THE MYSTERIOUS MANIFOLD

The world of Calabi-Yau [manifolds] ... is in its present stage of infancy most similar to a Universe still in its "first three minutes".

Tristan Hübsch (1992)

[Physicists] found that the extra dimensions in string theory must be curled up into a Calabi-Yau shape.

Brian Greene (1999)

Calabi-Yau manifolds ... are the shapes that satisfy the requirement of space for the six hidden spatial dimensions of string theory, which must be contained in a space smaller than our currently observable lengths.

Kefeng Liu (2007)

You're trying to find the one metric given to you by God.

Robert Greene (2008)

[Calabi-Yaus] are alive and well and, if not living in Paris, are at least still prominent.

Shing-Tung Yau (2010)

He's here. He's even early. Well, it's nine-fifteen. I hand him his thick backlog off the printer and move to *Manifolds* before he can get away. He needs to have some concept of a Manifold. Not least because I worry he may get sucked in by strings and Manifolds are found all over the string world. I put it to him as he takes his seat: A Manifold, I say Yau says, is just a space or maybe surface. A lead balloon, almost my favorite band; he looks as if he's waiting for the balance of the sentence.

It's a mathematical idea, I say, of what a space can be. Physics' spaces come in lots of different kinds. For starters there are various dimensions. Not only three, but two or four or six. Actually, any number that the physicist might fancy is just fine. Of course it doesn't help. He just looks blank.

I try a different approach. Suppose we have one of those globes that show the surface of the Earth. I wave my hands to make a global shape. I should have bought one; pricey for a twenty-second demonstration but she wouldn't mind. In math, Earth's surface, I explain, is just a space. It's a Manifold with two dimensions. We see three, but critters living *in* the surface would see two. They would have no clue that there are really three. In fact, I go on, we see it as spherical, as curved, but to the surface critters it is flat. In desperation I remind

him of the Flat Earth people. See, I say, like surface critters they look east and west or north and south and all they see is flat.

Thing is, he's going to find physicists and even some philosophers who work in this or that imagined space. Often they won't take the time to say so. They'll toss off a line about some kind of Manifold. He only needs to know they are imagining a space.

After he is gone I struggle through Yau's tale of how he proved Calabi's manifolds exist. They are weird asymmetric shapes. Why do I care? Turns out that they make spaces that can get along with Einstein's. Susskind says they are the DNA of strings. This could be important. Shall I tell him in the morning? Not.