

# SHINE A LIGHT

See Saw Margery Daw

Johnny shall have a new master;  
He shall earn but a penny a day,  
Because he can't work any faster.

Nursery rhyme (ca. 1700)

The whole fifty years of continuous brooding have not brought me  
nearer to the answer to the question 'What are light quanta?' Nowadays  
every Tom, Dick and Harry thinks he knows it, but he is mistaken.

Albert Einstein (1951)

I suspect that scientists are driven by the sense that the world out  
there—reality—contains a hidden order.

Michael Crichton (1988)

"Of course there really *are* no Windows."

This is how he lets me know he's here today. Outrageous! They are *his* invention. He has me extol their virtues to the whole assembled cast. And now he says they don't exist?

"They're just a way of thinking."

I've gone on at length about them. What am I supposed to do? Rewrite it all?

"It's a relationship. Think of it as a Link."

To me a link is hypertext. It's something on a Web page that's one click away from something else.

"That's right. A Link."

His tone is mollifying, like he doesn't like adrenalin and wants to calm me down. I think his Windows crack was to distract me from my photons. I was thinking about Einstein's question, about Big Flash photons, about what they are. Does he aspire to find the answer?

Aether holds the physics spotlight in the 1800s until photons seize the center stage. From then on, for physics, photons are like trouble city. Unrelated to the All-Stars who are cool. The whole idea of photons has been hot since Einstein used it to kick off QM. They were the first quanta, now they shape *all* quantum thoughts. They contrive the concept of Duality. They reach top cosmic speed. The Big Flash is pure photons, stretched (and so refrigerated) beyond recognition. Now he needs them in *his* picture of the cosmos.

"Let's say Einstein's right about his rods contracting and clocks slowing."

It doesn't seem the time to tell him that SR is seen as local. At large scale,

space and time get bent so badly that it's meaningless to think of an Inertial Frame. But let his rods contract and clocks slow down, the Big Flash is not local. Ignoring my objection he plows on.

"So nearly fourteen billion years ago an overheated atom cuts a photon loose."

It would be a hot electron in an atom but there's no point in my getting cute.

"And it ends up absorbed by an atom in my eyeball."

To detect it we would need a microwave receiver, but an eyeball—if one has one—absorbs photons from the Big Flash, it is true.

"So I travel with the photon. Speed of light?"

Alright.

"How far does the photon go? In *its* Frame of Reference?"

I'm not sure his photon *has* a Frame of Reference. But can I bring up that objection now? I didn't when he stretched his Frame of Reference all the way from the Big Flash. As he knows, it's trivial; the answer's zero. Anything in its own Frame of Reference always goes no distance. Or putting it another way: SR says that, moving at the speed of light, measuring rods—however long—all shrink to zero. Ditto distances, however far.

"Zero kilometers, right? Zero nanometers? Zero anything?"

I get it; he must know I do.

"So in the *photon's* Frame of Reference the atom that emits it half a universe away, and here, the atom that absorbs it, are exactly the same place."

I know where he's going next and, sure enough, he does.

"So how long does it take?"

If I buy his assumptions then the answer must be zero. He is right. *If* he could ride with a photon and could take a Frame of Reference with him—two big ifs—the ride would be no distance, traveled in no time.

"So two adjacent particles trade energy. One loses it; the other gains. We don't need rods and clocks to follow that!"

He's saying, going with the photon he will see two atoms or electrons that are in the selfsame place. But I've got him. I don't need to mention that the mass of each is infinite. He is his own undoing or, as Will has Hamlet say,

"Tis the sport to have the enginer Hoist with his own petar...."

Has he forgotten all the Flecks that lie between them? There must be many of them lined up over fourteen billion light years, even though not all of them exist when he sets out. Has he forgotten Amelino-Camelia showing a light-speed observer can agree with slower others on the size of Flecks?

"Are you forgetting that a Fleck does not have length?"

I still don't buy it. Flecks have volume.

“How will you make them line up?”

By now I'm weaving like a boxer who has gone too many rounds. The fact is that they *won't* line up. And worse, there *is* no line. Although his photon ride is trivial his real point is that after the Beginning the whole concept of the photon needs to be redone. I buy it. He seems satisfied but can't resist a final shot.

“A photon's an amount of energy the UC won't allow out on its own.”

I've been thoughtless. Seems he feels imprisoned. Maybe so would I.