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A Novel About the Creation

Written by Alan Lightman

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a novel about the creation

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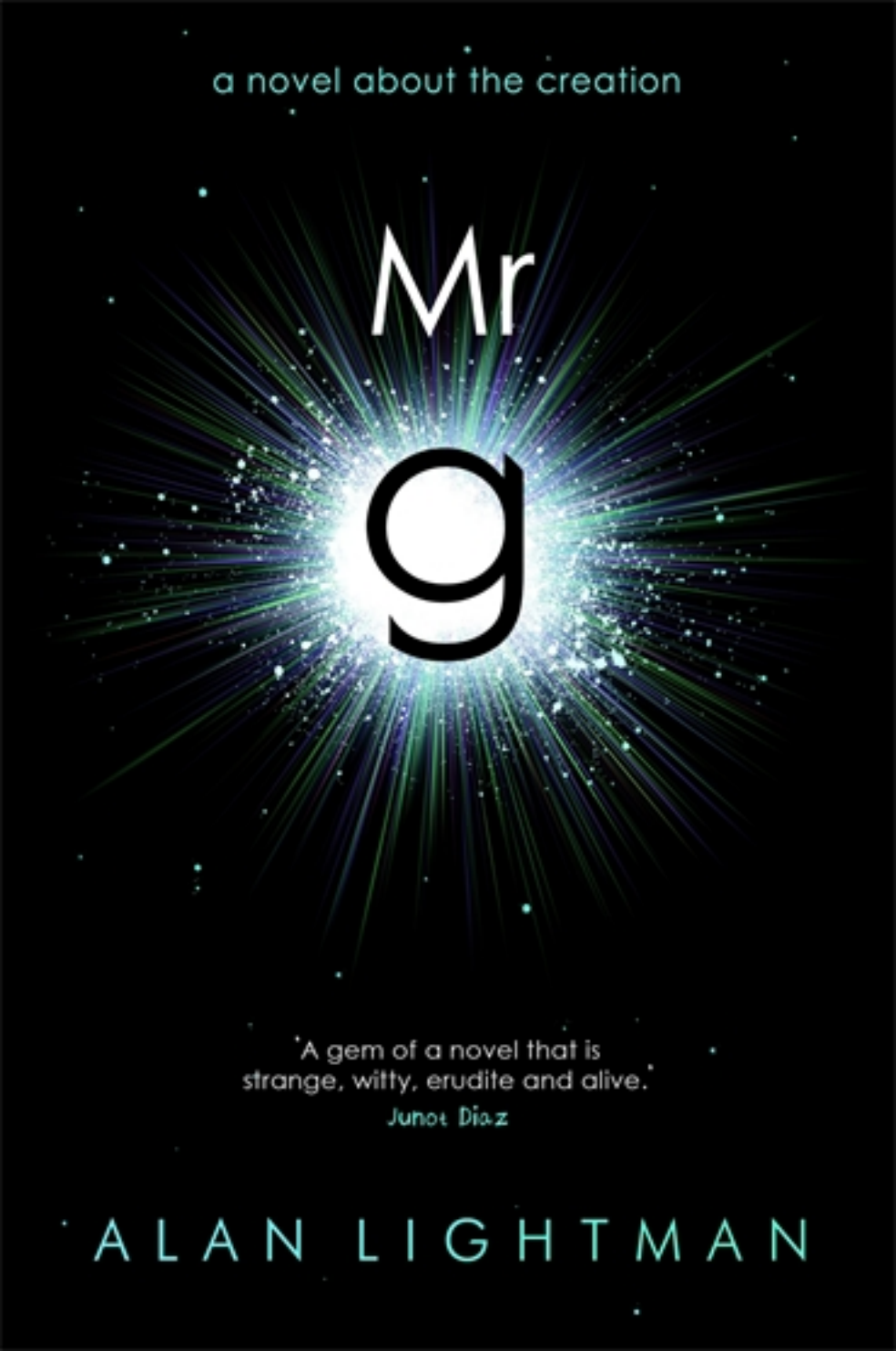

"A gem of a novel that is strange, witty, erudite and alive."
Junot Díaz

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Time

As I remember, I had just woken up from a nap when I decided to create the universe.

Not much was happening at that time. As a matter of fact, time didn't exist. Nor space. When you looked out into the Void, you were really looking at nothing more than your own thought. And if you tried to picture wind or stars or water, you could not give form or texture to your notions.

Those things did not exist. Smooth, rough, waxy, sharp, prickly, brittle—even qualities such as these lacked meaning. Practically everything slept in an infinite torpor of potentiality. I knew that I could make whatever I wanted. But that was the problem. Unlimited possibilities bring unlimited indecision. When I thought about this particular creation or that, uncertain about how each thing would turn out, I grew anxious and went back to sleep. But at a particular moment, I managed . . . if not exactly to sweep aside my doubts, at least to take a chance.

Almost immediately, it seemed, my aunt Penelope asked me why I would want to do such a thing. Wasn't I comfortable with the emptiness just as it was? Yes, yes, I said, of course, but . . . You could mess things up, said my aunt. Leave Him alone, said Uncle Deva. Uncle toddled over and stood beside me in his dear way. Please don't tell me what to do, retorted my aunt. Then she turned and stared hard at me. Her hair, uncombed and knotted as usual, drooped down to her bulky shoulders. Well? she said, and waited. I never liked it when Aunt Penelope glowered at me. I think I'm going to do it, I finally said. It was the first decision I'd made in eons of unmeasured existence, and it felt good to have decided something. Or rather, to have decided that something had to be done, that a change was in the offing. I had chosen to replace nothingness with something. Something is not nothing. Something could be anything. My imagination reeled. From now on, there would be a future, a present, and a past. A past of nothingness, and then a future of something.

In fact, I had just created time. But unintentionally. It was just that my resolution to act, to make things, to put an end to the unceasing absence of happenings, required time. By deciding to create something, I had pressed an arrow into the shapeless and unending Void, an arrow that pointed in the direction of the future. Henceforth, there would be a

before and an after, a continuing stream of successive events, a movement away from the past and towards the future—in other words, a journey through time. Time necessarily came before light and dark, matter and energy, even space. Time was my first creation.

Sometimes, the absence of a thing is not noticed until it is present. With the invention of time, events that had once merged together in one amorphous clot began to take shape. Each event could now be enveloped by a slipcover of time, separating it from all other events. Every motion or thought or the slightest happenstance could be ordered and placed exactly in time. For example, I realized that I had been sleeping for a very long time. And near me—but I couldn't say how near, because I had not yet created space—Aunt Penelope and Uncle Deva had also been sleeping, their loud snores rising and falling like something or other, their tossings and turnings unfolding in time. And their interminable bickering could now be identified with moments of wakefulness, which in turn could be understood as taking place between periods of sleep. I refused to think how much time I had wasted. In fact, we had all slept in a kind of pleasant amnesia, a swoon, an infinite senselessness. In various ways, had we not luxuriated in the unstructured Void, unaccountable for our actions? Yes, unaccountable. Because without time, there could be no reactions to

actions, no consequences. Without time, decisions need not be considered for their implications and effects. We had all been drifting in a comfortable Void without responsibilities.

See, my aunt complained when it became apparent that we were now conscious of time. I told you that you would mess things up. She shot Uncle a look of disapproval, as if he had encouraged me to act as I had, and then she began an unhappy summary of the various things that she had done and not done during the immediate past, then during the past before that, and so on, back and back through the now visible chasms of time, until Uncle begged her to stop. You should never have created the past and the future, she said. We were happy here. See, now I must say *were*, when before . . . Oh! There it is again. It was nicer when everything happened at once. I can't stand to think about the future. But don't you think that we have some responsibility to the future? I suggested. To all the things and beings I might create? Nonsense, shrieked Aunt Penelope. What a foolish argument. You have no responsibility to things that don't yet exist and won't ever exist if you could just keep your big thoughts to yourself. But it's too late now, she went on. I can feel time. I can feel the future. She had gotten herself into one of her states, and the Void twisted and throbbed with her displeasure.

Gently, Uncle caressed her. For the first time ever, she responded to his touch. Her ranting diminished. Soon after, she realized that her hair needed combing, and that was the beginning of something and probably all for the best.

The Void

Time trickled by for certain periods and intervals. At other moments, it gushed ahead, flew headlong into the future, then braked and slowed again to a trickle. Having created time, I had not decided whether it should flow uniformly or in fits and starts. But the matter was more nettlesome than that. Since I had not yet created clocks, one could not say what constituted a smooth versus a choppy passage of time. There was nothing to measure it. Perhaps the movement of time might even be relative to the observer. Or perhaps it could be only perception. At the beginning, all any of us knew for sure was that time flowed. I didn't feel like committing myself right away to one possibility or the other—I had been pondering much as it was—so I decided to decide the texture of time at a future date.

Whether smooth or choppy, the creation of time had already altered the Void. Before time, we did not

move through the Void so much as we experienced it all at once. Or rather, the Void clung to our beings, the Void contained our thoughts, the Void constituted the nothingness against which our somethingness existed. After time, the Void remained an infinite and unchanging emptiness, but now one could travel through it as well as think it, one could say that one had been at a particular place of the Void at one moment and another place at a later moment. Not that the Void had signposts or markers to designate definite locations—the Void was perfectly smooth, empty, and without any shape—but we understood that such locations existed in principle, and we could pass from one to the other over a period of time. And even though the Void was empty, totally empty, at various moments we could glimpse the faintest of features—wispy draperies, veils, gossamer ridges, valleys of nothingness—that would briefly appear and then disappear. Such elusive structures arose between the seams of the many layers of nothingness packed on top of one another, where they did not fit precisely together. If one began moving towards a particular of these evanescent topographies, it would vanish in short order but nevertheless provide a momentary route of travel, a fleeting destination, a temporary break from the complete formlessness of the Void.

I spent great swaths of time moving through the

Void. Although empty, the Void constantly beckoned with its infinite wells of possibilities. I would travel in a certain direction for a long time, moving through vapors of nothingness, then suddenly decide I wanted to explore new territory and would turn to the right or to the left and travel for a long period in another direction. Occasionally, I would do an about-face and go back the way I had come, traveling for extremely long durations through one empty place and then another and another. Frequently, I had no particular destination in mind but was merely following a natural curiosity to understand how the Void had been transformed by time. Sometimes, I would play games with myself, pretending to be lost, and I would identify my position not by my innate knowledge but by estimating the amount of time passed in various directions and performing geometrical calculations. I once moved around in a spiral of ever-increasing diameters, passing near places I had passed before, virtually the same emptiness but with the most subtle changes in each repetition, minute alterations in the vacuum brought about by the lapsing of time. Sometimes I would stop altogether and just admire the quiet beauty of the Void, the serenity, the unending pilasters and balustrades of nothingness. I could never gauge the actual distance traversed in any of these outings, since space didn't exist, but I knew that vast amounts of time had transpired. At various moments, Aunt

or Uncle would appear from behind a billowing veil of the Void, we would register surprise at having encountered each other, say hello, and go our separate ways. Such chance meetings, requiring a before and an after, never happened before the creation of time.

I can say that my long treks through the Void were pleasing. I liked being in motion, going from one place to another. With movement, I felt a heightened intensity of existence and being. And the emptiness had a way of accumulating as I traveled, the clouds and vapors of nothingness sticking to me in increasing numbers, so that I had the sensation of being cloaked by an ever-thickening garment of soft cushions. I certainly had an utter vacuum in which to think. Given that the Void was total and complete emptiness, I proceeded to fill it with my thoughts, and those thoughts served as signposts of a kind. Here is where I had the idea of the universal ratio of circumference to diameter, the number π. Over there is where I had the notion of a spectrum of colors. And so forth. The Void served as a gracious receptacle for my thoughts. It was my playground of ideas.

Then there was music. The Void had always vibrated with the music of my thoughts, but before the existence of time the totality of sounds occurred simultaneously, as if a thousand thousand notes were played all at once. Now we could hear one note following another, cascades of sound, arpeggios and glissades.

We could hear melodies. We could hear rhythms and metrical phrases gathering up time in lovely folds of sound. Duples and triples and offbeat syncopations. As we moved through the Void, all of us—Aunt Penelope, Uncle Deva, and I—were transfixed by the most exquisite sounds, the tender and melodic and rapturous oscillations of the Void.

Much of the music I devised from a scale with a fixed ratio of frequencies, generally $2^{1/12}$, since exponential powers of that number came closest to ratios of small integers like 3:2 and 4:3. Chords based on these scales were pleasing to hear. But I also experimented with quarter-tone ratios, nonharmonic ratios, and even scales with variable ratios, and these also produced beautiful music as long as two different notes were not sounded together. By varying the intensity of harmonics of each tone, I created an infinite variety of sounds.

In every place and in every moment, we were wrapped and engulfed in music. At times, the music poured forth in fierce heaving swells. At other times, it advanced in the softest little steps, delicate as a fleeting veil in the Void. Music clung to our beings as parcels of emptiness had in the past. Music went inside us. I had created music, but now music created; it lifted and remade and formed a completeness of being.

Space

I had in mind a great number of things I wanted to make. But with no previous experience with materiality, I could think of these things only in terms of their functions or qualities: the quantification of time, communication, light, shelter, et cetera. Soon I grew tired of abstractions. I wanted to touch and to feel. After all, I had been sleeping for a very long time. And I might add that I needed something new to interest me, a challenge, perhaps even other beings to surprise and amuse me. My ideas, for both animate and inanimate invention, required material existence, extension, volume. And for that I needed to create space.

Space did not appear all at once, but in a languorous progression, gradually increasing in length, width, and breadth. (I had toyed with various numbers of dimensions. Two seemed unnecessarily confining, suffocating in fact, while four or more struck me as extravagant and could lead to the misplacing of

small objects. I decided my first try should be three.) As I recall, space first appeared in a minuscule round bubble that sat quietly in my mind. Then it stretched slightly in length, humming at a high pitch as it did so. For a time, the universe was a tiny ellipsoid. Slowly, breadth and width began to catch up with length, making an impatient, clucking sound. Sphericity was restored. Then, with a sigh and a low rumble, all three dimensions began to unravel at once, tumbling and sprawling into the Void.

My universe had come into being! It was tiny at first, but beautiful, a lovely little sphere. Its surfaces were smooth and silky, yet infinitely strong. It glistened. It spun slightly. And it vibrated with energy. I found that I could not create space without energy—the two were inextricably bound, as if one gave form to the other. The energy howled and struggled to break out of those smooth, silky walls, but it could not, since those walls contained all that was (except for me, Aunt, and Uncle), and it was a mathematical and tautological impossibility for anything from within to emerge without. Only the Void remained outside those walls. In its continual battle to escape the inescapable, the energy seethed and boiled at a ferocious temperature, it distorted the walls, stretched them first in one direction and then another. And then, as if in frustration, it set about stretching space itself,

warping diameters and circumferences, angles and curves—contorting the very mathematics of space. The geometry, responding to the fierce stresses and strains, began to emit its own piercing hum, and the two—energy and geometry—fought with each other in a shrill screech, first the mesas and terraces of space muscling the energy by brute force, and then the energy striking back and reshaping the architecture of space. As the combat ensued, the tiny sphere that was the universe began inflating at an alarming speed.

Aunt Penelope, who in a rare moment had been quietly brushing her hair, was knocked over by the expanding sphere. Save me, she screamed to Uncle Deva, overdramatizing the situation as she often did. Uncle helped right her and steadied her. What was that thing? she shouted. The impertinence! Then, without thanking Uncle, she stomped off into the Void. Even though she had disappeared behind the folds and pleats of the vacuum, I could hear my aunt muttering: What's He done now! There's no end to this, no end. No end to this. No end. No end to this. No end . . .

Meanwhile, my universe was growing larger and larger. Once created, it seemed determined to become as fat as it could. I decided to make another. This one, I slightly pricked at the moment it came into existence,

just the smallest of flicks to see what a slight alteration would bring. The little sphere began expanding like the previous universe, but after a few moments its expansion coasted to a halt, it briefly hovered in a fleeting equilibrium, then it began contracting and dwindling in size, getting smaller and smaller until it was just the tiniest dot. Then, with a faint pop, it disappeared altogether. I was delighted. I made other universes. With each one, I tried a different variation. To some, I gave a slight lateral nudge. To others, a bit of extra spin. Some I squeezed just at the moment of creation, to add a smidgeon of energy. In some, I even altered the number of dimensions of space: four, seven, sixteen, to see what might happen. And why not try fractional dimensions, like 13.8. Some universes never came into being, unable to accommodate all the initial conditions. Some leaped into existence with a frightening energy and then petered out. Some remained flaccid from the beginning; others careered through the Void, producing high-pitched trills and vibratos. One universe remained constant in size but spun faster and faster until it split apart at its midsection. Several began expanding, then contracted down to almost nothing, hesitated, and expanded again in a kind of frothy rebirth—then repeated the entire cycle, expansion, contraction, expansion, contraction, on and on in an unending series of births, destructions, and rebirths.

After a time, a gigantic number of universes were flying about—spinning on their axes, throbbing and pulsing, expanding and contracting at fantastic speed. My aunt was nowhere to be seen. Uncle Deva, as sympathetic as he was to my enterprise, had ducked for cover. In short order, as seemed almost inevitable, some of the universes began colliding with others. Each collision made a terrific explosion, sending fragments of worlds hurtling through the Void, oscillating dimensions, fractured energies.

It occurred to me that I had not carefully considered whether I should make one universe or many. Perhaps I should have been more circumspect. One universe would avoid the possibility of collisions, but then again it might become boring. One universe would have one truth. Many would have many truths. There were advantages and disadvantages to both propositions.

I sat down, centered myself, and began mulling over the matter. Then I meditated. I tried to let all thoughts flow from my mind. I breathed in the Void, breathed out the Void. Breathed in the Void, breathed out the Void. Slowly, I grew calm. A peace spread over the Void. Aunt and Uncle appeared as tiny lights, dancing together to a waltz in andante, and a peace descended on them as well, and the Void settled and sighed and drifted in unwinding time. I breathed in and I breathed out and I came to the decision that

there should be only One, one universe, and the myriad temporal universes that I had made faded and dissolved, and the one universe remained.

And then, while still meditating, I decided to create quantum physics. Although I keenly appreciated the certainty of logic and clear definition, I also felt that the sharp edges of existence needed some rounding. I wanted a bit of artistic ambiguity in my creations, a measured diffusion. Perhaps quantum physics invented itself. It was gorgeous in mathematical terms. And subtle. As soon as I had created quantum physics, all objects—even though objects at that point existed only in my mind—billowed out and swelled into a haze of indefinite position. All certainties changed into probabilities, and my thoughts bifurcated into dualities: yes and no, brittle and supple, on and off. Henceforth, things could be hither and yon at the same time. The One became Many. And a great softening blanket of indeterminancy wrapped itself over the Void. My breathing slowed to a sleepy imperceptibility. Listening carefully, I could hear a billion billion tiny rattles and tinklings from all over the Void, the sound of new universes waiting to be. With the invention of quantum, each point of the Void had developed the potential to become a new universe, and that potentiality could not be denied. My creation of time, and then space, had made a universe

possible—and that possibility alone, nestled within the quantum foam of the Void, was sufficient to bring into being an infinite number of universes. Soon, new universes were once again whizzing through the vacuum. I revised my earlier decision that there should be only One. Or, more precisely, my creation of quantum physics necessarily required the Many. Peering out into the Void, I tried to find my original universe, the first one I'd made. But it was hopelessly lost among billions and billions of others flying about, throbbing spheres, distended ellipsoids, gyrating cosmoses thrashing with energy. The Void trembled with rumbles and shrieks and sharp popping noises.

By and by, Aunt Penelope emerged from her hiding place, Uncle Deva from his. You've been busy, said Uncle, looking with mild annoyance at the many universes flying about. If I were you, I wouldn't get attached to any of them. You'll just be disappointed. I took Uncle's comment under advisement. Already, I was rather fond of some of the expanding spheres.

What's in those things, anyway? asked Aunt Penelope. Space, I answered. Umph, she said. Well now that we have space, I'd like, please, a chair to sit down on. I've been standing for a very long time. So I made a chair for Aunt Penelope. That chair was my first creation of matter. It had three curved legs and an octagonal back, and I'd designed it to be comfortable

but not too comfortable. My aunt sat down on it without comment.

Far more awaited. I wanted to make more matter. I wanted to make galaxies and stars. I wanted to make planets. I wanted to make living creatures, and minds. But for the moment, I sat and I meditated and I gazed with contentment at the empty but vibrating universes I had made.