From: The Man Who Loved Only Numbers, by Paul Hoffman (Hyperion, 1998) pp. 233-236

6

GETTING THE GOAT

> My only advice is, if you can get me to offer you $5,000 not to open the door, take the money and go home.
>
> —Monty Hall

Although numbers were Erdős's intimate friends, he did occasionally misjudge them. Good as he was, his intuition was not always perfect. Indeed, the last time he visited Vázsonyi, at his retirement home in California's wine country, he tripped up on a tricky brain teaser posed in "Ask Marilyn," Marilyn vos Savant's column in *Parade* magazine. Flashy and confident, vos Savant is someone professional mathematicians love to hate. She bills herself as the person with the "Highest IQ" ever recorded, a whopping 228, according to *The Guinness Book of World Records*. She sports a wedding ring of pyrolytic carbon, a special material used in the Jarvik artificial heart, which was invented by her husband, Robert Jarvik. Her reputation in the mathematics community was not helped by her book *The World's Most Famous Math Problem* (1993), in which she questions Wiles's proof of Fermat's Last Theorem and Einstein's theory of relativity. "Ask Marilyn" has been described as a

kind of "Hints from Heloise" for the mind, with lots of mathematics thrown in. Some of the dislike for her stems from puzzle envy: Her *Parade* column is read by millions every Sunday, and the accompanying books and speaking engagements have earned her a good living. Many professional mathematicians, on the other hand, have not earned a cent from their books.

In her column for September 9, 1990, vos Savant answered a well-known brain teaser submitted by one of her readers. You're on a game show and you're given the choice of three doors. Behind one door is a car, behind the other two are goats. You choose, say, door 1, and the host, who knows where the car is, opens another door, behind which is a goat. He now gives you the choice of sticking with door 1 or switching to the other door? What should you do?

This was the so-called Monty Hall dilemma faced by guests on Monty Hall's classic TV game show *Let's Make a Deal*, only the consolation prizes weren't goats. Vos Savant advised her correspondent to switch doors. Sticking with the first choice gives a one-third chance of winning, she said, but switching doubles the odds to two-thirds. To convince her readers, she asked them to imagine a million doors. "You pick door No. 1," she said. "Then the host, who knows what's behind the doors and will always avoid the one with the prize, opens them all except door No. 777,777. You'd switch to the door pretty fast, wouldn't you?"

Evidently not. No sooner had her column appeared than she was besieged by mail from readers who disagreed, including many mathematicians. They maintained the odds were only fifty-fifty, not two-thirds, in favor of switching. In her December 2, 1990, column vos Savant ran some of the letters:

As a professional mathematician, I'm very concerned with the general public's lack of mathematical skills. Please help by confessing your error. . . .

Robert Sachs, Ph.D., George Mason University

You blew it, and you blew it big! I'll explain: After the host reveals a goat, you now have a one-in-two chance of being correct. Whether you change your answer or not, the odds are the same. There is enough mathematical illiteracy in this country, and we don't need the world's highest IQ propagating more. Shame!

Scott Smith, Ph.D., University of Florida

This time, to drive her analysis home, vos Savant made a table that exhaustively listed the six possible outcomes:

Door 1	Door 2	Door 3	Outcome *(choose No. 1 and stick with No. 1)*
Car	Goat	Goat	Win
Goat	Car	Goat	Lose
Goat	Goat	Car	Lose

Door 1	Door 2	Door 3	Outcome *(choose No. 1 and switch)*
Car	Goat	Goat	Lose
Goat	Car	Goat	Win
Goat	Goat	Car	Win

The table demonstrates, she wrote, that "when you switch, you win two out of three times and lose one time in three; but when you don't switch, you only win one in three times."

But the table did not silence her critics. In a third column on the subject (February 17, 1991), she said the thousands of letters she received were running nine to one against her and included rebukes from a statistician at the National Institutes of Health and the deputy director of the Center for Defense Information. The letters had gotten shrill, with suggestions that she was the goat and that women look at mathematical problems differently from men. "You are utterly incorrect about the game-show question," wrote E. Ray Bobo, a Ph.D. at Georgetown, "and I hope this controversy will call some public attention to the serious national crisis in mathematical education. If you can admit your error, you will have contributed constructively toward the solution to a deplorable situation. How many irate mathematicians are needed to get you to change your mind?"

"When reality clashes so violently with intuition," vos Savant responded in her column, "people are shaken." This time she tried another tack. Imagine, she said, that just after the host opened the door, revealing a goat, a UFO lands on the game-show stage, and a little green woman emerges. Without knowing what door you originally chose, she is asked to choose one of the two unopened doors. The odds that she'll randomly choose the car are fifty-fifty. "But that's because she lacks the advantage the original contestant had—the help of the host. . . . If the prize is behind No. 2, the host shows you No. 3; and if the prize is behind No. 3, the host shows you No. 2. So when you switch, you win if the prize is behind No. 2 *or* No. 3. *YOU WIN EITHER WAY!* But if you *don't* switch, you win only if the prize is behind door No. 1." Vos Savant was completely correct, as mathematicians with egg on their faces ultimately had to admit.