

THEOLOGY IN A DYNAMIC UNIVERSE

by *Arnold Benz*

Abstract. According to recent astrophysical evidence, the present universe has been forming for the past 14 billion years. New kinds of objects have emerged even recently. The reverse side of this creativity is the observed and predicted decay of all objects. Will new structures form in the future? This is a question of hope, which is not a scientific term but originates from experience on the level of personal and religious perceptions requiring participation. Anticipating the future, science and theology of creation meet, and the tension between practical knowledge and visionary hope enters a constructive dialogue.

Keywords: astrophysics; creation; evolution of the universe; future; hope; pattern recognition; religious perception; science and religion; star formation; worldview.

The worldview of science has changed several times in the course of the twentieth century. In the first half, the hypothesis prevailed that the universe has existed since infinite time, without beginning and end. Later observations suggested a view in which the cosmos formed a few billion years ago. Toward the end of the century it was becoming more and more evident that both views are wrong. No object in the present universe formed in the Big Bang. For example, the Sun's age is only one-third that of the current universe, and human consciousness has existed for only a few hundred thousand years. The conditions for the formation of structures such as atoms, galaxies, and living beings emerged only in the course of time. The cosmos appeared not as in a theater where the curtain rises, the stage is set, and the play begins; in the modern view the universe materialized much more dramatically, as if in the beginning there was only a glowing

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magma that solidified to stone from which a building was made. Therein a workshop for stage constructions and an actors' school formed, a stage and auditorium were built, everything collapsed, was rebuilt, and so on—and finally our play started.

NEW STARS FORM TODAY

In our Milky Way, a regular galaxy of a few hundred billion stars, some hundred million stars are forming today. The formation of a star takes roughly ten million years. Thus, about ten new stars are born every year in our astronomical neighborhood. The cosmos overflows with fertility.

Stars evolve from interstellar molecular clouds, well known for their beautiful, fluffy, dark structures. In places where the gas is denser, gravity attracts more gas. The fluctuation gets even denser and attracts more, so the process reinforces itself. Interstellar matter gradually concentrates in this way into cloud cores until these collapse under their own gravity. The gas then falls freely toward the center of the core where the remaining angular momentum forms it into a rotating disk.

After ten million years the temperature and density in the center become great enough to start the fusion of hydrogen to helium. Nuclear energy of stupendous proportions is unleashed, and the additional gas pressure stops further contraction. In the innermost part of the vortex an equilibrium is formed between gravity and pressure: the star is born.

Star formation is an example of how heavenly bodies are created even today. However, the capacity of formation has a reverse side: decay and death. When their energy is exhausted, stars shrink to white dwarf stars or explode as supernovae and heave a part of their matter and ashes into interplanetary space. There, new stars form again. It is not an eternal cycle but an evolutionary step. Completely new structures such as planets, asteroids, and comets may emerge from the cinders of previous star generations (for a review, see Benz 2000).

When we look up at the starry sky on a clear night and believe that at least the stars are the same as always, this impression arises from the fact that our time scale is too small. In reality, the universe displays amazing dynamics; the origin of stars and the formation of planets represent only a segment of processes that build upon earlier cosmic developments, such as the formation of matter out of elementary particles in the early universe or the origin of galaxies. Qualitative development is a fundamental characteristic of the cosmos, and time plays a crucial role.

THE BASIS OF FORMATION

Is a creator involved in this dynamic creativity? For more than two hundred years, scientists (such as P. S. Laplace in the eighteenth century) pointed out again and again that this hypothesis is not needed (see Dewhirst and

Hoskin 1999). Obviously, much remains unexplained scientifically, yet there are already models of how even the universe may have formed from a vacuum according to physical laws. In this sense, there are no gaps in understanding the development of the universe from the Big Bang to the evolution of human beings that could be interpreted only as the action of a supernatural being. Existing gaps are the working fields of scientists, who have the great goal to diminish and close them.

Yet at least one essential question remains: Why did something form and not nothing? The question addresses the fundamental issue concerning the basis for the laws of nature. That things have formed is indisputable, and considerations similar to those of Greek philosophers in the fifth century B.C. on the Basis of Being are appropriate. Its modern analogue in a dynamic universe would be the "Basis of Formation." Appealing here to God's creative will, however, may introduce a mere metaphysical entity without direct relation to science or to the questioner.

PARTICIPATING PERCEPTIONS

The biblical notion of God does not originate from philosophical or scientific reflections. It is based on experiences and perceptions that differ fundamentally from those of science: the mystical vision of a burning bush, the safeguarding during the escape from Egypt, appearances on a mountain top and after the death of Jesus, and the everyday experiences of Jesus' disciples.

Scientific measurements and observations must be reproducible and objective. The researcher is exchangeable and the result independent. In religious perceptions, however, a human being is always strongly involved. I would not say that such participating perceptions are purely subjective, as they usually refer to an object. More important, they change many people's lives in visible and often very positive ways. If "reality" denotes what has a lasting effect in real life, these perceptions testify to the experienced reality. A person directly takes part in the process of perception. In fact, the human being is the proper observing instrument. Thus, the observer is not interchangeable, a situation similar to art where experiences similarly require participation of the individual but are universally human. A participating perception may be metaphorically described as a resonance phenomenon between object and observer.

It follows that the seminal perceptions, the very starting points of science and religion, are fundamentally different. The two fields of experience consequently span two different planes of methodology and language. Misunderstanding and false expectations in the present discourse between science and theology result when the two planes of perception are not clearly separated. It is not just the difference of language games that separates the two (as, for example, in Atkins 1981; Tipler 1998). Difference of origin is the reason why science will never find God or be able to deny

God's existence. It is as hopeless to find a compelling trace of God in scientific results as to find a palm tree in a Canadian forest. It is the wrong place to search. There is no direct path from scientific measurements to religious experience.

The path can only be indirect and through the human consciousness. For example, the apparent fine tuning of the universe to the benefit of evolution is certainly amazing. If a person believes in God based on other experiences, he or she can apprehend in cosmic evolution the work of God. Only then does the Basis of Formation become what is meant by the biblical concept of God. Without participating perceptions it remains an abstract principle.

NEXUS OF FUTURE

The continuous unfolding of the universe may be interpreted in religious terms as a continuous creation. This may sound rather innocuous, but it changes significantly the worldview concerning the present and the future. The dialogue of science and faith should therefore not be confined to the past but should include reflection on the future, which, aspired to or feared, inevitably penetrates into the present and into human existence.

On the side of science, predictions concerning the exhaustion of an energy supply are very reliable. The remaining lifetime of the Sun, some 6 billion years, is well known. Its decay is certain. For systems with many interacting parts, like the planetary system and terrestrial weather, the future is uncertain. Their development is unpredictable after a certain time. Such systems develop nonlinearly and are called chaotic. There is an intriguing asymmetry between the decay of all objects in the universe, which we can predict quite accurately, and chaotic systems that cannot be predicted and that even may form new structures. In the long range, astrophysics can predict only decay. The new cannot be foreseen, although it can never be excluded. There is no scientifically provable hope (Moltmann 1967).

On the religious side, hope is a central element. Here there is hope despite decay, even despite reason, and ultimately hope in the face of death. The basis of hope is not a part of this world. Science and religion have different perspectives, and here some tension becomes apparent.

ANTICIPATIONS

Faced with the two counterstreaming developments of decay and unpredictable formation, the human consciousness seeks to recognize a pattern. Regarding the future, we search for and select the "signs of the times." Pattern recognition is a basic means of human apprehension, distinct from pure measurement but common to both science and religion. Pattern recognition means that we interpret facts and construct their meaning. Con-

struction is necessary if a phenomenon cannot be partitioned into elements having mathematical relations. Two steps are required (Duda and Hart 2001): First, out of countless perceptions and experiences, human reason selects facts that are considered relevant. This selection may occur unconsciously, without reflection, or even by a computer. The second step in construction is association with a fitting pattern. Patterns are derived from previous perceptions and experiences constituting mental prototypes. A pattern is recognized by its similarity with the new situation if the probe and the example agree within a certain margin. Errors can occur when a pattern is not recognized or a pattern is erroneously thought to fit. The two-step interpretation by selection and pattern recognition constitutes a successful method for solving certain problems and has important applications in technology, such as robotics (Tveter 1998).

The way we anticipate the future depends on how we interpret the present. There is a choice of various patterns: It is getting better; it remains as it has ever been; it gets worse and worse; or something new will appear. The fourth pattern is central for Christian hope, where the events of Good Friday and Easter are the archetypal pattern. The four patterns are exclusive. Independent interpretations of the same present may thus contradict one other. Only later experiences will confirm or refute an interpretation.

Interpreting the present is important, as the future may require preparation, initiative, or defense. Human beings are masters of interpretation, very likely because reliable pattern recognition was a selective advantage in the evolution of hominids. Those who interpreted well had more chances to survive and to have descendents. The future punishes those who interpret wrongly.

The tension between science and religion concerning the anticipation of the future cannot be fully harmonized and must remain as it is—the tension between practical knowledge and visionary hope. This tension is within ourselves, not between fields of inquiry. It is an important part of reality and of our life.

DIALOGUE

The two planes come into constructive contact when a pattern of one plane serves as an image in the other. This comes about when a religious experience is expressed by a metaphor (Greek: *metapherein*, “transfer”) from science. A metaphor transfers a well-known pattern (e.g., the formation of a new structure) into the other plane of perception and concepts. The notion of hope could thus be communicated by the following metaphor: “Despite decay and death, something new will arise out of this existence, just as our planet formed from cosmic dust, the ashes of former stars.” Note that the hope expressed here cannot be deduced from the physics of

planet formation but must originate in the plane of religious perceptions, where this boundless confidence is experienced.

Hope for the “wholly other new” is one of several patterns for the interpretation of the signs of the times. If we live with this pattern, the past development of the universe may become a metaphor for the future of our existence. By interpreting scientific results with this pattern, we evaluate them based on other, additional experiences. The scientific facts then appear in another perspective and in a different light: The universe is revealed as a continuous creation, and, most of all, there is hope for new creation in the future.

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