

THE PROBLEM OF TWO THEORIES

There was once an old sailor my grandfather knew
Who had so many things which he wanted to do
That, whenever he thought it was time to begin
He couldn't because of the state he was in.

A.A. Milne (1927)

Truth is a whole, and the truth of physics will be found to link on
and to be but part of that larger truth which is the nature and the
character of the universe.

Jan Smuts (1931)

There is no way we can have two theories of nature covering
different phenomena, as if one had nothing to do with the other.
Any claim for a final theory must be a complete theory of nature. It
must encompass all we know.

Lee Smolin (2006)

There could only be one truth.

Stieg Larsson (2008)

Drawing up the list is tricky. As the French would say: *Ce n'est pas de le tarte*. Which is best left untranslated but, if someone should insist, might say: It isn't pie. Or, a little looser (the French has better flavor): It's not a piece of cake. *He* is the reason why.

She's a cinch. All she asks of me is: Collect clues and feed them to him one by one. She leaves sequence up to me. There is of course a natural progression. On the other hand there's him; or he. All I can think of is to take it easy, very easy.

As he's seen already, GR and QM are both successful theories. The problem is that they describe two different kinds of universe, two different realities, as it were. Or, as Smolin says, 'We now have in our possession laws that can describe correctly every experiment we have been able to invent.' The problem is for each experiment we must choose which law to apply.

This is disturbing. One theory, or even two that are compatible, would be much better. Having two that don't agree would be okay if one is wrong. But while each has its problems, each is too successful to discard, at least until there's something that can take its place. Evidently theories are the kind of thing where two are less than one. The problem becomes even worse when they describe the

universe. Neither is up to the task.

That's the pragmatic statement of the Problem. But the real problem is, as Smolin says: It's one universe. There must be one way to explain it.

Which gives rise to the question: What kind of way? In 1919, Einstein writes about two types of theories in physics, constructive theories and principle-theories. Constructive theories, he says, 'attempt to build up the picture of the more complex phenomena out of materials of a relatively simple formal scheme from which they start out.' By contrast, principle-theories start from elements 'that are not hypothetically constructed but empirically discovered ones.' In these terms, both his theories of relativity are principle-theories. Though he has polite words for constructive theories, one can't help feeling he sees his kind as superior.

Is there a lesson to be found in this dichotomy? Maybe there is: Frank's big on empirical discovery. Casing the scene, he calls it. But how can empirical discovery help him find out how the universe begins? It's a scene he cannot case.

It's not his problem but the only way to *solve* the Problem of Two Theories is to come up with one theory that will work for everything. QG *aims* to work for everything so it should reconcile the Two. It should be, as Smolin says, the 'complete theory of nature.' But no one knows what QG is. There are several contestants. They have two impediments to overcome—QM and GR—whose successes make it risky for a physicist to fly too far. It's easier to start from solid ground of one established theory and inch toward the other. Some physicists have put a lot of effort into inching. It hasn't worked so far. To me it seems it never will. Why not? Well, because both QM and GR are built on background—GR less so than QM. Working through a book or two it becomes clear this disability's well known. Why then do they keep on trying? There's that definition of insanity . . .

Maybe it's a double-ended dead end: Setting out from 'quantum' or from 'gravity' doesn't seem to get to 'quantum gravity.' Is it like that *Millinocket* line?

You can't get there from here.

From where *is* it possible to get there? Hopeful answers to this question populate QG. Few physicists work on them. But for Frank the Problem of Two Theories is just a clue. He's not supposed to work on QG; he's supposed to look for the Beginning—a completely different issue. Or is it? After all, if QG—whatever that is—is the one and only theory of the universe, wouldn't it begin with the Beginning?