

CAREER CHOICES

Exploring the Realm between Science and Art

Preparing to interview Alan Lightman, I wonder how it is possible that a theoretical astrophysicist, and a successful one at that, could become a best-selling novelist. When I arrive at his MIT office, a spare, neat space overlooking an anonymous courtyard, Lightman offers me his own desk chair. It is the most comfortable seat in the room, but I choose instead a hard-backed chair. Lightman, without a word, does the same. His is a simple gesture, and yet quite revealing. For such natural sympathy pervades his writing. It is also a quality that may explain, at least in part, the evolution of his career.

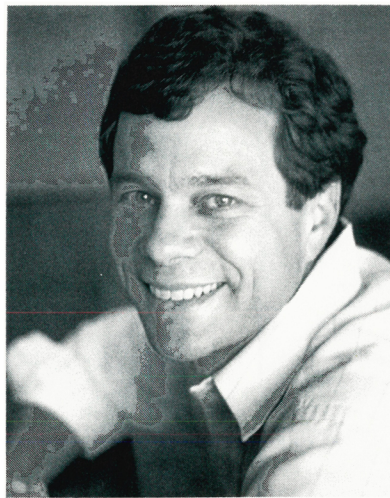
As Lightman notes in the foreword to *Dance for Two*, a collection of his essays published last year: "Science, for me, was the most rigorous and extreme expression of order in the physical world. Yet the desire for that order, and often the means to declare it, were human, oddly nestled against the emotion and wild flight of the human world. Where those two worlds met seemed a subject for literature."

Pool balls and black holes

Born and raised in Memphis, Tennessee, Lightman did well in math and enjoyed building model rockets and other such boyhood pursuits. He entered Princeton University in 1966, intending to study science. In the eating hall one evening, a friend who was taking the freshman physics course mentioned that he had just learned exactly where to strike a pool ball so that it would roll without sliding. "I thought, Now this is a really fine practical application that can come out of a college subject," Lightman recalls. "I decided that I would have to start taking physics."

He soon discovered he was "a disaster in the laboratory," and so opted for physics theory over experiment. In 1970, after receiving his BS in physics, he enrolled at Caltech, joining the half-dozen other graduate students in Kip Thorne's group, all of them immersed in the study of black holes and spurred on by the recent identification of Cygnus X-1. On occasion, the students would share their findings over lunch with the likes of Richard Feynman. "It was a very exciting time to be a graduate student in physics," Lightman says.

After earning his PhD in theoretical physics in 1974, he spent two years at Cornell University, where he and an-



ALAN LIGHTMAN

other young astrophysicist, Stuart Shapiro, enjoyed "a very rich period of collaboration." In 1976, Lightman joined the astronomy faculty at Harvard University, continuing his work on accretion disks, radiative processes and relativistic plasmas.

The transition from physics to writing happened gradually, Lightman says, "almost unconsciously." He enjoyed writing poetry as a teenager, and while he was in graduate school, some of his poems appeared in small literary magazines. Even then, he says, "My aspirations were not very high. I was writing mainly for myself."

By the early 1980s, he had branched out into writing essays about science, writing a monthly column in the magazine *Science 80*. His essays, as well as two popularized books on cosmology, found an appreciative audience, and increasingly, he became known as a science writer. In 1989, in a formal recognition of his evolving pursuits, Lightman accepted a joint appointment at MIT, as a professor of science and writing and a senior lecturer in physics.

Dreams and fiction

One day in early 1991, while Lightman was sitting in his office, he was struck by an inspiration. It was an idea for a book, or rather the title for one: *Einstein's Dreams*. "The title just grabbed me and took me away," Lightman recalls. From the title, he began imagining the young Albert Einstein as he wrestled to complete his special theory of relativity, his sleep suffused

with dream worlds in which time took on an infinity of possibilities.

Lightman recognized that the book would only work as fiction, and yet he was not a fiction writer. Or was he? "In retrospect, I can see that my interest in poetry and the parables that I had been writing as some of my essays and also my keen reading and admiration of the magic realist writers such as Gabriel García Márquez, Salman Rushdie and Italo Calvino—writers who distort reality in order to see reality more clearly—had all prepared me to take that title in the direction that I did."

Although he got to work almost immediately, it was several months before he felt with any certainty that the idea could be realized. "I didn't know if I could come up with a sufficient number of interesting dreams, or the narrative glue to hold the whole thing together." Working intensely through the summer, he finished the manuscript, including revisions, within a year. Published in 1993, *Einstein's Dreams* received enthusiastic reviews and soon was appearing on best-seller lists; it has since been translated into 27 languages.

Lightman went on to write a second novel, *Good Benito*, which garnered high praise for its sympathetic portrayal of the theoretical physicist's solitary existence. Although the book's characters and events are largely fictional, the author says, "the general culture that [the protagonist] lives in is drawn from my own experience. I really think that a writer can't write about something that he doesn't know about in one way or another." Last year, in recognition of his writing, Lightman received the American Institute of Physics's Andrew Gemant Award, given to individuals who have linked physics to the arts and humanities.

Lightman's fiction has drawn him into a distinguished circle of literary colleagues, including Rushdie, Michael Ondaatje, Ben Okri and Annie Proulx. With them, he shares ideas, thoughts, impressions. "Writing is a lonely business," observes Lightman. "It's even more lonely than theoretical physics. So it's wonderful to occasionally come out of your trench and talk to other writers." He is at work on a new novel, but notes "it's far too early to say anything more than that."

He is also a teacher of writing at

NICHOLAS ALTENBERND

From the Writing of Alan Lightman

In Alan Lightman's Good Benito (Pantheon, 1995), the physicist Bennett Lang, after several long and fruitless months of research, experiences for the first time the epiphanous moment of discovery. That creative moment, Lightman says, is common to both writing and physics:

He was taking a shower in his apartment before breakfast. Suddenly his body turned light as a feather. His head lifted up off his shoulders, and he felt like the time he had planed in a sailboat. The boat had been traveling at normal speed, but the wind was extremely high. Without warning the hull lifted out of the water and the drag instantly dropped to near zero and the boat began flying, as if some giant hand had grabbed hold of the mast and flung the boat over the surface like a skimming stone.

He was planing. He sank down on the tiles, with the water pouring over his head, and saw his error as well as the entire solution to his problem. . . . The answer appeared in his mind as a beautiful curve and he tingled and shivered. It had to be right. He leaped out of the shower. Without bothering to get dressed, or even to dry off, he went to the kitchen table and got out his pages of calculations and a new pad of white paper and began writing. He lost track of time, he lost track of his body. He was completely outside of himself, outside of the world. Within two hours he had reworked his problem in complete quantitative detail. Shaking, he graphed the solution and it matched the arc in his mind. The equations, which over the last months had grown tired and suspicious, came to life, and they were right and they were graceful and they glistened like a moon over trees.

In the essay "Smile," from Dance for Two (Pantheon, 1996), Lightman explores the science behind our senses of sight and hearing:

The man and the woman stand on the wooden dock, gazing at the lake and the waves on the water. They haven't noticed each other.

The man turns. And so begins the sequence of events informing him of her. Light reflected from her body instantly enters the pupils of his eyes, at the rate of ten trillion particles of light per second. Once through the pupil of each eye, the light travels through an oval-shaped lens,

then through a transparent, jellylike substance filling up the eyeball, and lands on the retina. Here it is gathered by one hundred million rod and cone cells. . . .

After about thirty seconds—after several hundred trillion particles of reflected light have entered the man's eyes and been processed—the woman says hello. Immediately, molecules of air are pushed together, then apart, then together, beginning in her vocal cords and traveling in a springlike motion to the man's ears. The sound makes the trip from her to him (twenty feet) in a fiftieth of a second. . . .

News of the woman's hello, in electrical form, races along the neurons of the auditory nerve and enters the man's brain, through the thalamus, to a specialized region of the cerebral cortex for further processing. Eventually, a large fraction of the trillion neurons in the man's brain become involved with computing the visual and auditory data just acquired. Sodium and potassium gates open and close. Electrical currents speed along neuron fibers. Molecules flow from one nerve ending to the next.

All this is known. What is not known is why, after about a minute, the man walks over to the woman and smiles.

From Einstein's Dreams (Pantheon, 1993):

There is a place where time stands still. Raindrops hang motionless in air. Pendulums of clocks float mid-swing. Dogs raise their muzzles in silent howls. Pedestrians are frozen on the dusty streets, their legs cocked as if held by strings. The aromas of dates, mangoes, coriander, cumin are suspended in space.

As a traveler approaches this place from any direction, he moves more and more slowly. His heartbeats grow farther apart, his breathing slackens, his temperature drops, his thoughts diminish, until he reaches dead center and stops. For this is the center of time. From this place, time travels outward in concentric circles—at rest at the center, slowly picking up speed at great diameters. . . .

Some say it is best not to go near the center of time. Life is a vessel of sadness, but it is noble to live life, and without time there is no life. Others disagree. They would rather have an eternity of contentment, even if that eternity were fixed and frozen, like a butterfly mounted in a case.

MIT, although he concedes that "it's difficult to teach writing—it might be impossible." Instead, he aims to "increase the students' sensitivity to good writing," by having them practice writing, of course, and also read. "I think any writer is influenced by hundreds of prior writers."

A creative life

Lightman does most of his writing during the summer, which he spends on a tiny, isolated island in Maine with his wife, who is a painter, and their two children. On a given day, he might rise at about 6:30, go for a run, have breakfast, make sure that the children are "happy and occupied" and then write for four or five hours. In the afternoon, he attends to correspondence, plays with the children and maybe takes a walk. "That's the ideal day," he says, "and it's sometimes the typical day."

Reflecting on his career, Lightman observes that "even when I was pas-

sionately involved with physics, I knew that I didn't have to be a physicist. What I did have to be was an explorer, I had to live a creative life." Over the years, he came to view writing as offering greater freedom for creativity and individual expression. This prompted a running debate with Subrahmanyan Chandrasekhar about science and art. "Chandra thought that there was room for individual expression in physics. And of course he did have an inimitable style, an elegance and formality that was unique to him." But Lightman was unswayed: "It is not the style of the scientist that matters in the end, it's the final equation or the final experimental result. Whereas in art, the individual style is everything."

There are, of course, similarities between good writing and good physics, Lightman says. Both require originality, "and yet in each, you have to connect with a preexisting body of understanding. There is a kind of verification

that takes place. In physics, you can't contradict established results. In writing, you have to connect with the emotional experience of your readers. You may have an original idea as a writer, but if it doesn't ring true to the reader, then it's not going to have an impact."

Several years ago, as his writing career was progressing, Lightman realized that he would no longer be able to continue doing physics research. "Research in science is not something you can do on a part-time basis—it's a consuming activity." And yet he still considers himself a physicist and he still views the world with a physicist's eye. "At least once a week, I will see something, like a swing swinging or a kite in the air, and do a back-of-the-envelope calculation, to figure out why the angles are what they are and so forth. I have the continuing compulsion to understand how things work and why things are as they are."

JEAN KUMAGAI ■