



God's Rays

The physicist's quest for understanding is not the only way to raise the level of our existence and give our lives meaning.

Bryce DeWitt

Editor's Note: Bryce DeWitt wrote this personal essay for PHYSICS TODAY before he died on 23 September 2004. With it, PHYSICS TODAY begins its celebration of the World Year of Physics 2005.

A vacant lot sprinkled with puncture vines spread westward, and the Sun was setting over the coast ranges. It must have been near the end of school for I was already walking barefoot, something that my father, the local country doctor, looked on with disfavor. There were clouds in the west, left over from a late spring rain, and the sun was sending shafts of golden rays earthward. "God's rays," said my companion, aged six, and we kneeled in obeisance until they disappeared.

Beauty we took for granted, and we responded accordingly. Our vacant lot was in a small village on the east side of the San Joaquin valley [in central California]. The puncture vines were hazards to bare feet, as they were to our bicycle tires, and we had to give attention to both as we crossed over. In 1930 there were many vacant lots. This one was close to where we parted ways, he to his home down the street and I to my maternal grandparents' farm down a country road.

Even though my grandparents were terribly pious, it was always a treat for me to visit them at the farm. Before sitting down to supper, we had to kneel, with our elbows on the chair seat, and listen to Grandfather give a long prayer. This was repeated after supper. In addition, Grandfather read a chapter or two from the King James Bible. He was working his way straight through the volume, chapter by chapter, book by book. (He had already gone through it twice before, although how he made it through the book of Numbers, I have never understood.) I remember absorbing nothing from these readings. What I got came from Grandmother, who plied me lovingly with Bible stories: The young Samuel and Eli, the high priest. The sword of the Lord and of Gideon. Daniel, Shadrack, Meshack, and Abednego (the original wholesome-food cranks). Moses and Pharaoh's daughter. . . . Grandmother also sang to me many religious hymns. What I got of Protestantism I got mainly from her. And I got it in a par-

ticularly evangelical form.

Grandfather was a failure as a farmer. For example, the farm had no electricity, and to my delight, we had to use coal-oil lamps inside. What he had always wanted to be was an astronomer. He built amateur telescopes, the lens of one of which is in

the Harvard College Observatory to this day. His family was too poor to send him to university. But his heart was in science. Naturally Grandmother hounded him to his deathbed, trying to make him give up believing in Darwinian evolution. In later years she and I too had our arguments. For example, according to her the world was made in 4004 BC. Counting forward 6000 years from that date and taking into account the fact that there was no year 0, that would bring us to 1997 AD, sometime in the summer according to Grandmother. Armageddon would then begin and would last for 3½ years. In 2001 AD, the "Son of man" would come "in the clouds of heaven with power and great glory," and the seventh millennium would be the great one. Grandmother always said that although she would be dead by then, I should live to see it. I confessed that it would be delightful to see such a phenomenon in the sky (I was already planning to become a physicist), but I pointed out to her that Jesus said, "Of that day and hour knoweth no man, no, not the angels of heaven." She would merely hang her head a bit.

It is amazing to me that when I tell this story today, I get quite a few responses to the effect that Grandmother just had her dates wrong. How depressing.

After the evening Bible reading, I was sent to bed with a big old alarm clock having a luminous dial. I loved to hold its face close to mine in the dark and watch the scintillations produced every time a radium nucleus decayed. It was better than a Teddy bear.

A few years later I was old enough (around 10) to go to Daily Vacation Bible School. It was organized by two energetic ministers in town, and even though it occurred during the summer vacation I was happy to go to it because it was fun, and it only lasted for about three weeks. It was held in the junior high school building, which had facilities such as a woodworking shop, a basketball court, and a baseball diamond. But the most exciting facility for me was the auditorium, where we had competitions. These were of two sorts. First, the student body was divided into teams, and once a week each team was asked to recite aloud the Bible verses they had memorized during the preceding week. Points were given for the number of verses memorized. Only the number mattered, not their length, so we quickly discovered where the shortest verses in the Bible were to be found.

The second competition involved speed. The two ministers had somehow acquired a supply of Bibles, which they passed out to the youngsters. One of them would call out a

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verse—for example Proverbs 4:7—

and the first youngster to locate it and read it out was the winner.

Since the Bibles were from a cheap edition and had no page tabs to help in the search, we had to learn the names of all the books in the Bible—in proper order. As a result we effortlessly acquired a command of all those great lines in the Bible that, up until the middle of the 20th century, could be assumed by English authors to be part of a common European cultural heritage.

Nowadays, when I am reading a 19th- or early 20th-century novel, I find myself wondering how many readers catch the biblical allusions. Since Shakespeare is still taught in our schools, I imagine that his lines do not go unnoticed. But what a pity it is to have lost the ability to make use of such great lines as

Gird up now thy loins like a man.

Where wast thou . . . when the morning stars sang together?

Out of the mouth of babes and sucklings hast thou ordained strength.

The heavens declare the glory of God; and the firmament sheweth his handiwork.

Comfort ye, comfort ye my people.

They that wait upon the Lord . . . shall mount up with wings as eagles.

We hanged our harps upon the willows.

Cast thy bread upon the waters.

Their work was as it were a wheel in the middle of a wheel.

Ye are the salt of the earth: but if the salt have lost his savour, wherewith shall it be salted?

For all they that take the sword shall perish with the sword.

For now we see through a glass, darkly; but then face to face.

Though I have all faith, so that I could remove mountains, and have not charity, I am nothing.

And on and on.

Amateur theologians

I have never felt a conflict between my sensitivity to the King James Bible and my beliefs as a physicist. I am a theoretical physicist, and it is common knowledge that theoretical physicists often start out as amateur theologians. They want to understand the *whole* of reality, and they begin by studying cosmology—the obvious starting point. Nowhere does a physicist's religious or philosophical preferences (one should really say prejudices) show up more clearly than in his approach to cosmology. In the early days of the so-called steady-state theory of the universe, everyone knew (though no one ever said so in print) that the model was motivated by antireligious sentiment. When evidence for the Big Bang began to accumulate, the steady-state theory nearly collapsed (a mutilated version

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of it has been kept alive) and the Vatican became ecstatic. Independent of the early history of the universe, there remains the question of its topology. Some cosmologists are convinced that the total volume of the universe must be finite, others that it must be infinite—in both cases without a shred of physical evidence. Usually these beliefs stem from a feeling that the structure of the universe should be describable in a neat compact form.

Once again I can only say, “How depressing.” Albert Einstein said, “The Lord God is subtle but He is not malicious.” I like to turn this around by saying, “The Lord God is not malicious, but He is subtle.” I have never believed that reality could turn out to be fixed by an unimaginative initial condition. Fortunately, some cosmologists have lately begun to consider models in which the “initial conditions” are aleatoric and hence far from simple. They even envisage infinite numbers of simultaneous universes, as well as possible behaviors *before* the Big Bang. For some reason, however, all their proposals ignore one of the most obvious.

At the time of Isaac Newton, the formalism of classical mechanics (laws of motion, gravitational forces, and the like) was regarded as providing a direct representation of reality. The formalism of quantum mechanics, on the other hand, has almost never been regarded as providing a direct representation of reality. Physicists seem to be scared by it. Those few who do envisage a direct connection between formalism and reality are, for some reason, more often from Europe than America.

The Europeans are braver than the Americans, because if one accepts the view that formalism and reality are isomorphic, then in the quantum theory one is obliged to accept a stupendous number of *simultaneous realities*, namely, all the possible outcomes of quantum measurements as well as all the possible “classical” worlds that emerge spontaneously from the wavefunction of the universe through the phenomenon of decoherence. The notion of a wavefunction for the whole universe is not ridiculous. Cosmologists who worry about quantum effects in the early universe (for example, in galaxy formation) use it all the time.

Among those who deal with such heady intellectual problems, use of the word “God” is not uncommon. It is used in some of the popularizations that physicists have written, which attempt to convey to the general reader some of the glory of physics, particularly cosmology. I am occasionally tempted to try writing such a book myself, but I know that it would be terribly one-sided. I know *some* physics, but there is much more to “reality” than physics, and of that I am largely ignorant. So I wind up instead writing a physics treatise for specialists!

The trouble with writing a popularization is that one has to be absolutely honest. There is a photograph taken from one of the early interplanetary probes, looking back toward Earth. Earth appears as a tiny blue sphere surrounded by an immensity of blackness. It is a photograph that makes tears flow. There is no sharper visual statement of the loneliness of our planet. Earth is an insignificant speck in a vast and overwhelmingly hostile universe. There is nothing to suggest that human beings have a special role to play in this universe. Steven Weinberg is

absolutely right when he says, "The more the universe is comprehensible, the more it also seems pointless."¹

Lifting human life

So where does that leave the amateur theologian, the young and eager theoretical physicist? Weinberg says, "The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of tragedy." It surely does that. But are there no other bright spots? For not everyone is a theoretical physicist.

Many years ago I had a postdoctoral assistant named Heinz Pagels, a very nice young man and very bright. Unfortunately he died in a mountain accident before he could display his full potential. He left a wife, Elaine, whom I have met only once, years ago, but who has meant a lot to me through her writings. She is a religious historian specializing in the first three centuries of the Christian era and in particular in the so-called Gnostic Gospels, several manuscripts of which were discovered in a cave in Egypt in the middle of the 20th century.

The period before 300 AD is a very difficult one to write about; the evidence is so fragmentary. The historian has to present every scrap of speculation about this period that has been put forward by dozens of other historians, and then answer those with whom she disagrees. Nevertheless, after all preliminaries have been cleared away, one message comes through loud and clear. Many Jesus cults arose around the Mediterranean basin in those years. Some believed that Jesus was divine, others that he was just a man. Some had their own gospels, with stories and sayings of Jesus. Some had their own bishops—intellectual types who couldn't resist trying to propose frameworks for belief. But the cults themselves typically arose

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among the lowest social strata (slaves, beggars, convicts) who were coming into contact, for the first time, with a "religion" very different from those they already knew about. This new religion touched such a deep chord in them that many were willing to oppose the authorities on its behalf even if that opposition meant death. And all these developments took place before Constantine co-opted the political power inherent in the new religion by setting up the Council of Nicaea in 325 AD.

What was the new element in this new religion that had such an overwhelming impact? In a word, *love*. That is the key word, for believers and nonbelievers alike, that raises our existence above the level of farce. And it needs no religious framework whatever to exert its power.

Reference

1. Steven Weinberg, *The First Three Minutes: A Modern View of the Origin of the Universe*, Basic Books, New York (1977). ■

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