

Modern Science and its implications

By Barry McWilliams

The world of ideas and the world of science have always been linked. The ancient Greeks who originated many of the concepts of geometry and science linked them with their gods. Scientific theory and concepts have had significant impact on Christianity as well.

The world and universe of the reformers

The Medieval world had reached its peak. The Earth was the center of the Ptolemaic Universe, surrounded by the Celestial Spheres, as it had for several thousand years since creation. It had recently “grown” to include the continents of the New World discovered by Columbus (1492) assisted by the compass. The invention of the mechanical clock, and spectacles assisted students of the liberal arts and law at the Universities - such as Paris, where Calvin studied. Aristotle and alchemy dominated science, and Church fathers like Augustine, Anselm and Aquinas dominated theology. Agriculture and industry was powered by water or muscles. History was the unfolding of the Divine plan of God whose Providence in a static world brought fortune or misfortune, and whose Plenitude had endowed man with the resources of the natural world. The monastic movements of the Medieval millennium had improved life greatly and a rebirth of culture, the Renaissance, was opening men’s minds to the world around them. Nationalism and corruption weakened the power of the papacy, and Gutenberg’s press was prepared for the dissemination of ideas in written form. Such was the world of Luther and Calvin - whose Protestant reforms restored the Bible and its teaching of grace to the faithful. Sola Scriptura, Sola Fide. And the Reformation also laid the foundation on which the scientific revolution would be built.

Isaac Newton and the beginnings of Modern science

The universe underwent a remarkable change as Copernicus (d. 1543) who, though opposed by the church, placed the Sun at the center of the solar system, backed up by the astronomy of Tycho Brahe; Johannes Kepler’s (d. 1630) Three Laws of Planetary Motion; and Galileo’s (d. 1643) observations through his recently invented telescope. Francis Bacon (d. 1626) had introduced the empirical (scientific) method, But it was Isaac Newton that shook the world in 1687 at the age of 23 with his Three Laws of Mechanical Motion and the Law of Gravity - the sparks that ignited the Enlightenment. Gone were the Celestial Spheres, replaced by planets and moons and countless stars.



Everything was in motion and man’s reason could discern the laws behind nature. As Decartes and other philosophers applied their reason to all of life, science made discovery after discovery, Robert Boyle proposed the elements (1661), Robert Hooke invented the microscope.

The scientific revolution had a tremendous impact on the thinking of the human race. Though men like Kepler and Newton believed they were discovering the wonders and glory of God, and evidence of His existence in the order He had given to creation - Deism emerged from the Enlightenment.

Creation was too perfect, functioning through the natural laws being discovered by reason, God became the merely the one who kept the stars apart and repaired the world - a heavenly fix-it man, whose attributes were read off of the natural world. If we can reduce reality to its smallest parts and motions, we can know it (Reductionism) - all the phenomena of the universe can be reduced to simple, logical, mechanical laws.

Newton was a strongly religious man - but he did not like the concept of the Trinity, preferring a Arain and Unitarian conception. He took the Bible literally and devoted much of his life trying to develop an accurate chronology of it. Born into a world torn by religious wars, his father died three months before his birth, abandoned by his mother, raised Puritan simplicity, he sought after God’s distant controlling order in the world with the kind of detached inquiry that has characterized so many Modern scientists.

Charles Darwin and the theory of Evolution

The nineteenth century saw tremendous progress for the Western world. It was a world that had become millions of years older - vast, meaningless and mechanistic. Its secrets and powers were being harnessed. The Sciences took form. Physics empowered humanity. Steam engines (1782 - James Watt), oil and natural gas, then electric power created industrial and tremendous mobility - trains and eventually automobiles and planes. Micheal Faraday (1831) and James Clerk Maxwell (d. 1873) unlocked electromagnetism and light and the theories of wave motion. The Spectroscope was invented, a tool that unlocked the composition of the stars, and Doppler (1842) discovered the effect that determines their distance. The universe became boundless. Lamarck and Hutton (1830) asserting a Uniformitarian geology based on fossils and unlimited time and the ideas of Herbert Spenser - Charles Darwin brought forth his theory of Evolution in 1859. Another revolution shook the world, one that especially shook the religious world. Man and science had found a mechanism for a natural explanation for man, and for man's social progress in the world, based on unlimited time and chance and the uniformity of natural causes in a closed system. God was no longer needed. The scientific method was applied to the human sciences and evolutionary concepts were used to attack religion and the Bible as well.

The battle between the church and evolution has been fierce for over a century. Even many scientists have rejected or modified the theory - Christian Catastrophists (arguing for the Flood) try to restore God's role as the Creator and Sustainer of creation, and balance what is taught in public schools, as well as defend the integrity of the Bible and its teaching about origins. Uniformitarian geology has been discarded - Albert Wegener's (1912) theory of Continental drift is now clearly accepted as Plate Tectonics, the mechanism behind earth's movements and earthquakes (and which also sustains it as a living planet) the concept established by the mapping of the sea floors and the global "rings of fire" during the International Geophysical Year (1957). But the idea of evolution persists, and the antiquity of the Earth continues to be a point of contention as well.

Shaking Universes: the Nineteenth and Twentieth Centuries

The impacts of ideas on human life and society have been enormous.

"In the nineteenth century the savants of the mechanistic universe finally broke the bonds of medieval time, and the Beginning receded into the mists of a remote past. . . God's temple of the Newtonian universe collapsed, and all that had seemed of highest value lay crushed in the ruins, empty of cosmic meaning.

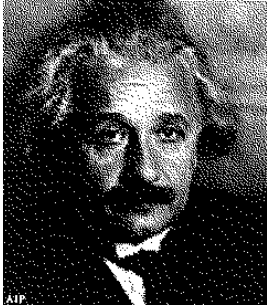
"World pictures became neurotic, even psychotic, and the consequences are apparent in the distress and pathological disorders of the twentieth century. . . the rise of a new and frightening universe. They rally to extremist groups, form iconoclastic movements against-this and down-with-that, revert to antiquarian religions, flock to political creeds that give cosmic significance to life, grieve in counterculture communities, or retreat into autistic worlds of secret knowledge.

It is hopeless trying to understand the nineteenth century with its fulmination's from pulpit and platform, without realizing that numerous persons were struggling to save their imperiled world pictures that gave meaning and purpose to life on Earth; nor can we hope to understand the furor of the scenes enacted in the present century unless we realize that many societies were struggling, and still are, to find new beliefs, often with dismal and tragic results." (Everett Harrison, Masks of the Universe, pp. 109-110.)

The scientific discoveries and revolutions of the twentieth century would make vast changes to man's conception of the universe and three concepts in particular radically altered his paradigms of thought. 1) The new cosmology beginning with the theory of Relativity which altered the concepts of time and space and revealed that the universe is expanding, perhaps from a "Big Bang" beginning; 2) the development of Quantum Physics; and the development of 3) Chaos Theory. The scientists who developed these concepts talk a great deal about "God" - and see themselves as trying to comprehend the mind of God, though their "Gods" are more in tune with paganism than the God of Christianity.

Albert Einstein and the theory of Relativity

Einstein, a profoundly simple man, has almost become an icon of twentieth century genius - his image a part of pop culture. His theories of Relativity in redrew the universe - the special theory in 1905, uniting energy and matter in the formula $E=MC^2$ in 1907, the general theory in 1915 transforming the concept of gravity from a force to a field and creating Spacetime - everything, the world seen in its four-dimensional totality - a concept of curved space and time affected by movement through space.



Einstein's intuitions created a universe he did not like. Relativity disrupted our concepts of time, and though Einstein did not like it, popular interpretation took it to mean there were no absolutes - the position and movement of observers is a critical factor - everything is judged relative to something else - what you think happened depends on your frame of reference - and so, relativity became relativism, not just in science, but in beliefs and morality as well. Einstein's studies in the photoelectric effect (which earned him his Nobel prize) gave birth to Quantum physics - the attempts to understand the meaning of the movements of things on the sub-atomic level, which Einstein saw as a threat to the cosmic order (he disliked the concept of chance - "God does not play dice".) He also rejected evidence the universe had might have changed over time - though it was predicted in his general theory.

Einstein spoke often about "God" the "Old One, the dear Lord" - who "*was manifested by the laws of nature; impersonal, sublime, beautiful, eternal, indifferent to human beings, but still important to them.*" His concept of God was filled with wonder and awe - but was not a personal God - he is often quoted for saying: "The most incomprehensible thing about the universe is that it is comprehensible."

Hubble, Hawkings and The "Big Bang" universe

In the 1920s, the universe was thought to be 200,000 light years across and consisted of the Milky Way Galaxy and a couple of smaller galaxies along side. Big Telescopes and other observational tools would soon make it much bigger. Edwin Hubble using the 100 inch Mt. Wilson Telescope began to resolve fuzzy patches of light into more galaxies. Using the Doppler effect, in 1929 it was found that they were receding from us, the farther away, the faster (which is Hubble's law or constant). The implications finally convinced even Einstein that he had blundered. The Universe was not static, it was expanding, stretching outward, uniformly in all directions. Hubble dated the age of the universe at two billion years. Two theories resulted - one that as an eternal universe expanded, matter was being created - a theory seemingly favored by many because it was far from the Genesis account. Fred Hoyle an advocate of this theory - referred to the other as the "Big Bang" theory in the 1950's - and the name stuck. By the 1960's Quasars had been discovered on the horizons - moving at 4/5 the speed of light, it became clear that we were looking at the past (light that had been traveling for billions of years) and the age of the universe became ten billion years. In 1965 the accidental discovery of the cosmic background radiation, the "echo" of the "Big Bang" convinced most scientists as to theory. By "tracking back" through the physical processes of this inflation (as opposed to an explosion of that "primal cosmic bit"), scientists are trying to explain the universes' origin and evolution in its present form, and predict its future.

One of the questions still to be answered is the question of the missing 90% of the matter of the universe which can't be seen, but is perceived by its gravitational effects. Perhaps this "dark matter" is contained in Singularities or "Black holes" - super massive objects from which light can not escape, and at whose event horizons time itself stops.



One of the scientists who has contributed much to understanding these is Stephen Hawkings, though stricken with Lou Gerig's disease, confined to a wheel chair and communicating through a computer operated by two fingers - his mind is brilliantly sharp. A PBS Show featured him in Stephen Hawkings Universe. His work with Singularities has reshaped concepts of spacetime - and beginnings. Once the big bang primal universe has been shrunk down to a particular point it becomes a "singularity" there is a barrier that science cannot penetrate. The universe has ceased to have an edge, and without time, a beginning, The universe is becoming very hard to comprehend. He says "We cannot

help wondering why the universe goes to all the bother of existing.” Hawking talks of knowing the mind of God, but sneers at the concept of seeing God as cause or explanation. Married to a devout Christian upon whom he was very dependent, their 25 year marriage ended in divorce in part due to “religious differences”.

Quantum Physics

Quanta (named by Max Planck) are the jumps particles make that make up the atom. Quantum Mechanics has been successful and transformed our world - giving us modern electronic technology - Televisions, computers, lasers, nuclear power and bombs. It was long thought that Atoms were the basic building blocks of all things, but sub-atomic particles were discovered in the 20s. Pioneered by Werner Heisenberg and Neils Bohr - they were shocked to discover that these particles are not predictable in their behaviors - and that they behave sometimes like particles and sometimes like waves. Beyond this, you can know either its location or its momentum, but not both. Quantum theory eliminated the Newtonian dream of a controllable measurement process. Quantum physics deals with probabilities and paradoxes. It introduces randomness and chance to physics. Inside the atom is a seething turbulence of possibility. Quantum Physics has been applied to “Big Bang” cosmology. But until the four forces in the universe are understood - the strong and weak nuclear forces, electromagnetism and gravity - and somehow unified there remains a point beyond which is only speculation. The particle accelerators, super-colliders and gravity wave detectors are being built at tremendous cost in search of these mysteries.



Quantum mechanics has affected the paradigms of modern thought and influenced its relativism. Bohr said that if a person can think about Quantum Physics without getting dizzy, it shows he hasn't understood anything about it. The randomness of the sub-atomic world is reflected in the meaninglessness of the man - himself a tiny bit, in a colossal universe. There are those who speculate that the physical laws of our universe came into existence during the process of the “Big Bang”. They further speculate that those laws could have taken a different form resulting in a far different universe. Some ponder a string of universes as it expands and collapses back - taking many forms; or that beyond our universe is a universe of universes. Where is God? Is he outside or contained within the Universe's “box”? Has God “monkeyed” with the physics to make the universe as it is balanced exactly for life to exist, and us as we are. The Anthropic Principle suggests that the universe was designed to favor life, and the development of conscious observers.

Ilya Prigogine and Chaos Theory

The third concept that has changed man's thinking is the concept of Chaos Theory. Moving beyond the probabilities of Quantum, it looks at complex phenomena holistically rather than in their parts. It applies to understanding the weather, fractals, the unpredictable things of life. Things so complicated that perhaps a butterfly's wings might change the weather on the other side of the globe. Chaos gives time a creative role. The second law of thermodynamics says that in converting energy to work, some is lost and wasted. Order moves towards disorder. But Chaos Theory suggests our universe is moving from simplicity to complexity. The Russian chemist Ilya Prigogine suggests our world is being shaped by the breakdown of equilibrium, and the development of complexity that it is in the process of becoming. We can expect novelty in this “world of ragged edges.” Change. A non-linear movement through time. In the interplay of order and disorder, on a computer screen whether looking a fractal, or the forms of nature - patterns and shapes and order emerge from seeming disorder. Each time the program is run, it turns out differently because of minute changes and elements of randomness. Variety like we see through the universe. Certainly a different world than the deterministic one of Newton. Does God play dice with creation? Is disorder and violence a part of the whole? Is this the God who spoke to Job out of the whirlwind? Is the universe like a scroll slowly unrolling.



“Ilya Prigogine was asked what role for God there was in his picture of an irreversible universe. On one hand, he suggested, it could lead to a new pantheism. It could suggest that divinity is immanent in the creative processes of the universe. On the other hand, he saw an even greater need for some transcendent dimension. God is not needed to intervene and produce creativity out of the system. . . . the universe is structured in such a way that it will spontaneously produce its own astonishing novelties. Time is essential to the creativity of the universe.” (Soul, Angela Tilby, p. 194)

The state of creation in the new age

So how does the Christian respond to these conceptions of the universe? At the time of the Westminster Confession of Faith (1640s) the universe was the geo-centric and anthro-centric universe of the reformers. It was created out of nothing in the space of six days by an infinite personal God and all very good. Sustained by His providence, it was open to His intervention - a concern that extended to sparrows as well as the cosmic. Man created in God's image had a role in creation - of understanding its meanings and giving it names, and of fellowship with and giving glory to God. The Bible reveals a God whose power and attributes are seen in creation (Rom 1), but Who also hides Himself (Isa 55). Nevertheless He is always in control and history is an unrolling of His plans.

But conceptions of the universe have undergone tremendous changes since then. The Newtonian universe discovered the laws He built into creation, and initially gave Him the glory, but soon set off on the Enlightenment experiment to take control of creation and use it for man's glory. The Deistic universe forgot Him - lost in an eternal and static universe millions of years old geologically, populated with the products of evolution - infinite time plus chance. The universe of the twentieth century changed again - now vastly larger - first two Billion - now fifteen Billion light years - a measure of both distance and time; and a sub-atomic world vastly smaller and even more difficult to comprehend. The universe no longer static or eternal but a place of wonders, power, change - with a beginning and an end, within the finite limits of spacetime. No wonder mankind feels so alone in the universe, and many have grasped for the flotsam of past mythologies and new age pseudo-scientific speculations to keep humanity afloat in an ocean of chaos and cosmic angst. Some look for UFO's or aliens to make Contact and deliver us from ourselves.

Christianity has had a hard struggle with the Darwinian universe - a battle over time and process - six days vs. eons, catastrophe and miracle vs natural process, revelation vs. reason, an ongoing battle that for some has become a jousting with windmills, for the universes of Relativity and the Big Bang and Quantum has brought new challenges to mind and doctrine. Liberal Christianity has made some attempts to cope - Paul Tillich and Bishop Robinson, for example. Many have grasped the “Big Bang” as proof of creation. And see scientific search for the “Mind of God” as an opening to truth, even though their conceptions tend more towards the god of the stoics or the gods of Hinduism. The “Pagan Broadcasting System” (PBS) spreads the new universe's new story in programs like NOVA, Carl Sagan's COSMOS or Stephen Hawking's UNIVERSE; the images and concepts of the new cosmology are understood by the common man. Postmodernism in some ways an ally - attacking rationalism - is also a foe - a progenitor of new age cults and pagan conceptions of God in a realm shaped by Quantum mystics and Chaotic process.

A big Universe and a Bigger God

Christianity needs to come to grips with this new cosmology. Many scientists are sincere in their search for understanding and their methodologies, though perhaps flawed and biased, have opened to us a vast reality. The “box” of finite creation is so big! No wonder the tendency is to put God within it - in contrast to the Christian conception of the eternal omnipotent God. But for many Christians - their conceptions of God too have been too small - reducing him to a judgmental old man, whose purpose for existence seems only to be to make them behave and be happy. How true the Biblical descriptions of God beyond human comprehension.

The new cosmology has made even time a creature - something Augustine realized in the Medieval world. Even those scientists biased against creation - wonder at the apparent design and purpose of a universe seemingly made for self-conscious life, the “miracles” that created the laws of physics in the “Big Bang” with just the right ingredients and constants for a universe to form with us in it. The new cosmology reveals a universe with a mighty and powerful forces actively at work, and many mysteries, yet to be solved.

Quantum physics has shattered the sense of orderliness in the universe - presenting a randomness that seems opposed to the concept of Divine providence and the role of God in the universe. Yet mysterious though it is, it works. The world of Quanta is also the world of Newton - and somehow - can it be in the mind of God ? - the two fit together.

Chaos Theory explores the worlds of order and disorder, of complexity and change and process, of things like the weather too complicated for us to order or control. Yet the Bible attributes to God the rain that falls and the seasons that bring forth harvest. If there are elements of unpredictability and hidden patterns in creation that sometimes emerge. Must God too be reduced to becoming along with His creation? That God delights in diversity and creativity can be seen from it. Is God just feeling His way along, or is the disorder a part of His overall plan? With Chaos theory there is no turning back - time marches on.

As a Christian, I wrestle with these things. I believe that God's "book" of creation and His book of revelation are in perfect agreement. Mankind, hampered both by finiteness and sin, is having great difficulty reconciling the two. I feel that God has not lied to us in creation, though He hides Himself well. Dinosaur bones and age old stones; the vastness of space filled with its wonders are not illusions, but neither is God's grace or His son. It may be hard for me to reconcile the words Genesis and the echoes of God's word of "Let there Be..." in the fossils and stones of the Rockies and the light of fuzzy galaxies in a backyard telescope, but I do not feel threatened. If God is big enough for the universe, and at the same time in control of the minute quarks and "sparks" of the atom - He certainly can be the right size to relate to me as a personal God. If God made me in His image to acknowledge His glories, I should not close my eyes to His creation. The scientists of the new cosmology see "God" - though in their lack of trust - not the God of the Bible and ponder his wonders. I too see God, not perfectly, but by faith at work in His creation, and I too see His Glory. Like Job, I have to acknowledge he is God, and there are many things I do not understand about Him. But I know He made me to know Him both through His word of creation, his word of revelation and most importantly his Word incarnation.

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