

BRIDGING DIVIDES

The whole world shall become as one book and the contradictions of science and theology shall be reconciled.

Fratras Rosa Crucis (1614)

A whole new field of reality was found, altogether beyond the appreciation of the Middle Ages during which supernatural revelation was the centre of all thought.

Werner Heisenberg (1934)

We are all agreed that your theory is crazy. The question that divides us is whether it is crazy enough to have a chance of being correct.

Niels Bohr (1958)

Einstein was simply ahead of his time. More than half a century later, his dream of a unified theory has become the Holy Grail of modern physics.

Brian Greene (1999)

Most mornings I'm here early and unlock the door, thinking the same thought: What are we doing? Each time I make to ask—when she shows up, that is—she waves me off. So today she starts her day by telling me America, the whole world really, could use a boost. That, she says—as if this should be obvious—is what we are about to do. The way she sees it, it is all already there. We just have to look it up. She means the Web. Maybe she's been listening to Frank. And she can't resist recycling her standard admonition: Check it out.

Yeah, right, ride the bullshit highway. And anyway her fancied field's been worked over by experts and picked over by millions. Her chances of pulling this thing off with Frank and me are nil, nix, nada. We'd need a *fictional* detective to have any chance at all. Whatever. She is paying. So I write.

But first I read. It soon comes to light that lots of thoughtful thinkers are now thinking about theories of gravity that might jibe with QM. In other words, they're hard at work to bridge the New Divide. String theory and quantum gravity are the main approaches. There are many papers about these two subjects—at least thousands, maybe millions—spanning more than fifty years. A goldmine of intellectual investment. Now there's a stylish turn of phrase. Frank, I think or maybe even say out loud, this is the record speaking. Listen up!

Is there some kind of echo in my head? I dismiss the thought. Only later do I think of it and wonder.

In the main the history of physics is a tale of bayous and backwaters. Seduced

by visions of the sudden stream, the tide that will take them to (they think) a legendary land, physicists like mariners of old toil mainly near the waters they know well, venturing within the margins of their maps. But once in many whiles one takes a longer leap. String theory may be one such.

Starting in the 1960s, string theory garnered physicists' attention. Actually, though, it's hard to say that this is so. There's a problem with the name string theory. What is loosely called string theory includes many different string theories. It's a problem. There are too darn many. How many? Nobody can say. Another problem is: Many physicists say none of them are theories and none will ever be. Why? Because none of them seems able to predict anything that can be disproved. But they are so beautiful that many physicists devote their careers to them.

So string theory is a mess. When I say so, he seems despondent. I can't imagine why. I'm like: Welcome to the Wild West of physics! In due course, I tell him, he will get a guided tour of its best sets. Till then I tell him all he needs to know about string theories in sixty words. They aim to reconcile GR and QM. How? They say particles that physics says are points with no size actually do have size when seen up close. They at least have length; they are like tiny bits of string. What they do is wiggle in a quantized kind of way. This means that only certain wiggles are allowed. Don't fret, I tell him, we will get to that.

Quantum gravity's a theory that we don't yet have. It's also a bunch of theories that we do have, some involving strings. The advantage of the one we *don't* have is that it will work. The advantage of the ones we *do* have is we have them. Physicists can fiddle with them hoping they may stumble on the *one*. What can I say? More of the Wild West? In a way it makes some sense but it's not easy to explain.

Once we have it QG will stitch GR and QM back seamlessly together. More important from our point of view, if there is any broad agreement across the New Divide it's that the ultimate theory must begin the way the universe begins. With no grasp of how the universe began, Physics wanders hand in hand with Mathematics chasing random rabbits, looking for tall trees, mindless of the ecosystem they inhabit. In principle the answer's simple: QG must be about the universe. All of it for all time.

There are many theories of the universe or of pieces of it. They could stock a cosmic zoo. Most are more or less dependent on a background. Background is a notion he will have to get his head around. I tell him it is like the cage for a zoo animal—the scene in which its life unfolds. Most people take the cage for granted but without it they would see no animal. The thing is: Someone had to build the cage before the animal arrived.

In physics, space and time or something like them are the background. So where did *they* come from? Many of his experts—physicists, that is—say that a theory must be background-independent—it must *explain* space and time rather than assume them—if it is to be a *Theory of Everything* like QG. So *he* will need to take a background-independent path to get to the Beginning. This will strain his brain. Masterly understatement. Many canny runs are taken at it, all in vain.

This is not the kind of problem that's a clue. It's a problem-problem. It might even be *the* problem. Hard to imagine but he may be in the bridging business, bridging what no one has bridged, the New Divide.

Of course this pep talk's nothing more than make-believe. It seems silly even as I think it. It's still silly when I write it down. But then I come across an intimation—something less than a suggestion—that holds out a trace, the slightest hint of hope. Joan's cousin John Baez does physics. He's at home in heavy-duty math:

Modern theoretical physics is difficult to understand for anyone outside the subject. Can philosophers really contribute to the project of reconciling general relativity and quantum field theory? Or is this a technical business best left to the experts? I would argue for the former. General relativity and quantum field theory are based on some profound insights about the nature of reality. These insights are crystallized in the form of mathematics, but there is a limit on how much progress we can make by just playing around with this mathematics. We need to go back to the insights behind general relativity and quantum field theory, learn to hold them together in our minds, and dare to imagine a world more strange, more beautiful, but ultimately more *reasonable* than our current theories of it. For this daunting task, philosophical reflection is bound to be of help.

True, it is a far stretch from reflection to detection. And maybe this would all be better if I'd asked her for a philosophical detective. A few sleuths in fiction have that kind of mind.

And the Old Divide? She's made it clear she doesn't want us to go near it. But if we are anywhere then near it is exactly where we are.

Tonight I go home early. Paycheck in my pocket I eat out for a treat. A classy restaurant on Wilshire. Confit, I am told, is any food cooked slow. I think but don't say to the waiter that slowly would be better grammar. I didn't know. What confit is, that is. I return to barracks sated. Then head down to the shoreline for a toke or two, trying not to think of what the coming day may bring.