Big and Old and Dark and Cold

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Is our universe user-friendly? Not obviously, for it is big and old and dark and cold. So it is easy for anyone who stares up into the night sky to feel insignificant. After all we are about six feet tall in a universe which is seventy thousand billion, billion miles across. We only last seventy years; the universe has been around for twelve thousand million of them.

Several millennia ago, when that Hebrew shepherd boy, David, later to become king, gazed up into the night sky he certainly thought that he was significant. He later talked about being made "a little lower than the heavenly beings." But whereas David could have counted no more than a thousand stars while he guarded his sheep against night prowlers, telescopes show that our own galaxy—the Milky Way—contains some hundred thousand million stars. And there are another hundred thousand million galaxies. That amounts to two million, million stars for every man, woman, and child alive today! How about significance in that sort of a world?

One reading of these large numbers reinforces feelings of human insignificance. But an alternative offers a new twist, one which goes like this:

It takes billions of years for the building blocks of life to be formed in stars, so, for us to be here, the universe *has* to be very old.

As a result of the Big Bang, matter moved off at nearly 186,000 miles a second—the speed of light. Keep traveling at that kind of speed for twelve billion years and you will go far! So the universe has not only to be old but also big.

The Big Bang was violent and it was hot. But because an expanding universe gets cold, and this expansion has been going on for a very long time, the universe is now colder than anything to be found on Earth outside the specialized conditions set up in low-temperature laboratories.

So we should not be surprised to find the universe the way it is.

As regards the development of the universe following the Big Bang, much depends on the density of matter. It is the gravitational attraction between matter that tends to slow down the expansion. Professor Stephen Hawking has suggested that "if the density of the universe one second after the Big Bang had been greater by one part in a thousand billion, the universe would have recollapsed after ten years. On the other hand, if the density of the universe at that time had been less by the same amount, the universe would have been essentially empty since it was about ten years old."

Professor Paul Davies has discussed how precise the matching of the outward exploding thrust of the Big Bang and the inward gravitational attraction needed to be in the early universe for life subsequently to develop. He points out that "the matching was accurate to a staggering one part in 10^{60}. That is to say, had the explosion differed in strength at the outset by only one part in 10^{60}, the universe we now perceive would not exist. To give some meaning to these numbers, suppose you wanted to fire a bullet at a one-inch target on the other side of the observable universe, twenty billion light years away. Your aim would have to be accurate to that same part in 10^{60}."

That was but one of many "coincidences" that had to be satisfied for life to put in an appearance. The physical constants governing the strength of the forces and other characteristics of nature also had to be finely poised for us to be here. Take, for example, gravity:

Out of the Big Bang there came mostly the lightest gases, hydrogen and helium. These needed to be fused together to cook up the heavier elements like carbon, nitrogen, and oxygen, which are the building blocks of life. The high-temperature, high-pressure conditions found in the interior of stars provide the ovens for doing this. Some stars then blow

up when they are old, scattering these heavier elements into space, eventually making up our bodies.

But how do stars form in the first place? Through gravity compressing a cloud of gas, heating it in the process, and igniting the nuclear fusion fires. Make gravity any weaker, and the stars will not ignite. Make it any stronger, and the stars will be so massive they will burn too fast and long-lived stars like the Sun will not exist.

Do these and other coincidences amount to a knockdown argument for the existence of a Designer God? I don't think so. Knockdown arguments for God are always suspect, perhaps because many believers don't see God as forcing people into corners from which there is no escape. What can be said is that this view of the universe is entirely consistent with belief in God. There is nothing irrational in believing in a Creator who made the universe with us in mind. Certainly there are scientific answers to why the universe developed the way it did, but they still leave unanswered the question of why there is a universe at all with the properties which gave rise to us.

If such speculations do point in any way toward a purposeful God, they point little further than to some remote originator of the universe. The turn of the millennium, however, directs our attention to history rather than to science for answers about purpose. It commemorates, and for many people celebrates, someone who claimed to be God incarnate —incarnate with a body made up of the ashes of long-dead stars. As if that claim was not staggering enough, he claimed to die for our sins, to defeat death by rising from the dead, and to be able and willing to show us the purpose for our lives today.

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