

[Cosmic resolutions for 2007](#)

- Howard Smith

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This was a productive year for astronomers investigating the origins of the universe, as a wealth of new data confirmed and refined the modern scientific picture. For most people however -- the 64 percent of Americans who say religion is "very important" to them (according to the Pew Research Center) -- this year presented spiritual challenges. The new results may have bolstered science, but they seemed to confirm the irreconcilable conflict between science and religion. Meanwhile authors Richard Dawkins and Sam Harris launched a broadside attack against religious belief. As we contemplate a new year, it is worth stepping back to consider what is happening, why it matters, and what to do.



Yes, today for the first time in history we know with some certainty how the universe was created. About 13 billion years ago, the cosmos we know was an infinitesimal speck. It exploded, expanded and is now about 46 billion light-years in size. The foundations for this "Big Bang" description were laid in 1929, after earlier puzzles led Edwin Hubble to his unexpected observation that other galaxies are moving away from us. Albert Einstein's theory of relativity explained those motions as cosmic expansion, shocking virtually all scientists (including Einstein) who had imagined that our own galaxy was the universe, and that it was eternal and unchanging.

Hubble measured the velocities of 46 galaxies. This year, several teams of astronomers reported their measurements of hundreds of thousands of galaxies, confirming that the universe was born and has been expanding ever since.

There was other impressive news. The embryonic cosmos was fabulously hot and dense. Light in this environment was scattered by hot plasma like headlights in a fog. But the universe was expanding, and as it swelled, it cooled. About 380,000 years after creation, once matter had cooled enough for atoms to assemble, light traveled freely. That light is seen today as "cosmic background radiation." Discovered in 1965, it has become, like the motions of galaxies, a diagnostic of what happened way back then.

In March, scientists using NASA's WMAP satellite announced their latest results: in the standard model, the universe is 13.73 billion years old, with a statistical precision of plus or minus 100 million years. (Last month, the 2006 Nobel Prize in Physics went to two astronomers who had measured this radiation with a pioneering 1989 NASA satellite.

But who cares about arcane science? Last February, the National Science Foundation released Science and Engineering Indicators 2006, a public survey of science attitudes that has been repeated for 30 years. The survey results suggest that you care. It consistently finds that Americans think "science and technology are making our lives healthier, easier and more comfortable" (91 percent), that "the benefits of scientific research outweigh the harmful results" (84 percent), and that "even if it brings no immediate benefits, scientific research that advances

the frontiers of knowledge is necessary and should be supported by the federal government(83 percent)."

On a gloomy note, the survey reports only 35 percent of adults knew the universe began with a big bang; 29 percent said the Sun goes around the Earth.

People tend to be fascinated by cosmology, whatever their scientific literacy or religious perspective, because it helps to frame the context of meaning in life. As British physicist Stephen W. Hawking opines, "We want to make sense of what we see around us and to ask: What is the nature of the universe....[W]here did it and we come from?" We also care because context can have ethical implications.

There is long tradition of deriving moral lessons from cosmology, with familiar examples being theological. The story of Adam and Eve, for instance, teaches that God made all humans related, descendants of one couple. In the 16th century, the Jews who were followers of the Jewish mystic tradition of Kabbalah taught that the cosmos was born and is changing, and derived a cosmic lesson: humanity can affect that change, as righteous deeds improve the fabric of creation. The contrasting, predominant scientific view -- a static universe -- persisted until Hubble, and lacked this ethical imperative.

Atheism prompts a cosmological ethic as well. This year Dawkins, in "The God Delusion," argued for replacing righteousness with a blend of Darwinian personal ethos and rational calculation. Unfortunately, he makes his case while chastising the faithful with boundless hubris. His indifferent reductionist philosophy peremptorily discards the morality of religion. Dawkins' book tries to quantify human attitudes and rationalize human spirit, but in so doing it leaves the creation without an ethical context, and thoughtful religious believers dismayed if not a bit bewildered.

It is possible to appreciate both the insights of religion and the lessons of science. This year's precise, self-consistent cosmology certainly prompts one ethical reflection: science's intellectual openness and quantitative inquiry have been wonderfully productive. They are worthy of emulation. Here's another: newly uncovered puzzles (dark matter, cosmic acceleration) compel humility. We do not know it all. Cosmology and Kabbalah illustrate that science and religion, presupposed opposites, speak to the same mysteries. Their perspectives, while different, are not necessarily contradictory. Their moral imperatives can enrich and motivate both rational and righteous behavior.

My New Year's resolution? In 2007, I hope that science and religion can cooperate, not clash, to solve social problems. I hope we listen with tolerance to opposing opinions, and replace hostile, defensive rhetoric with thoughtful analyses. And, not least, we need to become better informed about our marvelous, blessed world.

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