Summary of course C.8-7: Special Ontology (Cosmology),

General

The Cosmology course examines theoretical physics and astrophysics from a philosophical and ontological perspective, analyzing the universe as a dynamic, ordered and evolving system.

Between the direct sensory perception of the world we inhabit and cosmic reality, there is always an abstract theoretical model that reduces reality to mathematical structural formulas and indirect measurements.

Natural science rests on three fundamental pillars - matter, energy and information - and describes the origin of the universe through Georges Lemaître's hot Big Bang theory, supported by the observation that the universe is expanding and by the discovery of cosmic background radiation.

The course highlights how the evolution of the cosmos moves from primitive chaos towards highly organized complexity and discusses the anthropic principle, which places human beings as observers at the center.

Finally, the text examines the limits of scientific scientism and uses historical pioneers such as Johannes Kepler to show how exact natural science, mathematical harmony and metaphysical transcendence can responsibly coexist.

Summary

1: Method, Models and the Three Fundamental Concepts of Physics

Physical cosmology approaches the universe not through direct sensory observation, but through indirect observation. Between the naked eye and microscopic or astronomical reality, there is always a theoretical model that reduces the sensory world we inhabit to objectified, abstract mathematical relationships. A typical example is X-ray crystallography: the lattice spacings of a crystal are not directly 'seen', but are converted into a visual model through computer calculations and the diffraction of radiation.

Contemporary physics rests on three central fundamental concepts that form the pillars of material reality:

- *Atomism:* The spatial, material component of nature, composed of molecules, atoms and subatomic particles such as electrons and quarks.
- *Energy (Energetics):* The force-related aspect of nature that characterizes systems and makes it possible to change the states of other systems (such as mechanical, electromagnetic or nuclear energy).
- *Information (Information Theory): The* structuring and organizing code present in both inanimate and living matter (such as the genetic code in DNA), which is processed by the human mind or by equipment.

In theoretical physics, researchers strive to develop unified theories that bring the fundamental forces of nature - gravity, the electromagnetic force, and the strong and weak nuclear forces - together within a single overarching mathematical framework.

2: The Hot Big Bang and the Evolution of the Universe

Whereas cosmology was formerly mainly a branch of philosophical metaphysics, it was transformed in the twentieth century into an empirical and theoretical astrophysics. The work of the Belgian priest and astronomer Georges Lemaître was crucial in this development. On the basis of Einstein's theory of relativity, he demonstrated that the universe is not static, but originated from a condensed 'primeval atom' that began expanding through a Big Bang.

The Big Bang theory was confirmed step by step by two decisive observations:

- *The redshift* of galaxies: Edwin Hubble discovered that distant galaxies display a light spectrum shifted towards the red end (the Doppler effect), demonstrating that the spatial distances between galaxies are continually increasing.
- *Cosmic background radiation:* Penzias and Wilson discovered ubiquitous fossil radiation from a 'blackbody' with a temperature of approximately 2.7 Kelvin. This radiation demonstrates that, in its earliest stages, the cosmos had an extremely high density and temperature, transforming the hypothesis into the hot Big Bang theory.

The evolution of the universe continues through nucleosynthesis: as it gradually cooled, the original chaotic particle soup transformed into increasingly organized forms of matter, from elementary particles to atoms, molecules, stars, planets and ultimately living organisms. Current developments such as string theory attempt to reduce these particles to extremely small vibrating strings in order to reconcile gravity with quantum mechanics.

3: Systems Thinking, Materialisms and the Anthropic Principle

The insights of physics have major implications for philosophical views of humanity and the world. Classical, reductive materialism (physicalism) reduced all of reality to dead, mechanical matter.

Modern philosophical approaches, however, distinguish between 'rich matter' and emergentism: the idea that new qualities, such as life, consciousness and culture, emerge from evolving matter without being reducible simply to purely mechanical particles.

In addition, rigid mechanism gave way to systems thinking, developed in part by Ludwig von Bertalanffy. Rather than speaking of a purely accidental interplay of atoms, modern cosmology views the universe as a dynamic network of organized complexity.

A clear distinction is made here between microscopic laws governing individual particles and macroscopic cooperative effects that arise when billions of particles together form an ordered pattern.

The Anthropic Principle plays a prominent role in this evolutionary cosmology. It states that the laws of nature and the physical constants of the universe are so precisely fine-tuned that the existence of human beings as intelligent observers and interpreters has been made possible.

While proponents of scientism regard this as a blind boundary condition, philosophical and theological interpreters see it as an indication that the cosmos is purposefully attuned to consciousness.

4: Transcendence, Criticism of Scientism and Kepler's Pythagorean Legacy

Finally, the course examines the relationship between natural science and transcendence (that which goes beyond observable matter). Scientism dogmatically claims that natural science is the only source of valid knowledge and that the universe constitutes a closed, self-organizing material system. However, scientism exceeds its own methodological limits when it makes claims about the non-existence of God, the human soul or values.

The course emphasizes that natural science and religious belief in creation need not conflict, provided their methodological domains remain clearly separated. The cryobiologist and priest Basile Luyet, for example, adopted the maxim: "Truth does not contradict truth." Natural science describes physical mechanisms (how things work), while theology and philosophy ask about meaning and ultimate grounds (why things exist).

Historically, this harmony is illustrated through the astronomer Johannes Kepler. Kepler was not only a pioneer of exact natural science who calculated

elliptical planetary orbits, but also a deeply mystical thinker in the Pythagorean-Platonic tradition. For Kepler, the solar system was the mathematical and musical expression of the 'harmony of the spheres' — a divine idea that the human mind can decipher through exact mathematical calculations and empirical observations.