# **Super-Neutron**

Isaac Asimov

It was at the seventeenth meeting of the Honorable Society of Ananias that we got the greatest scare of our collective lives and consequently elected Gilbert Hayes to the office of Perpetual President.

The Society is not a large one. Before the election of Hayes there were only four of us: John Sebastian, Simon Murfree, Morris Levin and myself. On the first Sunday of every month we met at luncheon, and on these monthly occasions justified our Society’s title by gambling the dinner check on our ability to lie.

It was quite a complicated process, with strict Parliamentary rules. One member spun a yarn each meeting as his turn came up, and two conditions had to be adhered to. His story had to be an outrageous, complicated, fantastic lie; and, it had to sound like the truth. Members were allowed to-and did-attack any and every point of the story by asking questions or demanding explanations.

Woe to the narrator who did not answer all questions immediately, or who, in answering, involved himself in a contradiction. The dinner-check was his! Financial loss was slight; but the disgrace was great.

And then came that seventeenth meeting-and Gilbert Hayes. Hayes was one of several non-members who attended occasionally to listen to the after-dinner whopper, paying his own check, and, of course, being forbidden to participate; but on this occasion he was the only one present aside from the regular members.

Dinner was over, I had been voted into the chair (it was my regular turn to preside), and the minutes had been read, when Hayes leaned forward and said quietly, “I’d like a chance today, gentlemen.”

I frowned, “In the eyes of the Society you are non-existent, Mr. Hayes. It is impossible for you to take part.”

“Then just let me make a statement, “ he rejoined. “The Solar System is coming to an end at exactly seventeen and a half minutes after two this afternoon.”

There was a devil of a stir, and I looked at the electric clock over the television receiver. It was 1:14 P.M.

I said hesitantly, “If you have anything to substantiate that extraordinary statement, it should be most interesting. It is Mr. Levin’s turn today, but if he is willing to waive it, and if the rest of the Society agrees—”

Levin smiled and nodded, and the others joined in.

I banged the gavel, “Mr. Hayes has the floor.”

Hayes lit his cigar and gazed at it pensively. “I have little more than an hour, gentlemen, but I’ll start at the beginning-which is about fifteen years ago. At that time, though I’ve resigned since, I was an astrophysicist at Yerkes Observatory-young, but promising. I was hot on the trail of the solution to one of the perennial puzzles of astrophysics-the source of the cosmic rays-and full of ambition.”

He paused, and continued in a different tone, “You know, it is strange that with all our scientific advance in the last two centuries we have never found either that mysterious source or the equally mysterious reason for the explosion of a star. They are the two eternal puzzles and we know as little about them today as we did in the days of Einstein, Eddington, and Millikan.

“Still, as I say, I thought I had the cosmic ray by the tail, so I set out to check my ideas by observation, and for that I had to go out in space. It wasn’t, however, as easy as all that. It was in 2129, you see, just after the last war, and the Observatory was about broke-as weren’t we all?

“I made the best of it. I hired an old second-hand ‘07 model, piled my apparatus in, and set out alone. What’s more, I had to sneak out of port without clearance papers, not wishing to go through the red tape the occupation army would have put me through. It was illegal, but I wanted my data-so I headed out at a right angle to the ecliptic, in the direction of the South Celestial Pole, approximately, and left Sol a billion miles behind me.

“The voyage I made, and the data I collected are unimportant. I never reported one or the other. It was the planet I found that makes the story.”

At this point, Murfree raised those bushy eyebrows of his and grunted, “I would like to warn the gentleman, Mr. Chairman. No member has yet escaped with his skin with a phony planet.”

Hayes smiled grimly, “I’ll take my chance. -To continue; it was on the eighteenth day of my trip that I first detected the planet, as a little orange disc the size of a pea. Naturally, a planet in that region of space is something of a sensation. I headed for it; and immediately discovered that I had not even scratched the surface of that planet’s queerness. To exist there at all was phenomenal-but it likewise possessed absolutely no gravitational field.”

Levin’s wine-glass crashed to the floor. “Mr. Chairman,” he gasped, “I demand the gentleman’s immediate disqualification. No mass can exist without distorting the space in its neighborhood and thus creating a gravitational field He has made an impossible statement, and should therefore be disqualified.” His face was an angry red.

But Hayes held his hand up, “I demand time, Mr. Chairman. The explanation will be forthcoming in due course. To make it now would only complicate things. Please, may I continue?”

I considered, “In view of the nature of your story, I am disposed to be lenient. Delay is granted, but please remember that an explanation will be required eventually. You will lose without it.”

“All right, “ said Hayes. “For the present, you will have to accept my statement that the planet had no gravity at all. That is definite, for I had complete astronomical equipment upon my ship, and though my instruments were very sensitive, they registered a dead zero.

“It worked the other way around as well, for the planet was not affected by the gravity of other masses. Again, I stress the point that it was not affected at all. This I was not able to determine at the time, but subsequent observation over a period of years, showed that the planet was traveling in a straight-line orbit and at a constant speed. As it was well within the sun’s influence, the fact that its orbit was neither elliptical nor hyperbolic, and that, though approaching the sun, it was not accelerating, showed definitely that it was independent of solar gravity.”

“Wait a while, Hayes.” Sebastian scowled till his gold premolar gleamed. “What held this wonderful planet together? Without gravity, why didn’t it break up and drift apart?”

“Sheer inertia, for one thing!” was the immediate retort. “There was nothing to pull it apart. A collision with another body of comparable size might have done it-leaving out of consideration the possibility of the existence of some other binding force peculiar to the planet “

He sighed and continued, “That doesn’t finish the properties of the body. Its red-orange color and its low reflective power, or albedo, set me on another track, and I made the astonishing discovery that the planet was entirely transparent to the whole electro-magnetic spectrum from radio waves to cosmic rays. It was only in the region of the red and yellow portion of the visible-light octave that it was reasonably opaque. Hence, its color.”

“Why was this?” demanded Murfree.

Hayes looked at me, “That is an unreasonable question, Mr. chairman. I maintain that I might as well be asked to explain why glass is entirely transparent to anything above or below the ultra-violet region, so that heat, light, and X-rays pass through, while it remains opaque to ultra-violet light itself. This sort of thing is a property of the substance itself and must be accepted as such without explanation.”

I whacked my gavel, “Question declared improper!”

“I object,” declared Murfree. “Hayes missed the point Nothing is perfectly transparent Glass of sufficient thickness will stop even cosmic rays. Do you mean to say that blue light would pass through an entire planet, or heat, for instance?”

“Why not?” replied Hayes. “That perfect transparency does not exist in your experience does not mean it does not exist altogether. There is certainly no scientific law to that effect This planet was perfectly transparent except for one small region of the spectrum. That’s a definite fact of observation.”

My gavel thumped again, “Explanation declared sufficient Continue, Hayes.”

His cigar had gone out and he paused to relight Then, “In other respects, the planet was normal. It was not quite the size of Saturn-perhaps half way in diameter between it and Neptune. Subsequent experiments showed it to possess mass, though it was hard to find out how much-certainly more than twice Earth’s. With mass, it possessed the usual properties of inertia and momentum-but no gravity.”

It was 1:35 now.

Hayes followed my eyes and said, “Yes, only three-quarters of an hour is left. I’ll hurry!...Naturally, this queer planet set me to thinking, and that, together with the fact that I had already been evolving certain theories concerning cosmic rays and novae, led to an interesting solution.”

He drew a deep breath, “Imagine-if you can-our cosmos as a cloud of-well, super-atoms which—”

“I beg your pardon,” exclaimed Sebastian, rising to his feet, “are you intending to base any of your explanation on drawing analogies between stars and atoms, or between solar systems and electronic orbits?”

“Why do you ask?” questioned Hayes, quietly. “Because if you do, I demand immediate disqualification. The belief that atoms are miniature solar systems is in a class with the Ptolemaic scheme of the universe. The idea has never been accepted by responsible scientists even at the very dawn of the atomic theory.”

I nodded, “The gentleman is correct. No such analogy will be permitted as part of the explanation.”

“I object,” said Hayes. “In your school course in elementary physics or chemistry, you will remember that in the study of the properties of gases, it was often pretended, for the sake of illustrating a point, that the gas molecules were tiny billiard balls. Does that mean that gas molecules are billiard balls?”

“No,” admitted Sebastian.

“It only means,” drove on Hayes, “that gas molecules act similarly to billiard balls in some ways. Therefore the actions of one are better visualized by studying the actions of the other. -Well, then, I am only trying to point out a phenomenon in our universe of stars, and for the sake of ease of visualization, I compare it to a similar, and better-known, phenomenon in the world of atoms. That does not mean that stars are magnified atoms.”

I was won over. “The point is well-taken,” I said. “You may continue with your explanation, but if it is the judgment of the chair that the analogy becomes a false one, you will be disqualified.”

“Good,” agreed Hayes, “but we’ll pass on to another point for a moment. Do any of you remember the first atomic power plants of a hundred and seventy years ago and how they operated?”

“I believe,” muttered Levin, “that they used the classical uranium fission method for power. They bombarded uranium with slow neutrons and split it up into masurium, barium, gamma rays and more neutrons, thus establishing a cyclic process.”

“That’s right! Well, imagine that the stellar universe acted in ways-mind you, this is a metaphor, and not to be taken literally-like a body composed of uranium atoms, and imagine this stellar universe to be bombarded from without by objects which might act in some ways similar to the way neutrons act on an atomic scale.

“Such a super-neutron, hitting a sun, would cause that sun to explode into radiation and more super-neutrons. In other words, you would have a nova.” He looked around for disagreement.

“What justification have you for that idea?” demanded Levin.

“Two; one logical, and one observational. Logic first. Stars are essentially in matter-energy equilibrium, yet suddenly, with no observable change, either spectral or otherwise, they occasionally explode. An explosion indicates instability, but where? Not within the star, for it had been in equilibrium for millions of years. Not from a point within the universe, for novae occur in even concentration throughout the universe. Hence, by elimination, only from a point outside the universe.

“Secondly, observation. I came across one of these super-neutrons!”

Said Murfree indignantly: “I suppose you mean that gravitationless planet you came across?”

“That’s right.”

“Then what makes you think it’s a super-neutron? You can’t use your theory as proof, because you’re using the super-neutron itself to bolster the theory. We’re not allowed to argue in circles here.”

“I know that,” declared Hayes, stiffly. “I’ll resort to logic again. The world of atoms possesses a cohesive force in the electro-magnetic charge on electrons and protons. The world of stars possesses a cohesive force in gravity. The two forces are only alike in a very general manner. For instance, there are two kinds of electrical charges, positive and negative, but only one kind of gravity-and innumerable minor differences. Still, an analogy this far seems to me to be permissible. A neutron on an atomic scale is a mass without the atomic cohesive force-electric charge. A super-neutron on a stellar scale ought to be a mass without the stellar cohesive force-gravity. Therefore, if I find a body without gravity, it seems reasonable to assume it to be a super-neutron.”

“Do you consider that a rigorously scientific proof?” asked Sebastian sarcastically.

“No,” admitted Hayes, “but it is logical, conflicts with no scientific fact I know of, and works out to form a consistent explanation of novae. That should be enough for our purpose at present.”

Murfree was gazing hard at his fingernails, “And just where is this superneutron of yours heading?”

“I see you anticipate,” said Hayes, sombrely. “It was what I asked myself at the time. At 2:09Y2 today it hits the sun square, and eight minutes later, the radiation resulting from the explosion will sweep Earth to oblivion.”

“Why didn’t you report all this?” barked Sebastian.

“Where was the use? There was nothing to be done about it. We can’t handle astronomical masses. All the power available on Earth would not have sufficed to swerve that great body from its path. There was no escape within the Solar System itself, for Neptune and Pluto will turn gaseous along with the other planets, and interstellar travel is as yet impossible. Since man cannot exist independently in space, he is doomed.

“Why tell of all this? What would result after I had convinced them that the death warrant was signed? Suicides, crime waves, orgies, messiahs, evangelists, and everything bad and futile you could think of. And after all, is death by nova so bad? It is instantaneous and clean. At 2:17 you’re here. At 2:18 you are a mass of attenuated gas. It is so quick and easy a death, it is almost not death.”

There was a long silence after this. I felt uneasy. There are lies and lies, but this sounded like the real thing. Hayes didn’t have that little quirk of the lip or that little gleam in the eye which marks the triumph of putting over a good one. He was deadly, deadly serious. I could see the others felt the same. Levin was gulping at his wine, hand shaking.

Finally, Sebastian coughed loudly, “How long ago did you discover this super-neutron and where?”

“Fifteen years ago, a billion miles or better from the sun.”

“And all that time it has been approaching the sun?”

“Yes; at a constant speed of two miles per second.”

“Good, I’ve got you!” Sebastian almost laughed his relief. “Why haven’t the astronomers spotted it in all this while?”

“My God,” responded Hayes, impatiently, “it’s clear you aren’t an astronomer. Now, what fool would look to the Southern Celestial Pole for a planet, when they’re only found in the ecliptic?”

“But,“ pointed out Sebastian, “the region is studied just the same. It is photographed.”

“Surely! For all I know, the super-neutron has been photographed a hundred times-a thousand times if you like-though the Southern Pole is the most poorly watched region of the sky. But what’s to differentiate it from a star? With its low albedo, it never passed eleventh magnitude in brightness. After all, it’s hard enough to detect any planets in any case. Uranus was spotted many times before Herschel realized it was a planet. Pluto took years to find even when they were looking for it. Remember also that without gravity, it causes no planetary perturbations, and that the absence of these removes the most obvious indication of its presence.”

“But, “ insisted Sebastian, desperately, “as it approached the sun, its apparent size would increase and it would begin to show a perceptible disc through a telescope. Even if its reflected light were very faint, it would certainly obscure the stars behind it.”

“True,” admitted Hayes. “I will not say that a really thorough mapping of the Polar Region would not have uncovered it, but such mapping has been done long ago, and the present cursory searches for novae, special spectral types, and so on are by no means thorough. Then, as the super-neutron approaches the sun, it begins to appear only in the dawn and twilight-in evening and morning star fashion-so that observation becomes much more difficult. And so, as a matter of fact, it just has not been observed-and it is what should have been expected.”

Again a silence, and I became aware that my heart was pounding. It was two o’clock even, and we hadn’t been able to shake Hayes’ story. We had to prove it a lie fast, or r d die of sheer suspense. We were all of us watching the clock.

Levin took up the fight. “It’s an awfully queer coincidence that the super-neutron should be heading straight for the sun. What are the chances against it? Remember, that would be the same thing as reciting the chances against the truth of the story.”

I interposed, “That is an illegitimate objection, Mr. Levin. To cite improbability, however great, is not sufficient. Only outright impossibility or citation of inconsistency can serve to disqualify.”

But Hayes waved his hand, “It’s all right. Let me answer. Taking an individual super-neutron and an individual star, the chances of collision, head on, are all but infinitely small. However, statistically, if you shoot enough super-neutrons into the universe, then, given enough time, every star ought to be hit sooner or later. Space must be swarming with super-neutrons-say one every thousand cubic parsecs-so that in spite of the vast distances between the stars and the relative minuteness of the targets, twenty novae occur in our single Galaxy every year-that is, there are twenty collisions between superneutrons and stars annually.

“The situation is no different really from uranium being bombarded with ordinary neutrons. Only one neutron out of a hundred million may score a hit, but, given time, every nucleus is exploded eventually. If there is an outer-universe intelligence directing this bombardment-pure hypothesis, and not part of my argument, please-a year to us is probably an infinitesimal fraction of a second to them. The hits, to them, may be occurring at the rate of billions to their seconds. Energy is being developed, perhaps, to the point where the material this universe composes has become heated to the gaseous state-or whatever passes for the gaseous state there. The universe is expanding, you know-like a gas.”

“Still, for the very first super-neutron entering our system to head straight for the sun seems—” Levin ended in a weak stammer.

“Good Lord,” snapped Hayes, “who told you this was the first? Hundreds may have passed through the system in geologic times. One or two may have passed through in the last thousand years or so. How would we know? Even when one is headed straight for the sun, astronomers don’t find it. Perhaps this is the only one that’s passed through since the telescope was invented, and before then, of course. And never forget that, having no gravity, they can go right through the middle of the system, without affecting the planets. Only a hit on the sun registers, and then it’s too late.”

He looked at the clock, “2:o51 We ought to see it now against the sun.” He stood up and raised the window shade. The yellow sunlight streamed in and I moved away from the dusty shaft of light. My mouth was dry as desert sand. Murfree was mopping his brow, but beads of sweat stood out all along his cheeks and neck.

Hayes took out several slips of exposed film-negative and handed them out, “I came prepared, you see.” He held one up and squinted at the sun. “There it is,” he remarked placidly. “My calculations showed it would be in transit with respect to Earth at the time of collision. Rather convenient!”

I was looking at the sun, too, and felt my heart skip a beat. There, quite clear against the brightness of the sun, was a little, perfectly round, black spot.

“Why doesn’t it vaporize?” stammered Murfree. “It must be almost in the sun’s atmosphere.” I don’t think he was trying to disprove Hayes’ story. He had gone past that. He was honestly seeking information.

“I told you,” explained Hayes, “that it is transparent to almost all solar radiation. Only the radiation it absorbs can go into heat and that’s a very small percentage of all it receives. Besides, it isn’t ordinary matter. It’s probably much more refractory than anything on Earth, and the Solar surface is only at 6,000 degrees Centrigrade.”

He pointed a thumb over his shoulder, “It’s 2:09½, gentlemen. The super-neutron has struck and death is on its way. We have eight minutes.”

We were dumb with something that was just simply unbearable terror. I remember Hayes’ voice, quite matter-of-fact, saying, “Mercury just went?” then a few minutes later, “Venus has gone!” and lastly, “Thirty seconds left, gentlemen!”

The seconds crawled, but passed at last, and another thirty seconds, and still another....

And on Hayes’ face, a look of astonishment grew and spread. He lifted the clock and stared at it, then peered through his film at the sun once more.

“It’s gone?” He turned and faced us, “It’s unbelievable. I had thought of it, but I dared not draw the atomic analogy too far. You know that not all atomic nuclei explode on being hit by a neutron. Some, cadmium, for instance, absorb them one after the other like sponges do water. I—”

He paused again, drew a deep breath, and continued musingly, “Even the purest block of uranium contains traces of all other elements. And in a universe of trillions of stars acting like uranium, what does a paltry million of cadmium-like stars amount to-nothing! Yet the sun is one of them! Mankind never deserved that!”

He kept on talking, but relief had finally penetrated and we listened no longer. In half-hysterical fashion, we elected Gilbert Hayes to the office of Perpetual President by enthusiastic acclamation, and voted the story the whoppingest lie ever told.

But there’s one thing that bothers me. Hayes fills his post well; the Society is more successful than ever-but I think he should have been disqualified after all. His story fulfilled the second condition; it sounded like the truth. But I don’t think it fulfilled the first condition.

I think it was the truth!