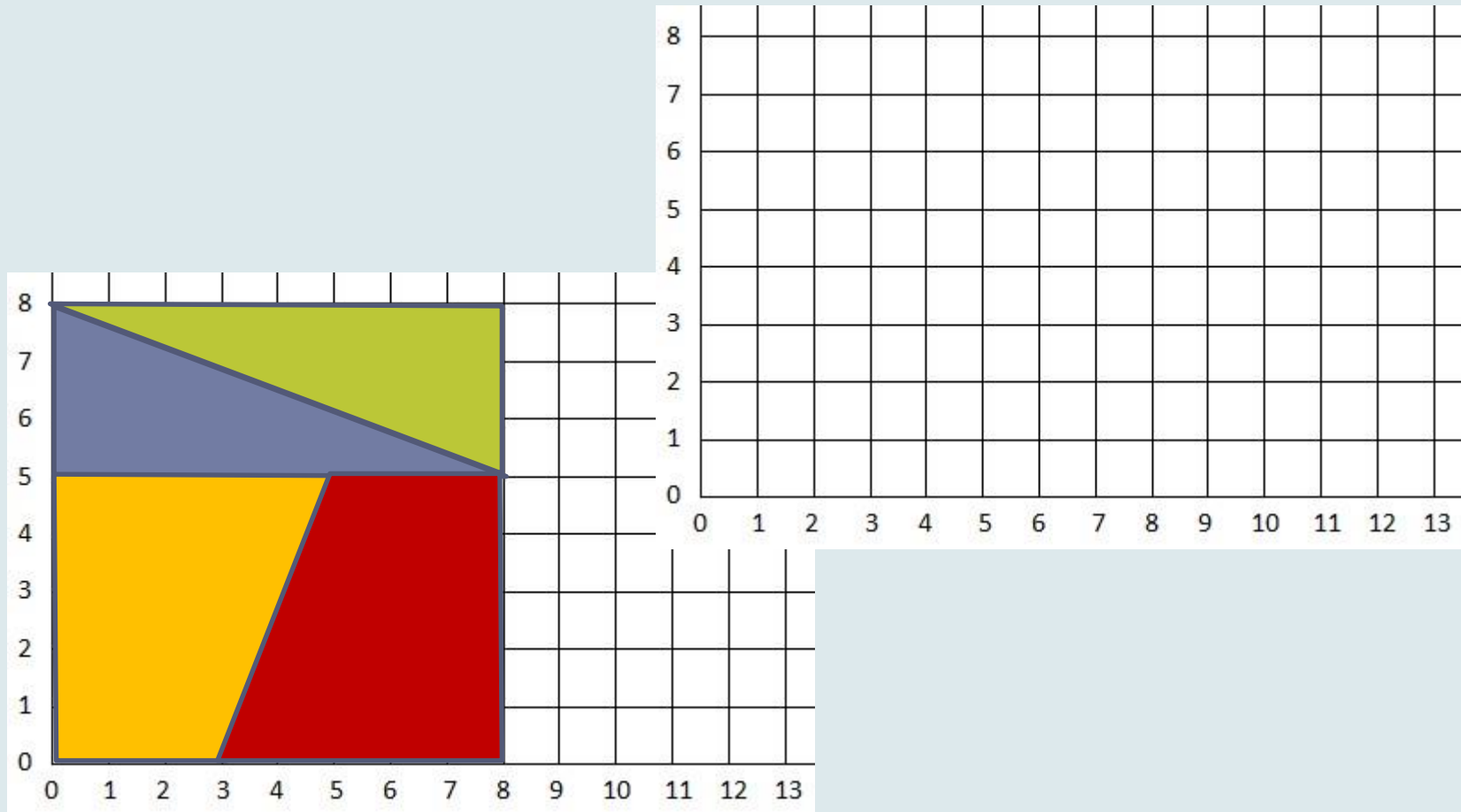


2 observations:

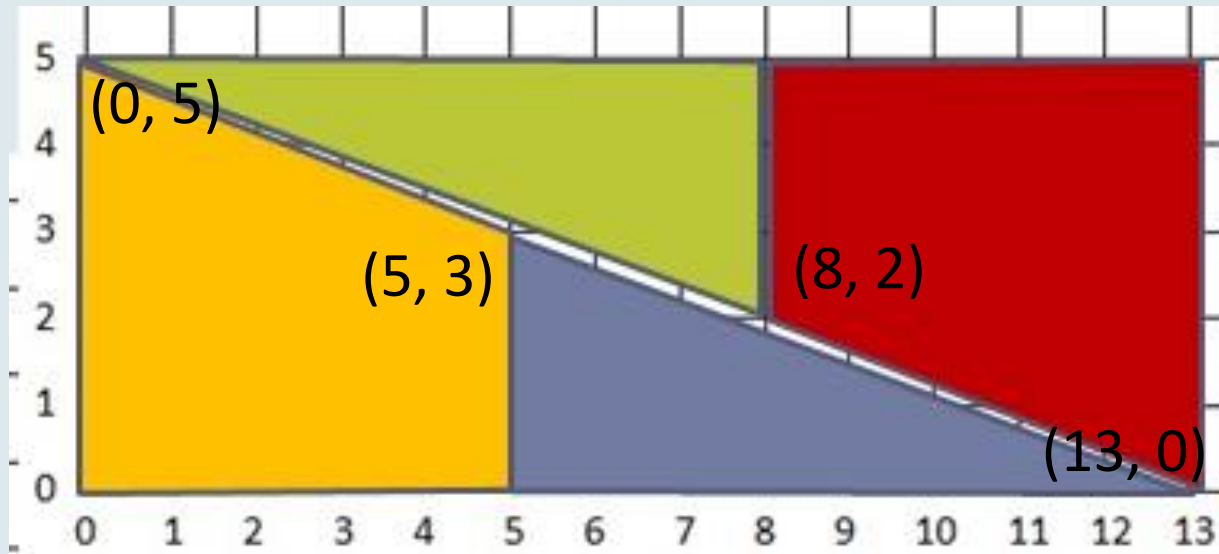
- Fibonacci numbers
- area changes by ± 1

What happens when we move the pieces very carefully?

You explore before we continue with the slides.....



Add coordinates to the diagram:



Calculate the slopes
of the 4 segments:

$$m_1 = \frac{5-3}{0-5} = -\frac{2}{5}$$

$$m_2 = \frac{5-2}{0-8} = -\frac{3}{8}$$

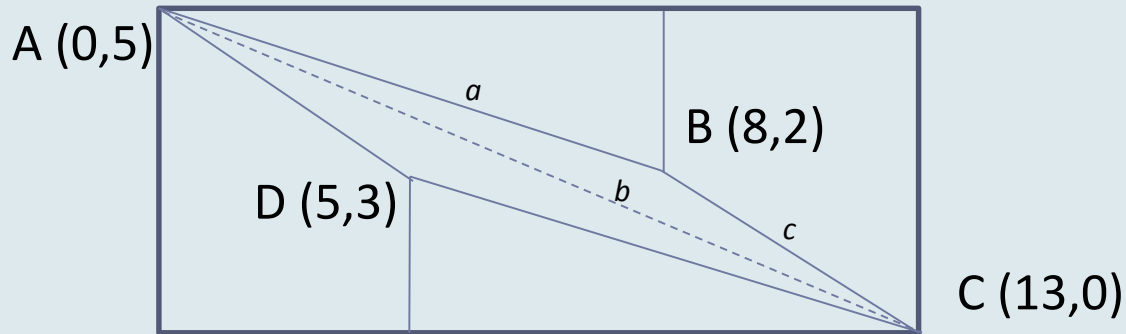
$$m_3 = \frac{2-0}{8-13} = -\frac{2}{5}$$

$$m_4 = \frac{3-0}{5-13} = -\frac{3}{8}$$

What first appeared to be a diagonal of the rectangle is actually a parallelogram shaped hole!!

What's the area of this parallelogram?

To better see what's happening here, let's redraw the rectangle (not to scale) and divide the parallelogram into 2 congruent triangles with sides a , b , and c .



$$m(\overline{AB}) = \sqrt{(0-8)^2 + (5-2)^2} = \sqrt{73} = \text{side } a$$

Using the distance formula: $m(\overline{AC}) = \sqrt{(0-13)^2 + (5-0)^2} = \sqrt{194} = \text{side } b$

$$m(\overline{BC}) = \sqrt{(8-13)^2 + (2-0)^2} = \sqrt{29} = \text{side } c$$

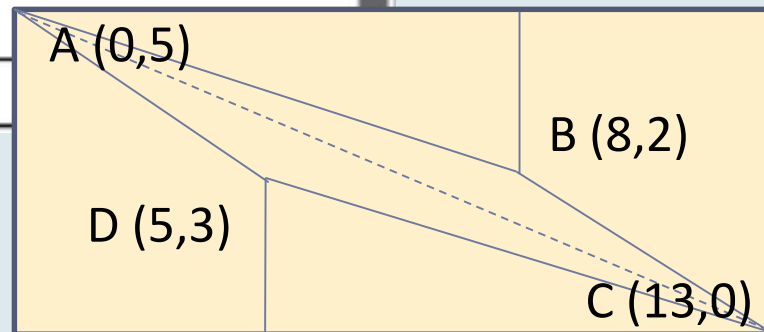
Next use Heron's Formula: $\text{Area } \triangle ABC = \sqrt{s(s-a)(s-b)(s-c)}$

with $s = \frac{a+b+c}{2}$

Using TI-Nspire:

The image shows a TI-Nspire calculator screen with the following content:

- Tab: 1.1
- Menu: herons formula ▾
- Equation: $area \triangle ABC = \sqrt{s \cdot (s - \sqrt{a}) \cdot (s - \sqrt{b}) \cdot (s - \sqrt{c})}$
- Text: with $s = \frac{a+b+c}{2}$
- Equation: Define $s = \frac{\sqrt{73} + \sqrt{194} + \sqrt{29}}{2}$ Done
- Equation: $\sqrt{s \cdot (s - \sqrt{73}) \cdot (s - \sqrt{194}) \cdot (s - \sqrt{29})}$ 0.5



Since $\triangle ABC \cong \triangle CDA$

Area parallelogram ABCD = .5 + .5 = 1

Therefore we have found the extra unit of area!!

This leads to an interesting generalization that helps us to better understand both this paradox puzzle and Fibonacci numbers, too.

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

From the previous slides, we see that :

$$5 \times 5 = 3 \times 8 + 1$$

$$8 \times 8 = 5 \times 13 - 1$$

$$13 \times 13 = 8 \times 21 + 1$$

$$F_n^2 = F_{n-1} \times F_{n+1} \pm 1$$

The square of any Fibonacci number is one more than or one less than the product of the two Fibonacci numbers on either side.

Fernando
Mission,
California



The Haines
Photo Co.,
Conneaut, O.

These vanishing area puzzles so captivated people in the late 1800's that they, like Sam Loyd's circular puzzles, were used in many advertising campaigns.

These pictures are 10 inches wide and from 2 to 6 feet in length. We have views taken in your section of the country—views that will appeal to your customers.

Let us send you particulars and prices in premium quantities.

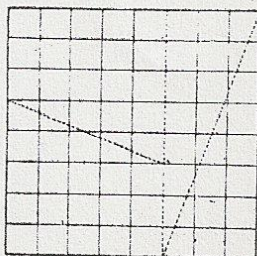
HAINES VIEWS,

We supply pictures for every purpose. We make up all kinds of special work to order from our own photographs or from photographs supplied by the customer.

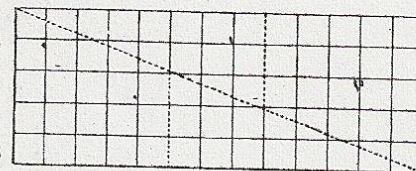
For further particulars address

CONNEAUT, O.

(11)



And a New Puzzle



Good puzzles are always in demand. Nothing gets more attention or is more certain to be passed about from hand to hand and talked about. Our "Elusive Square" Puzzle has them all guessing. Made of four pieces of cardboard printed with squares. Arranged in one way, there are sixty-four squares; arranged another way, there are sixty-five squares. The puzzle—where does the extra square come from? A puzzle that appeals to the children and to the mathematically and scientifically inclined as well. Your ad printed right on the face of the puzzle.

A sample free to any business concern.

CHARLES SCHINDLER

*Manufacturer of Ad Novelties
that appeal to children*

Toledo, Ohio

stand rolling and handling count of its greater toughness than the coated stock that it for the straight lithographic plate printing, we adopted printing for the reproduction "The calendars that we h were of small size, 12x24, inc d, of course homes, we ing feature alendar sit endars were ne use of c hroughout es, skimmu ays anxio

play a De Laval calendar.

**De Laval Calendar Is
Advertisement**

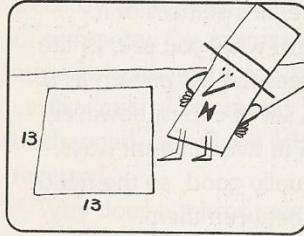
"It also seemed to us that f stores and in such other pla tioned, it would be better to l would feature our separators nently. In other words, it s some extent, to sacrifice art t with this idea in view, four c adopted a second style of cal tribution. Inasmuch as we could get practically 100 per tions and use for this caler principal feature of the calen style machines, and used a cal 20x50, with a very large pad.

"I do not believe we get piece of advertising matter t ally used or better apprecia calendars. I know I do not say that it is one of the bigge tive calendars distributed to our line. And while, of cour tributed is not nearly so lar small calendars, I believe that for all the money we invest medium.

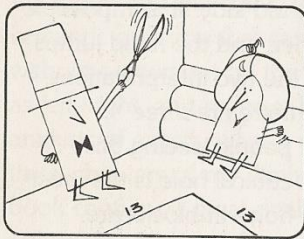
"For the same reason tha

July 1916 N.W.

Randi's Remarkable Rugs

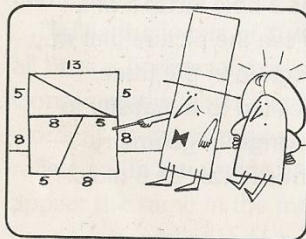


Mr. Randi, the world famous magician, owns a rug that is 13 decimeters by 13 decimeters. He wants to change it to an 8-by-21 rug. Mr. Randi took the rug to Omar, a rug dealer.

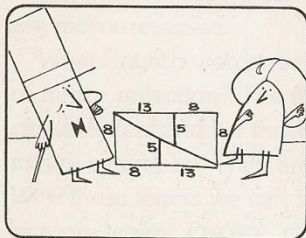


Randi: Omar, my friend, I want you to cut this rug into four pieces, then sew them together to make an 8-by-21 rug.

Omar: I'm sorry, Mr. Randi. You're a great magician but your arithmetic is terrible: 13-by-13 is 169, 8-by-21 is 168. It won't work.

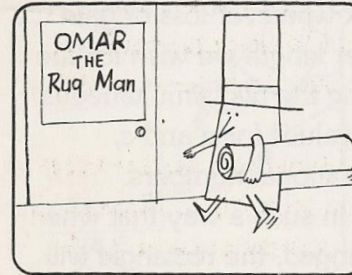


Randi: My dear Omar. The great Randi is *never* wrong. Kindly cut the rug into four pieces like this.



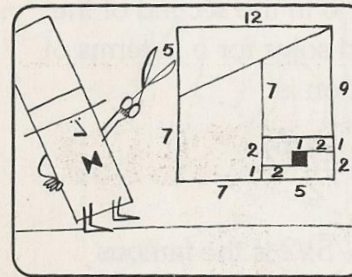
Omar did as he was told. Then Mr. Randi arranged the pieces, and Omar sewed them together to make an 8-by-21 rug.

Omar: I can't believe it! The area has shrunk from 169 to 168! What happened to that missing square decimeter?

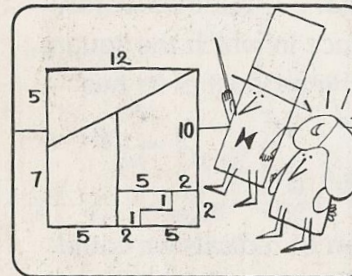


A few months later, Mr. Randi returned with a rug 12 decimeters by 12 decimeters.

Randi: Omar, old pal, my electric heater overturned and burned this beautiful carpet. By cutting and sewing, it will be easy to get rid of the hole.

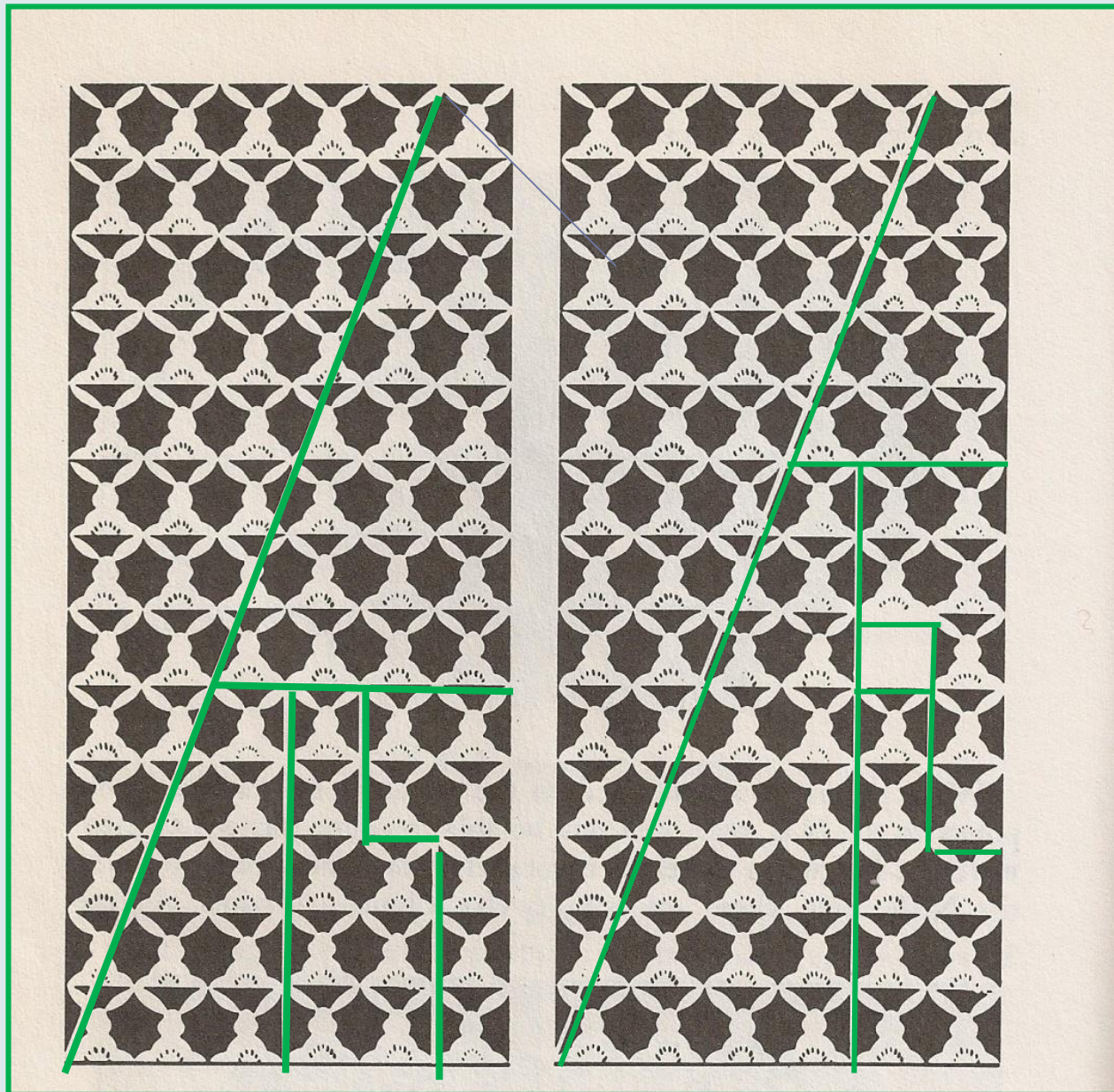


Omar was doubtful, but he followed Mr. Randi's instructions. After the pieces were sewn together, the rug was still 12-by-12 but the hole had vanished!



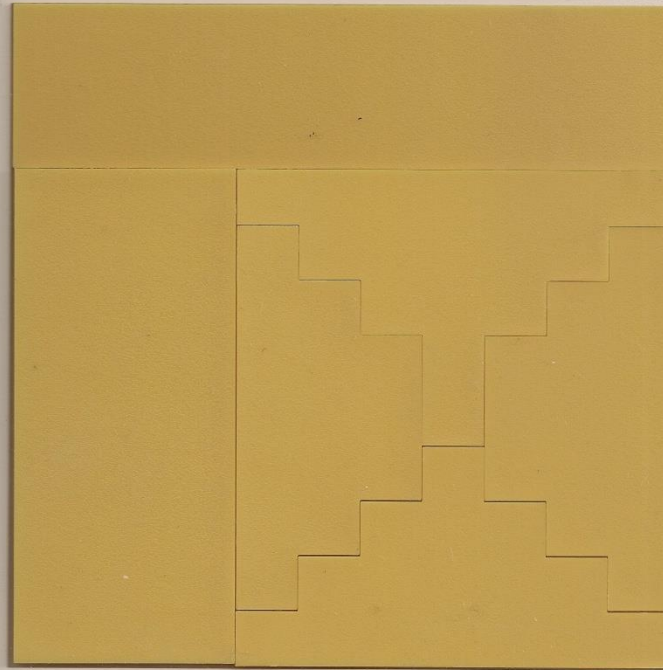
Omar: Please, Mr. Randi, how did you do it? Where did that square decimeter come from to fill the hole?

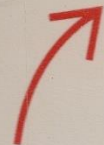
From Martin Gardner's GOTCHA!
Paul Curry first used this version of the paradox in the 1950's.



6 by 13 = 78 rabbits

6 by 13 = 77 rabbits and
1 rabbit hole



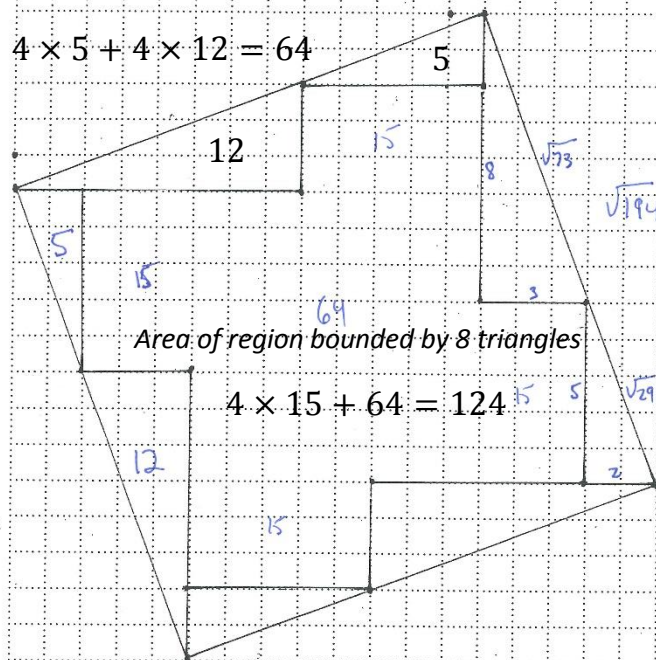
 ***Fit the Square inside the Puzzle***



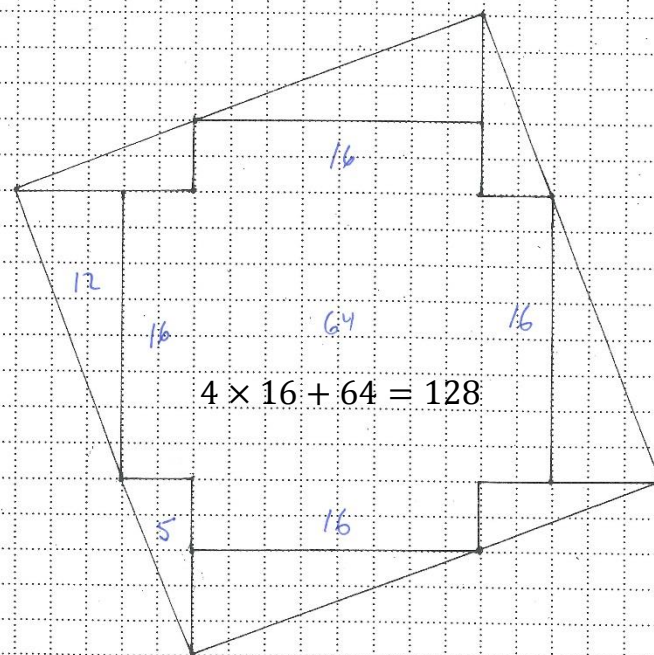
Each of these squares contains 8 right triangles; 4 with an area of 12 and 4 with an area of 5 sq cm. with a total area of 68 sq cm. Note also that the triangles with area of 5 are all congruent and the triangles with an area of 12 are all congruent.

The remaining polygon in the upper square has an area of 124 while the polygon in the lower square has an area of 128. Explain the discrepancy.

Area of 8 triangles:



$4 \times 5 = 20$	
$4 \times 12 = 48$	
$4 \times 15 = 60$	
$1 \times 64 = 64$	
	<u>192</u>



$4 \times 5 = 20$
$4 \times 12 = 48$
$4 \times 16 = 64$
$1 \times 64 = 64$
<u>196</u>

DISAPPEARANCES

I wonder how magicians make their rabbits disappear;
Enchanted words like “hocus pocus” can not interfere
With laws of science and facts of mathematics that are clear.

The prestidigitators, making use of devious schemes,
(although they never tell you how) transport things as in dreams:
At times suspended, banished, null and void-or so it seems.
There must be something secret, yes, a trick that will involve
-when done with sleight of hand- a force that’s able to dissolve.



The Cheshire Cat family all grinned when they saw Alice.
And, as usual, one of the cats vanished quite slowly,
beginning with the tail, and ending with the grin, which
remained some time after the rest of it had gone.

Gathering for Gardner II • January 17-21, 1996 • Atlanta, Georgia
Binary Arts Corporation • Alexandria, Virginia



The Cheshire Cat family all grinned when they saw Alice.
And, as usual, one of the cats vanished quite slowly,
beginning with the tail, and ending with the grin, which
remained some time after the rest of it had gone.

Gathering for Gardner II • January 17-21, 1996 • Atlanta, Georgia
Binary Arts Corporation • Alexandria, Virginia

From MoMath (on the -1st floor)

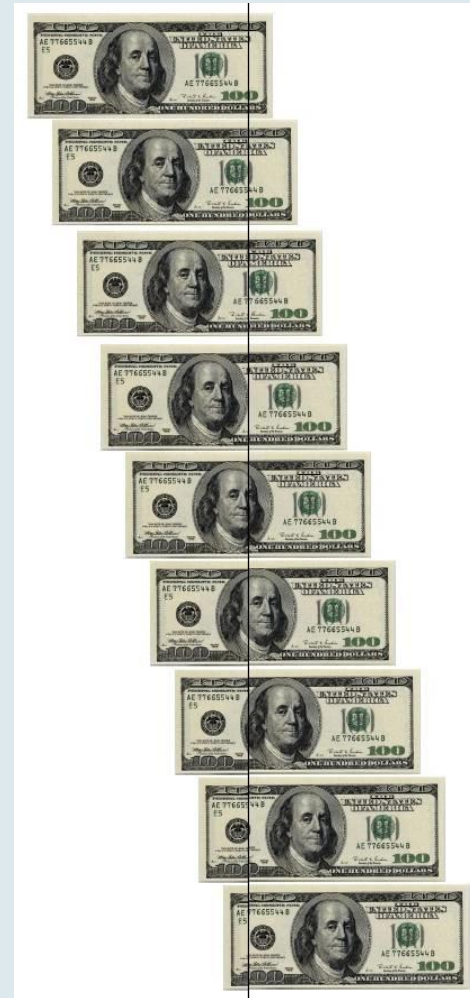
Simple geometrical vanishes are not hard to make.

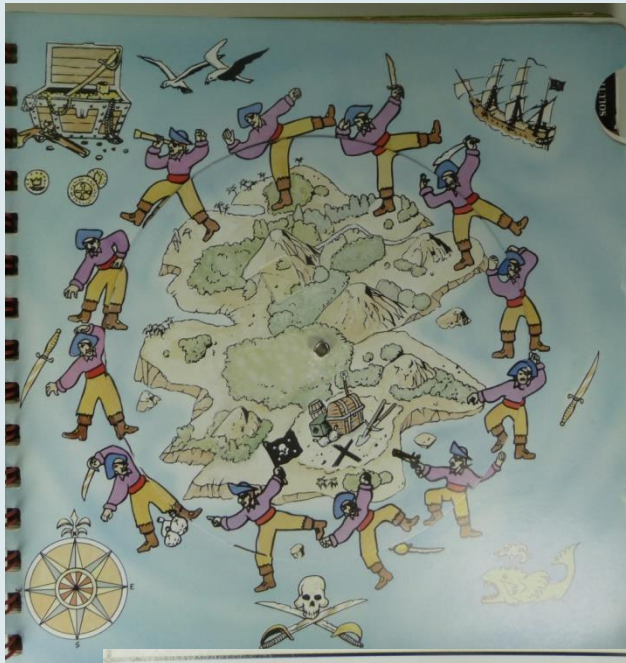
On a strip of paper, draw a horizontal dotted line. Then pick an object that looks like itself even if you cut some of the top or bottom off – like a skyscraper or a tree. Draw some of those objects evenly spaced across the horizontal line, but make sure that the one on the far left is completely above the line and the one on the far right is completely below the line. Now cut along the horizontal line to make two strips, and watch the objects disappear as you slide the bottom strip back and forth.



Don't Do This At Home!

According to Martin Gardner, in 1968 a man in London was sentenced to 8 years in jail for doing this with 5 pound notes.





Teachable moment:
The more times you
explain a concept,
the better your
explanations will get.



Slocum, 2011

The Wheel of Disappearing Pirates pg. 15

Slocum, 1996

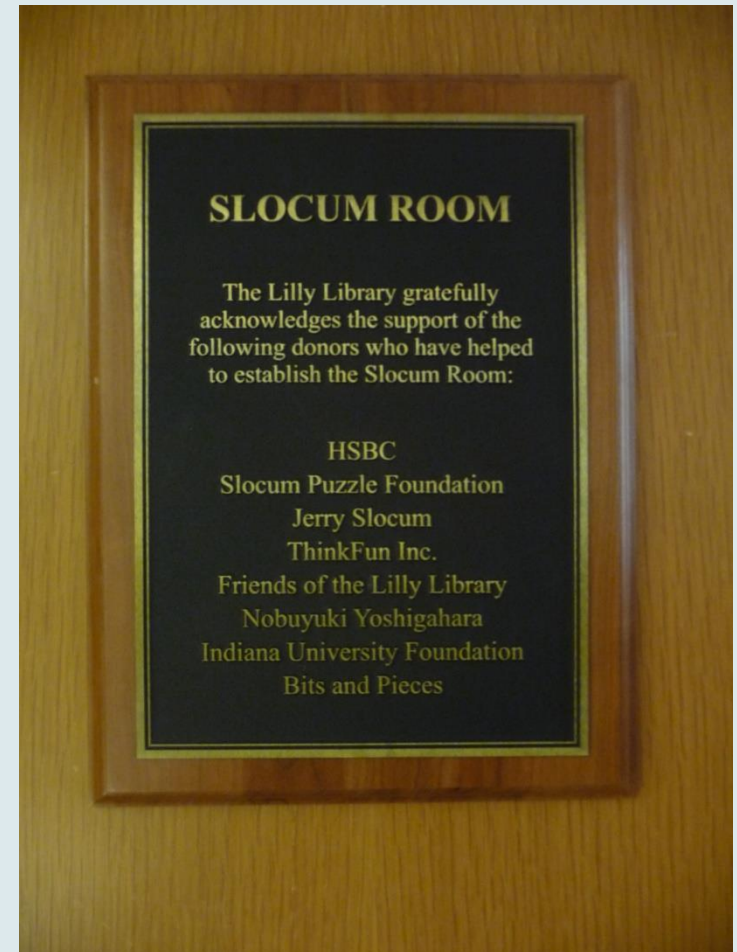
Look at the hint again. If I had 12 full glasses of water, and put a little bit of each one into the empty 13th glass, at the end of it all, it would LOOK as if I magically filled 13 glasses with the water from only 12 full glasses. Of course I haven't. It's just that the difference is too small to pick up visually. With the disappearing pirates, the principle is the same. A little bit of each of the 12 pirates is all added up to make the 13th. Of course the art is carefully drawn to hide what's going on.

Cover: The Disappearing Bicyclist!

Notice when the arrow on the wheel points to A there are 13 boys and the first boy on the lower left is almost completely outside of the wheel. Each subsequent clockwise boy has been drawn slightly further toward the center of the wheel, until the last boy is almost all inside the wheel/tire. When the wheel section is rotated from A to B, 12 boys gain some part of their body and are $\frac{1}{12}$ larger. So in reality no boy has actually disappeared.

The New Home for Jerry's Puzzles

The Lilly Rare Book Library at Indiana University, Bloomington



REFERENCE LIST

Personal visit with Jerry Slocum at his home and Private Museum, Beverly Hills, CA
February 18, 2011

Personal visit to Slocum Puzzle Collection, Lilly Rare Book Library, Indiana University,
Bloomington, IN April 14, 2011.

Hooper's Paradox with a Java Applet

<http://www.cut-the-knot.org/Curriculum/Fallacies/HooperParadox.shtml>

<http://www.samuelloyd.com/gote/index.html>

<http://www.samloyd.com/vanishing-puzzles/index.html>

<http://www.slocumpuzzles.com/index2.htm>

Who Turned to Doggie Doo? animated

<http://debreuil.com/ddw/puzjava/picmove.htm>

Explanations for several Java animated puzzles

http://library.thinkquest.org/28049/geometrical_vanishes.htm

David Singmaster's Annotated Bibliography on Recreational Mathematics

<http://www.g4g4.com/MyCD5/SOURCES/singmaterial.htm>

<http://www.usc.salvationarmy.org/usc/downloads/The%20Vanishing%20Sin%20Paradox%20Jan-Feb%20%2707.pdf>

New York Times Obituary for Martin Gardner

http://www.nytimes.com/2010/05/24/us/24gardner.html?_r=2

Dr. Gayle Olson-Raymer's lecture notes on Anti-Chinese policies in California

<http://users.humboldt.edu/ogayle/hist383/CentralPacific.html>

MORE REFERENCES

- Appel, John and Selma, *Sino-Phobic Advertising Slogans: "The Chinese Must Go"*, Ephemera Journal 4: 35-40.
- Dudeney, H. E., 536 Puzzles and Curious Problems, New York, Charles Scribner's Sons, 1967.
- Folletta, Nicholas, The Paradoxican., New York., John Wiley and Sons, Inc. 1983.
- Frederickson, Greg, Dissections: Plane and Fancy Cambridge University Press. 2003.
- Gardner, Martin, Mathematics, Magic and Mystery, New York, Dover, 1956.
- Gardner, Martin, Aha! Gotcha, New York, W.H.Freeman and Co, 1982.
- Garland, Trudi, Fascinating Fibonacci, Palo Alto, CA Dale Seymour, 1987.
- Guyot, Edme Nouvelles Recreations Physiques et Mathematiques 1st ed. 1770, 2nd ed. 1775
- Hochberg, Burt, "As Advertised" Games Magazine, February, 1993.
- Hooper, William, Rational Recreations, 1st ed. 1774, 4th ed. 1794
- Poundstone, William, "Get Off the Earth" *The Incredible Racist Advertising Puzzles of Sam Loyd*, Believer, Sept 2006.
- Restak, Richard. Kim, Scott. The Playful Brain, Riverhead Books, New York, 2010.
- Slocum, Jerry, (and Jack Botermans), New Book of Puzzles, 101 Classic and Modern Puzzles to Make and Solve, New York, NY: W. H. Freeman, 1992.
- Slocum, Jerry, The Puzzle Arcade, Palo Alto, CA, Klutz Press, 1996.
- Slocum, Jerry, The World's Best Paper Puzzles, 2012.
- Serlio, Sebastiano, Architettura, 1545
- Wanko, Jeff. Spatial Reasoning That Makes Kids Think, Prufrock Press.
- Wells, David, Book of Curious and Interesting Puzzles, Penguin Books, 1992.