

“Mathematics, Magic & Mystery” – and the Man Who Brought Them Together

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Mathematics Awareness Month 2014

Mathematics Awareness Month 2014

Theme: Mathematics, Magic & Mystery

Mathematics Awareness Month 2014

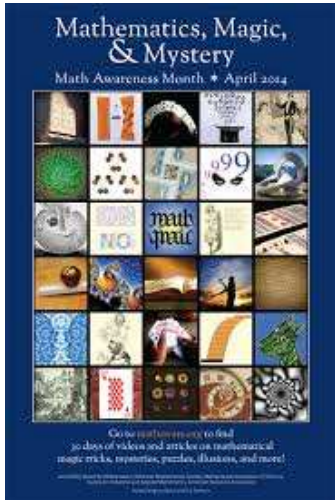
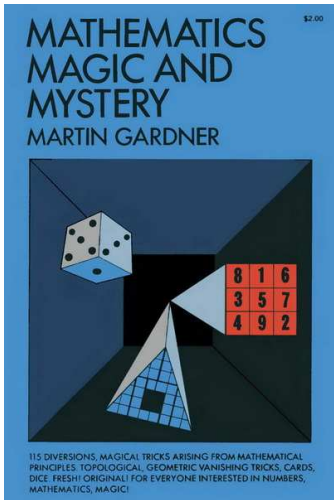
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www.mathaware.org

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Mathematics, Magic & Mystery



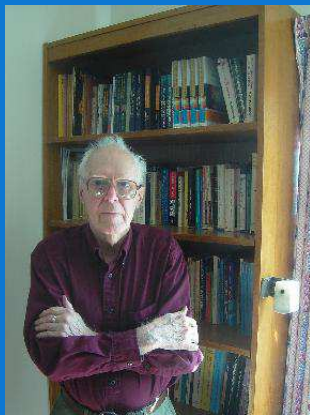
MAM 2014 Committee



Bruce Torrence, Eve Torrence, and ...

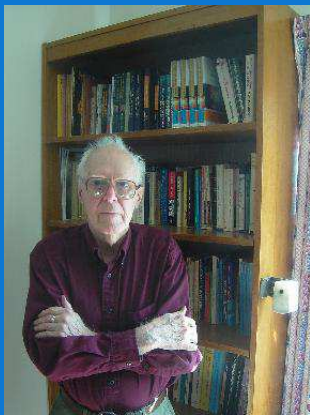
Martin Gardner (1914-2010)

The Best Friend Mathematics Ever Had



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—standing by every word he ever wrote

Fun as motivator

"GARDNER UNDERSTOOD INSTINCTIVELY THAT MATHEMATICS WAS BIGGER, RICHER AND MORE FUN THAN WHAT WAS ALLOWED IN CLASS. AND HE DID MORE THAN ANYONE ELSE IN THE 20TH CENTURY TO GET THAT MESSAGE TO THE PUBLIC"

- JORDAN ELLENBERG

"THE BEST WAY, IT HAS ALWAYS SEEMED TO ME, TO MAKE MATHEMATICS INTERESTING TO STUDENTS AND LAYMEN IS TO APPROACH IT IN A SPIRIT OF PLAY"

- MARTIN GARDNER

"SURELY THE BEST WAY TO WAKE UP A STUDENT IS TO PRESENT HIM WITH AN INTRIGUING MATHEMATICAL GAME, PUZZLE, MAGIC TRICK, JOKE, PARADOX, MODEL, LIMERICK, OR ANY OF A SCORE OF OTHER THINGS THAT DULL TEACHERS TEND TO AVOID BECAUSE THEY SEEM FRIVOLOUS"

- MARTIN GARDNER

"WHILE I AM STILL A TEENAGER, ONE OF MY GOALS IN LIFE IS TO SHOW THE WORLD THAT MATHEMATICS IS FASCINATING, FUN, AND ACCESSIBLE. I DRAW INSPIRATION DIRECTLY FROM MARTIN GARDNER EVERY WEEK WHEN I WRITE A POST FOR MY BLOG COOL MATH STUFF"

-ETHAN BROWN

Mathematical Martin

While the bulk of Martin's writing was non-fiction, the first time he received payment for his writing was for several short stories he placed with *Esquire* magazine in the late 1940s.

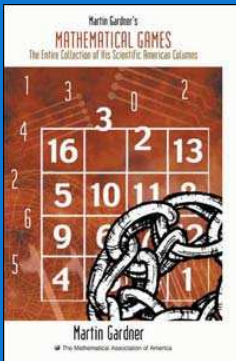
As a result, he decided to try making a living as a freelance writer.

His second story for *Esquire*, "The No-Sided Professor"—which he termed his best-known science-fiction yarn—had a topological twist.

He wrote 4 articles for *Scripta Mathematica* (1948–1952) before he wrote *Mathemagic, Magic and Mystery* (1956).

Scientific American

Most well known in mathematical circles for the 300-odd “Mathematical Games” columns he wrote for *Scientific American* between late 1956 and 1986, later issued in 15 books (“The Canon” according to Knuth), and in 2006 as on a single searchable CD-rom available from the MAA:



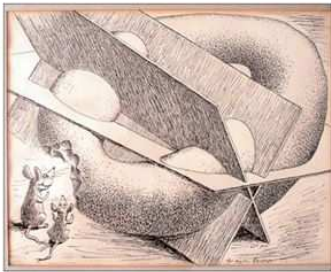
Scientific American

He introduced generations of readers to hexaflexagons; the Soma cube; origami; Eleusis; rep-tiles; tangrams; pentominoes; polyominoes; the art of M. C. Escher; the $3n + 1$ problem; Conway's game of Life; Fermat's last theorem; the four-color map problem; RSA cryptography; fractals; and paradoxes from A to Z (all crows are black, infinity, Newcomb's, nontransitive dice, the unexpected hanging, Zeno's).

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Figure 6. An artist friend drew this picture for Gardner, illustrating the maximum number of pieces into which a bagel can be sliced by three planes.



Subtly significant

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Two missiles speed directly toward each other, one at 9,000 miles per hour and the other at 21,000 miles per hour. They start 1,317 miles apart.

Without using pencil and paper, calculate how far apart they are one minute before they collide.

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Solution: A combined speed of 21,000 mph plus 9,000 mph is 30,000 mph.

In a minute the distance between them decreases by $30,000 \times \frac{1}{60} = 500$ miles. They are that far apart a minute before they collide.

The influence of Martin Gardner

"YOU'D BE SURPRISED HOW MUCH MATH YOU CAN LEARN BY EXPLORING SOME OF THE IMPLICATIONS AND RAMIFICATIONS OF WHAT MAY SEEM AT FIRST NO MORE THAN A TRIVIAL BRAINTEASER"

— MARTIN GARDNER

"THERE IS ABSOLUTELY NO QUESTION THAT HE, MORE THAN ANYONE ELSE IN THE WORLD WAS RESPONSIBLE FOR TURNING PEOPLE OF ALL AGES ON TO THE PLEASURES OF MATHEMATICAL RECREATIONS. MANY HAVE TRIED TO EMULATE HIM—NOBODY HAS SUCCEEDED"

— RON GRAHAM

"MORE PEOPLE HAVE PROBABLY LEARNED MORE GOOD MATHEMATICAL IDEAS FROM GARDNER THAN FROM ANY OTHER PERSON IN THE HISTORY OF THE WORLD"

— DONALD KNUTH

"THERE ARE THOUSANDS OF ENTERTAINING TRICKS WITH CARDS, DICE, COINS, AND OTHER OBJECTS THAT REQUIRE NO SLEIGHT OF HAND. THEY WORK BECAUSE THEY ARE BASED ON MATHEMATICAL PRINCIPLES"

— MARTIN GARDNER

Skeptical American

In addition to his science and mathematical passions, Martin was a leading light in the debunking of pseudoscience:

"HE WROTE THE CLASSIC *FADS AND FALLACIES IN THE NAME OF SCIENCE* AND THERE HAS NEVER BEEN A HARDER BLOW AT SCIENCE'S IRRATIONAL FRINGE"

— ISAAC ASIMOV

"WE BELIEVE IT THE *DUTY* OF SCIENTISTS TO DEBUNK BAD SCIENCE. A DEMOCRACY WORKS BEST WHEN CITIZENS ARE ENLIGHTENED VOTERS. ONLY HARM CAN RESULT FROM AN ELECTORATE UNABLE TO TELL GOOD SCIENCE FROM BOGUS"

— MARTIN GARDNER

He was a founding member of CSICOP in 1976, joining forces with Kurtz, Hyman, Asimov, Sagan and others to counteract irrationality and bogus science.

One of his last publications was "Oprah Winfrey: Bright (but Gullible) Billionaire" (*Skeptical Inquirer*, Spring 2010).

Wonderous American

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"IF GOD CREATES A WORLD OF PARTICLES
AND WAVES, DANCING IN OBEDIENCE TO
MATHEMATICAL AND PHYSICAL LAWS, WHO
ARE WE TO SAY THAT HE CANNOT MAKE USE
OF THOSE LAWS TO COVER THE SURFACE OF
A SMALL PLANET WITH LIVING CREATURES?"

-MARTIN GARDNER

Magician Martin

Martin's first publication was a magic trick for the *Sphinx* in May of 1930. He was fifteen years old. The last publication in his lifetime was a magic trick that he contributed to the May 2010 issue of *Word Ways*.

Martin's magical interests were focussed on table and close-up magic, and for three decades, he published a lot of original magic. He is well known for innovative tapping and spelling effects, with and without cards.

However, he never performed magic professionally, except during a few Christmas seasons in the mid 1930s as a student, when he could be found entertaining shoppers in Marshall Fields's department store in Chicago.

He left us many short books on magic and two whoppers:
The Encyclopedia of Impromptu Magic (Magic Inc, 1978) &
Martin Gardner Presents (Kaufman and Greenberg, 1993).

In 1999, he was listed in the “100 Most Influential Magicians of the Twentieth Century” by *MAGIC* magazine, and in 2005 he was given the “Lifetime Achievement Award” from the Academy of Magical Arts, the Magic Castle, Hollywood, CA.

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In 1999, he was listed in the “100 Most Influential Magicians of the Twentieth Century” by *MAGIC* magazine, and in 2005 he was given the “Lifetime Achievement Award” from the Academy of Magical Arts, the Magic Castle, Hollywood, CA.

“I have never been a [magic] performer. I consider myself fortunate in this respect. Had I taken up conjuring as a profession (God forbid), I might never have become a writer,” he wrote in his memoirs.

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It would be natural, given his Martin's stature in the world of mathematics, to assume that he was an active mathematician by trade, accumulating degrees in the usual way, teaching college students by day, giving numerous high profile lectures around the country each year, and regularly publishing in refereed journals.

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Martin Gardner famously said that he never took a math class past high school.

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He once told me that he never gave a lecture in his life, and that he wouldn't know how to—that last self-assessment is uncharacteristically far off the mark for such a brilliant thinker and writer.

Martin did publish from time to time in regular mathematical outlets, starting (in his 75th year) with a joint research article co-authored with Fan Chung & Ron Graham (“Steiner Trees on a Checkerboard,” *Mathematics Magazine* 62, 83-96, 1989).

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In due course, he won the Trevor Evans Award (1998) and George Pólya Award (2000) for some of these papers.

He also won the Leroy P. Steele Prize (1987) from the AMS.

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“I don’t think I ever wrote a column that required calculus.”

“The big secret of my success as a columnist was that I didn’t know much about math.”

“I had to struggle to get everything clear before I wrote a column, so that meant I could write it in a way that people could understand.”

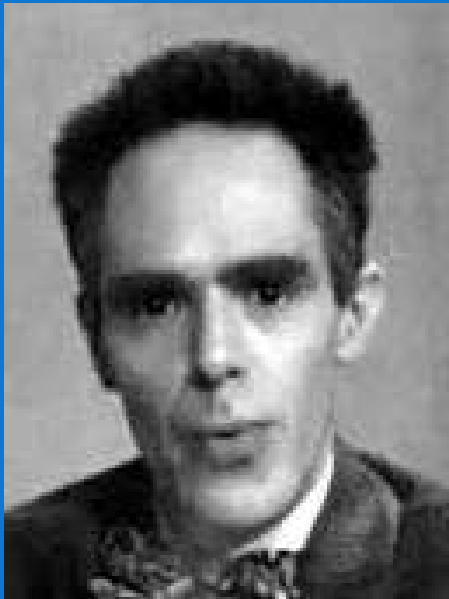
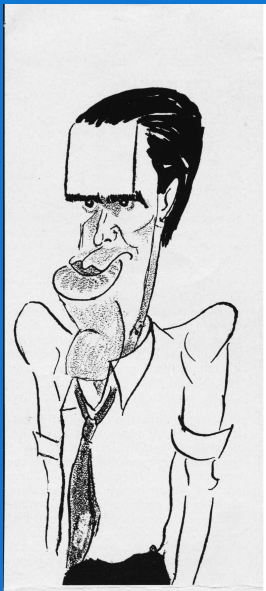
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"I believe that the human mind, or even the mind of a cat, is more interesting in its complexity than an entire galaxy if it is devoid of life. I belong to a group of thinkers known as the 'mysterians.' It includes Roger Penrose, Thomas Nagel, John Searle, Noam Chomsky, Colin McGinn, and many others who believe that no computer, of the kind we know how to build, will ever become self-aware and acquire the creative powers of the human mind. I believe there is a deep mystery about how consciousness emerged as brains became more complex, and that neuroscientists are a long long way from understanding how they work."

Skeptical Inquirer, Mar/Apr 1998

Once upon a time

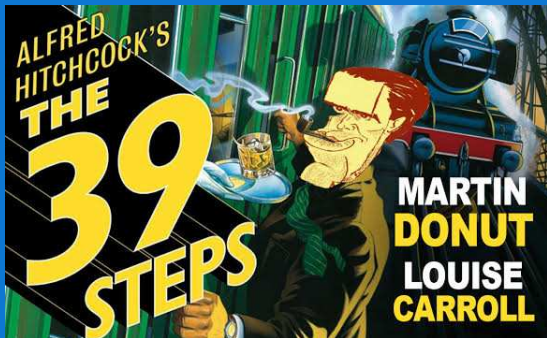


Missed opportunities

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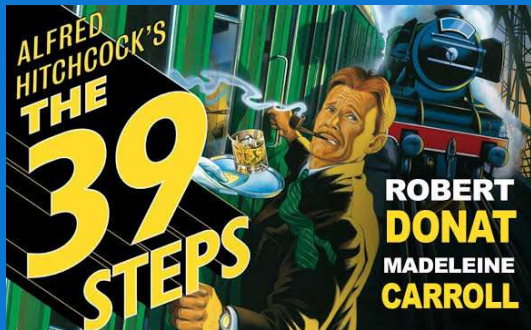


Missed opportunities



The reality

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Take 39 steps ... back

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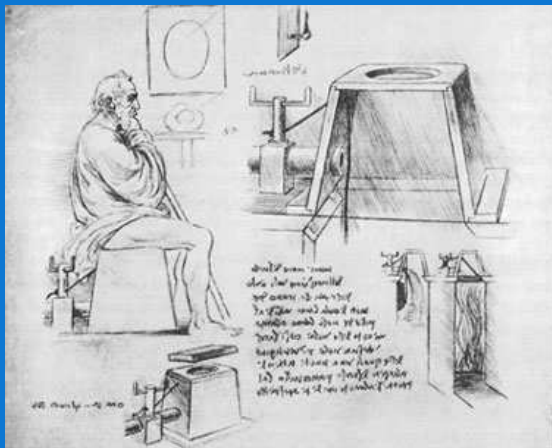
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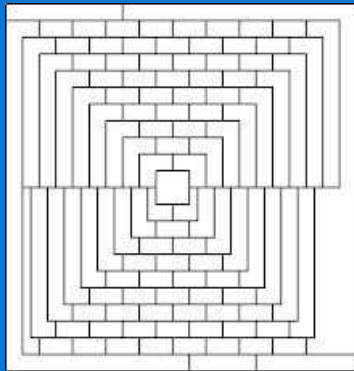
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163 is one of the Heegner numbers (related to imaginary quadratic fields, class numbers, and j-function modular forms).

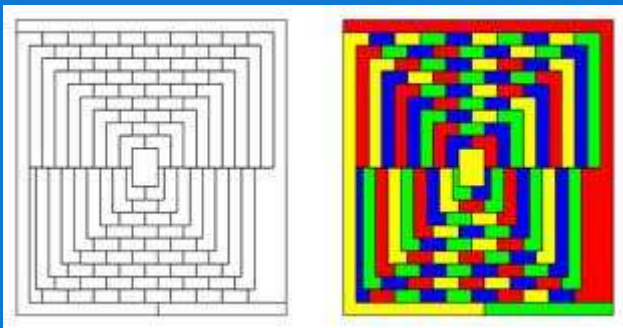
The same column revealed that the flush toilet was invented by Leonardo da Vinci.



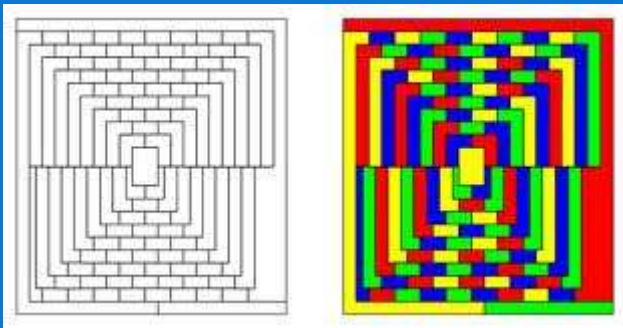
Impossible Map



The 110-region map by William McGregor of Wappingers Falls, New York, that couldn't be four-colored (predating Appel-Haken computer proof), also in *Time Travel and Other Mathematical Bewilderments* (W.H. Freeman, 1988).



Maybe it can be four-colored!



Maybe it can be four-colored! Appel and Haken's 1976 proof that all maps can be four-colored started by showing that there is a particular set of 1,936 maps, each of which cannot be part of a smallest-sized counterexample.

What to remember about Martin Gardner?

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First and last, he was a **skeptic**

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First and last, he was a **skeptic**, who was most well known as a **scientific American, writer** and **annotator**.

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This mere **mortal** was also a **mathematician, magician & mystician**.

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First and last, he was a **skeptic**, who was most well known as a **scientific American, writer** and **annotator**.

This mere **mortal** was also a **mathematician, magician & mystician**.

He turned out to be a big **inspiration** to several generations of people all over the world.

How www.martin-gardner.org is organized:

Magician

Inspiration

Skeptic

Writer

Scientific American

Mathematician

Annotator

Mysterian

Mortal

Martin may be gone, but his voice resonates

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On Twitter

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*Undiluted Hocus-Pocus:
The Autobiography of Martin Gardner*

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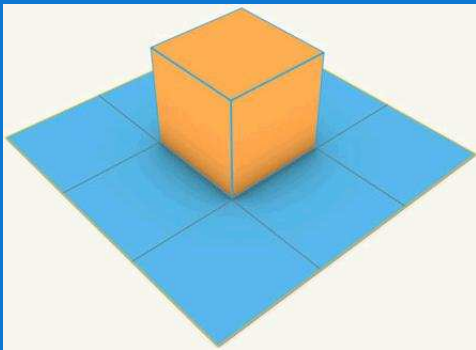
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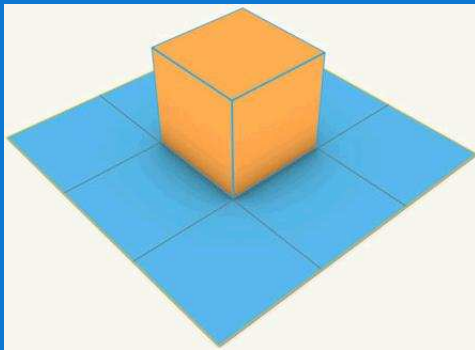
Princeton University Press, Sep 2013

Let's wrap it up

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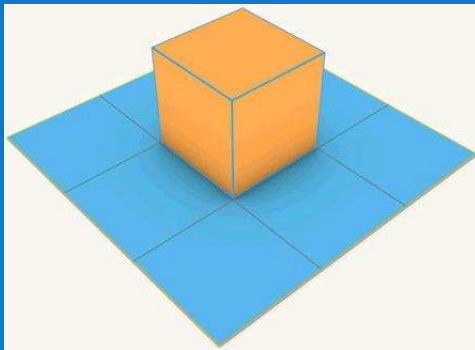


Let's wrap it up



Goal: wrap the gold cube in the blue paper.

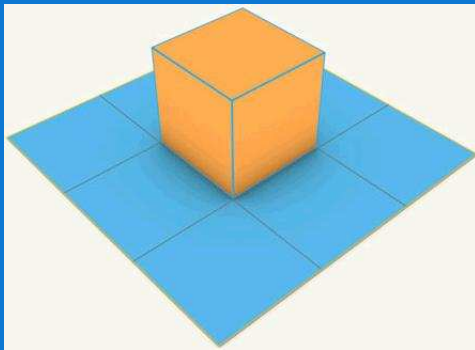
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Cutting and folding is allowed

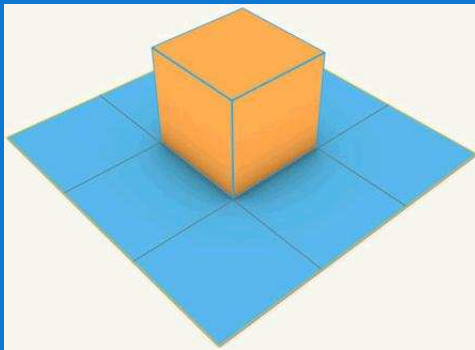
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Goal: wrap the gold cube in the blue paper.

Cutting and folding is allowed, but only along existing grid lines.

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Cutting and folding is allowed, but only along existing grid lines.

The paper must remain in one piece.

Source:

In Russian at www.etudes.ru/ru/sketches

In English later as “Wrapping a Cube” on
www.mathteacherctk.com

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Which in turn points back to the June 1960 “Mathematical Games” column.

Thanks to the Joint Policy Board for Mathematics:

- MAA
- AMS
- SIAM
- ASA

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- MAA (Mathematicians Annotators Americans)
- AMS (Americans Magicians Skeptics)
- SIAM (Skeptics Inspirations Annotators
Mysterians)
- ASA (Annotators Scientific Americans)

The legacy of Martin Gardner

"HE BROUGHT MORE MATHEMATICS
TO MORE MILLIONS THAN ANYONE
ELSE"

— RICHARD K. GUY

"FOR THOSE OF US WHO HAVE TRIED TO
MAKE MATHEMATICS ACCESSIBLE TO A
WIDER AUDIENCE, THERE IS ONE GIANT
WHO TOWERS ABOVE EVERYBODY ELSE:
MARTIN GARDNER"

— KEITH DEVLIN

"WARNING: MARTIN GARDNER HAS TURNED
DOZENS OF INNOCENT YOUNGSTERS INTO
MATH PROFESSORS AND THOUSANDS OF
MATH PROFESSORS INTO INNOCENT
YOUNGSTERS"

— PERSI W. DIACONIS

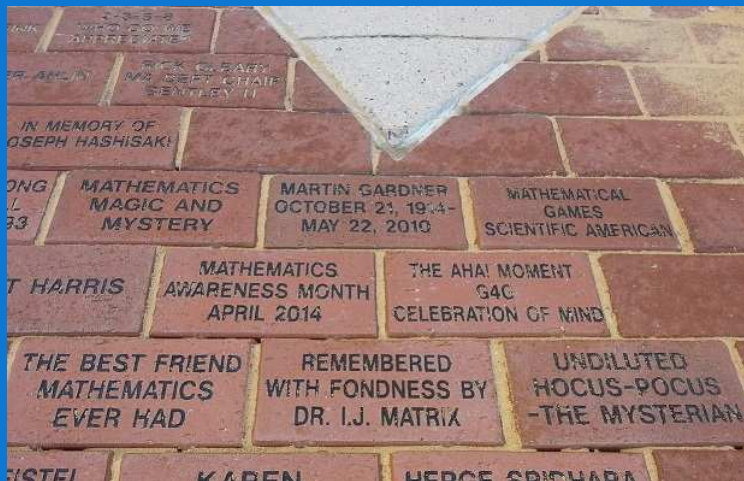
"MARTIN HAD A PERHAPS UNIQUE
ABILITY TO SAY JUST ENOUGH AND
THEN LET THE READER CARRY THINGS
FURTHER OR MOVE ON, AS THE SPIRIT
MOVED"

— PETER RENZ

Moving forward

"IT IS HARD TO EXAGGERATE THE IMPORTANCE AND INFLUENCE OF THESE [SCIENTIFIC AMERICAN] BOOKS... FASCINATING, USEFUL, FUN, AND HISTORICALLY SIGNIFICANT. TIME HAS PASSED, AND A GENERATION THAT KNOWETH NOT GARDNER HAS ARISEN. NOW WE CAN FIX THAT" — **FERNANDO Q. GOLIVEA**

New addition to the Mathematical Walk of Fame



MathFest and Celebration of Mind and G4G

Come to MathFest in August and hear
Persi Diaconis speak about Martin!

Please host a Celebration of Mind next
(and every) October!

www.celebrationofmind.org

Spring 2016: the 12th Gathering 4 Gardner
conference.