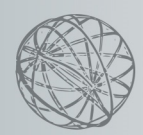# Recreational
Mathematics
Magazine

MARTIN GARDNER'S MATHEMAGICAL LIFE

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Martin Gardner's Mathemagical Life

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on the occasion of the 100th anniversary of birth

Abstract: *Martin Gardner has turned dozens of innocent youngsters into math professors and thousands of math professors into innocent youngsters.*

Persi Diaconis [32]

Key-words: Martin Gardner, 100th anniversary.

1   Introduction

There are a lot of people who devote a great deal of their lives to mathematics, but it is difficult to find those who have done more for the promotion of mathematics than Martin Gardner. Despite the fact that Gardner had not a formal mathematical education, his position in the world of mathematics is unique.

Being the author of the "Mathematical Games" column that ran for twenty-five years in Scientific American magazine, he opened the eyes of the general public to the beautiful and fascination of mathematics and inspired many to go on to make the subject their life's work. His column was the place where several important mathematical notions, such as Conway's Game of Life and Penrose tiles, first became widely known. It was also a place where the sheer fun of mathematical games and puzzles was celebrated and savored.

Allyn Jackson [26]

Martin Gardner had many lifelong passion and mathematics was one of them. In spite of, or perhaps because of, lacking proper mathematical education, Gardner's articles influenced generations of mathematicians. Thanks to his boundless enthusiasm and careful choice of topics, his articles got the general public interested in mathematics. Apart from mathematics he was an amateur magician, a well-known skeptic and also a leading figure in refuting pseudoscientific theories

Figure 1: Martin Gardner.

ranging from modern diets to flying saucers. He showed great interest in religion, was a writer of fiction and poetry. He wrote more than 70 books concerning magic, philosophy, mathematics or commented on other authors' books.

2   Personal life and education

Martin Gardner was born October 21, 1914, in Tulsa, Oklahoma. His father was a geologist who owned a small oil company. His mother once worked as a kindergarten teacher, but after the delivery of her third child she decided to stay at home and became a housewife. From an early age Martin was fascinated by various puzzles, mathematical games, resolving paradoxes or mysterious stories. "My mother read the *Wizard of Oz* to me when I was a little boy, and I looked over her shoulder as she read it," he remembered from his childhood [2]. With his childhood friend John Bennett Shaw they collected different kinds of brain teasers. Later on, J. B. Shaw's extensive collection consisting of various brain teasers and Sherlock Holmes' mementos was awarded a prize[1].

Figure 2: Martin's brother Jim, Martin's father Dr. Gardner, and Martin.

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[1]More detailed information about Gardner parents and his childhood is described in the article [2].

Martin Gardner loved physics in high school. He admired his physics teacher and his hopes were to become a physicist too. He applied for his dream job to Cal Tech[2] and found out that he was supposed to spend two years at university before he might be accepted. He wasn't discouraged and decided to study at the University of Chicago. During his studies Gardner got absolutely enthused by philosophy, especially philosophy of science. He chose to change his field of study and in 1936 obtained a bachelors degree in philosophy.

In his free time Gardner kept in touch with mathematics, unfortunately he couldn't take any maths courses at university because of his study plan. The main idea was to introduce the widest possible range of scientific disciplines to students in the first two years of their study. Optional subjects (maths in Gardner's case) could be chosen in the third year.

Gardner was always very keen on philosophy, but he already knew he would not make living as a philosopher [13]: "If you're a professional philosopher, there's no way to make any money except teach. It has no use anywhere." Gardner was sure he did not want to teach - partly this was due to his shyness but also because by then he knew really liked writing. He started occasionally to write some articles for various magazines but he didn't get paid. Then he worked shortly for the *Tulsa Tribune* as an assistant oil editor.

Before World War II he returned to Chicago to work in the public relation office of the *University of Chicago Office of Press Relation*, mainly writing science. During World War II he served for four years in the U. S. Navy. He spent about a year at Madison, Wisconsin, which bad a radio training school there [8]: "I handled public relations for the school, and edited a school newspaper," he described his work. The following three years he served as a yeoman on DE-134[3], a destroyed escort, in the Atlantic.

Figure 3: Martin Gardner in the Navy.

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[2]Caltech or California Institute of Technology is private research university located in Pasadena, California, United States.

[3]USS Pope (DE-134) was an Edsall-class destroyer escort built for the U.S. Navy during World War II. She served in the Atlantic Ocean and provided destroyer escort protection against submarine and air attack for Navy wessels and convoys.

After World War II he went back to the University of Chicago, where he took some graduate courses and started to sell short stories to *Esquire Magazine*. His first story for magazine called "The Horse on the Escalator". It was a humorous and crazy story about a man who collected shaggy dog jokes[4] about horses. Shortly after his first story was published he wrote a second one named No-Sided Professor, in which Gardner explains the basis for topology with the help of the Möbius Strip. He made his living by writing for *Esquire Magazine* for about a year or two. Most stories are collected in the book called *The No-Sided Professor and Other Stories*[5].

In the early 1950s, Gardner moved to New York City and started to work for a children's magazine *Humpty Dumpty*. Not only did he write short stories and various columns, he was also in charge of inventing various paper-folding toys and cutouts for children. He was inspired by magazine called *John Martin's Book* where he found lots of interesting sources (activity features, where you cut things out of the page and fold them into different things, pictures that turn upsidedown, or you hold them up to the light and see through) [4]: "I grew up on this magazine." And these puzzles and folding paper toys had influence on his writing style for the magazine *Scientific American*, where he was employed from 1956 until 1981.

In 1979, Gardner moved with his wife Charlotte to Hendersonville in North Carolina. After her death in 2002, he decided to move to Norman, Oklahoma, where his son lived. In May 22, 2002 he died here.

Figure 4: Martin and with his wife.

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[4]Shaggy dog joke is an extremely long-winded anecdote characterized by extensive narration of typically irrelevant incidents and terminated by an anticlimax or a pointless punchline.
[5]More detailed description we can find in the article [3].

3 Recreational mathematics and Scientific American

I dare say so, what Martin Gardner has done is of far greater originality than work that has won many people Nobel Prizes.

Douglas Hofstadter [22]

3.1 Recreational mathematics

Gardner always tried his best to give the general public insight into mathematics and mathematical research. He though that one of the reasons for unpopularity of mathematics lies in its isolation from the outside world [8]: "Well, that's a tough one, because almost all the really exciting research going on in mathematics is not the sort of thing that the public can understand. It takes considerable knowledge of mathematics to know what the breakthroughs are. And the really big breakthroughs that take place are just-it seems almost impossible to put it in terms that the general public can understand, whereas big breakthroughs in biology and so on are popularized, I think, fairly easily." In this connection he appreciated Sherman Stein's[6] job of popular articles on the subject, and books that the layman can read and understand. Gardner wished more similar mathematicians had written some popular articles and had introduced mathematical research to the public.

The method that Gardner chose to hook the interest in mathematics, was based on the attractiveness of the so-called *recreational mathematics* [8]: "...if they don't make mathematics to a certain degree fun to those first coming to it..." He believed that if mathematics teachers would use some problems from recreational mathematics in their lessons, the interest of their students could be attracted: "...the students are so bored that they get turned off by the topic, especially if the teachers are dull teachers." Gardner defined the term *recreational mathematics* in the very broad sense: "include anything that has a spirit of play about it".

Gardner was not only a "popularizer" of mathematics. American writer and cognitive scientists Douglas Hofstadter[7] considers Gardner's approach and his ways of combining ideas are truly unique and truly creative [22]: "In each column Martin managed to point out some little known but profound issue, and to present it in such a clear (and often humorous) fashion..."

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[6]Sherman Stein (*1953) is a professor emeritus of mathematics at the University of California at Davis. He is the author of books *How the Other Half Thinks: Adventures in Mathematical Reasoning* (McGraw-Hill, 2002), *Strength in Numbers: Discovering the Joy and Power of Mathematics in Everyday Life* (Wiley, 1999) and *Mathematics: The Man-Made Universe* (Dover Publications, 1998) [49].

[7]Douglas Richard Hofstadter (*1945) is an American professor of cognitive scientists of wide interests. In his early career he focused on the logic, mathematics, computer science and other cognitive sciences. Later he got interested in interdisciplinary themes. He produced program in computer modeling of mental processes (he called "artificial intelligence research"). He was appointed adjunct professor of history and philosophy of science, philosophy, comparative literature, and psychology. He is best known for his book *Gödel, Escher, Bach: an Eternal Golden Braid*, first published in 1979. It won both the Pulitzer Prize for general non-fiction, in 1980 [16].

He put special emphasis also on the applications. He held the view that it is necessary to combine mathematics with its applications [8]: "...If the math can be applied somehow thats useful in the childs experience and things can be introduced so theyre challenging and have a play aspect..." With rapidly evolving technology and computers he saw success of popularization of mathematics in conjunction recreational maths with computer programming.

Martin Gardner didn't consider himself a "true mathematician". At the same time he believed that in this lies his advantage [8]: "If I can't understand what I'm writing about, why, my readers can't either." Maybe this is the reason why more people have probably learned more from him. He devoted a lifetime to work with mathematics and we could say that he kept himself busy with recreational mathematics in the U.S. for most of the twentieth century. However, he became really famous for his column entitled Mathematical Games in magazine *Scientific American*.

3.2   Scientific American and other recreational literature with mathematical topics

Everything began in 1952 when Gardner sent off an article on history of logic machines[8] to *Scientific American*. Editors of the magazine were so pleased with the article and they showed interest in an other contribution. So, in December 1956, Gardner published his article on hexaflexagons. A hexaflexagon is a paper model with hexapolygon shape, folded from straight strip of paper. One of the ways to construct such hexaflexagon is shown in the image below. Hexaflexagons have the fascinating property of changing their faces when they are "flexed". When we pinch two adjacent triangles together and push the opposite corner of the hexaflexagon toward to center, the model would open out again, a "budding flower" according to Gardner, and show a completely new face[9].

The article had overwhelmingly positive response from readers. A lot of people were folding hexaflexagon models, drew some motives on them and sent them back to the magazine or some of them were used in advertising. The magazine publisher Gerard Piel did not hesitate a minute to ask for a monthly column but also wanted to know if Martin thought there was enough material to warrant a monthly column. Although Gardner did not own any books on recreational mathematics, he knew that there are a big field out there [8]. His first column called *A new kind of magic square with remarkable properties*[10] appeared in the January 1957 issue and it was called Mathematical Games[11].

Since then the column appeared regularly every month exactly for a quarter of a century. It is remarkable that all this time Gardner was taking care of the articles on his own, as well as inventing new topics, gathering correspondence from his readers and answering to it. Gardner never wanted any assistants. He claimed that he had learned to type fast when being a yeoman in the Navy and

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[8]Logic Machines 186, 68-73, Mar 1952

[9]A detailed description of the construction of hexaflexagon and its other curious property we can find, for example in the book [18].

[10]A new kind of magic square with remarkable properties Jan 1975 (169,1,-)

[11]Note that the initial letters of words in the title of the article are also Gardner's initials.

2) *Fold back at A and then up at B*

1) *Fold back at A and then up at B*

3) *Repeat back and up folds to get the "spiral" strip below*

4) *Fold back*

6) *Tuck this triangle underneath*
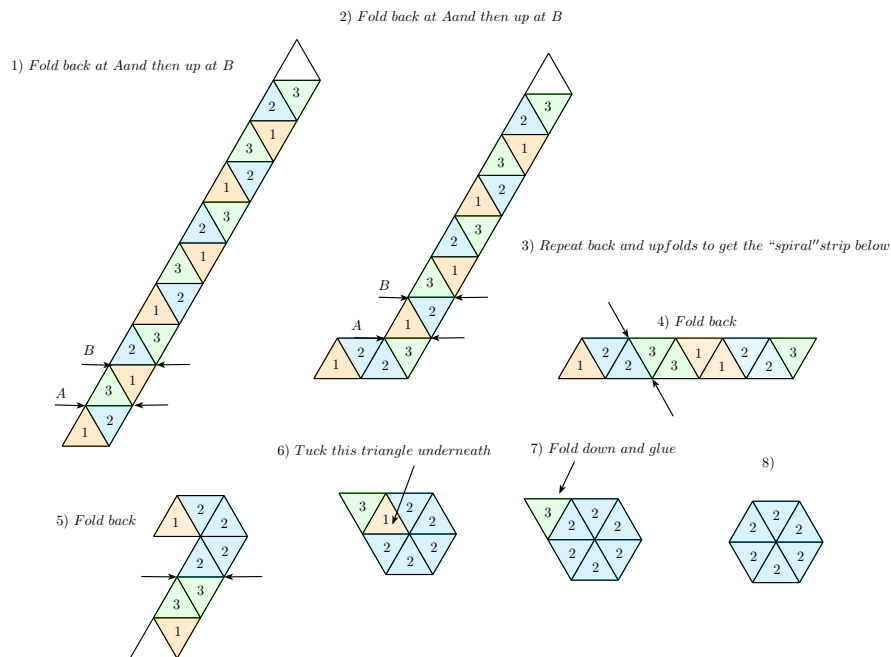
7) *Fold down and glue*

8)

5) *Fold back*

Figure 5: The construction of hexaflexagon

so that it was faster for him to type himself rather than to dictate anything. Only his wife Charlotte was allowed to help him. She proofread for him, checked the text for grammatical errors and spelling.
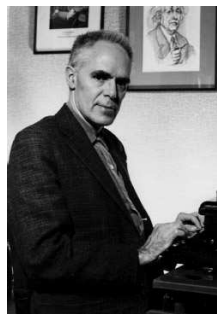
Figure 6: Martin Gardner during the writing

Gardner chose the topics of his column with great care [8]:"I try to pick a topic that is as different as possible from the last few topics; that's one of my criteria in choosing topics, so that I get a maximum variety from month to month," said Gardner. He kept gathering and piling possible future topics over the years. He drew inspiration from some books that came out in the recreational maths field, periodicals (he subscribed to about ten journals), and, of course, from a big correspondence with his readers who sent him ideas [8]: "Once the column

became popular and the people interested in recreational math started reading it, why, they started writing to me. And then if I replied on my own stationery, why then they could write to me directly, and not have to go through Scientific American. So about half the correspondence I get comes through the magazine and about half I get directly." Among his column correspondents were several distinguished mathematicians and scientists as John Horton Conway[12], Persi Diaconis[13], Ron Graham[14], Douglas Hofstadter, Richard Guy[15], Donald Knuth[16], Sol Golomb[17] and Roger Penrose[18].

Gardner particularly enjoyed writing columns where philosophical things were interfering into mathematical issues and the other way round, for example a marvelous paradox called *Newcomb's paradox*. It is a thought experiment (a game) between two players, when one of them claims that he is able to predict the future [19]:

Two closed boxes, B1 and B2, are on a table. B1 contains $1 000. B2 contains either nothing or $1 million. You do not know which. You have an irrevocable choice between two actions:

1. Take what is in both boxes.

2. Take only what is in B2.

At some time before the test a superior Being has made a prediction about what

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[12]John Horton Conway (*1937) is a British mathematician active in the theory of finite groups, knot theory, number theory, combinatorial game theory and coding theory. He has also contributed to many branches of recreational mathematics, notably the invention of the cellular automaton called the *Game of Life* [27].

[13]Persi Diaconis (*1945) is an American mathematician and former professional magician. He is the Mary V. Sunseri Professor of Statistics and Mathematics at Stanford University. He is particularly known for tackling mathematical problems involving randomness and randomization, such as coin flipping and shuffling playing cards [36].

[14]Ronald Graham (*1935) is an American mathematician credited by the *American Mathematical Society* as being "one of the principal architects of the rapid development worldwide of discrete mathematics in recent years". He has done important work in scheduling theory, computational geometry and Ramsey theory [41].

[15]Richard Guy (*1916) is a British mathematician, Professor Emeritus in the Department of Mathematics at the University of Calgary. He is best known for co-authorship of *Winning Ways for your Mathematical Plays* and authorship of *Unsolved Problems in Number Theory*, but he has also published over 100 papers and books covering combinatorial game theory, number theory and graph theory [1].

[16]Donald Knuth (*1938) is an American computer scientist, mathematician, and Professor Emeritus at Stanford University. He is the author of the multi-volume work *The Art of Computer Programming*. Knuth has been called the "father" of the analysis of algorithms [15].

[17]Solomon Golomb (*1932) is an American mathematician, engineer and a professor of electrical engineering at the University of Southern California. He is best known for his works on mathematical games. Most notably he invented *Cheskers* or *Polyominoes* and *Pentominoes*, which were the inspiration for the computer game *Tetris*. He has specialized in problems of combinatorial analysis, number theory, coding theory and communications [47].

[18]Roger Penrose (*1931) is an English mathematical physicist, recreational mathematician and philosopher. He is the Emeritus Rouse Ball Professor of Mathematics at the Mathematical Institute of the University of Oxford, as well as an Emeritus Fellow of Wadham College. He is best known for his scientific work in mathematical physics, in particular for his contributions to general relativity and cosmology [40].

you will decide. If the Being expects you to choose both boxes, he has left B2 empty. If he expects you to take only B2, he has put \$1 million in it. If he expects you to randomize your choice by, say, flipping a coin, he has left B2 empty. In all cases B1 contains \$1 000. What should you do?

Due to the popularity of Gardner's columns many of these articles have been collected in a book *The Scientific American Book of Mathematical Puzzles and Diversions*, published in 1959. Over the next forty years, he published another fourteen books[19].

In 1981, Gardner handed his coulmn over to Douglas Hofstadter. Gardner had so many other writing interests in these days that he felt he could no longer maintain the column. Hofstadter was looking up to Gardner. On one hand he feared being put in Martin Gardner's shoes, but on the other hand he understood if he hadn't taken the chance he would have regretted it later. He didn't want the readers to expect him to copy Gardner's style so he decided to rename the column. So Metamagical Themas (anagram of the earlier title) came to existence.

Hofstadter managed to publish his column regularly for almost three years. But in 1983 he was swamped with work to such an extent, it became clear that he would be unable to continue producing columns at a monthly pace. And so a Canadian mathematician Kee Dewdney[20] took over Hofstadter. The change of the author meant the change of title again. So this time Computer Recreations first saw the light.

In September 1987, a Scottish mathematician Ian Stewart[21] got the opportunity to contribute to this column. Stewart also gratefully accepted the chance of writing articles for *Scientific American*. Although he had never met Martin Gardner, Stewart admitted that was a regular and faithful reader of Gardner's column, since he was sixteen years old [48]: "Every column contained something new to attract my attention, and it was mathematical, and it was fun. There was plenty of room for new ideas and creative thinking. It is probably fair to say that Martin Gardners column was one of the reasons I ended up becoming a mathematician."

In December 1990, there was another change of the column's title. It was renamed the Mathematical Recreations and a few months later Ian Stewart became officially its author. Stewart had problem with choice of the topics. He thought that Martin Gardner had already used loads of interesting themes. He identified himself with Gardner's point of view [43]: "The way to explain math to nonspecialists is to understand it thoroughly yourself, to strip away needless technicalities, and to focus on the central story." And exactly this principle he tried to follow.

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[19]Most Martin Gardner bibliography we can find on the Web side [31].

[20]Alexander Keewatin Dewdney (*1941) is a Canadian mathematician, computer scientist and author who has written a number of books on mathematics, computing, and bad science [6].

[21]Ian Nicholas Stewart (*1945) is a professor of mathematics at the University of Warwick, England, and a widely known popular-science and science-fiction writer [24].

The last one to finish the famous columns was an American mathematician Dennis Shasha[22]. He started to work on the column, which changed its name for the last time in early 2001. The Puzzling Adventures columns were published in print until May 2004, and since the following month the columns were accessible only on the website of the magazine. The very last article was published in June 2009, and then column came to an end.

From 1977 until 1986 Gardner also was contributive to the magazine *Asimov's Science Fiction.* His column was focused primarily on "puzzle tale".

Retirement did not stop Gardner from working. He only focused more on writing scientific literature and updating his older books such as *Origami, Eleuis and the Soma Cube.*

3.3   Gathering for Gardner

Despite the fact that Gardner was very popular among people, he was known for his shy personality. He refused to receive several awards just because he would have to take part in the public ceremony [17]: "I hate going to parties or giving speeches. I love monotony. Nothing pleases me more than to be alone in a room, reading a book or hitting typewriter keys." Once he told Colm Mulcahy [30]: "...I have never given any lecture in my life and most probably I wouldn't know how to do it."

However, in 1993, Atlanta puzzle collector Tom Rodgers persuaded Gardner to attend a special evening occasion devoted to Gardner's puzzle-solving efforts. The event met with roaring success and was repeated in 1996, again with Gardner's presence. No wonder that Rodgers and his friends decided to organize the gathering on regular basis. Since then it has been held every other year (even-numbered) in Atlanta, and the programme consists of any topic which is concerning Gardner and his writing career in any way. The event is named *Gathering for Gardner*, in short G4Gn, when n stands for the number of the event (the 2010 event thus was G4G9) [23]. Gardner attended the 1993 and 1996 events.

4   Pseudoscience

Even when a pseudoscientific theory is completely worthless there is a certain educational value in refuting it.

Martin Gardner [17]

Despite his introverted nature Gardner was considered to be one of the leading polemics against pseudoscientific and fringescientific theories, astounding

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[22]Dennis Shasha is a professor of computer science at the Courant Institute of Mathematical Sciences, a division of New York University. He does research in biological computing (including experimental design), pattern recognition and querying in trees and graphs, pattern discovery in time series, cryptographic file systems, database tuning, and wireless [14].

[23]Detailed event program we can find, for example in the article [12].

discoveries, the paranormal and everything what became later known as *pseudoscience.*

In his articles, he tried to put all these misleading and confusing information appearing in the media straight. He was irritated by boundless human gullibility. He warned scientists that at the time they do not write any popular articles attacking pseudoscience and do not acquaint the general public with scientific discoveries, there is space for pseudoscientists to popularize their dubious discoveries and inventions and it may easily happen that the general public would consider pseudoscience a real science. He believed that if he explained everything rationally, he would be able to influence people's opinions and also mitigate the damage caused by pseudoscientists. "Bad science contributes to the steady dumbing down of our nation", declared Gardner [17].

For many years he tirelessly researched and studied different pseudoinventions and pseudofacts from a scientific view point, and wrote various articles concerning these topics. The first article which had the scent of distrustful spirit and reacted negatively to the results of pseudoscience was called The Hermit Scientist and was published in 1950 in the journal *Antioch Review*. This article wasn't definitely the last one and only two years later he published his first book dealing with these issues entitled *In the Name of Science*. It was a skeptical book by its nature - it explored myriads of dubious outlooks and projects including modern diet, fletcherism[24], creationism[25], Charles Fort[26], Rudolf Steiner[27], scientology[28], dianetics[29], UFOs, dowsing[30], extra-sensory perception[31] and psychokinesis[32]. Not only this book but many others, for example *Science: Good,*

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[24]Fletcherism is a kind of special diets named after Horace Fletcher (1849–1919). The basic tenets of diet were these: one should eat only when genuinely hungry and never when anxious, depressed, or otherwise preoccupied; one may eat any food that appeals to the appetite; one should chew each mouthful of food 32 times or, ideally, until the food liquefies (see [23]).

[25]the belief that the universe and living organisms originate from specific acts of divine creation, as in the biblical account, rather than by natural processes such as evolution [28].

[26]Charles Fort (1874–1932) was an American writer and researcher into anomalous phenomena [10].

[27]Rudolf Joseph Lorenz Steiner (1861–1925) was an Austrian philosopher, social reformer, architect, and esotericist. Steiner gained initial recognition as a literary critic and cultural philosopher. At the beginning of the twentieth century, he founded a spiritual movement, anthroposophy (see [42]). Anthroposophy is a human oriented spiritual philosophy that reflects and speaks to the basic deep spiritual questions of humanity, to our basic artistic needs, to the need to relate to the world out of a scientific attitude of mind, and to the need to develop a relation to the world in complete freedom and based on completely individual judgments and decisions [7].

[28]Scientology a religious system based on the seeking of self-knowledge and spiritual fulfilment through graded courses of study and training. It was founded by American science fiction writer L. Ron Hubbard (191186) in 1955 (see [44]).

[29]Dianetics is a system developed by the founder of the Church of Scientology, L. Ron Hubbard, which aims to relieve psychosomatic disorder by cleansing the mind of harmful mental images. [45].

[30]Dowsing a technique for searching for underground water, minerals, ley lines, or anything invisible, by observing the motion of a pointer (traditionally a forked stick, now often paired bent wires) or the changes in direction of a pendulum, supposedly in response to unseen influences [38].

[31]Extrasensory perception (ESP) involves reception of information not gained through the recognized physical senses but sensed with the mind [34].

[32]Psychokinesis or telekinesis is an alleged psychic ability allowing a person to influence a physical system without physical interaction [39].

Bad and Bogus, (1981); *Order and Surprise*, (1983), *Gardner's Whys & Wherefores*, (1989), caused that number of fierce opponents and critics arose in the fields of fringe science and New Age philosophy, with many of them he kept up in touch (both publicly and privately) for decades.

Another reason for Gardner's uncompromising attitude towards pseudoscience it was its impact on the real science. It often happened that pseudoscientists used some serious scientific discovery, which they interpreted erroneously and applied it as the basis for their pseudoresearch. In the worst case, it became the very opposite - scientists did not recognize a pseudodiscovery was not based on the real facts and they took it seriously. In many cases, they made fools out of themselves.

Gardner wanted to prevent these situations, and so in 1976, he was a founding member of the *Committee for the Scientific Investigation of Claims of the Paranormal*, in short CSICOP[33]. It is to serve as a sort of neutral observer that examines various psychic phenomena from a scientific point of view. From 1983 until 2002 Gardner wrote a column called Notes of a Fringe Watcher (originally Notes of a Psi-Watcher) in magazine *Skeptical Inquirer* (originally *Zeletic*). All the articles were later collectively published in several books. Especially in his old age, Gardner was an excellent sceptic about paranormal phenomena. In August, 2010, Gardner´s contributions in the skeptical field earned him, in memoriam, an award rom the *Independent Investigations Group* on its 10th Gala Anniversary.

5   Religion

During his life Gardner found lifelong fascination for religion. As a youngster he was influenced by a Sunday school teacher and the Seventh-day Adventist Church. Young Gardner became convinced that the Second Coming of Jesus was close [52]:

"I grew up believing that the Bible was a revelation straight from God," he recounted. He had lived in this belief before he began studying at university and met some other points of view on Christianity and religion. University life and some ideas of authors whose books Gardner read slowly weakened his fundamental beliefs. Among these authors belonged e.g. Platon[34], Immanuel Kant[35],

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[33]The mission of the Committee for Skeptical Inquiry is to promote scientific inquiry, critical investigation, and the use of reason in examining controversial and extraordinary claims. More detailed information we can find on the Web site www.csicop.org.

[34]Platon (427 BC – 347 BC) was a philosopher in Classical Greece. He is one of the most important founding figures in Western philosophy. Plato's sophistication as a writer is evident in his Socratic dialogues, his dialogues have been used to teach a range of subjects, including philosophy, logic, ethics, rhetoric, religion and mathematics [37].

[35]Immanuel Kant (1724–1804) was a German philosopher who is widely considered to be a central figure of modern philosophy. He argued that human concepts and categories structure our view of the world and its laws, and that reason is the source of morality [25].

Gilbert Keith Chesterton[36], William James[37], Charles Sanders Pierce[38], Rudolf Carnap[39] and Herbert George Wells[40]. Gardner tried to catch pearls of wisdom from every single one of them [52]: "From Chesterton I got a sense of mystery in the universe...", he explained. "From Wells I took his tremendous interest in and respect for science. That's why I do not accept the virgin birth of Christ or a blood atonement for the sin of Adam and Eve." Gardner was also inspired by the theology of a Spanish philosopher Miguel de Unamuno[41] According to Unamuno belief in God and the desire for immortality were as important as any scientific and rational view of the world. He claimed that one feels the need for faith in God and at the same time he yearns for recognition of his personality as an individual [33]: "the most tragic problem of philosophy is to combine the intellectual with the emotional needs, and also with free will."

With highest respect to all religious convictions Gardner described his own belief as *philosophical theism* [9]: "I am a philosophical theist. I believe in a personal god, and I believe in an afterlife, and I believe in prayer, but I dont believe in any established religion."

Gardner professed his faith in God as creator, but criticized and rejected everything which was beyond human understanding: God's revelation, prophecy, miracles, the authority of the Church. Despite all the criticism of the Church he believed in God and asserted that this belief cannot be confirmed or denied by science. At the same time, he was sceptical about claims that God has communicated with human beings through spoken or telepathic revelation or through miracles in the natural world [30]: "There is nothing supernatural, and nothing in human reason or visible in the world to compel people to believe in any gods. The mystery of existence is enchanting, but a belief in *The Old One* comes from faith without evidence. However, with faith and prayer people can find greater happiness than without."

Gardner often compared parapsychology with religion in his comments, and

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[36]Gilbert Keith Chesterton (1874–1936) was an English writer,lay theologian, poet, dramatist, journalist, orator, literary and art critic, biographer, and Christian apologist [20].

[37]William James (1842–1910) was an American philosopher and psychologist who was also trained as a physician. James was one of the leading thinkers of the late nineteenth century and is believed by many to be one of the most influential philosophers the United States has ever produced, while others have labelled him the "Father of American psychology". He is considered to be one of the greatest figures associated with the philosophical school known as pragmatism [51].

[38]Charles Sanders Peirce (1839–1914) was an American philosopher, logician, mathematician, and scientist, sometimes known as "the father of pragmatism". He is appreciated largely for his contributions to logic, mathematics, philosophy, scientific methodology, and semiotics, and for his founding of pragmatism [11].

[39]Rudolf Carnap (1891–1970) was a German philosopher, mathematician and logician. He made significant contributions to philosophy of science, philosophy of language, the theory of probability, inductive logic and modal logic [35].

[40]Herbert George Wells (1866–1946) was an English writer, now best known for his work in the science fiction genre (see [21]).

[41]Miguel de Unamuno (1864–1936) is a Spanish writer, philosopher and one of the main leaders of the Group Generation 98. The central theme of his essays and poetry is faith. He touched topics such as finding personal spirituality, mental anguish, time, death, pain caused by confidentiality God and others. Second quote is from his the most famous book *Del sentimiento trágico de la vida*, published in 1913. Other information we can find, for example on the Web side [33].

claimed that he considered parapsychology and other researches on paranormal phenomena completely the same as "God temptation" and "looking for signs and wonders".

His attitude towards religion is best explained and described in his novel with autobilgraphical features *The Flight of Peter Fromm*[42] of 1973. This novel is not purely autobiographical, because Gardner does not identify himself with Peter, the main character. Nevertheless, the main character goes through the same changes of his own faith as Gardner which makes the book partly autobiographical.

6 Magic

Apart from brain teasers and puzzles Gardner expressed his interest in magic from his early age. Magic was hobby of his father who showed him some magic tricks (see [2]): "I learned my first tricks from him, in particular one with knife and little pieces of paper on it..." Gardner never made a living by magic. He only got paid once for doing magic at the occasion of presenting Gilbert´s magic set at the Marshall Field department store[43].

It is no surprise that Gardner prefered tricks with a touch of maths, particularly those that are breaking topological laws [2]: "The most important thing is to startle people, and have them wonder how it's done." Close-up magic is very different from the stage illusion that David Copperfield does. In close-up magic or micromagic hold true that "hands must be always quicker than eye".

It is not surprising that Gardner preferred tricks with a mathematical flavor and especially those that they are violating topological laws [2]: "In recent years magicians have gotten interested in rubben band tricks that are all topologically based... I did a book for Dover Publications on mathematical tricks that has a chapter on topological tricks."

Gardner wrote two voluminous books for magicians: *The Encyclopedia of Impromptu Magic* and *Martin Gardner Presents*. Both books have about five hundred pages where original tricks with cards, matches, dices, coins or mental magic tricks can be found.

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[42]Character of novel is better explained in the article [8] and [3].

[43]Alfred Carlton Gilbert (1884–1961) was an American scientist, inventor, illusionist, athlete and scholar. Gilbert turned to magic by his studies at Yale. He began performing illusions on street corners and in shop windows. At these performances, Gilbert sold tricks and magic kits to his audience. He developed a local following and the Mysto Manufacturing Company became interested in publishing his magic toys. In 1990, Gilbert collaborated with the New Haven-based company to produce fis first toy, the Mysto Magic Set [46].

7 Literature

Gardner was considered a leading expert on Lewise Carroll[44]. They both shared love for mathematics, puzzles, formal logic and conjuring. Carroll was delighted to do simple magic tricks for his little audience and often took children to magic performances or wrote books for children. Among his best-known books belong *Alice's Adventures in Wonderland* and *Through the Looking Glass.* Although it might seem that it is just a fairy tale, in fact, both Alice books are full of logical and mathematical tricks and wordplays. Gardner admitted that he appreciated the depth of Carroll's stories when he was a grown-up [5]: "I did not discover the richness of this kind of humor in the Alice books until I was in my twenties, but since then I have felt a close kinship with Carroll."

In 1960, Martin Gardner published his annotated version of both Alice stories. Garnder revealed and explained all the mathematical riddles, wordplays, and literary references hidden in the Alice books. Later Gardner published a follow-up book with new annotations called *More Annotated Alice* and in 1999, the last edition combining the notes from earlier editions and new pieces of knowledge *The Annotated Alice: The Definitive Edition* was released.

Over the years Gardner's annotated Alice book has become a best seller [8]: "I was lucky there in that I really didn't have anything new to say much in The Annotated Alice, because I just looked over the literature and pulled together everything in the form of footnotes in the book. But it was a lucky idea because thats been the best seller of all my books." In following years more editions of the book appeared and it was translated into many languages.

Figure 7: Martin Gardner with Alice in Central Park

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[44]Charles Lutwidge Dodgson (1832–1898), better known by his pen name, Lewis Carroll, was an English writer, mathematician, logician, Anglican deacon and photographer. His most famous writing are *Alice's Adventures in Wonderland* and its sequel *Through the Looking Glass and What Alice Found There*), as well as the poems "The Hunting of the Snark", all examples of the genre of literary nonsense [29].

From childhood Gardner fell in love with the books by Lyman Frank Baum about *The Wizard of Oz*. He wrote several forewords in additional issues of Baum's books and in 1998 Gardner published his own book called *Visitors From Oz*. Although Gardner's Visitors from Oz is an imitation of Baum's Wizzard of Oz book, again, he added some mathematics into it. Gardner made use of Klein's bottle, which appears throughout the story, as a magical feature for transition between parallel worlds[45].

Apart from Alice books Gardner published annotated edition of the books by Gilbert Keith Chesterton *The Innocence Of Father Brown* and *The Man Who Was Thursday*. He also commented on famous poems e.g. *The Rime of the Ancient Mariner, Casey at the Bat, The Night Before Christmas* and *The Hunting of the Snark* too.

Over the years he was expressing his concerns with many present-day problems. In 1993 he described his philosophical opinions and attitudes in his book *The Whys of a Philosophical Scrivener* [5]: "It is my favorite because it is a detailed account of everything I believe... Well, the book is controversial because almost everybody who believes in a personal god is into an established religion." Later Gardner harshly panned his own book in a review written under the pseudonym George Groth for *New York Review of Book* [52]: "I heard that people read the review and didn't buy the book on my recommendation."

After Martin Gardner's death his autobiographical book under title *Undiluted Hocus-Pocus* was released. The book was meant as a present for his fans. There are no dramatic revelations to be found, it only summarizes the story of his life, ideas and beliefs.

8   Closing

Martin Gardner was a man of wide interests. He was passionate about all types of paradox and revealing secrets. His columns and writings are unique considering constant novelty of human thoughts. He managed to get freed from expected patterns of thoughts, broke seemingy-solid laws, and discovered unexpected connections and revelations.

He died at the age of 95 and there is no doubt that he attracted many people of all ages to recreational mathematics during his lifetime. His infectious enthusiasm and brilliant choice of topics are unrivalled. There were plenty of those who tried to emulate him, but nobody has succeeded. American mathematics Douglas Hofstadter paid Martin Gardner a compliment saying [13]: "...is one of the great intellects produced in this country in the 20th century".

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