

The Light Machine

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Tubby took his feet off the fender of the little stove in the back room of O'Connor's Grocery and glared at his two friends aggressively.

"That ain't so," he declared. "That ain't so, nohow."

"Well *he* said," the first man repeated, "as how that's just the way it is—that light travels one hundred and eighty-six thousand miles in a second."

"'Taint so," said Tubby. "That's too fast for anything to go."

"That's what he said," the first man reiterated imperturbably. "One hundred and eighty-six thousand miles in a second—that's what he said."

"Well 'taint so," Tubby repeated; he rose to his feet suddenly. "You can see light, can't you?" he demanded.

"'Course I can see light. I ain't blind."

"Can you see a automobile when it's going past a hundred miles a hour?" Tubby pointed a fat little forefinger directly into the first man's face.

"Why, why, yes," said the first man, surprised into confusion.

"And can you see the *spokes* of a automobile wheel when it's going past a hundred miles a hour?"

The first man thought a moment. “Why, why, no,” he said finally.

Tubby lowered his forefinger. “Then that proves it ain’t so,” he declared triumphantly. “Nor you couldn’t see a bullet if I shot it past your nose, could you?”

“You couldn’t, Jake,” the second man put in.

“No, you couldn’t,” said Tubby. “Nor you couldn’t see light if it went that fast neither. Ain’t I right? Could you?”

“He’s right, Jake,” said the second man.

Tubby sat down.

“Well, *he* said,” the first man resumed unabashed—“he said as how light travels one hundred and eighty-six thousand miles in a second. And furthermore, and in addition, he said as how some of the stars were so far away that it takes the light hundreds and hundreds of years just getting here from them.”

“It was all in the movie,” said the second man wearily. “‘The Wonders of Light’—I remember it.”

“Well, *I* don’t believe it,” said Tubby. “Because I know it ain’t so—not none of it.”

He stood up again; then with sudden thought he waddled across the room to the open window.

“Come here,” he said, commandingly; the two other men joined him.

“Ain’t them stars up there?” he asked. He pointed through the open casement to a brilliant, cloudless summer evening sky.

“Yes—them’s stars all right,” the first man agreed. “If that’s what you mean.”

“That *ain’t* what I mean,” said Tubby. “I said, ‘Ain’t them stars up there?’ Are they up there, or ain’t they? That’s what I want to know.”

“They’re up there all right, Jake,” said the second man.

“If you can see them, mustn’t they be there?” Tubby persisted.

“Yes,” said the first man. “When you can see them they must be there.”

“Then,” said Tubby—he paused impressively—“then the light of them must be here and there at the same time. Am I right?”

“He’s right, Jake,” said the second man. “‘Cause if it took the light a hundred years to get here we couldn’t see them for a hundred years yet. Am I right?”

The first man went back to the stove. Tubby and the second man joined him after a moment.

“I ain’t telling you what *I* think,” the first man remarked. “I’m telling you what *he* said—”

“It ain’t got no sense,” said Tubby.

“*I’m* going to the movies,” said the second man abruptly. “Come on.”

“Not me,” said Tubby. “I ate too much. I’m going to sleep.”

“It’s ‘The Burning of Rome,’” said the first man. “Nero playing the piano while the city burns. Come on. It’s good—I seen the pictures.”

And reluctantly Tubby allowed himself to be led away.

The little Moving Picture Theater was hot and stuffy; Tubby found an aisle seat with his friends, near the back. For a quarter of an hour or more he sat blinking at the flickering screen. The Topical Review interested him not at all; he yawned and squeezed his fat little body lower into the hard narrow seat.

Then the picture changed. It was not “The Burning of Rome” yet, but a short picture, evidently science. Tubby frowned at it in silence.

The first man nudged him. “Wake up,” he said. “Here’s a astronomical picture about the stars. Wake up. It’ll be good. ‘The Burning of Rome’s’ next.”

“I ain’t asleep.” Tubby whispered back. “I’m thinking.”

The wonders of celestial space were unfolding before Tubby’s eyes. But he hardly saw them. He was thinking of what Jake had said—those tremendous figures Jake had reeled off to him. What was it he had said? One hundred and eighty-six thousand miles in a second. There were sixty seconds in a minute, and sixty minutes in an hour! That would be—

“‘Taint so,” he muttered to himself doggedly.

He felt a light touch on his arm and looked up to see a little man standing beside him in the aisle. In the dim light Tubby could not see the little man very well; but he *could* see that he did not know him.

The little man bent down toward Tubby's ear.

"I want to talk to you," he whispered.

"What about?" said Tubby.

The little man shook his head. "I can't talk in here. Come outside for a moment."

Tubby hesitated.

"It's very important," the little man added. "You must come—just for a moment. I've wanted to see you for a very long time."

Tubby clambered to his feet; his two friends, absorbed in the picture before them, did not notice him leave. In silence he followed the stranger back up the aisle to the lighted theater lobby.

"I've wanted to see you for a long time," the little man repeated. Tubby could see now he was a very little man, with a thin, frail body and a very big head set upon a long spindly neck. His hair was snow-white and long about his ears. His yellow face was seamed with lines, but most of it was hidden by flowing side-whiskers and by a pair of huge iron-rimmed spectacles. He wore a long black frock coat that hung from his thin shoulders like a shroud.

“I’m a professor,” said the stranger. He held out a shriveled, taloned hand. “A Professor of Light,” he added impressively.

“Oh,” said Tubby.

“My name is Obadiah Oats.”

Tubby shook hands. “Mine’s Tubby,” he said. “Pleased to meet you.”

The professor put on his high hat, which made him nearly as tall as Tubby.

“I want to consult you on a matter of very great importance to both of us,” he said slowly.

Tubby waited.

“About light,” the professor added. He linked his arm in Tubby’s confidentially. “I need your help. They tell me you’re the smartest man in town. I wanted to find you. With a brain like yours and mine—”

“Yes,” said Tubby breathlessly, when the professor paused.

“My laboratory’s right across the street,” said the little man. “I’ll show you.” Tubby followed the professor out of the theater, through a little doorway across the street and up several flights of rickety stairs into a room on the top floor of the house.

“This is where I work,” said the professor. “Sit down.”

It was a large room with endless row of bottles upon tiers of shelves lining its walls. Several long tables stood about, and Tubby saw they were crowded with curious apparatus—little

tubes in racks, microscopes, triangular pieces of glass with candles behind them, and several contrivances of wheels and weights that looked like clock works. In the exact center of the room was one larger apparatus of a sort Tubby had never seen before; it seemed very complicated and he stared at it with awe. He could make nothing out of it except that part of it was a huge telescope, extending up through the skylight of the room. He glanced upward, and there, through a narrow, open slit in the glass, he could see the stars shining.

“That’s a Light Machine,” said the professor, following his glance. “There’s only one in the world, and there it is.”

“Yes,” said Tubby.

“It’s the most wonderful machine that was ever built,” the professor went on softly. “I built it; and now *you* are going to help me make money out of it.”

“Yes,” said Tubby. “How?”

“That’s what *you* are going to tell *me*. Don’t you see? I am a man of science—you are a business man. That’s the difference between us.”

“Yes,” said Tubby.

“First I’ll have to explain. You have a head for figures, of course?”

“No—yes,” said Tubby. “Of course.”

“But you don’t know much about light?”

“Yes—no,” said Tubby.

“Naturally. How could you. Nobody does—but me. And I know all about it—*all*.” He emphasized the last word impressively. “And now I’m going to tell it to you.”

“Thank you very much,” said Tubby, and waited.

“All my life,” began the professor—he spoke softly; his eyes, fixed on Tubby seemed staring at dim, distant spaces—“all my life—since I was a little boy—I have been studying the properties of light. It is a very wonderful thing—you realize that, do you not—the most wonderful thing in the whole of science?”

“Oh, yes,” said Tubby.

The professor drew in a deep breath, like a long sigh reversed. “Light,” he began again, “is a vibratory wave in the Ether. You know what the Ether is?”

“No,” said Tubby.

“It is like air. But you cannot breathe it. It exists everywhere—even in the outermost realms of Space. Now do you understand?”

“Yes,” said Tubby.

“Light is vibration of the Ether,” the professor went on in his droning voice. “Its vibrations travel through the Ether at the rate of one hundred and eighty-six thousand three hundred and twenty-four miles a second.”

“I know *that*,” said Tubby.

“You are a learned man,” the professor said admiringly. “You have a wonderful mind. I knew you had—they said so.”

“Yes,” said Tubby. “Go on.”

The professor jerked his little body upright in his chair suddenly, so suddenly that Tubby started violently with fright.

“How long is a second?” the professor asked aggressively.

“Why—tick-tick. That’s it,” said Tubby.

The professor relaxed in his chair. “You *are* a clever man. You will have your little joke.

“But we must be serious. I will tell you how long a second is. It is exactly one-thirty-one millionth, five hundred and fifty-eight thousandth, one hundred and forty-ninth part of a year.”

“Oh,” said Tubby.

“Do you know what a year is?”

“Three hundred and sixty-five days,” said Tubby promptly.

The professor smiled again. “A year is the time it takes the Earth to revolve once around the Sun. Thus you see there are 31,558,149 seconds in a year—which is a little more than $365\frac{1}{4}$ days.”

“Yes,” said Tubby. “I see.”

“Now to find out how far light travels in a year we simply take its speed per second and multiply it by sixty. That is its speed

per minute. Multiply that by sixty gives it speed per hour and so on up to a day or a year. Do you understand?"

"Yes," said Tubby. "How—how far does it go in a year?"

The professor raised his hand.

"*That* is a very simple problem—only mental arithmetic for me. Wait. Let us go further."

"Yes," said Tubby. "Go on."

"The distance Light travels in one year is called a Light-year. Now, some of the stars are so far away that it takes light many centuries to come from them, traveling at that speed I have just mentioned. Thus we measure their distance from us as so many hundred Light-years. Do you see?"

"Yes," said Tubby. "How—how many miles away from us is the farthest star—the very farthest?"

The professor leaped to his feet. "Ah, I was expecting you to ask that." His face was beaming. "You *are* a clever man. But I'm ready for you. I figured it all out this afternoon and wrote it down. I'll show you."

He led Tubby to a corner of the room. Tubby saw a perfectly enormous roll of narrow paper tape, like the tape that comes from a stock ticker, or is rolled up around baby ribbon. Only this roll was bigger than he was. It was hung vertically on a spindle, which had a handle to rotate it so that the tape could be unwound and wound again easily. A few feet away there was a similar spindle, but empty.

“I wrote it down for you,” the professor repeated—“the distance in miles of the furthest star from the Earth. I wrote it down—on this.”

He took the loose end of the tape and reeling off a few feet hooked the end onto the empty spindle.

“Watch closely,” he said. “I’m going to show you the number.”

He started to wind up the tape on the empty spindle. Tubby stood close beside the strip of tape stretching the space between the two spindles; it passed directly under his face.

“Watch closely,” said the professor again. “There comes the first of it.” Tubby saw a row of little digits start on the tape. The first three were 154. Then after the comma began a string of ciphers; after each three ciphers was another comma. The moving tape carried this endless row of little ciphers swiftly under Tubby’s nose. He stared at them fascinated. Faster and faster they flew by as the roll of tape wound up on the spindle the professor was turning. For half an hour he turned briskly. Then the row of ciphers stopped just as the other end of the tape fluttered off the unwinding spindle.

The professor leaned against the wall, breathing hard.

“That—was—the—number,” he gasped.

Tubby blinked. “What—what number was it?” he asked finally.

The professor recovered his breath and sat down again in his chair wearily.

“It was one hundred and fifty-four zin-tillions,” he answered. “The largest number that has ever been written down. Wrote it down this afternoon.”

“Yes,” said Tubby. “It *was* a big number.”

The professor pulled at his side-whiskers thoughtfully. “We must get on,” he said. “Now you understand how far the stars are away. And how fast light travels. That brings us to my Light Machine.”

Tubby sat up with interest. “To the Light Machine. Yes, go on.”

“As you can see,” the professor continued. “I know all about Light—I am its master. No one in the world knows as much about Light as I do. And only one man in the world thinks he does.” The professor’s eyes gleamed vindictively. “Ah, how I hate him, that man!”

“Who?” Tubby asked with interest. “What is his name?”

“His name is Einstein,” answered the professor. “I hate him—I loathe him—I despise him.”

“Oh,” said Tubby. “I’m sorry.”

“But he cannot harm *me*. I’m too clever for him. And *you* will help me. We still have time—he cannot prove anything yet.”

“No—yes,” said Tubby.

The professor stood up. “Let us get on with my invention. *Then* you’ll see what a wonderful man I am. I will be brief.”

Tubby joined him beside the telescope in the center of the room.

“What you must understand first,” said the professor, “is *my* theory of Light.” Tubby waited.

“No light is ever destroyed,” the professor continued. “It passes beyond our vision, that is all. But it always exists somewhere, in the outer realms of Space.”

“That’s where it goes when it goes out,” Tubby put in. “Ain’t I right?”

“Yes,” said the professor. “That’s where it goes—out into the realms of Space.

“Now what you must understand is that light can be reflected, refracted, polarized, but never destroyed.” He pointed to his instruments on one of the tables. “*I* can do all those things to it—and a thousand more—but I cannot destroy it.”

“Right,” said Tubby. “But if you put it out you can’t never get it back, can you now?”

The professor beamed on him genially. “Your brain works too keenly,” he said. “You anticipate me. No, *I* cannot get it back. But it comes back. That’s just the point—it comes back. That’s what nobody in the world knows except me—me and you.

“The sun,” he went on, “gives us most of our light—it gets here to the earth from the sun in a few minutes. The moon gives us reflected sunlight. It is the same light, only it comes to us from the sun by way of the moon. It takes a little longer that way.”

“How much?” Tubby asked.

“Not much—just a few seconds—the moon is not far away. Now all this light that strikes the earth is reflected back into space. In a hundred years—less or more according to the distance—it strikes the different stars. There it mingles with other light. And then, mark me well, and then”—the professor paused impressively—“then in another hundred years it comes back to us again—the same light—mixed with other light of course—but some of the same light we had two hundred years before. Do you understand?”

“No—yes,” said Tubby.

“That,” said the professor, “is the *Oats Theory of the Rationality of Light*. I call it that because it *is* rational—it is in accordance with all known physical laws.

“Some others I could name”—the professor’s voice shook with suppressed passion; his eyes gleamed again wickedly—“some others are not so scrupulous. *Their* theories do *not* coincide with recognized physical laws—they transgress them all. Mere astronomical outcasts—mathematical lepers—scientific pariahs—”

“Oh—you mean that other guy?” said Tubby.

The professor calmed himself with an effort. He pulled a huge black silk handkerchief from his pocket and mopped his dripping forehead.

“We won’t talk of him,” he said after a moment.

“No, we better leave him out of it,” Tubby agreed. “Ain’t I right?”

The professor nodded. “Now we come to *my* great discovery. I’ll tell you about that now.

“When this sunlight is reflected from the moon to us, it brings with it an image of the moon, which was not in the light when it left the sun. Do you understand?”

“No—yes,” said Tubby.

“That’s why we can see the moon—the light brings us the image. All light carries an image of something—that’s why we can see things.

“Now when light leaves the earth and goes out into space it takes with it an image of the earth and everything that is happening on the earth.”

“Right,” said Tubby. “Go on.”

“Now some of this light may have to travel a hundred years before it reaches a star. When it does it mixes with other light and is reflected back in another hundred years to us. But—mark you this—but it still carries the image of the earth and what happened on the earth when it was here.”

“But you don’t see *that*,” said Tubby. “We see the star. Ain’t I right?”

“Yes,” said the professor. “Of course you’re right. And the reason we see the star is because that image is the last one the

light got. That is predominate. All the others are there—but they are hidden away beneath the star image.”

“Oh,” said Tubby.

“Nobody ever knew they were there, and so of course nobody ever tried to get them out. But *I* knew they were there— that’s the *Oats Theory of the Rationality of Light*. And I have got them out!” His voice rose in triumph. “That’s the Light Machine—the greatest invention in the history of the world!”

“Oh, the Light Machine,” said Tubby, when the professor paused.

“The Oats Light Machine—here it is—the only one in the world. I’ll show you at once.”

He switched off the lights. The room was quite dark except for a little beam of white light that seemed to thread its way through the intricate system of mirrors and prisms of the Light Machine. Tubby could not see where this light came from or where it went to. But he saw distinctly that it turned several corners and was alternately broad and narrow. It was white throughout most of its course; but in one short span it was a dark, angry red, and in another a deep, beautiful purple.

“The Light Machine,” the Professor began; his fingers caressed one of its little reflectors lovingly, “is able to extract from light all the images it holds, no matter how long they have been there.”

“That’s wonderful, ain’t it?” said Tubby with admiration.

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