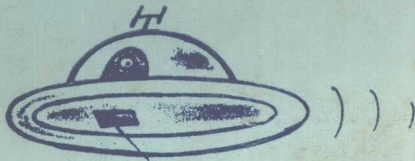




OXFORD

Martin Gardner

PUZZLES
from
OTHER WORLDS



Fantastical
brainteasers from
*Isaac Asimov's
Science Fiction
Magazine*



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PUZZLES
FROM
OTHER
WORLDS



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Martin Gardner

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FOREWORD

Since *Isaac Asimov's Science Fiction Magazine* started in 1976, I have had the pleasure and honor of contributing to each issue a puzzle clothed in a science-fiction or fantasy story line. The first thirty-six of these vignettes were published in 1981 as *Science Fiction Puzzle Tales*. This book reprints the next thirty-seven. As in the previous collection, I have added to the final answers some additional comments about whatever I think will most interest readers. In many cases these remarks derive from pleasant correspondence with readers of Asimov's magazine.

Almost every puzzle leads to a second and related puzzle, which in turn usually leads to a third, and occasionally to a fourth. The answers on all four levels are gathered at the back of the book, where they are numbered to correspond with the problems. Needless to add, you will get much more fun as well as instruction from the book if you try seriously to solve each puzzle before you turn to its solution.

—MARTIN GARDNER

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SCIENCE: GOOD, BAD AND BOGUS

Martin Gardner

Martin Gardner, whose 'Mathematical Games' column has amused and puzzled readers of *Scientific American* for many years, is an unrivalled master of the art of deflating the pseudo-scientific and crackpot ideas that have run riot in the last few decades. In this book he applies his considerable wit to the examination of such phenomena as biorhythms, ESP, psychokinesis, faith-healing, and psychic surgery.

'Absolutely fascinating!' Isaac Asimov

ORDER AND SURPRISE

Martin Gardner

During a career spanning more than fifty years, Martin Gardner has proved himself a fine science popularizer and a tireless champion of reason. This book includes essays on a whole range of subjects, from propaganda art and Santa Claus to word play and quantum mechanics; and reviews of the works of Orwell, Eysenck, Lewis Carroll, and many others. It will delight old Gardner fans and captivate new ones.

THE WHYS OF A PHILOSOPHICAL SCRIVENER

Martin Gardner

Unlike many modern thinkers Martin Gardner considers himself a philosophical theist, and convincingly argues that 'one can be a theist, with all that faith in a personal God entails, and at the same time combine theism with the utmost respect for reason and science'.

In this book Gardner takes the reader on a philosophical journey, in the course of which he defends with skill, humour, and erudition his strong opinions on the problems and dilemmas of classical philosophy. The result is a remarkable personal confession, often entertainingly satirical, by a man who, though devoted to scientifically ascertainable fact, can still find science and life surrounded by, and interfused with, vast and impenetrable mystery.

'It is always interesting to witness the thinking of a clever and knowledgeable man.' Peter Medawar, *New Scientist*

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From Darwin on evolution to Einstein on relativity, covering subjects as diverse as science and literature, the sea, the laws of physics, the beautiful woman, logic, and the life of the bee, this is a lively collection of essays by some leading interpreters of science.

Contributors include: Isaac Asimov, Rachel Carson, Charles Darwin, Albert Einstein, Sigmund Freud, Stephen Jay Gould, Bertrand Russell, Carl Sagan, Lewis Thomas, and H. G. Wells.

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PUZZLES

BUJILES

CHESS BY RAY AND SMULL

Two young mathematicians in the computer shack of the spaceship *Bagel*, Ray and Smull, were enjoying a few hours of leisure by inventing unusual chess games to play with VOZ, the ship's computer.

"I've got a great idea," said Ray. "We'll ask VOZ to put the five black pieces—king, queen, bishop, knight, and rook—on five randomly selected squares of the board. We'll tell him not to display the pieces on the screen, but only to star the five cells where he puts them. You and I will sit at two consoles and wear earphones so each of us can ask VOZ questions, but neither of us can hear what he says to the other."

"And so?" said Smull.

"Each question," Ray went on, "will be about any designated square of the board. We'll ask VOZ how many pieces are attacking that cell."

"Can we ask about a starred cell?"

"Certainly. Of course no piece attacks the cell it is on. If we ask about a starred cell, the answer can be 0, 1, 2, 3, or 4. If we ask about an empty cell, it can be 0, 1, 2, 3, 4, or 5. Instead of asking how many pieces attack a cell, we can ask if a certain piece is on a certain cell. To such questions VOZ will answer yes or no."

"I think I can anticipate," said Smull. "VOZ will keep a record of the number of questions we each ask until we have determined the positions of all five pieces. Whoever asked the fewest questions is the winner."

"You've got it!" said Ray. "It's a sort of chessboard version of the old twentieth-century game of Master Mind."

The two men soon became fascinated by the game, even though VOZ complained that it was trivial and a big waste of his valuable time. In the course of their play they discovered a number of remarkable problems. For example, consider the computer display shown in Figure 1.

FIGURE 1

8				*				
7	2					*		
6								
5		*					2	
4								
3			*		*			
2								
1				2				
	a	b	c	d	e	f	g	h

The five pieces are on the starred cells. VOZ has indicated that three other squares are each attacked by just two pieces. This information is all you need to determine which piece is on which starred cell. It's a fine exercise in chess logic. You are urged to try to solve it before checking the answer.

2

THE POLYBUGS OF TITAN

After the spaceship *Bagel* returned from its last mission, the crew enjoyed a month's vacation on Earth before the ship embarked again. Its new mission was to land on Titan, the largest of Saturn's moons, to determine what sort of life, if any, flourished beneath the satellite's thick cover of yellow clouds.

The trip to Titan was uneventful. The *Bagel* made a cautious landing on the side of the moon facing Saturn. Larc Snaag, the ship's captain, and Stanley G. Winetree, an exobiologist, were the first to venture outside the ship.

"What a cold, gloomy world!" exclaimed Snaag as they tramped slowly across a gooey surface between pools of liquid nitrogen. Looking up through the dense nitrogen atmosphere, they could barely make out the huge outline of Saturn and its rings even though the planet was almost wholly illuminated by the sun.

"Halloo! What's this?" shouted Winetree, lowering his head so that a bright beam of light from the top of his space helmet was directed downward. Myriads of tiny life-forms, all gray in color, were scurrying about over the black goo like a swarm of ants.

With the gloved hand of his spacesuit, Winetree scooped about a thousand of the little creatures into the large specimen box he was carrying. Back in the *Bagel's* biochem lab, close inspection of the life-forms disclosed some astonishing facts. Each body was a hard crystal, about half a centimeter in diameter, in the shape of a perfectly formed convex polyhedron! The appendages, which served as

legs, varied in number from six to twenty. There were no indications on the body of eyes or a mouth.

A convex polyhedron is a solid with flat polygon faces. Convex means that if any two points in or on the solid are joined by a straight line, the line is wholly in or on the solid. All of Titan's "polybugs," as Winetree named them, were "simple." This means there were no holes going through them.

Every conceivable variety of polyhedron with no more than 30 edges seemed to be represented. Careful examination of the polybugs in the collected sample disclosed that the number of edges on a polybug could be any number from 6 through 30 with just one exception—the number 7.

"I can't understand it," said Winetree to Ronald Couth, the ship's top mathematician. "I know the simplest polyhedron is a tetrahedron. It has 4 corners, 4 faces, and 6 edges. Lots of our polybugs are tetrahedrons. And lots of others have 8 edges. Why not 7?"

Couth broke into a laugh. "You've forgotten your elementary solid geometry, Stan," he said. Then he went on to explain why no polybug had 7 edges. What was his explanation?

3

CRACKER'S PARALLEL WORLD

"You mean," exclaimed Ada Loveface, "there really *are* parallel worlds?"

"The evidence is overwhelming," said Professor Alexander Graham Cracker. "I know you like classic science fiction, so you must have read H. G. Wells's great utopia novel *Men Like Gods*. If so, you may recall that his protagonist, Mr. Barnstaple, along with several other persons, gets transported to a parallel earth with a history almost the same as ours, but not quite."

"I know the book well," said Ada. "Wells modeled his Rupert Catskill on Winston Churchill, and Father Amerton on Gilbert Chesterton. Most science-fiction fans don't know that."

"To tell you the truth," said Cracker, looking surprised, "I didn't know it. I'll have to read the book again sometime. Anyway, you'll be pleased to know I've discovered a way of entering parallel worlds provided they're no more than half a centimeter away from us along the fourth space coordinate."

At that time Cracker was a research physicist at Columbia University, in Manhattan, and Miss Loveface was his companion and top assistant. It took six months to construct the parallel-world machine, with its ingenious hyperspace Dean drive, and to surround it with supercooled superconductors capable of creating a magnetic field strong enough to allow the drive to displace the machine half a centimeter through 4-space.

Ada joined Cracker in their first test. They squeezed

PUZZLES

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