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How It All Began

by Irwin Savodnik, M.D., Ph.D.

WHEN IT COMES TO HOW THE WORLD CAME INTO being, it's good to know a lot of physics, astronomy, mathematics and even philosophy. More than anything, though, you'd better have a really rich imagination, one that knows no limits. Add to this preparation the requirement that you won't ever *really* know which theory is right or wrong, since verifying your idea of how the world stepped out of its egg can't be confirmed. The reward for divining a path through this maze of problems is the process itself. It's great fun if you like puzzles. Here are a few ideas that led to the emergence of what is now known as the Big Bang Theory.

In 1927, a Belgian priest, Georges Lemaître, suggested that the universe got its start with a gargantuan explosion. Lemaître, who received his Ph.D. from MIT in the same year, proposed that the galaxies were moving away from one another in all directions. The universe, he claimed, was expanding. Lemaître's problem was that he had no evidence to support his theory. It took a few years before Edwin Hubble, working at Mount Wilson observatory in California, offered Lemaître's idea without ever having heard of him. Unlike Lemaître, Hubble had evidence to support his position and the idea of a cataclysmic beginning to the universe was launched. He determined that the velocity of a galaxy was directly proportional to its distance from us. A galaxy twice as far from us is also traveling twice as fast. Combined with the red shift, a change in the spectrogram of a galaxy, the idea of a sudden blow up at the beginning of everything received added support.

In 1964, two researchers, Arno Penzias and Robert Wilson discovered background microwave radiation that the Big Bang Theory predicts. For this work they received the Nobel prize. More recently, NASA's COBE satellite detected cosmic microwaves from the furthest reaches of the universe, indicating that there was a remarkable homogeneity of matter in the earliest moments of the universe's existence.

In the succeeding moments, billions of times shorter than a single second, there came into existence madly rushing particles of matter and anti-matter. As the two different kinds of particles collided, they destroyed one another, leaving energy in their wake. As this process progressed, more matter survived than anti-matter, which is fortunate for us since we are not made out of anti-matter. Billions of moments before the end of the first second, the universe continued to expand and other particles began to form. These particles, known as baryons, were created at about 10^{-33} seconds after the big bang and included photons, neutrinos and quarks. The infant universe began to cool and more complex particles such as protons



and neutrons came into being. Soon came leptons, which included electrons, neutrinos and photons that would begin the process of forming elements like hydrogen, helium, lithium and more.

When did all this begin? Put down your calendar. Astronomers and physicists estimate that the age of the universe is between 10 and 20 billion years. It's the calculation that's really interesting. Here's how it works. Astrophysicists can determine the distance of a particular galaxy as well as its velocity. If you divide the distance by the velocity you get time. Here's what the numbers look like:

$$4.6 \times 10^{26} \text{ cm} / 1 \times 10^9 \text{ cm/sec} = 4.6 \times 10^{17} \text{ sec}$$

It turns out that 4.6×10^{17} sec equals approximately 15 billion years. It doesn't matter which galaxy you use. Just plug in the numbers for that bunch of stars and you wind up with the same age for the universe. In other words, about 15 thousand billion years ago there was a huge explosion that brought into existence the world as we experience it today.

The Big Bang Theory has a number of detractors who offer a variety of arguments. One theorist asserts that the spectroscopic changes that make up the red shift are caused by another process than the one supporting the Big Bang. Another argues that the age of some objects in the universe is older than the theoretical age of the universe itself. There is a theory that our galaxy, the Milky Way, has only undergone 45 to 60 rotations, which is not enough time for it to have assumed its spiral shape. It would have had to spin around on its axis many more times in order to develop the geometric eccentricity of a spiral structure. Also, there have been identified chains of galaxies in the universe that would have required hundreds of billions of years to develop.

So don't relax too much about the origin of the universe. There is still plenty of mystery to keep you up at night. And if you get really excited about how the world came into being, get a small telescope, wait for a clear night and point it up at the sky. Look at the Great Nebula in Andromeda and just imagine the trillions of miles, the billions of worlds and the magnificence of creation. All from a moment before time began. — IS

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SAVODNIK'S PICKS

A Monthly Review of Dr. Savodnik's Favorite Books-On-Tape

Monsignor Quixote

by Graham Greene



Graham Greene, author of *Monsignor Quixote*, lived a long, rich and complex life. Born into the Anglican faith in 1904, converting to Catholicism in 1926 and producing a broad array of literary works, he embodied the existential uncertainty of modern life.

While he resented those who viewed him “merely” as a Catholic writer, he clearly found in the church a source of meaning and direction he had been seeking in his youth. In this picaresque work, Greene examines how people embrace their belief systems and then picks away at the absolutism so often found in the hearts of their adherents.

Greene departed from other British Catholic writers such as Evelyn Waugh and Anthony Burgess in leaning to the left. He became a fan of Fidel Castro and objected to what he perceived to be American Imperialism. He was, though, always a loyal British subject who worked in British intelligence. By the end of his life, it was not clear whether he was a novelist who spied or a spy with a literary cover.

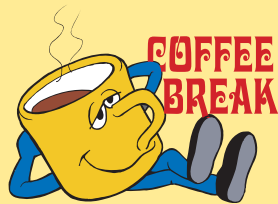
It was in the latter days of his earthly habitation that Greene wrote *Monsignor Quixote*, published in 1982. Yes, it does play on the Cervantes theme, though it is hardly a re-run of

that masterpiece. Father Quixote, who regards himself as a descendent of Cervantes' character, is a priest in the small town of El Toboso in Spain's La Mancha region. After helping an Italian bishop whose car has broken down, he is rewarded by being made a Monsignor. Quixote's own bishop, concerned about him, suggests he take some time off and see the countryside. In short order, he and his friend Sancho, the ex-mayor of El Toboso, take off on an extended trip across Spain in the priest's Seat 600 named, appropriately enough Rocinante, after his “predecessor's” horse.

There is a lot of wine, a bordello and pornography of a sort that grace the pages of the book. In their travels Quixote and Sancho talk about their respective ways of viewing the world, Quixote from the perspective of Christianity, Sancho from that of communism. In the quietude of evening, their ideas come alive and do battle with one another. Hints emerge that each of them is not as certain as he has been of the tenets of his faith.

In a metaphysical ascent, Greene reveals the fragility of belief, the vulnerability of the spirit to the allure of new ideas and the ubiquitous wine that is at once an intoxicant and a sacramental fluid. The one element that does not yield is the friendship between the two men.

The book was produced as a television movie in 1988 and starred Alec Guinness. It's a charming film worth seeing but the novel stands alone. Read it, see the movie and travel across Spain courtesy of Greene's lustrous imagination. — IS



THE COFFEE BREAK QUIZ

The Mental Status Examination is:

- A. a test for entry into British colleges
- B. a test required for American citizenship
- C. a part of an appendectomy
- D. a part of a psychiatric exam

The Mental Status Exam is akin to a physical and surgery.

ANSWER: D.